

Congestion Mitigation and Air Quality Program
2004 Annual Report

August 17, 2005

Background

The purpose of the Congestion Mitigation and Air Quality Improvement Program (CMAQ) is to reduce vehicle related pollution that plays a major role in the deterioration of air quality in urban areas. The Federal Clean Air Act sets National Ambient Air Quality Standards (NAAQS) for pollutants. Transportation sources are significant for three of the NAAQS pollutants that include carbon monoxide (CO), ozone, and particulate matter – 10 microns or less (PM-10).

Congress established the CMAQ program in ISTEA and continued it in TEA-21 to provide extra funding to help reduce CO, ozone, and PM-10 in areas designated as non-attainment and maintenance under the Clean Air Act. In Colorado, the non-attainment / maintenance areas are the Denver, Fort Collins, and Colorado Springs urban areas, as well as, five rural areas: Aspen / Pitkin County, Canon City, Pagosa Springs, Steamboat Springs / Routt County, and Telluride / Mountain Village. The Transportation Commission has delegated project selection to the local level.

CMAQ Projects are typically strategies that reduce pollutants emitted by motor vehicles. The funds primarily support new facilities, equipment, and services that reduce transportation related emissions.

Following is summary of CMAQ project categories and activities (a complete list is found in Appendix C):

- **Construction** – HOV Lanes, Park and Rides
- **ITS / Signals** – Intelligent Transportation Systems, Traffic Signal Coordination
- **TDM and Shared Ride** – Travel Demand Management, Carpools, Marketing
- **Transit** – New, Expanded, or Express Transit Service
- **PM-10** – Paving (unpaved roads), Sweeping, Deicing

In 2000, the Colorado Transportation Commission expressed concern about the effectiveness of the CMAQ program in improving air quality and adopted a resolution (TC-807) to increase accountability for the CMAQ funds. In 2002, as part of the CMAQ 2001 Annual Report, the MPOs made recommendations for improving the CMAQ benefit reporting system. Following is a summary of those recommendations and how the group is responding to them:

CDOT, MPOs, and Feds establish goals for the program and work together to determine most effective way to calculate project benefits

- Efforts to calculate a cost effectiveness measure that will account for long-term benefits of capital improvements and construction projects are ongoing.

CDOT and MPOs should develop standards for monitoring project effectiveness during multi-year implementation

- The CMAQ Reporter has been refined to account of long-term benefits over a number of years.

Continue policy for formula distribution of CMAQ funds and clearly explain available funds

- Commission has continued to following existing formula of 50 percent VMT and 50 percent population, after a \$1 million of-the-top allocation to the five CMAQ eligible rural areas.

Continue to allow each MPO to establish its own selection criteria and selection process

- Commission has continued to follow existing policy for MPOs with CDOT input to select projects while emphasizing the need for the most efficient use of the CMAQ funds.

The CMAQ Reporter tracks measurable emission reduction results and allows CMAQ recipients to use standardized formulas to calculate emission reductions and report obligated funds. As a result of the above recommendations the CMAQ reporter has been refined to provide reporting consistency.

Funding

In 2004, \$25 million was available for the CMAQ program statewide. According to resolution TC-807, the funds are shared between the MPOs based on a formula of 50 percent vehicle miles traveled (VMT) and 50 percent population, with an off-the-top \$1 million split among the five rural areas.

As shown in Figure 1, 76 percent or \$18.2 million was allocated to Denver Regional Council of Governments (DRCOG), 18 percent or \$4.3 million and 5 percent or \$1.2M were allocated to Pikes Peak Area Council of Governments (PPACG) and North Front Range (NFR) MPO respectively. Rural areas, Aspen/Pitkin County, Canon City, Pagosa Springs, Steamboat Springs/Routt County, and Telluride/Mountain Village, each received a \$200,000 allocation.

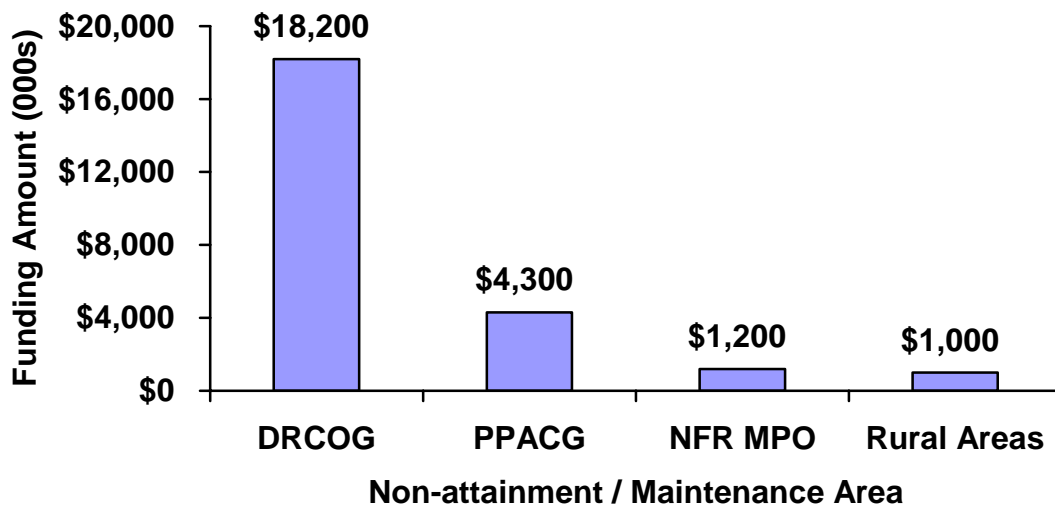


Figure 1 – FY 2004 Allocated Funds by Non-attainment / Maintenance Area

Projects

Overall, 52 percent of the available funds were obligated for transit improvements. The Intelligent Transportation System (ITS) and signal projects were obligated at 30 percent and Transportation Demand Management (TDM) was obligated at 13 percent. The PM-10 and construction projects received 4 percent and 1 percent respectively. Slightly more funds were obligated in 2004 because of additional funds available from previous years.

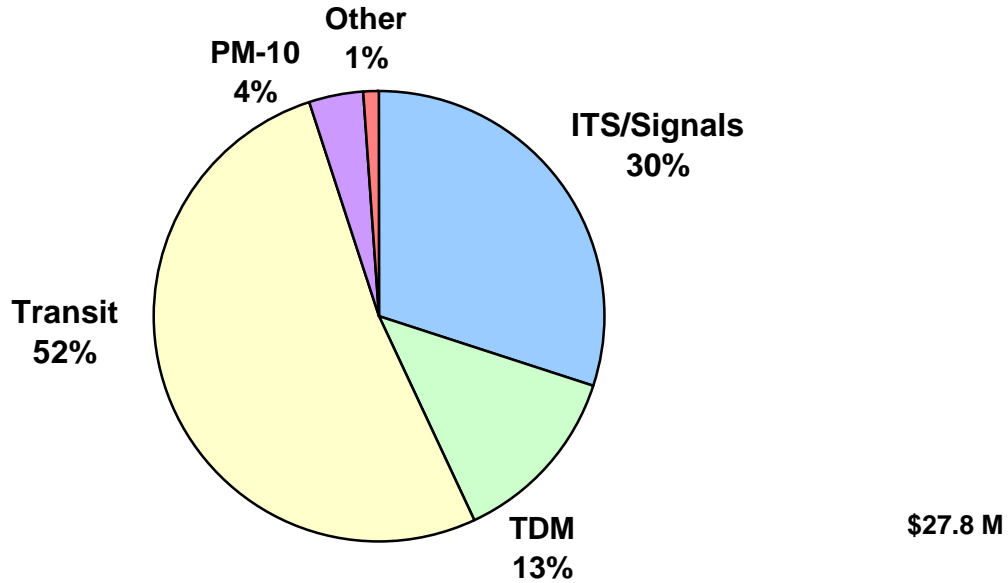


Figure 2 – FY 2004 Obligated Funds by Improvement Type

The following sections detail how each area distributed the available CMAQ funds according to obligations during fiscal year 2004. Figure 2 shows the statewide funds obligated by project type. Figure 3 further illustrates how the MPOs obligated their 2004 CMAQ funds. Note that the amount obligated may be higher or lower than amount allocated in Figure.1. This difference can be due to project readiness, budgeting timelines, or the availability of funds from previous years.

