APPENDIX A4

AIR QUALITY TECHNICAL MEMORANDUM

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Illingworth & Rodkin, Inc.

INTRODUCTION AND BACKGROUND

The I-70 West Vail Pass Auxiliary Lanes project is located in Eagle and Summit Counties, with the eastern terminus just east of the Vail Pass Rest Area and the western terminus in the Town of Vail. The project study limits include eastbound (EB) and westbound (WB) I-70 from mile post (MP) 179.5 to MP 191.5. The project location and approximate study area are shown in **Figure 1**.

As part of the initial National Environmental Policy Act (NEPA) analysis, a Tier 1 Environmental Impact Statement (EIS) for the I-70 Mountain Corridor (C-470 to Glenwood Springs) was completed in 2011. This EIS, the *I-70 Mountain Corridor Programmatic Final Environmental Impact Statement* (PEIS), recommended the addition of auxiliary lanes EB and WB on the west side of Vail Pass from MP 180 to MP 190 as part of the Preferred Alternative's Minimum Program of Improvements. The PEIS also identified the potential for an elevated Advanced Guideway System (AGS) for transit along the I-70 corridor, including the West Vail Pass project corridor. A follow-up AGS Feasibility Study in 2014 analyzed potential alignments and costs for an AGS system and determined there were three feasible alignments for future AGS. While AGS is not part of the West Vail Pass Auxiliary Lanes project, the AGS Feasibility Study was used to ensure the project did not preclude the favored alignment of the three, which would be partially within CDOT right-of-way (ROW).

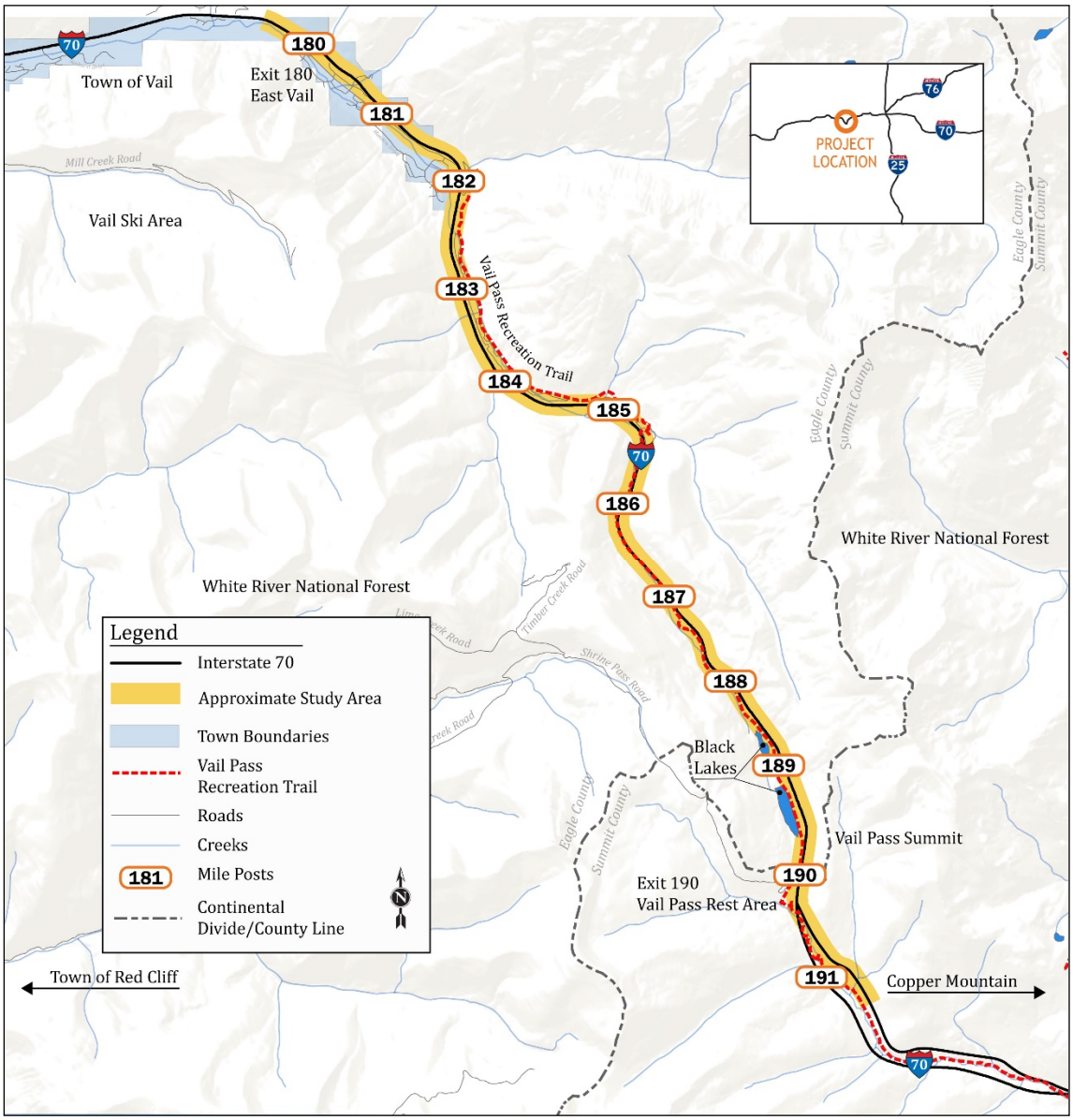
A Tier 2 NEPA analysis is the next step required to move highway improvements forward. The project is following the Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA) NEPA process to confirm the needs for improvements to West Vail Pass, identify a Proposed Action, investigate the anticipated benefits and impacts of the proposed improvements (through an Environmental Assessment), produce conceptual design plans, and make funding, scheduling, and phasing recommendations.

