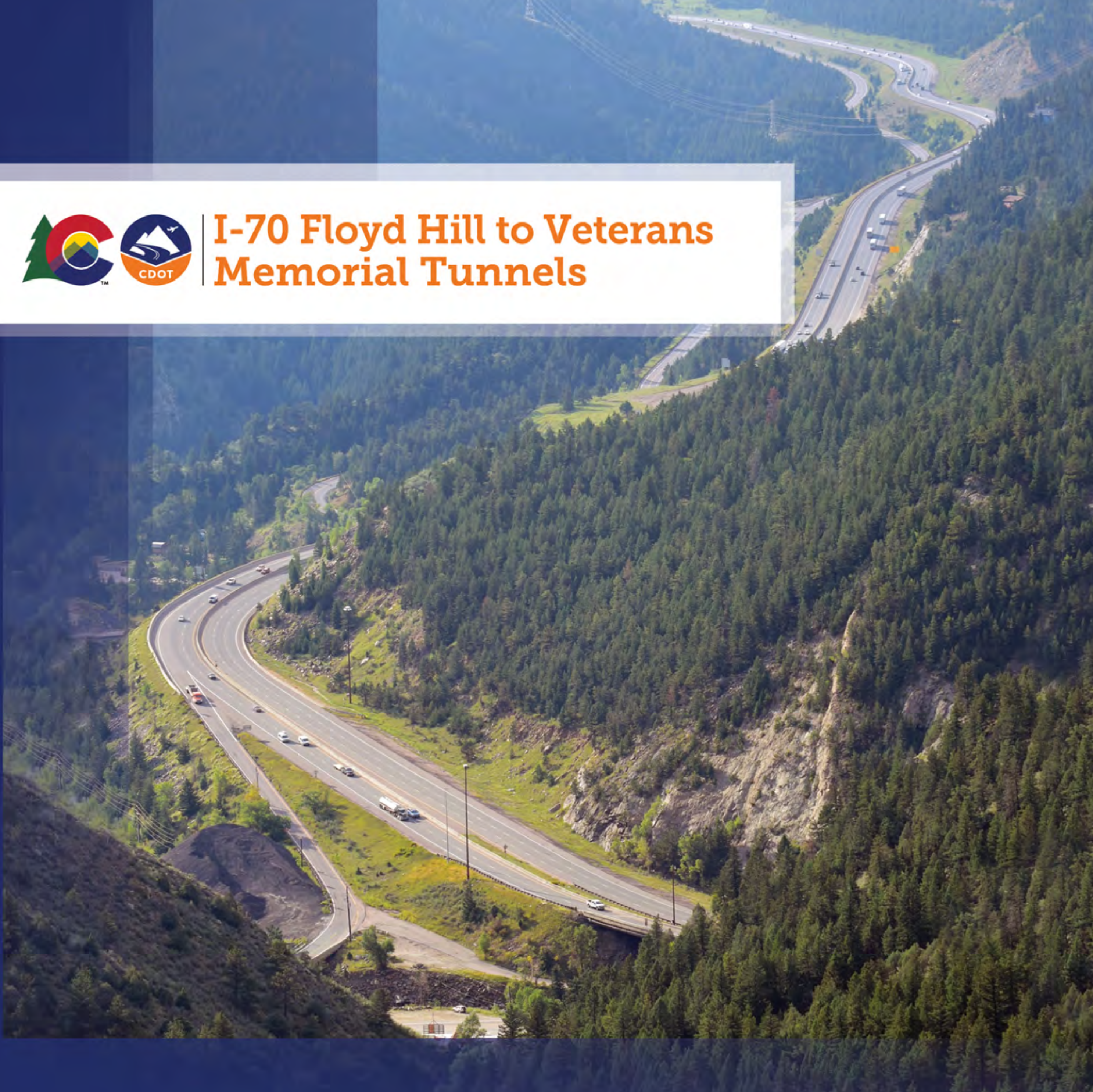
I-70 Floyd Hill to Veterans Memorial Tunnels



Air Quality Technical Report

May 2021

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List of Exhibits

List of Acronyms

$\mu g/m^3$	micrograms per cubic meter
AADT	average annual daily traffic
ADA	Americans with Disabilities Act
APCD	Air Pollution Control Division
AQCC	Air Quality Control Commission
CAA	Clean Air Act
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CMAQ	Congestion Mitigation and Air Quality
CMGC	Construction Manager/General Contractor
CO	carbon monoxide
CO_2	carbon dioxide
CR	County Road
DOTs	Departments of Transportation
DPM	diesel particulate matter
DRCOG	Denver Regional Council of Governments
EA	Environmental Assessment
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	greenhouse gas
HAPs	hazardous air pollutants
HEI	Health Effects Institute
I-70	Interstate 70
IRIS	Integrated Risk Information System
LOS	Level of Service
MEXL	Mountain Express Lane
MOVES	Motor Vehicle Emissions Simulator
MP	milepost
mph	miles per hour
MPO	Metropolitan Planning Organization
MSAT	mobile source air toxic
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NOx	nitrogen oxide
NREL	National Renewable Energy Laboratory
O3	ozone
Pb	lead
PEIS	Programmatic Environmental Impact Statement
PM	particulate matter
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
PM_{10}	particulate matter 10 microns or less in diameter
ppb	parts per billion
ppm	parts per million
ROD	Record of Decision
SIP	State Implementation Plan
SO_2	sulfur dioxide
TIP	Transportation Improvement Program
US 6	U.S. Highway 6
US 40	U.S. Highway 40
USDOT	U.S. Department of Transportation
VOC	volatile organic compounds
VMT	vehicle miles traveled

1. Introduction and Purpose of this Report

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA), in cooperation with local communities and other agencies, are conducting the Interstate 70 (I-70) Floyd Hill to Veterans Memorial Tunnels Environmental Assessment (EA) to advance a portion of the program of improvements for the I-70 Mountain Corridor identified in the 2011 Tier 1 *Final I-70 Mountain Corridor Programmatic Environmental Impact Statement* (PEIS) and approved in the 2011 *I-70 Mountain Corridor Record of Decision* (ROD). The EA is a Tier 2 National Environmental Policy Act (NEPA) process and is supported by resource-specific technical reports.

The purpose of this technical report is to document the existing conditions, impacts, and mitigation for air quality. This report also includes a description of applicable laws and regulations and a summary of the resource analysis and mitigation framework from the PEIS and ROD.

Based on concerns raised throughout this Project's NEPA process as well as other past project development processes regarding air quality in the I-70 Mountain Corridor, CDOT conducted air quality analysis to address those concerns. The results of that air quality modeling are included in the *State Air Quality Analysis Report*, provided in Appendix A of the EA.

2. Proposed Action and Alternatives

2.1. Description of Proposed Action and Alternatives

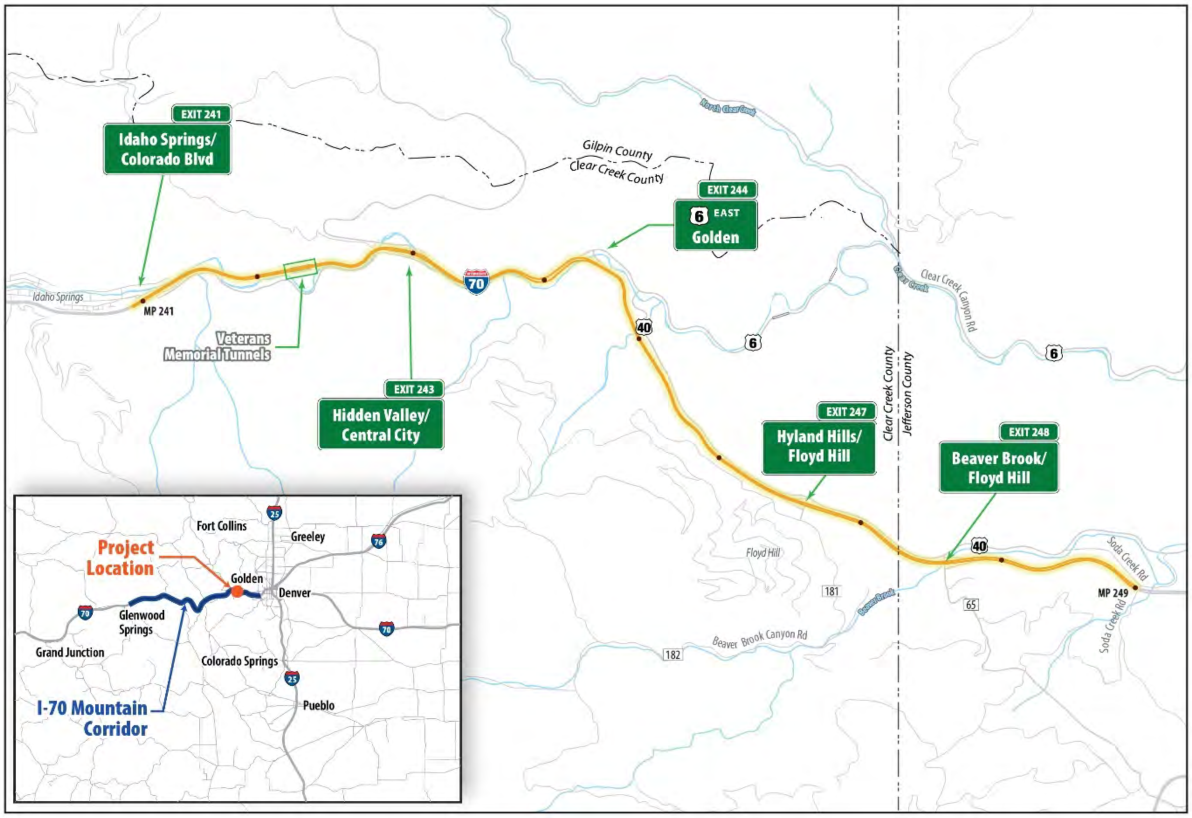
CDOT and FHWA propose improvements along approximately 8 miles of the I-70 Mountain Corridor from the top of Floyd Hill through the Veterans Memorial Tunnels to the eastern edge of Idaho Springs. The purpose of the Project is to improve travel time reliability, safety, and mobility, and address the deficient infrastructure through this area.