Metropolitan Area Projects

In 2004, DRCOG obligated 64 percent of the available CMAQ funds on transit, 23 percent on Intelligent Transportation System and signal projects, and 12 percent on Transportation Demand Management (including shared ride projects). The remaining funds were used on PM-10 projects such as purchasing sweepers.

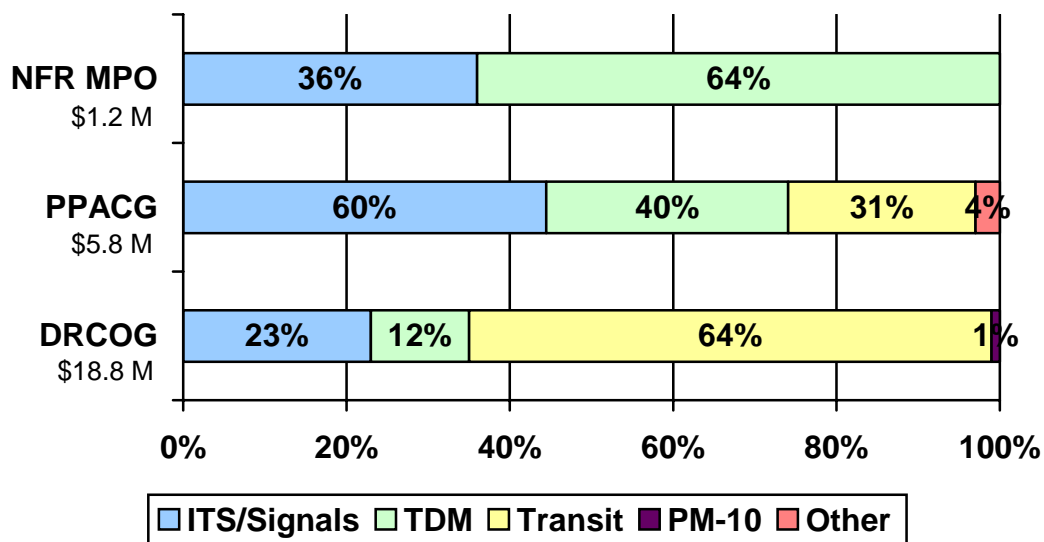


Figure 3 – FY 2004 Obligated by Project Type – DRCOG, PPACG, and NFR MPO

In 2004, PPACG distributed 60 percent of the available CMAQ funds for Intelligent Transportation System and signal projects, 31 percent toward transit, and the small remainder on construction and Transportation Demand Management projects.

In 2004, the NFR MPO used 36 percent of the available funds toward ITS/signals while 64 percent went toward Transportation Demand Management.

Rural Area Projects

CMAQ eligible rural areas can spend money on various PM-10 reduction projects. These include deicing (purchase of a truck, tank, and liquid), sweeping, and paving. In 2004, rural areas used CMAQ funds to pave soft surface roads, purchase deicer, and purchase a flush truck to wash away sand from paved streets. Sweeping efforts with equipment purchased in previous years are ongoing and are accumulating addition emission reductions.

Accomplishments

No violations of the Ozone, CO, or PM-10 standards occurred in 2004. The tables on page 11 list emission levels as compared with Federal standards for the eight air quality non-attainment / maintenance areas across the state.

The following pollutants are the focus of the emission reduction in the CMAQ program:

- **CO / Carbon Monoxide** – caused by incomplete fuel combustion in motor vehicles and is an issue in winter
- **NOx / Nitrogen Oxides** – contributes to ozone formation in summer and PM-10 in winter
- **VOC / Volatile Organic Compounds** – caused by fuel leakage; contributes to ozone formation in summer
- **PM-10 / Particulate Matter (10 microns or more)** – road dust; contributes to visibility problems in winter

Review of 2003 Benefits

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2003 Results

Non-attainment / Maintenance Area	CO	NOx	VOC	PM
Aspen / Pitkin County	-	-	-	3
Canon City	-	-	-	10
Colorado Springs (PPACG)	3,633	-	-	-
Denver (DRCOG)	3,544	34	170	736
Fort Collins (NFR MPO)	178	-	-	-
Pagosa Springs	-	-	-	86
Steamboat Springs / Routt County	-	-	-	284
Telluride / Mountain Village	-	-	-	1
2003 TOTAL	7,355	34	170	1,120

Source: 2003 CMAQ Reports from Project Sponsors
 Note: Emission reduction expressed in 1000 kilograms per year

2004 Results without Future Benefits

DRAFT AUGUST 5, 2005

2004 Results

numbers without future benefits

Non-attainment / Maintenance Area	CO	NOx	VOC	PM
Aspen / Pitkin County	-	-	-	results pending
Canon City	-	-	-	26
Colorado Springs (PPACG)	581	-	-	-
Denver (DRCOG)	1,590	47	44	1
Fort Collins (NFR MPO)	1,116	-	-	-
Pagosa Springs	-	-	-	65
Steamboat Springs / Routt County	-	-	-	0
Telluride / Mountain Village	-	-	-	639
2003 TOTAL	3,287	47	44	730

Source: 2004 CMAQ Reports from Project Sponsors
Note: Emission reduction expressed in 1000 kilograms per year

2004 Results with Future Benefits

As mentioned in the previous annual report, CMAQ efforts that involve capital projects have benefits that extend well passed the first year of operation. These long term benefits must be captured to develop a cost benefit calculation that gives equal credit to both short and long term projects. A typical lifespan for these long term projects is as follows:

- Signal Timing / ITS Improvements – 5 years
- Paving Soft Surface Roads – 10 years
- Transit Stations – 20 years

The following table shows the projects from 2004 with the associated long term benefits. Benefits are reported when the funds are obligated. For example, in the Pikes Peak Area, El Paso County installed video detection to reduce the amount time cars spend waiting at signals. This project was obligated in 2004. Above, only benefits that occurred during 2004 are shown, however, it is assumed that this one year effort will reduce emissions over a period of five years. The table below accounts for the benefits for all five years (2004 – 2008).

2004 Results

numbers include future benefits

Non-attainment / Maintenance Area	CO	NOx	VOC	PM
Aspen / Pitkin County	-	-	-	results pending
Canon City	-	-	-	181
Colorado Springs (PPACG)	14,835	-	-	-
Denver (DRCOG)	29,035	1,730	1,896	3
Fort Collins (NFR MPO)	1,634	-	-	-
Pagosa Springs	-	-	-	644
Steamboat Springs / Routt County	-	-	-	0
Telluride / Mountain Village	-	-	-	6388
2004 TOTAL	45,504	1,730	1,896	7,216

Source: 2004 CMAQ Reports from Project Sponsors

Note: Emission reduction expressed in 1000 kilograms per year

Appendix A - 2004 Emission Reduction

The following table list the annual emission reductions provided by projects obligated during 2004.