This memorandum describes air quality impacts associated with the I-70 West Vail Pass Auxiliary Lanes project.

I-70 FINAL PEIS AND RECORD OF DECISION CLIMATE AND AIR QUALITY (TIER 1 ANALYSIS)

The I-70 Final PEIS identified and recommended mitigation for climate and air quality issues throughout the I-70 Mountain Corridor (Corridor) for the Preferred Alternative. With the exception of the east end of the Mountain Corridor in Jefferson County in the Denver metropolitan area, the I-70 Final PEIS found that the Corridor meets the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. However, air quality was found to be a growing concern to Corridor communities due to increasing development, construction, and traffic along the Corridor, combined with windblown dust from street maintenance activities, mine tailings, sand and gravel mining operations, and woodburning.

Figure 1. Project Location and Study Area



Source: DEA Project Team

As identified in the I-70 Final PEIS and Record of Decision (ROD), CDOT will conduct the following activities during Tier 2 NEPA processes:

- Develop specific and more detailed mitigation strategies and measures.
- Develop best management practices specific to each project.
- Adhere to any new laws and regulations that may be in place when Tier 2 NEPA processes are under way.

The I-70 Mountain Corridor ROD identified mitigation strategies that address climate and air quality concerns with regards to continued vehicular emissions and dust generation. The mitigation measures identified at the end of this memo are consistent with the mitigation strategies identified in the ROD.

LEGISLATION

Air quality is primarily regulated under the 1970 Clean Air Act (Title 42 United States Code [USC] Chapter 85) and amendments from 1977 and 1990. The purpose of the Clean Air Act is to protect and enhance air quality to promote public health, welfare, and the productive capacity of the nation. The Clean Air Act addresses criteria air pollutants (regulated through the National Ambient Air Quality Standards [NAAQS]), hazardous air pollutants (HAPs) (a subset of HAPs is referred to as mobile source air toxics [MSATs]), and greenhouse gases (GHGs).

NEPA and its implementing regulations (40 CFR 1500) mandate that transportation decisions involving a federal nexus or federal funds adhere to the NEPA regulations. NEPA requires that federal agencies use a systematic, interdisciplinary approach to decision-making when federal actions may affect the quality of the human environment. In addition, CDOT strives to meet the intent and requirements of NEPA for state transportation activities, regardless of whether or not these activities are federally funded. Therefore, CDOT conducts air quality evaluations for its projects for various reasons, including:

- To fulfill requirements of the Clean Air Act and amendments, including the Transportation Conformity Rule (40 CFR 93 Subpart A – This subpart provides structure for DOTs to comply with section 176(c) of the Clean Air Act).
- To comply with NEPA and CDOT's environmental stewardship guide, which ensures the statewide transportation system is constructed and maintained in an environmentally responsible, sustainable, and compliant manner.

In addition, the following regulations and guidance apply to air quality resource evaluations:

- EPA project-level conformity guidance and other resources – EPA guidance on hot-spot analysis and project level conformity. Last updated 2017.
- EPA NAAQS – National Ambient Air Quality Standards (NAAQS), as required by the Clean Air Act. The most recent NAAQS are from 2015.
- FHWA's Mobile Source Air Toxic Analysis in NEPA – This memo updates guidance on how the FHWA should analyze Mobile Source Air Toxics. Last updated 2016.
- AQCC Regulation No. 10, Criteria for Analysis of Transportation Conformity – This regulation establishes a SIP revision and requires any person adopting or approving a regionally significant project to comply with 40 CFR Part 93 subpart A. Last updated 2016.
- AASHTO's Practitioner's Handbook: Addressing Air Quality Issues in the NEPA Process for Highway Transportation Projects. Last updated 2017.

- CDOT's Air Quality Project-Level Analysis Guidance, Version 1, is the guidance for conducting project-level air quality analyses for road improvement projects in Colorado. Published 2019[1].

Study Area

As indicated above, the project location and study area are shown in **Figure 1.** This includes the project study limits of EB and WB I-70 from MP 179.5 to MP 191.5. Receptors within 500 feet of the study limits were considered in this analysis.

Purpose and Need

The purpose of the project is to improve safety and operations on EB and WB I-70 on West Vail Pass.

This project is needed to address safety concerns and operational issues due to geometric conditions (steep grades and tight curves) and slow-moving vehicle and passenger vehicle interactions that result in inconsistent and slow travel times along the corridor. The I-70 Mountain Corridor Programmatic Environmental Impact Statement (PEIS) identified safety and mobility issues on West Vail Pass related to speed differentials due to slow-moving vehicles. *(Mobility is defined as the ability to travel along the I-70 Mountain Corridor safely and efficiently in a reasonable amount of time.)*

- Safety Concerns: A high number of crashes occur along the corridor related to speed, tight curves, narrow roadway area, and inclement weather/poor road conditions. Speed differentials between passenger vehicles and slow-moving vehicles causes erratic lane changes and braking maneuvers resulting in crashes and spin outs. Emergency response is hampered by vehicular speeds and lack of roadway width to provide room for emergency vehicles to pass.
- Operational Issues: The steep grades and resulting speed differentials causes slow and unreliable travel times through the corridor. Tight curves also cause drivers to slow down. The corridor is frequently closed by vehicle incidents, due to lack of width to maintain a single lane of traffic adjacent to emergency responders, resulting in substantial traffic backups and delays. During winter months, the travel lanes and shoulders are severely impacted by snow accumulation, impacting the overall capacity of the corridor. *(Operations is intended to describe the flow of traffic at desirable speeds given the geometric and prevailing weather conditions.)*