The major Project elements include:

- Adding a third westbound travel lane to the two-lane section of I-70 from the current three-lane to two-lane drop (approximately milepost (MP) 246) through the Veterans Memorial Tunnels
- Constructing a new frontage road between the U.S. Highway 6 (US 6) interchange and the Hidden Valley/Central City interchange
- Improving interchanges and intersections throughout the Project area
- Improving design speeds and stopping sight distance on horizontal curves
- Adding an eastbound auxiliary lane to I-70 on Floyd Hill between the US 6 interchange and the Hyland Hills/Floyd Hill interchange
- Improving the multimodal trail (Clear Creek Greenway) between US 6 and the Veterans Memorial Tunnels
- Reducing animal-vehicle conflicts and improving wildlife connectivity with new and/or improved wildlife overpasses or underpasses
- Providing two permanent air quality monitors at Floyd Hill and Idaho Springs to collect data on local air quality conditions and trends
- Coordinating rural broadband access with local communities, including providing access to conduits and fiber in the interstate right-of-way

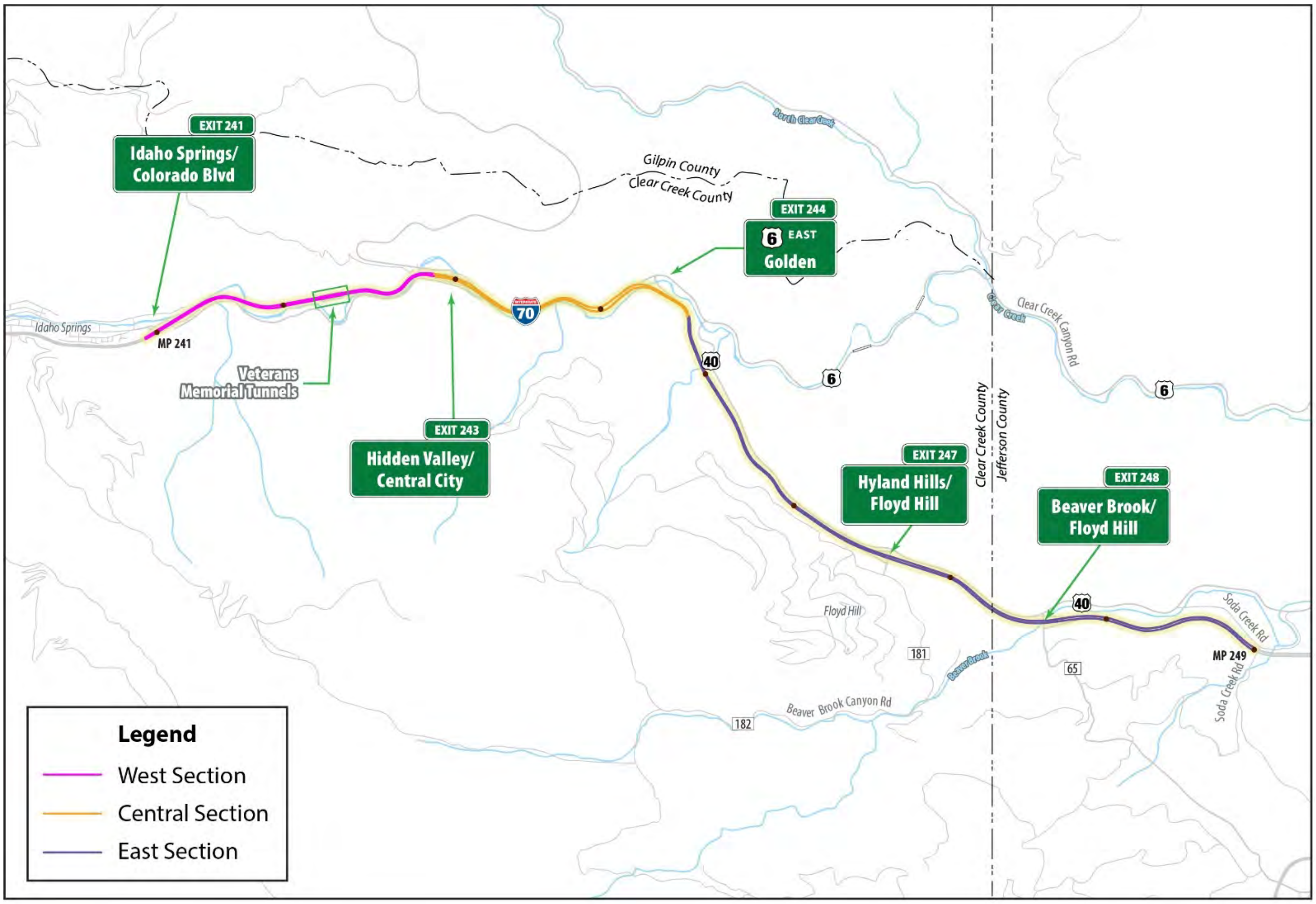
The Project is located on I-70 between MP 249 (east of the Beaver Brook/Floyd Hill interchange) and MP 241 (Idaho Springs/Colorado Boulevard), west of the Veterans Memorial Tunnels. It is located mostly in Clear Creek County, with the eastern end in Jefferson County (see Exhibit 1). The primary roadway construction activities would occur between County Road (CR) 65 (the Beaver Brook/Floyd Hill interchange) and the western portals of the Veterans Memorial Tunnels (MP 247.6 and MP 242.3, respectively), with the Project area extended east and west to account for signing, striping, and fencing.

Exhibit 1. Project Location



Three alternatives are being evaluated in the EA: (1) No Action Alternative, (2) Tunnel Alternative, and (3) Canyon Viaduct Alternative. The Project improvements are grouped into three geographic sections: (1) East Section (top of Floyd Hill to US 6 interchange), (2) Central Section (US 6 interchange to Hidden Valley/Central City interchange), and (3) West Section (Hidden Valley/Central City interchange through Veterans Memorial Tunnels) (see Exhibit 2).

Exhibit 2. East, Central, and West Project Sections



The action alternatives—the Tunnel Alternative and Canyon Viaduct Alternative—include the same improvements in the East Section and West Section to flatten curves, add a third westbound travel lane (the new lane would be an Express Lane), provide wildlife and water quality features, and improve interchange/intersection operations.

Through the Central Section between the US 6 interchange and the Hidden Valley/Central City interchange, the action alternatives vary in how they provide for the third westbound I-70 travel lane and frontage road connections, as follows:

- The **Tunnel Alternative** would realign westbound I-70 to the north (along the curve between MP 244.3 and MP 243.7) through a new 2,200-foot-long tunnel west of US 6. Eastbound I-70 would be realigned within the existing I-70 roadway template to flatten curves to improve design speed and sight distance. This alternative also would include two design options for the alignment of the new frontage road—north or south of Clear Creek. The Clear Creek Greenway trail would be reconstructed in its current location on the south side of Clear Creek.
- The **Canyon Viaduct Alternative** would realign approximately one-half mile of both the westbound and eastbound I-70 lanes (along the curve between MP 244 and MP 243.5) on viaduct structures approximately 400 feet south of the existing I-70 alignment on the south side of Clear Creek Canyon. Through the realigned area, the frontage road would be constructed under

the viaduct on the existing I-70 roadway footprint north of Clear Creek. The Clear Creek Greenway would be reconstructed in its current location on the south side of Clear Creek. The viaduct would cross above Clear Creek and the Clear Creek Greenway twice.

Additional information regarding the alternatives evaluated in the EA can be found in *the I-70 Floyd Hill to Veterans Memorial Tunnels Alternatives Analysis Technical Report* (CDOT, 2020a).

2.2. No Action Alternative

The No Action Alternative includes ongoing highway maintenance. In addition, due to its poor condition, the westbound I-70 bridge at the bottom of Floyd Hill is programmed to be replaced regardless of whether CDOT moves forward with one of the action alternatives. Therefore, replacing the bridge in kind (as a two-lane bridge) is part of the No Action Alternative. Under the No Action Alternative, the bridge would be replaced in its current location but would need to be designed to current standards, with a 55 mile-per-hour (mph) design speed and improved sight distance with wider shoulders.