Denver Regional Council of Governments

Projects Project (Obligated Amount) Project Code	2004 Benefits	2004 Funding
<p>Boulder Intermodal Center (\$2,425,000) 14358* Regional activity center to support developing rapid transit system, serve as a terminus for US-36 rapid transit service, connects to high-frequency local transit, and bicycle and pedestrian systems.</p>	<p>50,189,680 miles 1,073,658 kg CO 80,149 kg VOC 86,969 kg NOx 2,344 kg PM-10 – future benefits (2007 – 2026)</p>	<p>Programmed \$7,850k Budgeted \$2,052k Obligated \$2,425k Expended \$197k</p>
<p>Union Station - Part III (\$9,273,000) FTA Purchase of Union Station to serve as a central hub for the regional transit system.</p> <p>The amount transferred to FTA is a portion of the total of this multi year project. Only the benefits attributable to the 2004 obligated funds (approx 33% of the total) are listed at right.</p>	<p>1,048M miles 22.21M kg CO 1.65M kg VOC 1.81M kg VOC – future benefits (2015-2034)</p>	<p>Transferred to FTA \$9,273k</p>
<p>Englewood Shuttle Bus Service (\$330,000) FTA New bus service connecting Englewood LRT station, downtown Englewood, and the Swedish/Craig Medical Complex.</p>	<p>71,760 miles 1,827 kg CO 146 kg VOC 135 kg NOx</p>	<p>Transferred to FTA \$330k</p>
<p>Regional Traffic Signal System Improvement (\$4,428,000) 14494, 14674, 14675, 14676, 14685, 14686, 14792 Implement cost-effective traffic signal timing and coordination improvements within the DRCOG Transportation Management Area (TMA)</p> <p>Amounts shown include multiple projects with funds from several years. Only 2004 benefits and funding are shown.</p>	<p>1,040,130 kg CO 4,160,520 kg CO – future benefits (2005 – 2008)</p>	<p>Programmed \$4,469k Budgeted \$4,428k Obligated \$4,293k Expended \$1,785k</p>
<p>RideArrangers (\$1,663,000) 14760 <u>Bike to Work Day</u> Bike to Work Day encourages individuals in the Metro Area to ride their bikes and use other forms of alternative transportation to get to work. <u>RideSmart Thursdays</u> The RideSmart Thursdays Campaign encouraged individuals to use alternative modes for their work and non-work trips. <u>Carpool, Schoolpool, and Vanpool</u> Carpool matching, Carpool matching for families with school-age children, and operation of regional vanpool program.</p>	<p>19,945,050 miles 505,440 kg CO 40,177 kg VOC 36,655 kg NOx 934 kg PM-10</p>	<p>Programmed \$1,683k Budgeted \$1,663k Obligated \$1,663k Expended \$1,533k</p>

Projects	2004 Benefits	2004 Funding
<p>Interim TDM 14671 Cherry Creek Bikestation (\$30,000) 14761 <u>Cherry Creek Bikestation</u> Transportation Solutions used CMAQ funds to advertise the Bike Rack, a commuter center where shoppers and workers can park their bicycles indoors, change clothing, and obtain information on transportation options available in the Cherry Creek Shopping District. <u>Bikestation/Eco Pass</u> Transportation Solutions encouraged the JW Marriott to purchase Eco Passes for all of its employees.</p> <p>DRCOG Vanpool (\$240,000) 14761 <u>2004 Vanpool Purchases</u> Funds were used to purchase minivans for use in the DRCOG/RTD vanpool program.</p> <p>Flatiron Improvement District (\$70,000) 14761 <u>2004 Eco Pass Program</u> The Flatirons Improvement District distributes and markets Eco Passes to the district's employees.</p> <p>Southeast Business Partnership (\$50,000) 14671 <u>Outreach along the I-25 Southeast Corridor</u> Targeted marketing and outreach products and services for businesses, developers and building managers in the I-25 Southeast Corridor.</p> <p>Stapleton TMA (\$40,000) 14761 Stapleton New Resident Program (REPORTING IN PROGRESS)</p> <p>US36 TMO (\$47,000) 14761 Outreach Activities (Postponed until 2006)</p> <p>Telework Colorado (\$77,000) 14761 Program encourages and assists companies in the development of telework programs.</p>	<p>3,682,217 miles 44,139 kg CO 7,062 kg VOC 6,925 kg NOx 178 kg PM-10</p>	<p>Programmed \$699k Budgeted \$693k Obligated \$693k Expended \$310k</p>
<p>Region 1 Sweepers (\$216,000) 14701* Purchase of two sweepers to reduce PM-10 in the Region 1 portion of DRCOG.</p> <p>This project has funds from 2004 and 2005. Only 2004 benefits and funding are shown.</p>	<p>Project postponed until 2006.</p>	<p>Programmed \$135k Budgeted \$135k Obligated \$135k Expended \$135k</p>

Fort Collins – NFR MPO

Projects	2004 Benefits	2004 Funding
<p>Advanced Traffic Management System (\$417,000) 14446 Twelve and one half mile expansion of the new fiber optic communication network for the City's Advanced Traffic Management System.</p>	<p>340,490 kg CO – 2004 benefits</p> <p>1,053,850 kg CO – <i>future benefits</i> (2005 – 2008)</p>	<p>Programmed \$430k Budgeted \$417k Obligated \$417k Expended \$417k</p>
<p>NFR SmartTrips (\$60,000) 14763 <u>SmartTrips Database</u> Develop a web-based carpool matching database and program to serve potential carpooling participants in northern Colorado.</p>	<p>2,844,964 miles 81,861 kg CO</p>	<p>Programmed \$63k Budgeted \$60k Obligated \$60k Expended \$56k</p>
<p>Ft Collins TDM Business Outreach (\$697,000) 14762 <u>2004 Bike Month</u> <u>2004 Bike to Work Day</u> <u>2004 CSU University Transit Pass Marketing</u> <u>2004 Carpool Matching</u> <u>2004 Freewheels Bike Share</u> <u>2004 Incentive/Data Collection</u> <u>2004 Passport Subsidized Employer Pass</u> <u>2004 SchoolPool</u> <u>2004 Telework</u> <u>2004 Transit Ad Campaign and Bus Schedule</u> <u>2004 Transit Senior Marketing Campaign</u> <u>2004 Vanpool Marketing</u> <u>2004 Walk A Child To School Day</u></p>	<p>5,528,900 miles 159,088 kg CO</p>	<p>Programmed \$717k Budgeted \$697k Obligated \$697k Expended \$697k</p>

Colorado Springs – PPACG

Projects	2004 Benefits	2004 Funding
<p>El Paso County ITS (\$510,000) 14816 <u>ITS-Signal Upgrade Program</u> There are 12 defective loops at any one time at the 36 intersections to be upgraded.</p>	<p>35,918 kg CO – 2004 benefits</p> <p>111,170 kg CO <i>future benefits</i> (2005 – 2008)</p>	<p>Programmed \$510k Budgeted \$510k Obligated \$510k Expended \$397k</p>
<p>Colorado Springs ITS/Signal (\$3,000,000) 14637 <u>ITS/Signal Improvements for I-25, SH 83 (Academy), and US 24</u> Installation of VMS Signs, Video Traffic Detection, and Traffic Signal Coordination</p> <p>This project is budgeted for \$6,671k from 2004 through 2006. Amounts shown are for the 2004 portion only.</p>	<p>837,392 kg CO</p> <p>13,608,608 kg CO <i>future benefits</i> (2005 – 2008)</p>	<p>Programmed \$3,019k Budgeted \$3,000k Obligated \$3,000k Expended \$2,563k</p>