No Action Alternative

The No Action Alternative is included as a baseline for comparison to the action alternative. Under the No Action Alternative, only programmed projects that are planned and funded by CDOT or other entities would be completed. Currently, there are no large-scale transportation projects to add safety improvements, operational improvements, vehicular capacity, and multimodal facilities along I-70 within the project area. The No Action Alternative would leave West Vail Pass as it currently is configured and would not provide substantial improvements beyond typical current maintenance (e.g. resurfacing and plowing) activities. The roadway would remain the same, with 2 EB and 2 WB

[1] Note this guidance was published subsequent to the scoping date of this project.

lanes (each 12 feet in width), an inside shoulder typically 4 feet in width, and an outside shoulder typically 10 feet in width.

Proposed Action Alternative

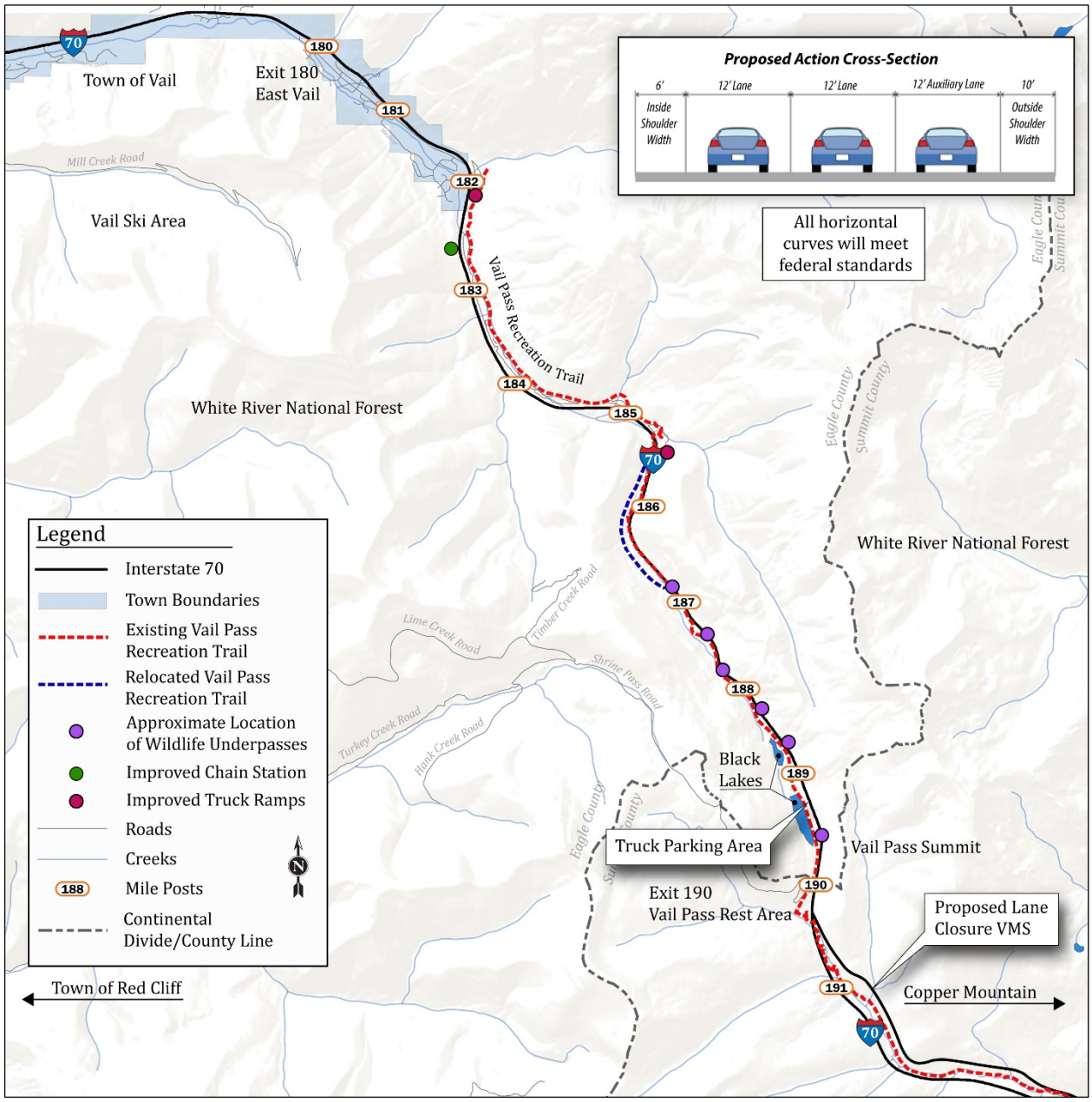
The Proposed Action (**Figure 2**) will add a 12-foot auxiliary lane, both EB and WB, for 10 miles from approximately the East Vail exit (MP 180) to the Vail Pass Rest Area exit (MP 190). Existing lanes will be maintained at 12 feet and the shoulders would be widened to a minimum of 6 feet for inside shoulders and be maintained at 10 feet for outside shoulders. All existing curves will be modified as needed to meet current federal design standards.