2.3. Action Alternatives: East Section

In the East Section between the top of Floyd Hill and the US 6 interchange, the Action Alternatives are the same. Through this section, westbound I-70 would be widened to the south to accommodate a third travel lane, which is planned as an Express Lane. The typical section would include an additional 12-foot travel lane and inside and outside shoulders of varying widths, depending on sight distance needs around curves. The proposed footprint would include a 4-foot buffer between the new Express Lane and the existing (general purpose) lanes.

In the eastbound direction, the three travel lanes would be retained but the roadway would be realigned where needed to accommodate westbound widening or curve modifications to improve sight distance and safety. An approximately one-mile-long eastbound auxiliary (climbing) lane would be added in the uphill direction from the bottom of Floyd Hill to the Hyland Hills/Floyd Hill interchange (Exit 247). Water quality features would be added along the south side of the eastbound lanes.

At the Beaver Brook/Floyd Hill and Hyland Hills/Floyd Hill interchange systems, the split-diamond interchange configuration (with on- and off-ramps connected by U.S. Highway 40 [US 40]) would remain, and no new accesses would be provided. However, roundabout intersections constructed on US 40 as part of a separate project address immediate issues with traffic flow and delays at the Floyd Hill neighborhood ingress and egress.

Wildlife fencing would be added along the north and south sides of I-70 between the Hyland Hills/Floyd Hill interchange on the west and Soda Creek Road on the east to reduce wildlife-vehicle collisions.

2.4. Action Alternatives: Central Section

The Central Section of the Project involves the most substantial improvements—including realigning curves, adding a third westbound travel lane, improving the Clear Creek Greenway, and providing the frontage road connection. These improvements occur within the most-constrained section of the Project area, where the existing I-70 footprint and planned roadway improvements are located between canyon rock walls north and south of existing I-70 and Clear Creek. Because of these constraints, the action alternatives within this section include the same improvements but differ with respect to the I-70 mainline and frontage road alignments and the relationship of the roadway improvements to the rock walls and the creek. The Clear Creek Greenway would be reconstructed generally along its existing alignment under both action alternatives, but the Clear Creek Greenway's location with respect to the creek and roadway infrastructure would differ.

2.4.1. I-70 Mainline

The I-70 mainline through this section continues the same roadway typical section from the East Section. Both alternatives would provide an additional westbound 12-foot travel lane; inside and outside shoulders of varying widths, depending on sight distance needs around curves; and a 4-foot buffer between the new Express Lane and the existing (general purpose) lanes.

Under the Tunnel Alternative, approximately one mile of westbound I-70 would be realigned to the north near the US 6 interchange. A portion of the realignment would extend through a 2,200-foot-long tunnel that would tie in to the existing westbound I-70 alignment and elevation just east of the Hidden Valley/Central City interchange. The three eastbound I-70 lanes through this area would remain within the existing roadway prism but would be realigned, moving approximately 100 feet north into the rock face adjacent to the existing westbound lanes to flatten horizontal curves and improve the design speed and sight distance.

Under the Canyon Viaduct Alternative, the westbound I-70 alignment would shift to the south on a new 5,300-foot-long viaduct beginning at approximately MP 245 east of the exit ramp to US 6 and it would rejoin the existing alignment about one-half mile east of the Hidden Valley/Central City interchange at approximately MP 243.5. Through this area, eastbound I-70 also would be realigned on a separate viaduct structure next to westbound I-70 from MP 243.4 east to just beyond MP 244.3. Both viaduct structures would cross Clear Creek and the Clear Creek Greenway twice near MP 243.9 and MP 243.5 (approximately 60 feet above ground level).

2.4.2. Frontage Road

Both alternatives include a new approximately 1.5-mile-long frontage road connection between the Hidden Valley/Central City interchange and the US 6 interchange. The frontage road would run from the intersection of CR 314 and Central City Parkway (south of the I-70 eastbound off-ramp at the Hidden Valley/Central City interchange where CR 314, which acts as a frontage road from east Idaho Springs, terminates) to the US 6/I-70 ramp terminal. The roadway section for the frontage road would consist of two 11-foot lanes (one in the eastbound direction and one in the westbound direction) with consistent 2-foot shoulders. The design speed would be 30 mph and the roadway would be constructed to comply with Clear Creek County local access standards.

The Tunnel Alternative includes two design options for this frontage road:

- **North Frontage Road Option** would provide the new frontage road connection between the two interchanges mostly on the north side of Clear Creek. The I-70 mainline would be realigned north into the mountainside, requiring substantial rock cuts (150 feet high) to make room for the frontage road between the creek and existing I-70. The Clear Creek Greenway would be reconstructed along its current alignment south of Clear Creek. In the Sawmill Gulch area where the existing trail's grade does not meet Americans with Disabilities Act (ADA) standards, the Greenway trail would be lowered to meet grades.
- **South Frontage Road Option** would provide the new frontage road connection between the two interchanges mostly on the south side of Clear Creek. Moving the frontage road to the south side of the creek would require new rock cuts on the south side of Clear Creek Canyon and less substantial rock cuts on the north side of I-70. The Clear Creek Greenway would be

reconstructed generally along its current alignment south of Clear Creek; in the Sawmill Gulch area, an approximately 1,500-foot new section of the Greenway trail would be constructed across the creek to the north (with two pedestrian bridge crossings of the creek) to be ADA compliant, and the existing trail would remain in place but not be resurfaced. The Clear Creek Greenway would be located closer to the frontage road than under the North Frontage Road Option; although the design seeks to maximize horizontal and vertical separation between the facilities and includes a new section of trail to meet ADA compliance, the alignment of the frontage road nearer to the Greenway and between the Greenway and creek is not supported by Clear Creek County, Idaho Springs, community members, or the Project Technical Team because it diminishes the recreational experience.

Under the Canyon Viaduct Alternative, the existing I-70 pavement under the elevated structures would be repurposed for the frontage road; excess right of way would be available for other uses—presumably, creek and recreation access—through this approximately one-mile area of the canyon.

2.5. Action Alternatives: West Section

The West Section between the Hidden Valley/Central City interchange and the Veterans Memorial Tunnels continues the widening of the interstate to add the third westbound travel lane and to flatten the S-curve in this location. Improvements in this section are the same under both action alternatives. The curve modifications require realigning both the I-70 mainline and frontage road through this section. The I-70 mainline alignment would shift south approximately 100 feet around the first curve from the Hidden Valley/Central City interchange, then north around the second curve approximately 50 feet, continuing a slight (25 foot) shift north before tying in to the existing alignment at the Veterans Memorial Tunnels. Much of CR 314 would be realigned south between the Doghouse Rail Bridge over Clear Creek near the Veterans Memorial Tunnels east portal and the Hidden Valley/Central City interchange. A small section of CR 314 (between MP 242.6 and MP 242.7) would remain and connect to the reconstructed portions west and east.

These alignment shifts result in substantial rock cuts on both the north and south sides of the canyon. On the north side, rock cuts up to 160 feet high would be required next to the I-70 westbound lanes (along the curve in the area where CR 314 is not reconstructed). To realign CR 314 south, rock cuts from 70 feet to 100 feet high are required on the south side of the canyon. Additionally, a 1,200-foot section of Clear Creek, which is located between I-70 and CR 314, would need to be relocated south near MP 242.5.

The Hidden Valley/Central City interchange would not be reconstructed, and the I-70 bridges would remain because they are wide enough to accommodate the widened I-70 footprint without being replaced. All the on- and off-ramps for the interchange would be reconstructed, but the bridges over Clear Creek for the I-70 westbound off-ramp and I-70 eastbound on-ramp also can be retained. New bridges over Clear Creek to the west would be needed for the I-70 westbound on-ramp and I-70 eastbound off-ramp to accommodate the curve flattening and shift of I-70 to the south in this location. The CDOT maintenance facility would need to be relocated.

No changes are required west of the Veterans Memorial Tunnels. Within the westbound tunnel, the roadway would be restriped for the third lane (the expansion of the tunnel to accommodate the third lane was completed in 2014). After the tunnel, restriping and signing would continue west to the next interchange at Idaho Springs/Colorado Boulevard (Exit 241), where the third lane would terminate. The Express Lane would operate in conjunction with the westbound Mountain Express Lane (MEXL) during peak periods (winter and summer weekends).

2.6. Construction of Action Alternatives

CDOT is planning to use a Construction Manager/General Contractor (CMGC) delivery method for construction of the Project. This contracting method involves a contractor advising in the design phases to better define Project technical requirements and costs, improve design quality and constructability, and reduce risks through the construction phase. This method promotes innovation and aligns well with the multidisciplinary Context Sensitive Solutions process. It was used successfully on the Twin Tunnels projects to reduce environmental impacts and accommodate community values in the design and construction project development phases.

Construction of the action alternatives is anticipated to be complex and take four to five years but could occur generally within the proposed right of way. CDOT would work with the CMGC to refine the construction details and develop a plan that promotes safety and minimizes disruption to the traveling public and nearby residents and businesses.