Ridefinders (\$253,000) 14734 <u>Bike to Work Day</u> Annual event in Colorado Springs to encourage bicycle commuting. Free breakfast for the public is held in 2-3 locations, Mayor's Ride, prize giveaways etc. <u>Carpool Program</u> Free carpool matching is provided for the public. Individuals are matched based on work site locations and work hours. <u>Vanpool Program</u> Long distance vanpool program for the public commuting to various work sites.	2,777,000 miles 77,373 kg CO	Programmed \$298k Budgeted \$298k Obligated \$253k Expended \$253k
I-25 / Northgate Park and Ride (\$250,000) FTA Build a park and ride lot near Northgate and I-25. This project has been postponed until 2007.	Project postponed until 2007.	Transferred to FTA \$250k
Front Range Express – FREX (\$1,016,000) FTA This project will demonstrate the viability of a express bus services from Fountain/Colorado Springs to Denver.	5,837,110 miles 162,657 kg CO	Transferred to FTA \$1016k
Downtown Colorado Springs Circulator (\$818,000) FTA <u>Downtown Colorado Springs Circulator</u> Free Circulator service in Downtown Colorado Springs	126,282 miles 3,519 kg CO	Transferred to FTA \$818k

Canon City – Region 2

Aspen/Pitkin County, Routt County/Steamboat Springs – Region 3

Pagosa Springs, Telluride/Mountain Village – Region 5

Projects	2004 Benefits	2004 Funding
Aspen/Pitkin County (\$200,000) 14909 <u>Flush Truck</u> This project purchases a truck that will flush streets after sand is no longer needed on local streets to minimize dust.	Results from the project are pending.	Programmed \$200k Budgeted \$194k Obligated \$194k Expended \$0k
Canon City (\$200,000) 13316 <u>Paving</u> The will pave Madison Street and South 3rd Street between Highland Ave and E. Douglas Ave., 100 block of Dewey Road, and Allison Avenue east of 10th St. This project is budgeted for \$667k from 2004 through 2006. Amounts shown are for the 2004 portion only.	26,496 kg PM-10 155,317k PM-10 <i>future benefits (2005 – 2013)</i>	Programmed \$200k Budgeted \$200k Obligated \$200k Expended \$0k
Pagosa Springs (\$200,000) 14767 / 14770 <u>Cemetery Road</u> This project paves Cemetery Road to minimize dust from previously soft surface. <u>Deicing on US 160</u> This project involves deicing on US 160 to minimize dust from sanding.	64,468 kg PM-10 580,212k PM-10 <i>future benefits (2005 – 2013)</i>	Programmed \$200k Budgeted \$211k Obligated \$211k Expended \$25k
Routt County / Steamboat Springs (\$200,000) 14867 The funds from fiscal year 2004 are being combined with those from 2005.	Postponed until 2006.	Programmed \$200k Budgeted \$188k Obligated \$179k Expended \$0k

<p>Telluride / Mountain Village (\$200,000) 14768 / 14769 <u>Columbia Street</u> This project paves Columbia Street to minimize dust from previously soft surface. <u>Galena Street</u> This project paves Galena Street to minimize dust from previously soft surface. <u>Deicing on SH 145</u> This project involves deicing on SH 145 to minimize dust from sanding.</p>	638,925 kg PM-10 5,750,325 kg PM-10 future benefits (2005 – 2013)	Programmed \$200k Budgeted \$211k Obligated \$211k Expended \$25k
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CO Emissions in Non-attainment / Maintenance Areas

In Colorado, there are three CMAQ eligible non-attainment / maintenance areas for CO. They are Denver, Colorado Springs, and Fort Collins. All three areas have met both 1-hour and 8-hour Federal standards for CO emissions during the past five years.

	2000		2001		2002		2003		2004	
	1hr	8hr	1hr	8hr	1hr	8hr	1hr	8hr	1hr	8hr
Standard	35	9	35	9	35	9	35	9	35	9
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Colorado Springs	9.5	4.2	9.3	4.4	9.8	5.2	6.7	3.8	6.5	3.1
Denver	12.8	5.4	9.3	4.1	7.4	3.7	14.9	4.5	8.7	4.1
Fort Collins	7.5	3.8	6.8	3	5.5	2.9	8.1	2.3	5.3	3.1

PM-10 Concentration in Non-attainment / Maintenance Areas

The six PM-10 non-attainment / maintenance areas in Colorado have met both the 99th percentile and annual mean standards during the past five years. In the rural areas, paving has been the primary method of PM-10 reduction. Other projects have included purchasing sweepers and deicing trucks and equipment. In the Denver non-attainment / maintenance area, sweepers have been the primary method to reduce PM-10.

	2000		2001		2002		2003		2004	
	99th	M	99th	M	99th	M	99th	M	99th	M
Standard	150	50	150	50	150	50	150	50	150	50
	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³	ug₃ / m³
Aspen Pitkin County	66	22	66	23	90	34	50	21	44	18
Canon City	133	17	40	15	42	17	30	16	23	14
Denver	85	37	97	40	88	38	111	37	92	35
Pagosa Springs	73	28	121	34	61	24	70	27	52	23
Steamboat Spgs Routt County	89	25	74	23	79	25	89	26	73	23
Telluride Mountain Village	59	22	52	18	58	22	74	25	59	18

Ozone Levels in Non-attainment / Maintenance Areas

Denver was an Ozone non-attainment / maintenance area in Colorado. The federal standards were met 1999 through 2002. However, one violation of the 8-hour standard occurred in 2003. DRCOG is pursuing projects, such as the purchase of Denver Union Station and which will provide a central hub for transit lines, which will reduce Ozone levels.

	2000		2001		2002		2003		2004	
	1hr	8hr	1hr	8hr	1hr	8hr	1hr	8hr	1hr	8hr
Standard	.12	.08	.12	.08	.12	.08	.12	.08	.12	.08
	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³	ug / m ³
Denver	.086	.071	.091	.072	.092	.073	.096	.085	.087	.078

Note: In areas where there are multiple air quality monitors, the maximum value is shown. These values were extracted from the EPA website (<http://www.epa.gov/air/data/>) August 2004.

Appendix B - Current Emission Budgets

The following table illustrates which areas across the state are in air quality non-attainment / maintenance for specific pollutants. The values in the table represent the emission budget in tons per day. An emission budget is set so that emissions will not cause an exceedance of Federal air quality standards. The Denver area has been designated non-attainment / maintenance for CO, Ozone, and PM-10. In the five rural areas PM-10 is the pollutant of primary concern. The Fort Collins and Colorado Springs areas have been designated non-attainment / maintenance for CO.

Non-attainment / Maintenance Area	CO	NOx > PM-10	NOx > Ozone	VOC	PM-10
Season	Winter	Winter	Summer	Summer	Winter
Units	Tons/day	Tons/day	Tons/day	Tons/day	Tons/day
Aspen/Pitkin County	-n/a-	-n/a-	-n/a-	-n/a-	8
Canon City	-n/a-	-n/a-	-n/a-	-n/a-	4
Colorado Springs (PPACG)	531	-n/a-	-n/a-	-n/a-	-n/a-
Denver (DRCOG)	800	101	134	119	51
Fort Collins (NFR)	99	-n/a-	-n/a-	-n/a-	-n/a-
Pagosa Springs	-n/a-	-n/a-	-n/a-	-n/a-	4
Steamboat Springs / Routt County	-n/a-	-n/a-	-n/a-	-n/a-	11
Telluride / Mountain Village	-n/a-	-n/a-	-n/a-	-n/a-	5

Appendix C - Federal Code

23 USC 149 – CMAQ Program

Sec. 149. - Congestion mitigation and air quality improvement program

(a) Establishment. -

The Secretary shall establish and implement a congestion mitigation and air quality improvement program in accordance with this section.