Intelligent Transportation System (ITS) equipment will also be installed along the I-70 project corridor, consistent with recent study recommendations. Additional variable message signs (VMSs) will be installed at key locations to warn drivers of upcoming curves, grades, and incidents. Additional variable speed limit signs will be installed to manage driver speeds to conditions. Automated lane closure signage will be installed approaching the East Vail exit on EB I-70 and approaching the WB I-70 Vail Pass Rest Area exit to quickly and efficiently close lanes when needed.

Additional elements of the Proposed Action include:

- The Vail Pass Recreation Trail will be directly impacted by the addition of the I-70 auxiliary lane and therefore relocated for approximately two miles from MP 185 to MP 187.
- Existing emergency truck ramps, located at approximately MP 182.2 and 185.5, will be upgraded to current design standards.
- Six wildlife underpasses and wildlife fencing will be constructed throughout the corridor.
- Additional capacity will be added to the existing commercial truck parking area at the top of Vail Pass.
- Widened shoulders (minimum of eight feet of additional width beyond the 10' shoulder) at multiple locations to accommodate emergency pull-offs, emergency truck parking, and staging for tow trucks.
- Improved median emergency turnaround locations to accommodate emergency and maintenance vehicle turnaround maneuvers.
- Improved chain station located at approximately MP 182.5 with additional parking, signage, lighting, and separation from the I-70 mainline.
- Avalanche protection located at approximately MP 186.

Figure 2. I-70 West Vail Pass Auxiliary Lanes Proposed Action Alternative



Source: DEA Project Team

METHODOLOGY

DETERMINATION OF TYPE AND APPLICABILITY OF AIR QUALITY ANALYSIS

Up to six types of analysis may be required, depending on the scope and location of the proposed project. The analyses may be quantitative or qualitative. The types of analysis are:

- Criteria pollutant for conformity (regional and/or local)
- Criteria pollutant not for conformity
- MSAT
- GHG/climate change
- Construction
- Cumulative and/or indirect effect

Applicability of the transportation conformity regulation is based on funding and location:

- Funding – Conformity regulations apply only to the approval, funding, or implementation of FHWA/FTA projects, as specified in 40 CFR 93.102(a)(1)(iii). Even if conformity requirements would not apply as a result of the funding source, section 40 CFR 93.121 does apply if the project is regionally significant, regardless of funding source.

  Location – Conformity regulations apply to projects that are in whole or in part in at least one ozone, CO, NO2, PM_{10}, and/or $PM_{2.5}$ nonattainment or maintenance area as specified in 40 CFR 93.102(b). If the project is not in one of these areas, conformity requirements do not apply.

A project that qualifies as a type listed in 40 CFR 93.126 is exempt from conformity requirements, regardless of funding source or location, unless the metropolitan planning organization and other agencies concur that the project has potentially adverse emission impacts for any reason.

LEVEL OF ANALYSIS

The project site is located in Eagle and Summit Counties and is designated attainment or unclassified for all NAAQS. Therefore, transportation conformity requirements do not apply to this project. The project is anticipated to have a low potential for MSAT effects; therefore, a qualitative analysis was conducted. Greenhouse gases are addressed through a qualitative analysis.

EXISTING CONDITIONS

SETTING

Many statutes, regulations, plans, and policies have been adopted at the federal, state, and local levels to address air quality issues related to transportation and other sources. Transportation projects are subject to air quality regulations at each of these levels. This section introduces the pollutants governed by these regulations and describes the regulation and policies that are relevant to the proposed project.

CRITERIA AIR POLLUTANTS

The Clean Air Act identifies six criteria air pollutants: carbon monoxide (CO), ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). PM is subdivided into two categories. PM with a diameter of 10 microns or smaller is referred to as PM_{10}. PM with a diameter

of 2.5 microns or smaller is referred to as $PM_{2.5}$. Transportation sources typically emit CO, NO_2, ozone precursor pollutants, and PM.

NAAQS specify the maximum allowable ambient concentrations of criteria pollutants over specific averaging times, above which adverse effects on human health or welfare may occur. Criteria pollutant concentrations are usually monitored at many locations in each state. Primary NAAQS, which are human health-based, have been established for each criteria pollutant to protect public health with an adequate margin of safety. Secondary NAAQS, which are welfare-based, have been established for some criteria pollutants to protect public welfare (e.g., crops, vegetation, wildlife, buildings and national monuments, and visibility). The U.S. Environmental Protection Agency (EPA) periodically update NAAQS. The EPA designates areas that exceed the NAAQS as nonattainment areas. State Implementation Plans (SIPs) are created to improve or maintain the air quality within the states, including the nonattainment areas. To reach these air pollution reduction goals, SIPs place control requirements on emission sources, which may include the transportation sector, as well as stationary sources. Once air pollution concentrations fall below the NAAQS in the nonattainment area for at least three years, the state can create a maintenance plan for EPA to approve. With this approval, EPA will re-designate the area to attainment/maintenance. If the area stays below the NAAQS for 20 years, the EPA may re-designate it as an attainment area.

Nonattainment and maintenance areas are subject to the Transportation Conformity Rule (40 CFR 93), which directs that federally supported transportation activities must be consistent with (i.e., "conform to") the purposes of any applicable SIP. Transportation projects outside nonattainment and maintenance areas are not subject to the conformity regulations.