The Tunnel Alternative would take approximately one year longer to build than the Canyon Viaduct Alternative; most of the additional time would be needed for the tunnel rock blasting and construction that could take place without disrupting traffic. However, in addition to the tunnel rock blasting, the Tunnel Alternative has considerable rock cuts at the tunnel portals and along the north side of I-70 to realign curves, widen the highway, and add the frontage road connection. Rock cuts, staging for the excavation of the tunnel portals, and haul of waste rock are major construction activities that are likely to interrupt traffic on I-70 due to increased construction equipment traffic on the highway and the proximity of construction to live traffic, the need for temporary lane closures and detours, and closures for blasting. The North Frontage Road Option has significantly larger (taller and longer) rock cuts than the South Frontage Road Option.

The Canyon Viaduct Alternative has substantially less rock cuts and blasting compared to the Tunnel Alternative but would require more work in the existing highway right of way. Bridge construction over and pier placement within the highway template will need to be carefully coordinated. However, construction of some elements, such as the bench portion of the viaduct, are separated from the existing I-70 alignment and could be constructed offline similarly to the tunnel excavation.

Specific construction methods and phasing will be determined with contractor input and could affect the duration and/or physical requirements for construction activities. The focus of environmental impact analysis during the NEPA process is to identify resources and locations sensitive to construction impacts and incorporate reasonable mitigation measures, including the potential to avoid impacts by avoiding sensitive areas, to inform the contractor's plans. Final design and construction plans will consider changes in resource impacts, and reevaluations will be completed as needed during final design.

3. Applicable Laws, Regulations, and Guidance

To provide protection for the nation's public health and the environment, the Clean Air Act (CAA) (amended 1990) requires the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for certain common and widespread pollutants based on the latest science and known impacts to human health. EPA has set NAAQS for six common "criteria pollutants"—particulate matter, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. In addition, the CAA contains general authorities that can be used to address pollution problems that emerge over time, such as greenhouse gases that cause climate change.

Sections 108 and 109 of the CAA govern the establishment, review, and revision of the NAAQS for each of the six criteria air pollutants to provide protection for the nation's public health and the environment, which are shown in Exhibit 3, below. Other regulations and guidance applicable to air quality resource evaluations are summarized below.

- EPA transportation conformity, 40 Code of Federal Regulations (CFR) 93 Subpart A—Provides structure for Departments of Transportation (DOTs) to comply with Section 176(c) of the CAA (EPA, 2012)
- EPA project-level conformity guidance—Provides EPA guidance on hot-spot analysis and project-level conformity (EPA, 2013)
- Regional conformity documents—Provides information on projects and air quality modeling used to determine that the regional transportation plans are in conformity with the state implementation plans (SIP) (Denver Regional Council of Governments [DRCOG], 2019a, 2019b, 2019c, 2019d)
- FHWA's *Mobile Source Air Toxics Analysis in NEPA*—Updates guidance on how the FHWA will analyze mobile source air toxics (FHWA, 2016)
- Colorado Air Quality Control Commission (AQCC) Regulation No. 10, Criteria for Analysis of Transportation Conformity—Establishes a SIP revision and requires any person adopting or approving a regionally significant project to comply with 40 CFR Part 93 Subpart A (Colorado Department of Public Health and Environment [CDPHE], 2016)
- CDOT *Air Quality Project-Level Analysis Guidance* (CDOT, 2019). This report is not required to completely adhere to this guidance because the Project was scoped prior to 2/14/19.

States are required to adopt enforceable state implementation plans to achieve and maintain air quality that meets the NAAQS, and may include controls on transportation, depending on the pollutant and the emission source. The Air Pollution Control Division (APCD) of the CDPHE is responsible for air quality monitoring within the state and compliance with the NAAQS, and transportation projects are expected to conform to the NAAQS.

Exhibit 3. National Ambient Air Quality Standards

Pollutant		Primary/Secondary	Averaging Time	Level*
Carbon Monoxide (CO)		primary	8 hours	9 ppm
			1 hour	35 ppm
Lead (Pb)		primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$ (1)
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb
		primary and secondary	1 year	53 ppb (2)
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)
Particulate Matter (PM)	$PM_{2.5}$	primary	1 year	12.0 $\mu g/m^3$
		secondary	1 year	15.0 $\mu g/m^3$
		primary and secondary	24 hours	35 $\mu g/m^3$
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)
		secondary	3 hours	0.5 ppm

Source: EPA, 2019

** ppm = parts per million, $\mu g/m^3$ = micrograms per cubic meter, ppb = parts per billion*

(1) In areas designated nonattainment for the Pb NAAQS prior to the promulgation of the current (2008) NAAQS, and for which implementation plans to attain or maintain the current (2008) NAAQS have not been submitted and approved, the previous NAAQS (1.5 $\mu g/m^3$ as a calendar quarter average) also remain in effect.

(2) The level of the annual NAAQS for NO_2 is 0.053 ppm. It is shown here in terms of ppb for clearer comparison to the 1-hour NAAQS.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards additionally remain in effect in some areas. Revocation of the previous (2008) ozone standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standard, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

4. Air Quality in the Tier 1 PEIS

4.1. Context

The I-70 PEIS examined air quality issues for the 144-mile Mountain Corridor, extending from Glenwood Springs in western Colorado to Highway C-470 on the western edge of the Denver metropolitan area. Through the I-70 Mountain Corridor, air quality differs depending on the density and type of surrounding development, traffic volumes and composition, local topography, and other emission sources. With the exception of the eastern end in Jefferson County in the Denver metropolitan area, including a small portion of the Floyd Hill Study Area, the I-70 Mountain Corridor meets the NAAQS for all criteria pollutants. No violations of the NAAQS have been recorded for the Project area outside Jefferson County. However, air quality is a growing concern to I-70 Mountain Corridor communities because of increasing development, construction, and interstate traffic volumes, combined with windblown dust from street maintenance activities, mine tailings, sand and gravel mining operations, and wood burning. Temperature inversions and dry climates exacerbate air quality and visibility concerns throughout the I-70 Mountain Corridor. Communities also are concerned about global climate change and the effects that the implementation of highway improvements in the PEIS Preferred Alternative have on those issues.

Consistent with other trends, the PEIS concluded that future I-70 traffic emissions for most criteria pollutants are expected to decrease substantially over time as the result of improved vehicle fuels, engines, and emission control technology. However, emissions of particulate matter smaller than 10 microns in diameter (PM_{10}) from re-entrained dust will increase due to increased traffic, as this source is not affected by the technological improvements. Likewise, the PEIS noted that emissions of greenhouse gases are likely to continue to increase, even as new programs are established to control those increases. While considered in Tier 2 processes overall, controlling greenhouse gas emissions is a national and international problem that is difficult to address or effect on a project level.

4.2. Analysis in Tier 2 Processes

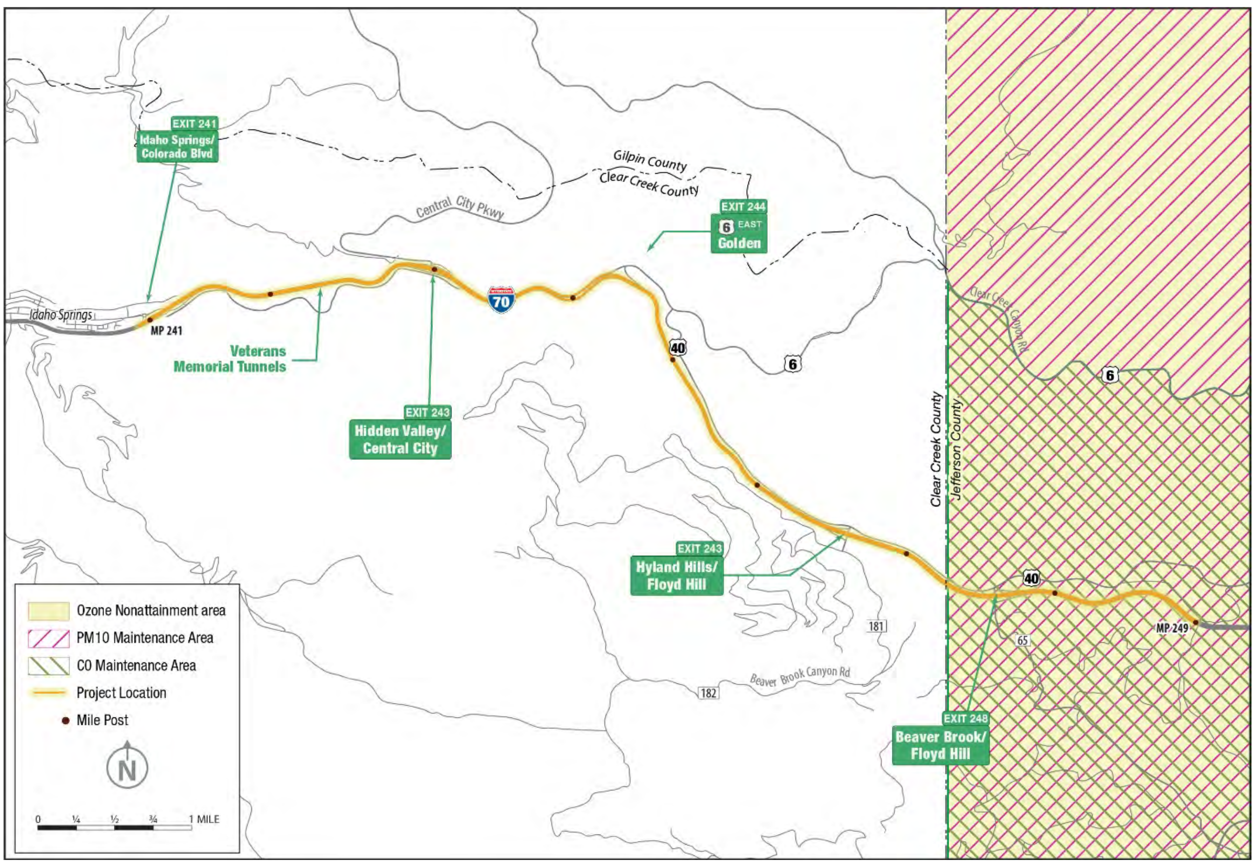
In the ROD, the FHWA and CDOT committed to conduct project-specific Tier 2 processes in accordance with FHWA and EPA air quality guidance available when analyses are conducted, including localized air quality modeling (such as hot-spot modeling for carbon monoxide and particulate matter) where appropriate in designated nonattainment or maintenance areas. Section 3 of this document presents a list of current air quality guidance. In Clear Creek County, where most of the Project activities are planned, these requirements would not apply because Clear Creek County is in attainment for all criteria pollutants.