(b) Eligible Projects. -

Except as provided in subsection (c), a State may obligate funds apportioned to it under section 104(b)(2) for the congestion mitigation and air quality improvement program only for a transportation project or program if the project or program is for an area in the State that is or was designated as a nonattainment area for ozone, carbon monoxide, or particulate matter under section 107(d) of the Clean Air Act (42 U.S.C. 7407(d)) and classified pursuant to section 181(a), 186(a), 188(a), or 188(b) of the Clean Air Act (42 U.S.C. 7511(a), 7512(a), 7513(a), or 7513(b)) or is or was designated as a nonattainment area under such section 107(d) after December 31, 1997, and -

(1)

(A) if the Secretary, after consultation with the Administrator of the Environmental Protection Agency, determines, on the basis of information published by the Environmental Protection Agency pursuant to section 108(f)(1)(A) of the Clean Air Act (other than clause (xvi) of such section), that the project or program is likely to contribute to -

(i) the attainment of a national ambient air quality standard; or

(ii) the maintenance of a national ambient air quality standard in a maintenance area; or

(B) in any case in which such information is not available, if the Secretary, after such consultation, determines that the project or program is part of a program, method, or strategy described in such section;

(2) if the project or program is included in a State implementation plan that has been approved pursuant to the Clean Air Act and the project will have air quality benefits;

(3) the Secretary, after consultation with the Administrator of the Environmental Protection Agency, determines that the project or program is likely to contribute to the attainment of a national ambient air quality standard, whether through reductions in vehicle miles traveled, fuel consumption, or through other factors;

(4) to establish or operate a traffic monitoring, management, and control facility or program if the Secretary, after consultation with the Administrator of the Environmental Protection Agency, determines that the facility or program is likely to contribute to the attainment of a national ambient air quality standard; or

(5) if the program or project improves traffic flow, including projects to improve signalization, construct high occupancy vehicle lanes, improve intersections, and implement intelligent transportation system strategies and such other projects that are eligible for assistance under this section on the day before the date of enactment of this paragraph.

No funds may be provided under this section for a project which will result in the construction of new capacity available to single occupant vehicles unless the project consists of a high occupancy vehicle facility available to single occupant vehicles only at other than peak travel times. In areas of a State which are nonattainment for ozone or carbon monoxide, or both, and for PM-10 resulting from transportation activities, the State may obligate such funds for any project or program under paragraph (1) or (2) without regard to any limitation of the Department of Transportation relating to the type of ambient air quality standard such project or program addresses.

(c) States Receiving Minimum Apportionment. -

(1) States without a nonattainment area. -

If a State does not have, and never has had, a nonattainment area designated under the Clean Air Act (42 U.S.C. 7401 et seq.), the State may use funds apportioned to the State under section 104(b)(2) for any project eligible under the surface transportation program under section 133.

(2) States with a nonattainment area. -

If a State has a nonattainment area or maintenance area and receives funds under section 104(b)(2)(D) above the amount of funds that the State would have received based on its nonattainment and maintenance area population under subparagraphs (B) and (C) of section 104(b)(2), the State may use that portion of the funds not based on its nonattainment and maintenance area population under subparagraphs (B) and (C) of section 104(b)(2) for any project in the State eligible under section 133.

(d) Applicability of Planning Requirements. -

Programming and expenditure of funds for projects under this section shall be consistent with the requirements of sections 134 and 135 of this title.

(e) Partnerships With Nongovernmental Entities. -

(1) In general. -

Notwithstanding any other provision of this title and in accordance with this subsection, a metropolitan planning organization, State transportation department, or other project sponsor may enter into an agreement with any public, private, or nonprofit entity to cooperatively implement any project carried out under this section.

(2) Forms of participation by entities. -

Participation by an entity under paragraph (1) may consist of -

(A) ownership or operation of any land, facility, vehicle, or other physical asset associated with the project;

(B) cost sharing of any project expense;

(C) carrying out of administration, construction management, project management, project operation, or any other management or operational duty associated with the project; and

(D) any other form of participation approved by the Secretary.

(3) Allocation to entities. -

A State may allocate funds apportioned under section 104(b)(2) to an entity described in paragraph (1).

(4) Alternative fuel projects. -

In the case of a project that will provide for the use of alternative fuels by privately owned vehicles or vehicle fleets, activities eligible for funding under this subsection -

(A) may include the costs of vehicle refueling infrastructure, including infrastructure that would support the development, production, and use of emerging technologies that reduce emissions of air pollutants from motor vehicles, and other capital investments associated with the project;

(B) shall include only the incremental cost of an alternative fueled vehicle, as compared to a conventionally fueled vehicle, that would otherwise be borne by a private party; and

(C) shall apply other governmental financial purchase contributions in the calculation of net incremental cost.

(5) Prohibition on federal participation with respect to required activities. -

A Federal participation payment under this subsection may not be made to an entity to fund an obligation imposed under the Clean Air Act (42 U.S.C. 7401 et seq.) or any other Federal law.

Appendix D - Commission Resolution

TC-807

WHEREAS, the Congestion Mitigation and Air Quality (CMAQ) improvement program was developed under the Intermodal Surface Transportation Efficiency Act (ISTEA) and has been continued with the Transportation Equity Act for the 21st Century (TEA-21); and

WHEREAS, the purpose of the CMAQ program is to provide a flexible funding source for spending on transportation projects and programs that help to meet the Clean Air Act requirements and that help to reduce transportation-related emissions for state and local governments; and

WHEREAS, funding is available for both non-attainment areas (areas not in compliance with the National Ambient Air Quality Standards) and maintenance areas (areas that were formerly in non-compliance and are now in compliance); and

WHEREAS, current resource allocation forecasts indicate that Colorado can expect to receive \$145,875,000 in CMAQ funds between Fiscal Year (FY) 2001–2006; and

WHEREAS, federal regulations state how the money can be spent; and

WHEREAS, CMAQ money is allocated to the state of Colorado to be distributed within the state among the eligible areas as determined by the State in consultation with non-attainment areas, local governments, MPOs and the state; and

WHEREAS, in the past, CMAQ money has been allocated to the carbon monoxide non-attainment area MPOs based on 50 percent Vehicle-Miles Traveled (VMT) and 50 percent population; and

WHEREAS, based upon TEA-21 provisions that allow CMAQ money to be used in PM-10 non-attainment areas, last year the Commission allocated a total of \$2 million over 3 years (FY 1998-2000) to the five rural PM-10 non-attainment areas; and

WHEREAS, CDOT's budget is now required by the Joint Budget Committee of the General Assembly to include performance measures describing the results of CDOT's various programs and projects; and

WHEREAS, CMAQ funds have not yet been allocated beyond FY 2000.

NOW THEREFORE BE IT RESOLVED, the Commission has determined that for the remainder of TEA-21 (FY 2001 – 2003):

A total of \$1,000,000 per year of CMAQ funds be allocated among the five rural PM-10 non-attainment areas;

the remaining balance of CMAQ funds will be allocated to the three non-attainment MPOs based on the 50% VMT and 50% population as follows:

DRCOG	76.31%
PPACG	18.13%
NFRT&AQPC	5.56%

project selection for CMAQ funds will be at the local level: in the non-attainment MPOs, projects, including eligible CDOT and transit agency projects, will be selected by the MPOs cooperatively with CDOT and the public transit agencies; and, in the rural non-attainment areas, projects will be selected by local governments cooperatively with their respective CDOT Regions.