MSAT

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. EPA regulate 188 air toxics, also known as hazardous air pollutants. The U.S. EPA has assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of U.S. EPA's Integrated Risk Information System (IRIS) (https://www.epa.gov/iris). In addition, the U.S. 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-hazard contributors from the 2011 National Air Toxics Assessment (NATA) (https://www.epa.gov/national-air-toxics-assessment). U.S. EPA has identified nine priority MSATs, which are usually in petroleum-fueled vehicle exhaust: benzene, acetaldehyde, formaldehyde, acrolein, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), naphthalene, polycyclic organic matter, and ethylbenzene (FHWA, 2016). FHWA also considers these to be priority MSATs, although the list is subject to change and may be adjusted in consideration of future U.S. EPA rules. MSATs are of concern because they are known or suspected to cause cancer or other serious health effects.

The 2007 U.S. EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using U.S. EPA's MOVES2014a model, even if vehicle activity (vehicle-miles traveled, VMT) increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emission rate for the priority MSATs is projected for the same time period, as shown in **Figure 2**.

GREENHOUSE GASES

Most GHG emissions from the transportation sector are carbon dioxide, resulting from the combustion of petroleum-based products, such as gasoline, in internal combustion engines. Relatively small amounts of methane and nitrous oxide are also emitted during fuel combustion. In addition, a small amount of hydrofluorocarbons are emitted from the use of mobile air conditioners and refrigerated transport. 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 due to acceleration of GHG emissions.

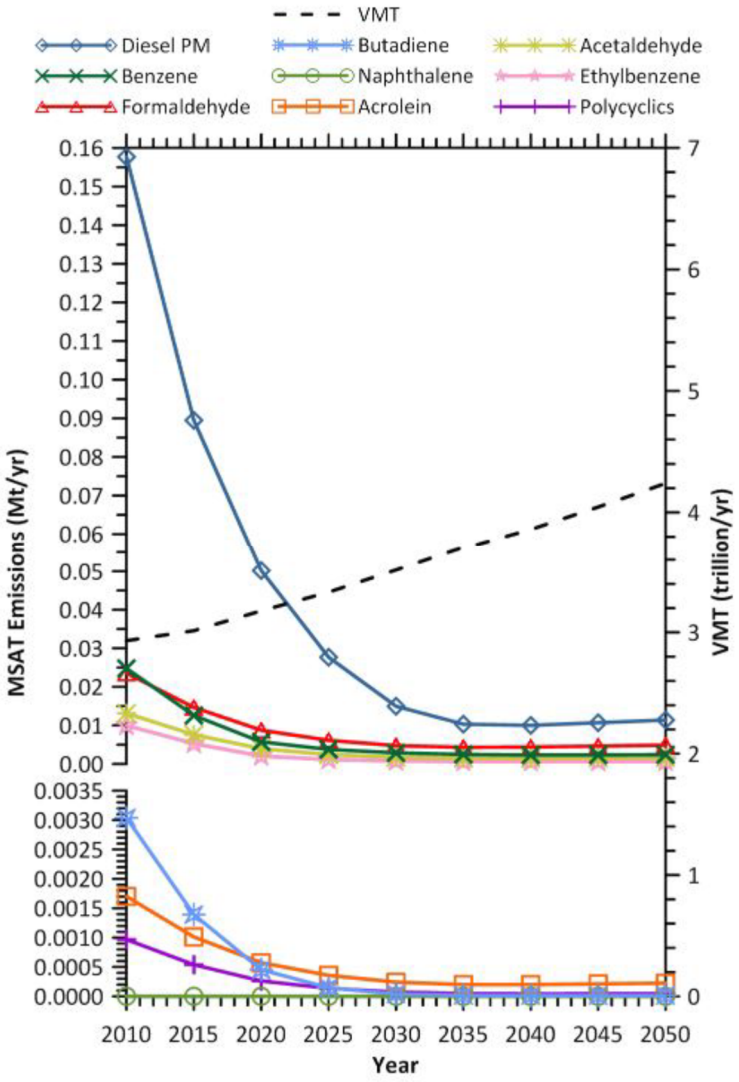
CLIMATE AND AIR QUALITY CONDITIONS

The relatively dry climate in Eagle and Summit counties contributes to PM_{10} emissions from windblown dust. Woodburning and re-entrained dust from highway and street sanding also contribute to PM_{10} emissions during the winter. Woodburning is less of an issue in Summit County due to restrictions on woodstove usage. Windblown dust from sand and gravel mining and construction activities is also a source of PM_{10} emissions.

AIR POLLUTANT LEVELS

The Air Pollution Control Division (APCD) of the Colorado Department of Public Health and Environment (CDPHE) conducts air quality and meteorological monitoring throughout the state. Ozone and particulate matter (PM_{10} and $PM_{2.5}$) monitors are the most abundant and widespread monitors in the network. The monitoring network is designed to measure air pollutant levels in accordance with the Clean Air Act, such that areas throughout the state can be classified with respect to attaining or not attaining the NAAQS. The project is located within the "Central Mountains" monitoring region, which is a rural area. Only PM_{10} is monitored in this region due to the concern of woodsmoke and roadway dust. APCD reports that all the region complies with the NAAQS (APCD 2018).