5. Affected Environment

5.1. Study Area

The affected environment for air quality can be regional in nature as well as local, depending on the pollutant and project location in relation to designated maintenance/nonattainment area boundaries. Traffic, local emission sources, topography, and climate affect the air quality. The rural nature of the Project area and the lack of local industrial sources indicate that the pollution levels in the Project area are minimal. Local sources of emissions include motorized vehicles on I-70 and frontage roads, local mining operations, and wintertime wood burning. The primary pollutants of concern for the Floyd Hill area of I-70 are carbon monoxide, particulate matter, and ozone. The eastern end of the Project is in Jefferson County, which is within the Denver-Boulder CO and Denver Metro PM_{10} maintenance areas, as well as the Denver Metro/North Front Range ozone nonattainment area (serious), as shown in Exhibit 4 (EPA, 2020a, 2020b).

Exhibit 4. Air Quality Maintenance and Nonattainment Areas near the Project



5.2. Climate and Topography

Local weather and climate conditions can affect emission rates and influence pollutant concentrations near a project. In lieu of certified historical weather information for the Project area, a general discussion of weather patterns based on topographical features is relevant to determine typical impacts of weather on air quality conditions because no air quality modeling is required for the Project. Westbound I-70 in the Project area traverses Floyd Hill and descends toward the Veterans Memorial Tunnels east of Idaho Springs, situated in the Clear Creek Valley, surrounded by steep mountain slopes. Clear Creek is at the base of the valley. These mountainous conditions, combined with daily wind and atmospheric dynamics, can trap air and pollutants close to the ground during thermal inversion conditions. The daily cycle of warming the ground from the heat of the sun also warms the air, which then rises above cold air flowing downhill. When the ground cools quickly at sunset, surface air no longer heats and rises, so this air stagnates. The onset of thermal inversions comes earlier in the day during winter, capturing more vehicle pollutants than on days when the sun sets later. However, the typical diurnal wind pattern through the valley includes steady westerly winds that disperse most locally generated emissions.

5.3. Criteria Pollutants of Concern

As stated above, EPA has set NAAQS for six common "criteria pollutants"—particulate matter, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. The pollutants of concern near the Project location include ozone, carbon monoxide, and PM_{10}.

5.3.1. Ozone

Ozone is a pollutant created by the chemical reaction of volatile organic compounds (VOC) and nitrogen oxides (NO_X) in the presence of sunlight. The ozone molecule is formed through this chemical transformation, typically downwind from the VOC and NO_X emission sources. As a result, ozone is considered a regional problem rather than a localized issue, and it is difficult to assign impacts to any single project. Typically, ozone is evaluated using the VOC and NO_X emission precursors. Health effects include breathing problems, reduced lung function, asthma, irritated eyes, stuffy nose, reduced resistance to colds and other infections, and acceleration of the aging of lung tissue. Ozone also damages plants, trees, rubber products, fabrics, and other materials.

In April 2004, the EPA designated the Denver Metro/North Front Range (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson and parts of Larimer and Weld counties) as nonattainment for the 1997 8-hour ozone standard, but deferred the effective date of the classification in return for starting an Early Action Compact to meet certain milestones. However, when the area was in violation of the federal ozone standard based on data from 2005 to 2007, the area became a "Marginal" nonattainment area for the 1997 federal ozone standard on November 20, 2007.

On April 30, 2012, the EPA designated the Denver Metro/North Front Range area as marginal nonattainment under the 2008 NAAQS for ozone (0.075 ppm). In December 2019, the EPA determined that the Denver Metro/North Front Range area should be reclassified as "serious" (EPA, 2020a; 2020b). In October 2015, the EPA lowered the primary and secondary NAAQS for ozone to 0.070 ppm, and Clear Creek County was designated as attainment/unclassifiable on August 3, 2018; Jefferson County, which is included in the Denver Metro/Front Range area, was classified as marginal nonattainment on August 3, 2018 (EPA, 2020a; 2020b).

5.3.2. Carbon Monoxide

This pollutant is a colorless, odorless gas emitted directly from vehicle tailpipes as a product of combustion. Because of this, CO tends to concentrate at intersections with long vehicle delays and poor level of service (LOS). In these cases of signalized intersections with poor operations, CO hot-spot modeling is required to quantify localized emissions. CO reduces the ability of blood to bring oxygen to body cells and tissues. High concentrations of CO may be particularly hazardous to people who have heart or circulatory problems and people who have damaged lungs or breathing passages. In severe cases, CO poisoning can cause death. The Denver-Boulder area has been in violation of the CO standards in the past, but the region was re-designated to a maintenance area for this pollutant in December 2001 (EPA, 2001).

5.3.3. Particulate Matter

PM is a complex mixture of very small particles and liquid droplets classified as either inhalable coarse-sized particles (PM_{10} refers to particles 10 microns or less) or fine particles ($PM_{2.5}$ refers to particles 2.5 microns or less). PM includes diesel tailpipe emissions; road, brake, and tire dust; and dust caused by construction activities. Health effects include nose and throat irritation, lung damage, and bronchitis. The Denver Metro area has violated the PM_{10} standard in the past, but the area was re-designated to maintenance status by the EPA on September 16, 2002 (EPA, 2002) and has maintained the NAAQS since that time. Although most of the mountain counties are not included in any nonattainment or maintenance areas, PM_{10} has been a concern in the I-70 Mountain Corridor due to winter road maintenance activities, use of traction sand, and construction activities. In the Project area, however, CDOT is no longer using traction sand (CDOT, 2019). Neither the Study Area nor the Denver Metro area has been in violation of the NAAQS for $PM_{2.5}$ (CDPHE, 2010).

5.4. Air Quality Monitoring

There are no air quality monitors located near the Project area or in Clear Creek County. CO is monitored only in central Denver in the state of Colorado; APCD discontinued monitoring CO west of Jefferson County in 2006 (CDPHE, 2020), and the closest CO monitor is the I-25 roadway monitor near 8th Avenue.[1] The air quality monitor nearest to the Project is located at the city government offices in Black Hawk, approximately three miles to the north of the Project Area, and it only collects data on ozone. Additionally, the site has been collecting data only since July 2019, and therefore has only 140 days of certified data, well short of the three years of data required for air quality analysis. The air quality monitor at the National Renewable Energy Laboratory (NREL) located approximately 11 miles east of the study area also monitors for ozone, and it has the data needed for the analysis. The Boulder Chamber of Commerce site, 20 miles northeast of the Project, is the closest site with similar terrain for monitoring PM_{10} (CDPHE, 2018).

The I-25 monitor recorded the highest maximum 1-hour CO average of 4.0 ppm, and the highest maximum 8-hour CO average of 3.7 ppm in 2018 (CDPHE, 2019). Both averages are well below the 1-hour NAAQS of 35 ppm, and the 8-hour NAAQS of 9 ppm.

[1] As noted in Section 2.1, the Project will install two new air quality monitors in the Project area, one at the top of Floyd Hill and one in Idaho Springs, to collect air quality data and evaluate trends.

At NREL, the 3-year average of the 4th maximum value for monitored ozone is 79 ppb, above both the 2008 and 2015 NAAQS (APCD, 2019). The 8-hour ozone NAAQS is written such that attainment is met if this value is less than or equal to 70 ppb.

There were no violations of the PM_{10} NAAQS in the Denver Metro area in 2018, or in the previous three years (CDPHE, 2019). The highest 24-hour maximum recorded at the Boulder site was 57 µg/m^3, and the annual average was 20.3 µg/m^3.

5.5. Mobile Source Air Toxics

The CAA Amendments of 1990 listed 188 hazardous air pollutants (HAPs) and addressed the need to control toxic emissions from transportation sources. In 2001, the EPA issued its first Mobile Source Air Toxics Rule, which identified 21 mobile source air toxic (MSAT) compounds as being hazardous air pollutants that required regulation. The EPA issued a second MSAT rule in February 2007, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health. The rule also identified several engine emission certification standards that must be implemented. In addition, the EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (DPM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter (CDOT, 2020b). Unlike the criteria pollutants, air toxics do not have NAAQS, making evaluation of their impacts more subjective.