CMAQ fund recipients will report annually in writing to the Commission on the effectiveness of the CMAQ fund expenditures.

CDOT will continue developing performance measures as part of its on-going resource allocation and budget requirements, including measures related to the CMAQ program, seeking input from external stakeholders.

If performance measurement of the CMAQ program indicates concerns regarding the effectiveness of the use of CMAQ funds, the Commission reserves the option for reviewing and altering the allocation formula.

FURTHER, for the period 2004 through 2020, the above formula can be used for planning purposes but is not a budget allocation.

Appendix E - Reporter Overview



Congestion Mitigation and Air Quality (CMAQ) Program

The purpose of the federal CMAQ program is to fund transportation projects that assist non-attainment and maintenance areas in meeting the National Ambient Air Quality Standards (NAAQS) established by the Clean Air Act (CAA). The focus for CMAQ funding is for areas designated as non-attainment or maintenance for ozone, carbon monoxide or PM-10. Funding is available for improvements to the transportation system that will have a tangible emission reduction.

What projects are eligible for CMAQ funding?

CMAQ Projects are typically strategies to lessen the pollutants emitted by motor vehicles. The funds are intended primarily for new facilities, equipment and services aimed at generating new sources of emission reductions. Operating funds that support these projects are generally limited to a three-year period. Projects categorized as maintenance, rehabilitation, and highway capacity improvements for single occupant vehicles (SOVs) are not eligible because they will not result in emission reductions. Following is a list from the Federal Highway Administration (FHWA) of projects eligible for CMAQ funding.

1. Transportation Activities in an approved State Implementation Plan (SIP)
 2. Transportation Control Measures (TCMs)
 3. Extremely Low-Temperature Cold Start Programs
 4. Public-Private Partnerships
 5. Alternative Fuels
 6. Traffic Flow Improvements
 7. Transit Projects
 8. Bicycle and Pedestrian Facilities
 9. Travel Demand Management
 10. Outreach and Rideshare Activities
 11. Telecommuting
 12. Fare/Fee Subsidy Programs
 13. Intermodal Freight
 14. Planning and Project Development Activities
 15. Inspection / Maintenance (I/M)
 16. Magnetic Levitation Transportation Technology Deployment Programs
 17. Experimental Pilot Programs
- (Excerpt from Federal Register, February 23, 2000, pg. 9047 – 9051)

What is the CMAQ Reporter?

The CMAQ Reporter is a web-based tool developed by the Colorado Department of Transportation and CMAQ recipients to meet the Federal Highway Administration (FHWA) and Colorado Transportation Commission reporting requirements. CDOT is required to report to FHWA annually on the amount of CMAQ funds obligated and the amount of emissions reduced through the implementation of CMAQ funded projects.

The CMAQ Reporter tracks measurable emission reduction results, on a consistent basis, for most Colorado CMAQ fund recipients. The Reporter allows most CMAQ recipients to use standardized formulas to calculate emission reductions and report obligated project funds. Using the CMAQ Reporter, information will be provided to FHWA and the Transportation Commission.

The next phase of the CMAQ Reporter will focus on developing an accurate picture of long-term air quality benefits and cost effectiveness. All CMAQ recipients will have the opportunity to make suggestions on how project life benefits should be calculated in the CMAQ Reporter. Long term benefits and cost effectiveness will not be reported until this phase of the CMAQ Reporter is completed.

What are the reporting requirements for CMAQ projects?

Project data is reported annually at the end of the calendar year. In October, CDOT supplies usernames, passwords, and other necessary information to CMAQ fund recipients. The MPOs and local sponsors report on their CMAQ projects on an annual basis in November and December. In turn, CDOT reports the CMAQ emission reduction results to FHWA at the end of January. Results are presented to the Transportation Commission as requested.

How does the CMAQ Reporter calculate emission reduction?

The Reporter calculates emissions for three types of projects: VMT Reduction, PM-10 / Road Dust Reduction, and Inspection/Maintenance. Projects that reduce VMT calculate emission reduction by applying a reduction factor to the VMT. Benefits for other types of projects such as ITS and Signal Timing are calculated manually by the project sponsor and entered directly into the Reporter.

VMT Reduction

$$\begin{array}{rcccl} \text{Annual VMT Reduction} & & \text{Emission Factor} & & \text{Emission Reduction} \\ \text{(AVMTR)} & \times & \text{CO, NO}_x, \text{VOC, PM-10} & = & \text{CO, NO}_x, \text{VOC, PM-10} \end{array}$$

Projects that reduce VMT include: carpool matching, vanpool matching, schoolpool matching, new or expanded transit service, construction of bike and ped facilities, construction of transit stations, HOV facilities, telecommuting/telework, bike share, and bike to work day.

PM-10 Road Dust Reduction

Projects that reduce PM-10 Road Dust include: paving, broom sweeping, deicing, vacuum sweeping, and reduced sanding. VMT is multiplied by various factors to determine the PM-10 reduction.

ITS and Traffic Control

ITS and Traffic Control projects reduce vehicle hours traveled (VHT) rather than VMT. Because of the complex calculations associated with these projects, the fund recipient calculates the emission reduction for each project manually. The amount of CO reduction is entered directly into the Reporter.

Inspection/Maintenance

Inspection and Maintenance projects reduce emissions by requiring improvements to high-emitter vehicles. For other projects such as fuel tank cap replacement and maintenance technician training, the fund recipient calculates the emission reduction for each project manually.

How is the CMAQ Reporter Accessed?

The Reporter is available at <http://denver.c-b.com/CMAQ/>. When asked from a username and password enter "view" for both fields. Specific user logins and passwords will be distributed as necessary for reporting.

Who should you contact if you have a question?

For questions about the CMAQ Reporter, contact CDOT Project Manager, Shawn McDowell by phone at 303-757-9063 or email at shawn.mcdowell@dot.state.co.us.

Appendix F - Reporter Formulas

Phase II Formulas extracted on August 19, 2003

Paving

PM10 Emissions Reduction (kg) = AVMT * (EFi - EFi*(1-RF))

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
EFi	0.606	kg/VMT	Emissions Factor before Paving
RF	0.9818	unitless	Percent Reduction in Emissions entered as a decimal (This value should not be changed)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Broom Sweeping (ADT > 5000)

PM10 Emissions Reduction (kg) = AVMT * (EFi - EFf)

Where:

Ei = Initial Emissions Factor = $k*(SLi/2)^{0.65}*WF$

Ef = Final Emissions Factor = $k*(SLf/2)^{0.65}*WF$

SLf = Final Silt Loading Factor = $((SLi-0.5)*(1-RF/100))+0.5$

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
k	0.0073	kg/VMT	Particle size range base emission factor (This value should not be changed)
SLi	-	kg/m2	Initial Silt Loading Factor entered by the administrator
RF	0.32	unitless	Percent Reduction in Emissions entered as a decimal (This value should not be changed)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Broom Sweeping (ADT < 5000)

PM10 Emissions Reduction (kg) = AVMT * (EFi - EFf)

Where:

Ei = Initial Emissions Factor = $k*(SLi/2)^{0.65}*WF$

Ef = Final Emissions Factor = $k*(SLf/2)^{0.65}*WF$

SLf = Final Silt Loading Factor = $((SLi-3.0)*(1-RF/100))+3.0$

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
k	0.0073	kg/VMT	Particle size range base emission factor (This value should not be changed)
SLi	-	kg/m2	Initial Silt Loading Factor entered by the administrator
RF	0.32	unitless	Percent Reduction in Emissions entered as a decimal (This value should not be changed)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Deicing (ADT > 5000)

$$\text{PM}_{10} \text{ Emissions Reduction (kg)} = \text{AVMT} * (\text{Efi} - \text{Efi})$$

Where:

$$\text{Ei} = \text{Initial Emissions Factor} = k * (\text{SLi}/2)^{0.65} * \text{WF}$$

$$\text{Efi} = \text{Final Emissions Factor} = k * (\text{SLfi}/2)^{0.65} * \text{WF}$$

$$\text{SLfi} = \text{Final Silt Loading Factor} = ((\text{SLi} - 0.5) * (1 - \text{RF}/100)) + 0.5$$

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
k	0.0073	kg/VMT	Particle size range base emission factor (This value should not be changed)
SLi	-	kg/m2	Initial Silt Loading Factor entered by the administrator
RF	0.2	unitless	Percent Reduction in Emissions entered as a decimal (This value can vary between .20 and .90)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Deicing (ADT < 5000)

$$\text{PM}_{10} \text{ Emissions Reduction (kg)} = \text{AVMT} * (\text{Efi} - \text{Efi})$$

Where:

$$\text{Ei} = \text{Initial Emissions Factor} = k * (\text{SLi}/2)^{0.65} * \text{WF}$$

$$\text{Efi} = \text{Final Emissions Factor} = k * (\text{SLfi}/2)^{0.65} * \text{WF}$$

$$\text{SLfi} = \text{Final Silt Loading Factor} = ((\text{SLi} - 3.0) * (1 - \text{RF}/100)) + 3.0$$

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
k	0.0073	kg/VMT	Particle size range base emission factor (This value should not be changed)
SLi	-	kg/m2	Initial Silt Loading Factor entered by the administrator
RF	0.2	unitless	Percent Reduction in Emissions entered as a decimal (This value can vary between .20 and .90)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Vacuum Sweeping

$$\text{PM}_{10} \text{ Emissions Reduction (kg)} = \text{AVMT} * (\text{Efi} - \text{Efi})$$

Where:

$$\text{Ei} = \text{Initial Emissions Factor} = k * (\text{SLi}/2)^{0.65} * \text{WF}$$

$$\text{Efi} = \text{Final Emissions Factor} = k * (\text{SLfi}/2)^{0.65} * \text{WF}$$

$$\text{SLfi} = \text{Final Silt Loading Factor} = \text{SLi} * (1 - \text{RF}/100)$$

Variable	Default	Units	Description
AVMT	-	miles	Total annual vehicles miles of travel affected by the project for the year
k	0.0073	kg/VMT	Particle size range base emission factor (This value should not be changed)
SLi	-	kg/m2	Initial Silt Loading Factor entered by the administrator
RF	0.34	unitless	Percent Reduction in Emissions entered as a decimal (This value should not be changed)
WF	0.5443	unitless	Weight factor (This value should not be changed)

Reduced Sanding or Sweeping

$$\text{PM10 Emissions Reduction (kg)} = \text{EF} * 907 * \text{APN} * \text{RF} * 240$$

Where:

907 is the conversion factor from tons to kilograms

240 is the number of days in the PM10 season. Multiplying by this factor will provide a yearly reduction.

Variable	Default	Units	Description
EF	102.1	tons/day	Uncontrolled emissions factor for the region
APN	-	unitless	Agency's percent of the reported sanding network for all reporting agency's. If you don't know this value, ask RAQC
RF	-	unitless	Percent of PM10 emissions reduced from the baseline level (1989). If this value is not known, it can be calculated by the following equation:

$$\text{RF} = (1 - (0.36 * (1 - (\text{SRC} * \% \text{ Swept}))) + (0.64 * (1 - \% \text{ Sand Reduction})^{0.8} * (1 - (\text{SRC} * \% \text{ Swept}))))$$

where:

0.36 is dust fraction of emissions and 0.64 is sand plus residual sand fraction of emissions

SRC = Sweeping equipment emissions reduction credit; currently recommended as 0.37 for Mechanical and Combination equipment or 0.61 or Vacuum and Regenerative Air equipment.

% Swept = % of Network Swept in 4 days, [as reported in section E of the annual Street Sand Use Report].

$$\% \text{ Sand Reduction} = ((\text{Baseline Rate} - \text{Material Application Rate}) / \text{Baseline Rate}) * 100$$

Baseline Rate (lbs./lane mile) = (Sand applied in tons * 2000) / Miles driven in 1989 for each entity. If Baseline is not know, contact the RAQC or APCD.

$$\text{Material Application Rate (lbs./lane mile)} = (\text{Material applied, as corrected total in tons} * 2000) / \text{Miles Driven}$$

Material Applied, as corrected in tons (Solids Only) = Sand/Salt and Ice Slicer shall be recorded as actual tons applied. Realite shall be multiplied by a factor of 1.1. All the above totals of solid material in tons shall be summed for the corrected total. Can be found in Section B of annual Street Sand Use Report

Miles Driven if do not know, can be found Section D of Annual Street Sand Use Report

The power of 0.8 is the EPA factor used to calculate emissions reduction credit from the reduction of applied sand.

240 is the number of days in the PM10 season, multiplying by this factor will provide a yearly reduction.

Carpool Matching

$$\text{AVMTR} = (N + \text{Nt-1} + 0.75 * \text{Nt-2}) * P * (1/\text{AVO}) * ((S-1)/S) * (F/W) * \text{Nt} * \text{Nd} * D$$

Variable	Default	Units	Description
N		people	The average number of carpool commuters at any given time during the year.
Nt-1		applications	Number of carpool matching applications processed in the

			previous year (i.e. 2001 if N = 2002)
Nt-2		applications	Number of carpool matching applications processed in the year prior to the previous year (i.e. 2000). The final portion of the equation is then multiplied by 0.75 to account for months 24 - 33 of carpool operation.
P	0.16	unitless	Ongoing placement rate. The proportion (expressed as a decimal) of matching applicants placed in carpools.
AVO	1.08	people	Average vehicle occupancy for work trips.
S	2.74	people	Average carpool size (including the driver).
F		days	Average number of days per week that carpool is used instead of driving alone.
W	5	days	Number of workdays in a week.
D	19.5	miles	Average one-way trip distance.
Nd	240	days	Number of benefit days per year.
Nt	2	trips	Number of one-ways trips per day.

Vanpool Matching

$$AVMTR = N * (1/AVO) * ((S-1)/S) * (FW) * Nt * Nd * D$$

Variable	Default	Units	Description
N	-	people	The average number of vanpool commuters at any given time during the year.
AVO	1.08	people	Average vehicle occupancy for work trips.
S	-	people	Average vanpool size (including the driver).
F	-	days	Average number of days per week that vanpool is used instead of driving alone.
W	5	days	Number of workdays in a week.
Nt	2	trips	Number of one-ways trips per day.
Nd	240	days	Number of benefit days per year.
D	19.5	miles	Average one-way trip distance.