Figure 2: FHWA Projected National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways Using EPA's MOVES2014a MODEL



Sensitive Receptors

Sensitive receptors are considered locations where people tend to congregate, such as day care centers, schools, retirement homes, hospitals, or residences, that are close to a transportation project. The western portion of the project, between the Big Horn Road interchange and Big Horn Road underpass, includes residential areas that are within 500 feet of the project. These areas are depicted on the aerial figures shown in **Figure 4**. The sensitive receptors within the blue boundary are within 500 feet of the project. Further east, there are recreational areas; however, these are uses that would not have sensitive populations exposed for extended durations.

IMPACTS

Project impacts include emissions from temporary construction. Operation of the project would not change traffic conditions in a manner that would permanently increase emissions and cause air quality impacts. Since the project has a low potential to affect criteria air pollutant, MSAT and GHG emissions, and is not located in an area designated nonattainment under the NAAQS, a qualitative analysis of air quality effects is appropriate.

CRITERIA AIR POLLUTANT ANALYSIS

The project modifies an existing traffic facility to provide improvements described above that mainly include new auxiliary lanes to improve traffic flow. Traffic using the project would continue to generate emissions of criteria air pollutants (and their precursors) at the same or similar rate as the existing facility. Overall roadway vehicle emissions are primarily dependent on traffic volume, traffic mix, traffic speed, and travel length. Average annual daily traffic (AADT) on the facility is 21,800 vehicles per day.

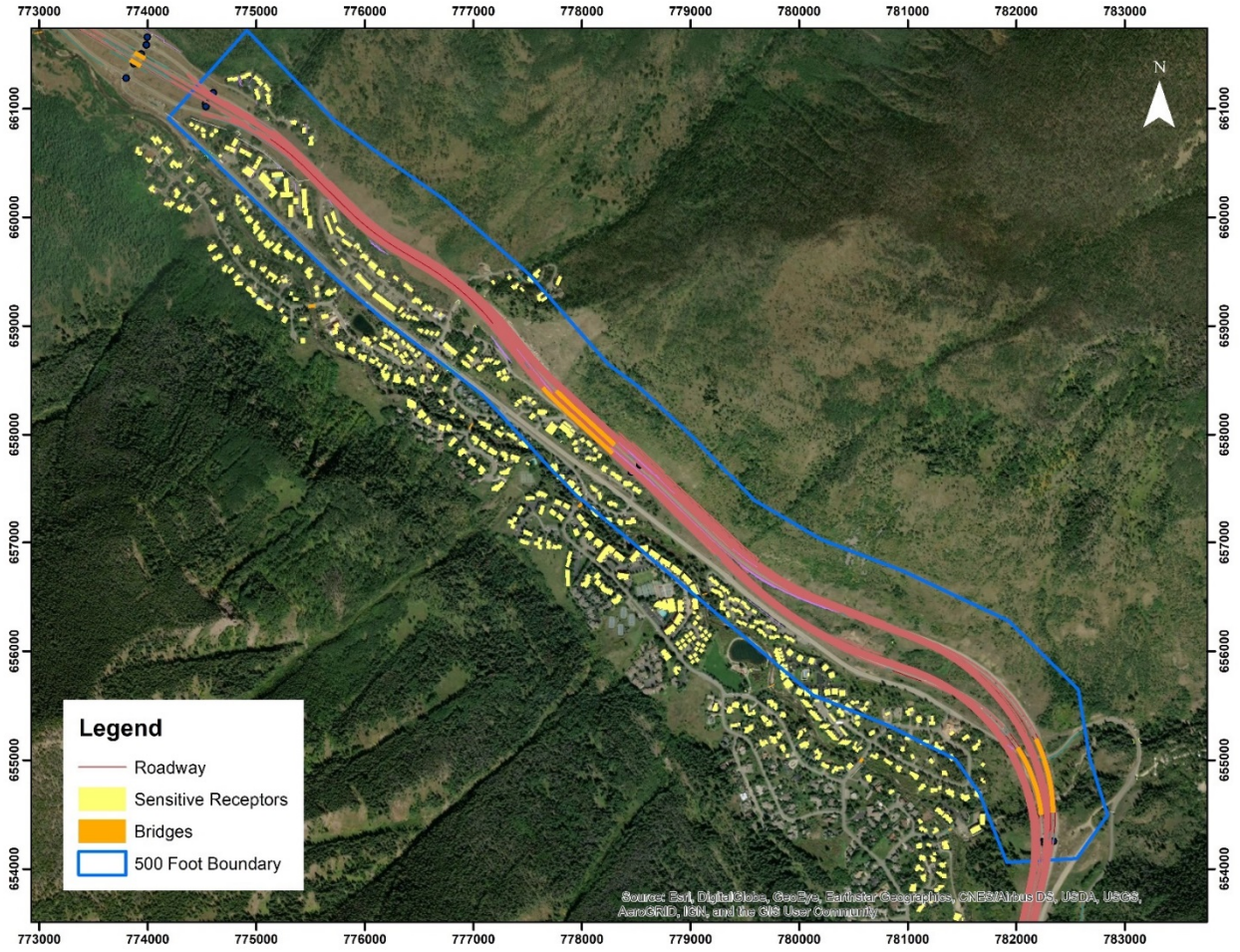
NO ACTION ALTERNATIVE

In the 2045 under No Action conditions, the AADT would increase to 37,400 vehicles per day. While traffic levels would increase, emission rates are anticipated to decrease. Emission decreases are predicted because the vehicle fleet on highways is always changing as newer vehicles replace older vehicles. New vehicles have lower emission rates due to improved emission control technology and greater fuel efficiency that reduces the amount of fuel combustion. There is also an increase in the volume of electric and hybrid vehicles that have little to no tailpipe or emissions.