FHWA has issued updated guidance for the analysis of MSATs (FHWA, 2016). Using this guidance, CDOT and FHWA have determined this Project has low potential for MSAT impacts and is exempt from conducting a quantitative impact assessment. The types of projects typically exempt from analysis include those that serve to improve operations of a highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. Examples of these types of projects are minor widening projects; new interchanges; replacing a signalized intersection on a surface street; and projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic (AADT). This Project has projected AADT of less than 70,000 in 2040—well below the threshold of concern for MSAT impacts. It has no signalized intersections and does not increase the percentage of truck traffic on the highway.

5.5.1. Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

The Council on Environmental Quality (CEQ) provisions in 40 CFR 1502.22 state that when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency will always make clear that such information is lacking. FHWA's *Updated Interim Guidance on Mobile Source Air Toxics Analysis in NEPA Documents* (FHWA, 2016) provides the following language for inclusion in NEPA documents:

> In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any

genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the CAA and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA, https://www.epa.gov/iris). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA's *Updated Interim Guidance on Mobile Source Air Toxics Analysis in NEPA Documents*. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts; each step in the process builds on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70-year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that timeframe, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways, to determine the portion of time that people are actually exposed at a specific location, and to establish the extent attributable to a proposed action; especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for DPM. The EPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (EPA IRIS database, Diesel Engine Exhaust, Section II.C. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal)."

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the CAA to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable (https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD5985257 8000050C9DA/$file/07-1053-1120274.pdf).

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against Project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

5.6. Greenhouse Gas Emissions

Climate change is an important national and global concern. While the Earth has gone through many natural changes in climate in its history, there is general agreement that the Earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two-thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the Earth's atmosphere. Because the atmospheric concentration of GHGs continues to climb, the planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

To date, no national standards have been established regarding GHGs, nor has the EPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO_2 under the CAA. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the U.S. National Academy of Sciences, the EPA, and other federal agencies.

GHGs are different from other air pollutants evaluated in federal environmental reviews because their impacts are not localized or regional—the affected environment for CO_2 and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad-scale actions, such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for individual transportation projects. Furthermore, currently there is no scientific methodology for attributing specific climatological changes to emissions from a specific transportation project.

6. Impacts

The scope for the air quality impact analysis was determined in coordination with CDOT and FHWA, and in compliance with the EPA and FHWA transportation conformity analysis laws and guidance. It is consistent with the air quality evaluation process described in the *CDOT NEPA Manual* (CDOT, 2017), the Memorandum of Agreement Between the Colorado Department of Transportation and the Air Pollution Control Division of the Colorado Department of Public Health and Environment Regarding Procedures for Determining Project Level Conformity (December 27, 1995), and CDOT's *Air Quality Project-Level Analysis Guidance* (February 2019).

6.1. Methodology

Several analyses were conducted to identify and compare potential air quality impacts associated with the Project alternatives. These analyses were informed by using traffic data collected and modeled for the Project, and they were used to determine whether the Project meets project-level and regional conformity.

A qualitative analysis of CO and PM_{10} was conducted along I-70 and at the Beaver Brook/Floyd Hill interchange (Exit 248), which is in Jefferson County, a maintenance area for both pollutants. A portion of the Project is in the Denver Metro PM_{10} maintenance area, and conformity requirements under 40 CFR 93 apply. However, a quantitative PM_{10} assessment is not required because the Project does not meet any of the conditions in Section 93.123(b)(1) of the conformity rule:

- The Project does not create a new highway that has a significant number of diesel vehicles.
- The Project does expand a highway, but it does not lead to a significant increase in the number of diesel vehicles, as the percentage of diesel vehicles is expected to remain the same at 3.5 percent from existing to future years (CDOT, 2020b).
- The Project does not affect any signalized intersections, nor are there any intersections with a significant numbers of diesel vehicles; the percentage of diesel vehicles is expected to remain the same at 3.5 percent from existing to future years (CDOT, 2020b).
- The Project does not add or expand bus or rail terminals or transfer points.
- The Project does not impact sites of possible violation that lie within the boundaries of any air quality implementation plan.

The Project is in the Denver-Boulder carbon monoxide maintenance area and, therefore, conformity requirements under 40 CFR 93 apply. However, per the *CDOT Air Quality Project-Level Analysis Guidance* (2019) a carbon monoxide Project-level hot-spot analysis is not required because the following conditions that would require a quantitative analysis in 40 CFR 93.123(a)(1) are not met:

- (i) the Project is not in or affecting locations, areas, or categories of sites which are identified in the Denver-Boulder plan (December 15, 2005) as sites of violation or possible violation;
- (ii) CO hot-spot analysis only applies to signalized intersections (EPA, 2012). The Project does not include signalized intersections, so a quantitative assessment of the air quality impacts was not required at this location;
- (iii) the Project is not one of the top three intersections in the maintenance area plan with the highest traffic volumes, as identified in the Denver-Boulder plan;
  (iv) the Project is not one of the top three intersections in the maintenance area plan with the worst level of service, as identified in the Denver-Boulder plan.

It can, therefore, be concluded that the Project would not have a significant adverse impact on air quality.

Jefferson County also is a nonattainment area for ozone. However, Project-level analysis of ozone was not required because ozone is not modeled at the project level (CDOT, 2019).

CO, and $PM_{10,}$ and ozone are modeled on a regional basis. This Project is in the *2040 Metro Vision Regional Transportation Plan* (I-70: Vicinity of US 6 and Floyd Hill). However, only the I-70 Westbound Bridge Over US 6 portion of the Project has been included in the 2020-2023 approved Transportation Improvement Program (TIP) (TIP ID: 2008-103). Most of Project improvements are outside of the relevant air quality maintenance and nonattainment areas. Project funding for construction must be identified, and the Project must be included in the current TIP, prior to FHWA's approval of the Project and signing of a Decision Document.

The MSAT analysis also was conducted qualitatively. The decision to not conduct a quantitative analysis was based on the projected AADT of the action alternatives being less than 70,000 in 2040[2] (FHWA, 2016).

To evaluate greenhouse gas emissions, LOS at the Beaver Brook/Floyd Hill interchange was compared for each alternative and standard language and calculations, provided by CDOT, were used for the greenhouse gas emissions analysis (CDOT, 2020b).

Impacts to air quality during construction were evaluated qualitatively and draw on experiences from recent construction projects in the Study Area.

6.2. No Action Alternative Impacts

Emissions of criteria pollutants, MSATs, and GHG in the Project area are not expected to change substantially under the No Action Alternative. Under the No Action Alternative, technological improvements would result in decreased tailpipe emissions. However, that would be offset by an expected increase in vehicle miles traveled (VMT) and proportional increase in emissions. The existing peak daily VMT in the Study Area is 1,667,442 VMT (Exhibit 5). By 2040, it is expected to increase 37 percent to 2,269,302 VMT.

With additional traffic and no additional capacity with the new westbound I-70 lane, drivers will increasingly to use the US 40 frontage road to try to bypass increasing I-70 congestion, resulting in more miles traveled overall and increased congestion and declining vehicle speed on both I-70 and US 40. Congestion and stop-and-go conditions increase fuel usage and vehicle emissions and degrades ambient air quality. With local improvements to the intersections of US 40 at both CR 65 and Homestead Road, queuing would be expected to decrease and circulation would improve resulting in a decrease in localized concentrations of vehicle emission from stopped and idling vehicles. However, I-70 congestion and associated interstate traffic diversion onto US 40 would continue to cause backups along US 40 even with the improved intersection operations.

[2] 2040 is the projection year used in the FHWA/CDOT Guidance (CDOT, 2020b).

Exhibit 5. 2040 Highest Peak Daily Vehicle Miles Traveled by Project Alternatives

Existing	No Action		Tunnel Alternative		Canyon Viaduct Alternative	
	2040 VMT	Percent Change (from Existing)	2040 VMT	Percent Change (from Existing)	2040 VMT	Percent Change (from Existing)
1,667,442	2,269,302	36%	2,234,431	34%	2,232,477	34%

Source: CDOT, 2020b

6.3. Action Alternatives Impacts

Changes in emissions are proportional to changes in VMT. For the Tunnel Alternative, existing peak daily VMT is expected to increase from 1,667,442 to 2,234,431 VMT by 2040. Peak VMT for the Canyon Viaduct Alternative would be slightly less, increasing to 2,232,477 VMT in 2040. Both action alternatives are expected to increase VMT by about 34 percent (increase of 566,989 for the Tunnel Alternative and 565,035 for the Canyon Viaduct Alternative). The increases for the action alternatives are very similar; therefore, the impacts discussion below does not distinguish between the two action alternatives.

6.3.1. Criteria Pollutants

Similar to the No Action Alternative, improvements in vehicle engines and fuels would reduce criteria pollutants such as CO, NO_x, and $PM_{2.5}$. However, air quality is expected to improve compared to the No Action Alternative because the action alternatives would decrease congestion and improve speeds on I-70. The operation of the new travel lane as an Express Lane is expected to improve traffic flow and resulting air quality. The action alternatives also provide a multimodal, non-vehicular travel option through the Project area with the Greenway bike and pedestrian trail.