School Pool

$$AVMTR = N * P * ((S-1)/S) * D * W * Nw * ((P2 * Nt) + (1 - P2) * Nf)$$

Variable	Default	Units	Description
N	-	people	Number of families in the database
P	0.2424	unitless	The proportion (expressed as a decimal) of families in the database that form carpools
S	2.13	people	Average carpool size (including the driver).
D	-	miles	Average one-way trip distance.
W	4.81	days	Number of carpool days in a week.
Nw	-	weeks	Number of weeks in a school year
P2	0.49	unitless	The proportion (expressed as a decimal) of two-way trip carpools. The remainder of carpools is assumed to be four-way trip carpools
Nt	2	trips	Number of one-ways trips per day for the two-way trip carpool
Nf	4	trips	Number of one-ways trips per day for the four-way trip carpool

New or Expanded Transit Service

$$AVMTR = (((Rf - Ri) * (1 - GR) * D * Nt * PSOV) - (EF * DBVMT)) * Nd$$

Variable	Default	Units	Description
Rf	-	people	Average daily ridership after project
Ri	-	people	Average daily ridership before project
GR	-	unitless	Yearly population growth rate (expressed as a decimal) for the surrounding community. For example, .2 = 20% growth, -.3 = 30% loss
D	19.5	miles	Average one-way trip distance.
Nt	2	trips	Number of one-ways trips per day.
PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
EF	-	unitless	Emission factor of transit vehicle (i.e., bus) relative to automobiles. For example, 3 = transit emits three times as much as automobiles.
DBVMT	1	miles	Average daily transit vehicle (i.e., bus) miles traveled, including route mileage and mileage to and from garage
Nd	290	days	Number of benefit days per year.

Bike Ped

$$\text{AVMTR} = \text{PSOV} * \text{Nd} * \text{D}$$

Variable	Default	Units	Description
PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
Nd	252	days	Number of benefit days per year.
D		miles	Total number of miles traveled on new facility per day (for all users)

New Transit Station

$$\text{AVMTR} = \text{N} * \text{Cs} / \text{CI} * \text{PSOV} * \text{Nd} * \text{D}$$

Variable	Default	Units	Description
N	-	people	Number of new trips traveling through the station
Cs		dollars	Cost of station
CI	-	dollars	Total cost of transit lines feeding into station
PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
Nd	290	days	Number of benefit days per year.
D	19.5	miles	Average one-way trip distance.

HOV Lanes

$$\text{AVMTR} = \text{N} * (\text{PSOV} - (1/\text{S})) * \text{Nd} * \text{D}$$

Variable	Default	Units	Description
N	-	vehicles	Average total number of vehicles traveling on HOV facility per day
PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
S	2.74	people	Average carpool size (including the driver).
Nd	290	days	Number of benefit days per year.

D	19.5	miles	Average one-way trip distance.
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Telework / Telecommute

$$AVMTR = N * P * D * Nt * W * Nw$$

Variable	Default	Units	Description
N	-	people	Total number of employees that work at companies with a telework program
P	0.0536	unitless	Percentage (expressed as a decimal) of employees that telework
D	19.5	miles	Average one-way trip distance.
Nt	2	trips	Number of one-ways trips per day.
W	1.62	days	Average days per week that employees telework instead of commuting
Nw	50	weeks	Number of work weeks per year

Bike Share

$$AVMTR = PSOV * Nd * D$$

Variable	Default	Units	Description
PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
Nd	252	days	Number of benefit days per year.
D		miles	Average daily number of miles traveled on shared bicycles

Bike to Work Day

$$AVMTR = N * R * D * Nt * Nd$$

Variable	Default	Units	Description
N	-	people	The average number of bike to work participants
R	0.59	unitless	Percentage (expressed as a decimal) of participants who already regularly bike to work
D	19.5	miles	Average one-way trip distance.
Nt	2	trips	Number of one-ways trips per day.
Nd	4.21	days	Number of benefit days per year. Equal to the number of days that participants biked to work during the initial event plus any months following the event.

Marketing

$$AVMTR = N * P * (R / E) * PSOV * Nt * Nd * D$$

Variable	Default	Units	Description
N	-	items	Number of items (e.g., pamphlets, flyers, etc.) distributed by the project
P	0.6	unitless	Proportion (expressed as a decimal) of items that are seen by the target audience. Default value is from Coloradoan.
R	0.27	unitless	Percent (expressed as a decimal) recall of multiple ads. Default value is from Riger Knowledge Base Media.
E	3	items	Minimum number of exposures needed to incite action in the target audience. Default value is from Riger Knowledge Base Media.

PSOV	-	unitless	Proportion of users (expressed as a decimal) that formerly commuted by single occupant vehicle
Nt	2	trips	Number of one-ways trips per day.
Nd	240	days	Number of benefit days per year.
D	19.5	miles	Average one-way trip distance.

Inspection and Maintenance (I/M)

$$\text{AVMTR} = \text{ADT} * \text{P} * (\text{J1} - \text{J2}) * \text{D} * \text{Nd}$$

Variable	Default	Units	Description
ADT	-	trips	Average number of trips per day
P	-	unitless	Proportion of vehicles (expressed as a decimal) subject to I/M
J1	-	unitless	Before I/M emission speed factor
J2	-	unitless	After I/M emission speed factor
D	-	miles	Average one-way trip distance.
Nd	252	days	Number of benefit days per year.

ITS and Traffic Controls

This formula allows for direct entry of CO emission reduction. The project sponsor provides calculations.

Variable	Default	Units	Description
VHT		hours	Total number of vehicle hours eliminated by the project during the year.
CO		kg	Total kilograms of carbon monoxide eliminated by the project during the year.

Common PM 10 Formula

$$\text{PM10 Emissions Reduction (kg)} = (\text{TPEF} + (\text{SLEF} / 1000)) * (1 - \text{RF}) * \text{AVMTR}$$

Variable	Default	Units	Description
TPEF	-	kg/mile	Tailpipe PM10 emissions factor entered by administrator
SLEF	-	g/vmt	Uncontrolled emissions factor for the region
RF	-	unitless	Percent PM10 reduction by the Agency, entered as a decimal

Appendix G - Reporter Emission Factors

Tailpipe Emission Factors

Emission Region	Year	CO	NO _x	VOCs	PM ₁₀
		(kg/mile)	(kg/mile)	(kg/mile)	(kg/mile)
Colorado Springs	2002	0.02807	0.00155	0.00197	3.00E-05
	2003	0.0273	0.00132	0.00184	3.00E-05
Denver Metro	2002	0.02419	0.00155	0.00192	3.00E-05
	2003	0.02387	0.0013	0.00179	3.00E-05
Fort Collins	2002	0.02807	0.00155	0.00197	3.00E-05
	2003	0.0273	0.00132	0.00184	3.00E-05
Other	2002	0.02097	0.00197	0.00244	0.001
	2003	0.02097	0.00197	0.00244	0.001

Silt Loading Factors

Emission Region	Silt Loading Factor	Silt Loading Factor
	2002 (g/m ²)	2003 (g/m ²)
Aspen - Local Streets	10.7	10.7
Aspen - Main St. (SH 82 in town)	15.2	15.2
Aspen - SH 82 Outside City	7.15	7.15
Canon City - Local Streets	9.714	9.714
Canon City - US 50	29.98	29.98
Pagosa Springs - Local Streets	9.714	9.714
Pagosa Springs - US 160 Through Town	29.98	29.98
Pitkin County Roads	14.84	14.84
Steamboat Springs - Lincoln Ave.	29.98	29.98
Steamboat Springs - Local streets	9.714	9.714
Steamboat Springs - US 40 Outside City	4.96	4.96
Telluride - SH 145 Near Society Turn	32.47	32.47
Telluride and Mountain Village Local Streets	9.714	9.714