PROPOSED ACTION ALTERNATIVE

The Proposed Action traffic volume would be the same as the No Action Alternative. The project would not change traffic speeds, except to increase speeds due to less congestion during busier periods. The roadway travel lengths would remain the same. Therefore, the Proposed Action would not increase emissions with respect to the No Action Alternative. As a result, the Proposed Action would not cause new or contribute to existing violations of the NAAQS.

Figure 4: Sensitive Receptors Located Near the Project



Mobile Source Air Toxics

FHWA released updated guidance in October 2016 (FHWA, 2016) for determining when and how to address MSAT impacts in the NEPA process for transportation projects. FHWA identified three levels of analysis:

- Category 1: No analysis for exempt projects or projects with no potential for meaningful MSAT effects;
- Category 2: Qualitative analysis for projects with low potential MSAT effects; and
- Category 3: Quantitative analysis to differentiate Alternative for projects with higher potential MSAT effects.

Projects with no impacts generally include those that:

- qualify as a categorical exclusion under 23 CFR 771.117,
- qualify as exempt under the FCAA conformity rule under 40 CFR 93.126, or
- are not exempt but have no meaningful impacts on traffic volumes or vehicle mix.

Projects that have low potential MSAT effects are those that serve to improve highway, transit, or freight operations or movement without adding substantial new capacity or creating a facility that is likely to substantially increase emissions. Most projects fall into this category, including this project. 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 average annual daily traffic (AADT). For these projects, a qualitative assessment of emissions projections is conducted. Qualitative assessments consider the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSAT for the project alternatives, including No-Action Alternative, based on VMT, vehicle mix, and speed. Because the emission effects of these projects typically are low, no appreciable difference in overall MSAT emissions among the various alternatives is anticipated.

No Action Alternative

Under the No Action Alternative, traffic volumes will increase from 21,800 to 37,400 vehicles per day by 2045. However, MSAT emissions will likely be lower with the Proposed Action than present levels in the horizon year as a result of U.S. EPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050.

Proposed Action Alternative

Under FHWA guidance, the Proposed Action falls under *Category 2: Qualitative analysis; projects with low potential MSAT effects*. The Proposed Action would improve highway operations without adding substantial new capacity or create a facility that is not likely to meaningfully increase MSAT emissions. Examples FHWA cites include minor widening projects (capacity adding) and projects in which design year traffic is projected to be less than 140,000 to 150,000 AADT.

The amount of MSATs emitted for each alternative would be proportional to the VMT assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for the Proposed Action is the same as for the No Action Alternative and the traffic mix would not change. The Proposed Action may have lower MSAT emission rates due to increased speeds due to improved traffic flow; according to the EPA's MOVES2014 model, emissions of all of the priority MSAT decrease as speed increases. Because the estimated VMT under each of the Alternatives are the same, it is expected there would be no appreciable difference in overall MSAT emissions among the alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050 (FHWA 2016). 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.

The additional travel lanes contemplated as part of the project alternatives will have the effect of moving some traffic closer to nearby homes; therefore, under the Proposed Action there may be localized areas where ambient concentrations of MSAT could be higher under the Proposed Action, compared to the No Action Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be constructed along the EB side between the Big Horn Road interchange and just east of the Big Horn Road underpass. Along this segment, there are residences along the EB side of the roadway. While essentially maintaining the

existing alignment, the Proposed Action would add an auxiliary lane that would place some traffic slightly closer to both the EB and WB side receptors. The new auxiliary lane of the roadway would be moved about 12 to 60 feet closer in some portions of the EB side of the project. At the curved portion of the alignment over Big Horn Road, the alignment would be moved about 60 to 100 feet closer where sensitive receptors are about 150 feet or further away. Along the WB side of the roadway, the new auxiliary lanes may be about 10 to 20 feet closer to residences that are 150 feet or further from the existing roadway.

The magnitude and the 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. In summary, when a highway is widened, the localized level of MSAT emissions for a build alternative could be higher relative to a no-build alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT emissions will be lower in other locations when traffic shifts away from receptors. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than current levels.

Additionally, it should be noted that current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts from transportation projects in a way that would be useful to decision-makers. See Appendix C from FHWA's MSAT interim guidance (FHWA 2016).

Greenhouse Gas Analysis

Human activity is changing the earth's climate by causing the buildup of heat-trapping greenhouse gas (GHG) emissions through the burning of fossil fuels and other human activities. Carbon dioxide (CO_2) is the largest component of human-produced emissions; other prominent emissions include methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons. These emissions are different from criteria air pollutants since their effects in the atmosphere are global rather than local, and also since they remain in the atmosphere for decades to centuries, depending on the species.

GHG emissions have accumulated rapidly as the world has industrialized, with concentration of atmospheric CO_2 increasing from roughly 300 parts per million (ppm) in 1900 to over 400 ppm today. Over this timeframe, global average temperatures have increased by roughly 1.5 degrees Fahrenheit (1 degree Celsius), and the most rapid increases have occurred over the past 50 years. Scientists have warned that significant and potentially dangerous shifts in climate and weather are possible without substantial reductions in GHG emissions. They have commonly cited 2 degrees Celsius (1 degree Celsius beyond warming that has already occurred) as the total amount of warming the earth can tolerate without serious and potentially irreversible climate effects. For warming to be limited to this level, atmospheric concentrations of CO_2 would need to stabilize at a maximum of 450 ppm, requiring annual global emissions to be reduced 40 to 70 percent below 2010 levels by 2050 (IPCC 2014).