VMT for the action alternatives would increase by approximately 34 percent compared to existing conditions by 2040 (Exhibit 5). In addition to tailpipe emissions, for the I-70 Mountain Corridor, increases in emissions of re-entrained road dust typically increase proportionally with increased VMT. More vehicle miles mean more tires stirring up dust from winter maintenance and sand application; this was identified as a substantial issue affecting air quality in the corridor in the PEIS. However, since the publication of the Tier 1 EIS, CDOT has stopped using traction sand during winter, and emissions of re-entrained road dust during the winter months is no longer a significant issue in the Project area.

6.3.2. Mobile Source Air Toxics

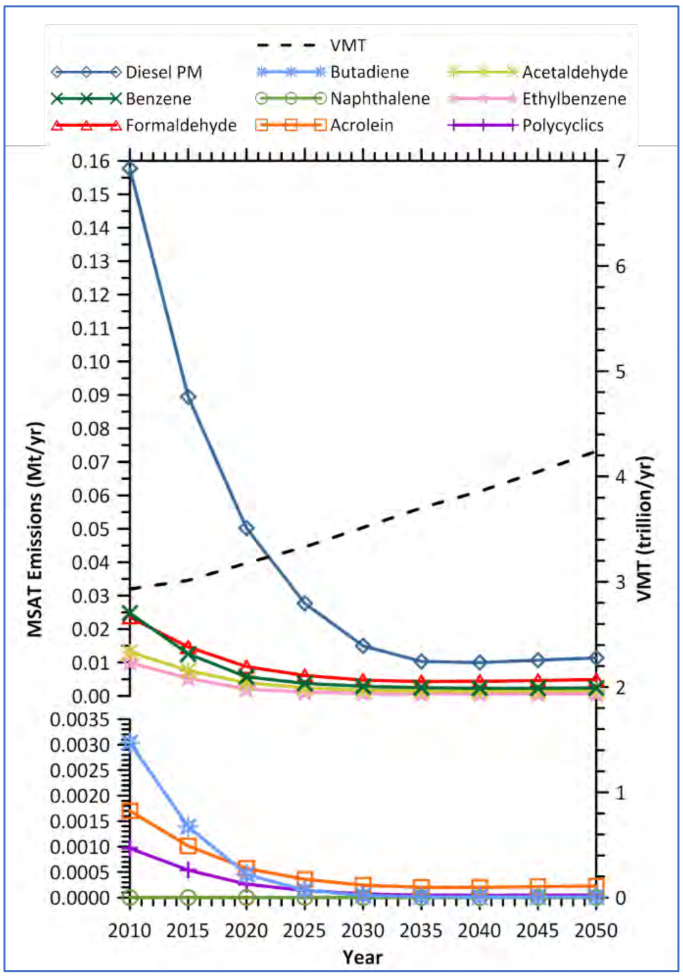
In general, adding travel lanes to an existing highway would move traffic closer to nearby receptors (homes, schools, and businesses) and result in higher ambient concentrations of MSATs in those localized areas. Sensitive receptors adjacent to I-70 within the Project area include one school and several residential properties and businesses. Most are located at the east end of the Project, by the US 40 and Homestead Road intersection. No roadway widening would occur in this location, so localized increased ambient concentrations of MSAT would not occur at these receptors.

However, a few sensitive receptors are located adjacent to the proposed third I-70 westbound lane. These include Two Bears Tap and Grill at the US 6 interchange and a few residential properties on the north side of I-70 in the Floyd Hill area. At these receptors, ambient concentrations of MSATs may be higher than those of the No Action Alternative. These increases would be offset by increased speeds and reduced congestion associated with the action alternatives (FHWA, 2016). As a result, localized

MSAT concentrations would be minor and only occur in areas where the highway is moved off its current alignment. The magnitude and duration of these potential increases compared to the No Action Alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting Project-specific MSAT health impacts.

Additionally, on a regional basis over time, emissions would be lowered due to EPA's national control programs that are projected to reduce annual MSAT emissions by more than 80 percent between 2010 and 2050 (Exhibit 7). Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the Study Area are likely to be lower in the future in nearly all cases.

Exhibit 6. FHWA-Predicted National MSAT Trends



Source: FHWA, 2016.

6.3.3. Greenhouse Gas Emissions

Per the version of the *CDOT NEPA Manual* available at the time this Project was scoped (CDOT, 2017), detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making.[3] Based on the nature of GHG emissions and the exceedingly small potential of GHG impacts from the action alternatives, as discussed below and shown in Exhibit 8, the FHWA has concluded that the GHG emissions from the action alternatives would not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)). The GHG emissions would be insignificant and would not play a meaningful role in a determination of the environmentally preferable alternative or the selection of the preferred alternative. More detailed information on GHG emissions "is not essential to a reasoned choice among reasonable alternatives" (40 CFR 1502.22(a)) or for making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternatives-level GHG analysis has been performed for this Project.

The context in which the emissions from the action alternatives would occur, together with the expected GHG emissions contribution from the Project, illustrate why the Project's GHG emissions would not be significant and would not be a substantial factor in any decision making. The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation. The transportation sector was responsible for approximately 27 percent of all anthropogenic (human caused) GHG emissions in the U.S. in 2010.[4] The majority of transportation GHG emissions are the result of fossil fuel combustion. CO_2 makes up the largest component of these GHG emissions. U.S. CO_2 emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO_2 emissions in 2010.[5] U.S. transportation CO_2 emissions accounted for about 6 percent of worldwide CO_2 emissions.[6] While the contribution of GHGs from transportation in the United States as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced, the GHG contributions become quite small. Using CO_2 because of its predominant role in GHG emissions, Exhibit 8 presents the relationship between current and projected Colorado highway CO_2 emissions and total global CO_2 emissions, as well as information on the scale of the Project relative to statewide travel activity.

Exhibit 7. Statewide and Project Emissions Potential, Relative to Global Totals

	Global CO_2 Emissions, MMT[1]	Colorado Motor Vehicle Emissions, MMT[2]	Colorado Motor Vehicle Emissions, % of Global Total	Project Study Area VMT, % of Statewide VMT	Percent Change in Statewide VMT due to Project
Current Conditions (2010)	29,670	10.3	0.0348%	2.17%	none
Future Projection (2040)	45,500	11.9	0.0261%	1.70%	-0.46%

Source: (CDOT, 2020b)

[3] See 40 CFR 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7

[4] Calculated from data in U.S. Environmental Protection Agency, Inventory of Greenhouse Gas Emissions and Sinks, 1990-2010

[5] Calculated from data in U.S. Energy Information Administration (EIA) International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8, accessed 2/25/13.

[6] Calculated from data in EIA figure 104 (http://www.eia.gov/forecasts/archive/ieo10/emissions.html) and EPA table ES-3 (http://epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf)

MMT = million metric tons

[1]These estimates are from the U.S. Energy Information Administration (EIA) International Energy Outlook 2010 and are considered the best-available projections of emissions from fossil fuel combustion. These totals do not include other sources of emissions, such as cement production, deforestation, or natural sources; however, reliable future projections for these emissions sources are not available.
[2]MOVES projections suggest that Colorado motor vehicle CO_2 emissions may increase by 14.9 percent between 2010 and 2040; more-stringent fuel economy/GHG emissions standards will not be sufficient to offset projected growth in VMT.

Based on emissions estimates from EPA's Motor Vehicle Emissions Simulator (MOVES) model[7] and global CO_2 estimates and projections from the Energy Information Administration (EIA), CO_2 emissions from motor vehicles in the entire state of Colorado contributed less than one tenth of one percent (0.0348 percent) to global emissions in 2010. These emissions are projected to contribute an even smaller fraction (0.0261 percent) in 2040[8]. By comparing the 2040 peak day VMT in the Project area (Exhibit 5) to the projected 2040 Daily VMT in Colorado of 131,434,700 (CDOT, 2020b), VMT in the Project area on a peak day represents approximately 2 percent of total Colorado travel activity. However, the Project itself would decrease statewide VMT by less than 1 percent by moving traffic from local roads to I-70 (CDOT, 2020b). As a result, based on the action alternative with the highest VMT[9], FHWA estimates that the proposed Project would not result in a meaningful change in global CO_2 emissions in 2040. This very small change in global emissions is well within the range of uncertainty associated with future emissions estimates.[10,11]

This document does not incorporate an analysis of the GHG emissions or climate change effects because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts would not be

[7] http://www.epa.gov/otaq/models/moves/index.htm. EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide and other GHGs. CO_2 is frequently used as an indicator of overall transportation GHG emissions because the quantity of these emissions is much larger than that of all other transportation GHGs combined, and because CO_2 accounts for 90 percent to 95 percent of the overall climate impact from transportation sources. MOVES includes estimates of both emissions rates and VMT, and these were used to estimate the Colorado statewide highway emissions in Exhibit 8.

[8] Colorado emissions represent a smaller share of global emissions in 2040 because global emissions increase at a faster rate.

[9] Selected to represent a "worst case" for purposes of this comparison; the Preferred Alternative may have a smaller contribution.

[10] For example, Figure 114 of the Energy Information Administration's *International Energy Outlook 2010* shows that future emissions projections can vary by almost 20%, depending on which scenario for future economic growth proves to be most accurate.

[11] When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency is required make clear that such information is lacking (40 CFR 1502.22). The methodologies for forecasting GHG emissions from transportation projects continue to evolve and the data provided should be considered in light of the constraints affecting the currently available methodologies. As previously stated, tools such as EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide and other GHGs. However, only rudimentary information is available regarding the GHG emissions impacts of highway construction and maintenance. Estimation of GHG emissions from vehicle exhaust is subject to the same types of uncertainty affecting other types of air quality analysis, including imprecise information about current and future estimates of vehicle miles traveled, vehicle travel speeds, and the effectiveness of vehicle emissions control technology. Finally, there presently is no scientific methodology that can identify causal connections between individual source emissions and specific climate impacts at a particular location.

meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives.

6.3.4. Construction Impacts

The action alternatives would result in temporary, intermittent increases in emissions during construction related to reduced speeds along the detour route, tunnel blasting, rock excavation, and general construction activities, such as use and staging of diesel-emitting construction equipment. However, impacts are expected to be minor. Monitoring of fugitive dust emissions (PM_{10}) conducted for the eastbound Twin Tunnels project confirmed that emissions from tunnel blasting activities were well below the NAAQS, establishing that impacts are minor, and monitoring is not necessary.

7. Mitigation

Mitigation measures are recommended to address permanent and temporary adverse impacts of the Project alternatives. Permanent impacts to air quality are not expected with any of the action alternatives. As part of the Project, CDOT plans to install two permanent air quality monitors in Idaho Springs and Floyd Hill to collect regulatory-grade data on local air quality conditions and trends, which will improve understanding and ability to estimate impacts on air quality in the I-70 Mountain Corridor. These data may help identify opportunities to further improve air quality in the area in the future.

7.1. Relevant Tier 2 Mitigation

To mitigate for the potential regional impacts identified in the PEIS of continued vehicular emission of pollutants of concern globally and locally, and the generation of vehicular emissions and dust during construction and from re-entrained dust from vehicular travel, CDOT committed to supporting the policies and programs, as described below, to improve air quality in the I-70 Mountain Corridor:

- Support local jurisdiction efforts, such as those in Clear Creek County, to secure grants to help develop data that will better inform air quality measurements and mitigation. Air quality monitoring during construction of the widening of the Twin Tunnels is an example of this.
- Support engine-idling ordinances to restrict emissions produced from idling auto and commercial vehicles, especially buses, delivery trucks, etc.
- Continue to support regional, statewide, and national efforts to reduce air pollutants and comply with current air quality regulations.

These mitigation measures are relevant to this Project because ozone, MSATs, and GHG are regional pollutants, and they require regional mitigation solutions. The ROD acknowledged that some issues of air quality, particularly emissions of greenhouse gases, are global issues that are difficult to assess on a project-specific level. As such, FHWA and CDOT committed to work on these broad issues at a program level, while also incorporating measures to control air pollutant emissions locally. Because the PEIS Preferred Alternative was not anticipated to cause or result in violations of any NAAQS, most mitigation measures for air quality identified in the ROD focus on controlling fugitive dust during construction, operations, and maintenance.

CDOT has employed travel demand management strategies and techniques that reduce overall VMT, which correlates to reductions in air pollutants. Examples of such strategies already employed by CDOT to reduce congestion along the I-70 Mountain Corridor include the MEXL peak period shoulder running lane with tolls and commuter incentive programs to delay or arrange for travel outside of peak periods. Operational strategies that focus on traffic management also help reduce MSAT emissions, including the use of active Intelligent Transportation System programs, such as traffic management centers, variable message signs, or incident management systems.

7.2. Mitigation for Temporary Impacts

Exhibit 9 summarizes the temporary impacts that are anticipated during construction of any of the action alternatives and recommended mitigation measures.

Exhibit 8. Recommended Mitigation Measures for Temporary Impacts

Location	Activity	Impact	Mitigation
Entire construction zone	Ground excavation and site preparation activities	Dust during construction	Monitor for particulate matter less than 10 microns in size (PM_{10}), which will allow for the real-time modification or implementation of various dust control measures during construction.
Entire construction zone	Ground excavation and site preparation activities	Dust during construction	• Obtain any required air quality permits prior to start of construction, including a CDPHE Air Pollutant Emission Notice (APEN), which requires a Fugitive Dust Control Plan to address how dust will be kept at a minimum at the Project site.
Entire construction zone	Construction equipment movement	Dust during construction	Locate staging areas as far away as possible from residential areas.
Entire construction zone	Diesel emissions from construction equipment and vehicles	Higher pollution emissions in construction areas nearest equipment	• Locate construction vehicles and equipment with diesel engines as far away as possible from residential areas. • Require heavy construction equipment to use the cleanest available engines or be retrofitted with diesel particulate control technology. • Keep construction equipment and vehicles well maintained to ensure exhaust systems are kept in good working order. • Post signage indicating engines should not idle more than 5 minutes.

Location	Activity	Impact	Mitigation
			• Install engine pre-heater devices to eliminate any idling for cold season construction. • Prohibit tampering with equipment to increase horsepower or defeat an emissions control device's effectiveness.

7.3. Mobile Source Air Toxics

7.3.1. Mitigation for Permanent Adverse Impacts

Travel demand management strategies and techniques that reduce overall VMT; reduce a particular type of travel, such as long-haul freight or commuter travel; or improve the transportation system's efficiency would mitigate MSAT emissions that may increase in localized areas where the alignment or footprint of I-70 changes. See Section 7.1 of this document for example strategies previously used by CDOT.

7.3.2. Mitigation for Temporary Impacts

Construction activity may generate a temporary increase in MSAT emissions from diesel equipment. Mitigation identified in Exhibit 9 will provide a reduction in temporary diesel emissions. In addition, FHWA and CDOT have supported a host of diesel retrofit technologies in the Congestion Mitigation and Air Quality (CMAQ) Improvement Program provisions—technologies that are designed to lessen a number of MSATs (FHWA, 2016).

7.4. Greenhouse Gas Emissions

To help address the global issue of climate change, the U.S. Department of Transportation (USDOT) is committed to reducing GHG emissions from vehicles traveling on our nation's highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon-intensive fuels. The agencies have jointly established new, more-stringent fuel economy and first-ever GHG emissions standards for cars and light trucks with model years from 2012 to 2025, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first-ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.[12] Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO_2 emissions in future years.

[12] For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: http://www.nhtsa.gov/fuel-economy/.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist states and metropolitan planning organizations (MPOs) in performing GHG analyses, FHWA has developed a *Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process.* The Handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level and will demonstrate how this evaluation may be integrated into the transportation planning process. FHWA also has developed a tool for use at the statewide level to model many GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and MPOs in assessing climate change vulnerabilities from their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted it in several locations.

At the state level, several programs are under way in Colorado to address transportation GHGs. The Governor's Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO_2 emissions standards and to reduce vehicle travel through transit, flex time, telecommuting, ridesharing, and broadband communications. CDOT issued a Policy Directive on Air Quality in May 2009. This Policy Directive was developed with input from numerous agencies, including the CDPHE, EPA, FHWA, the Federal Transit Administration (FTA), the Denver Regional Transportation District, and the Denver Regional Air Quality Council. This Policy Directive and it accompanying implementation document, the *CDOT Air Quality Action Plan*, address unregulated MSATs and GHGs produced from Colorado's state highways, interstates, and construction activities.

As a part of CDOT's commitment to addressing MSATs and GHGs, some of CDOT's program-wide activities include:

- Researching pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
- Developing air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools, including development of vehicle idling reduction programs for schools and communities.
- Offering outreach to communities to integrate land use and transportation decisions to reduce growth in VMT, such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.
- Committing to research additional concrete additives that would reduce the demand for cement.
- Expanding Transportation Demand Management efforts statewide to better use the existing transportation mobility network.
- Continuing to diversify the CDOT fleet by retrofitting diesel vehicles, specifying the types of vehicles and equipment contractors may use, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner-burning fuels through bidding incentives where feasible.
- Exploring congestion and/or right-lane-only restrictions for motor carriers.
- Funding truck parking electrification.
- Researching additional ways to improve freight movement and efficiency statewide.
- Committing to use ultra-low sulfur diesel for non-road equipment statewide.
- Developing a low-VOC emitting tree landscaping specification.

As outlined above, the FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO_2 emissions—and to assess the risks to transportation systems and services from climate change. Even though project-level mitigation measures will not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved, the above-identified activities are part of a program-wide effort by FHWA and CDOT to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c). FHWA will continue to pursue these efforts as productive steps to address this important issue. Finally, the construction best practices described above represent practicable Project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the federal-aid highway program.

8. Agency Coordination

The Project team has coordinated with CDOT and FHWA staff to ensure compliance with the CAA and NEPA requirements for review of potential air quality impacts. Even though major portions of construction for the Project are outside of the nonattainment and maintenance areas in the region, APCD and the EPA will be sent copies of this completed technical report for review of the conformity determination; concurrence from APCD will be required.

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