State and national governments in many developed countries have set GHG emissions reduction targets of 80 percent below current levels by 2050, recognizing that post-industrial economies are primarily responsible for GHGs already in the atmosphere. As part of a 2014 bilateral agreement with China, the United States pledged to reduce GHG emissions 26 to 28 percent below 2005 levels by 2025; this emissions reduction pathway is intended to support economy-wide reductions of 80 percent or more by 2050 (The White House 2014).

GHG emissions from vehicles using roads are a function of distance traveled (expressed as VMT), vehicle speed, and road grade. A major factor in mitigating increases in VMT is EPA's GHG emissions standards, implemented in concert with national fuel economy standards. The U.S. Energy Information Administration projects that vehicle energy efficiency (and thus, GHG emissions) on a per-mile basis will improve by 28 percent between 2012 and 2040 (EIA 2016). This improvement in vehicle emissions rates is more than sufficient to offset the nationwide increase in VMT.

Construction and subsequent maintenance of the selected project alternative would generate GHG emissions. Preparing the roadway corridor (for example, by earth-moving activities) would involve a considerable amount of energy consumption and resulting GHG emissions; manufacturing of the materials used in construction and fuel used by construction equipment would also contribute GHG emissions. Typically, construction emissions associated with a new road account for about 5 percent of the total 20-year lifetime emissions from the road, although this can vary widely with the extent of construction activity and the number of vehicles that use the road.

The addition of new road-miles to the roadway network in the project study area would also increase the energy and GHG emissions associated with maintaining those new road-miles in the future. The increase in maintenance needs as a result of adding new roadway infrastructure would be partially offset by the reduced need for maintenance on existing routes (because of lower total traffic and truck volumes on those routes).

Construction

No Action Alternative

Construction would not occur under the No Action Alternative.

Proposed Action Alternative

Site preparation and roadway construction will involve clearing, some cut-and-fill activities, grading, bridge work, and paving roadway surfaces. During construction, short-term degradation of air quality is expected from the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment powered by gasoline and diesel engines are also anticipated and would include CO, NO_X, VOCs, directly emitted PM_{10} and $PM_{2.5}$, and some MSATs such as diesel exhaust particulate matter. Construction activities may increase traffic congestion in the area at times, resulting in increases in emissions from traffic during the delays. These emissions would be temporary and limited to the immediate area surrounding the construction site.

Mitigation Measures and Best Management Strategies

Air quality impacts resulting from roadway construction activities are typically not a concern when appropriate control measures are utilized. Contractors are required to perform all construction activities and operations in accordance with Colorado AQCC Regulation Numbers 1 (5 CCR 1001-3, Emission Control for Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides) and 3 (5 CCR 1001-5, Stationary Source Permitting and Air Pollutant Emission Notice Requirements) to ensure adequate control measures are in place. Mitigation measures to minimize dust and diesel emissions during construction have been identified in **Table 1**.

Table 1. Resource Mitigation Measures

CONTEXT			
The western portion of the project, between the Big Horn Road interchange and Big Horn Road underpass, includes residential areas that are within 500 feet of the project and are considered sensitive receptors for air quality. Particulate matter emissions (i.e., primarily PM_{10}) are a concern from windblown dust and wood burning in Eagle and Summit Counties.			
IMPACT TYPE	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION ALTERNATIVE**	**MITIGATION**
Fugitive dust and particulate matter emissions	**Permanent Impacts**: None – no change to the roadway facility would occur that would increase emissions.	**Permanent Impacts:** None – the project would slightly change the roadway alignment but not increase traffic or change vehicle fleet mix, therefore, traffic emissions would not increase. **Temporary Impacts:** Would impact air quality during construction due to diesel-powered equipment emissions and dust from ground-disturbing activities.	**Permanent:** None. **Temporary:** CDOT includes mitigation measures to minimize construction period air pollutant emissions. These may include: • An Air Pollutant Emissions Notice (APEN) for projects over 25 acres and that last more than 6 months in length may be needed. A permit may be needed if emissions exceed permit thresholds. If needed, the APEN and permit will cover APCD required mitigation measures for active construction. If required, prepare a Fugitive Dust Control Plan. Contractor will utilize dust control methods such as: • Apply water or wetting agents to manage dust when appropriate. • Usage of wind barriers and wind screens to minimize the spread of dust in areas where large amounts of materials are stored. • Usage of a wheel wash station and/or large-diameter cobble apron at egress/ingress areas to minimize dirt being tracked onto public streets. • Usage of pick-up brooms to control dirt tracked onto public streets.

Impact Type	No Action Alternative	Proposed Action Alternative	Mitigation
			• Coverage of or wetting temporary excavated materials. • Usage of a binding agent for long-term excavated materials. • Construction vehicle engines may be required to be properly tuned and maintained. • Water active grading and parking areas as required. • Apply best management practices to stockpiles. • Cover loads on all trucks hauling dirt, sand, or other loose material.
Diesel emissions during construction			In areas near sensitive receptors (western project limits to just east of the Gore Creek), additional measures to reduce diesel emissions from construction equipment should be included. Recommended measures include the following: • Prohibit unnecessary idling of construction equipment. • Locate construction diesel engines as far away as possible from residential areas. • Locate staging areas as far away as possible from residential areas. • Limit unnecessary idling of less than 5 minutes by posting signage. • 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

PERMITS

The construction phase of this Project could have several localized diesel-emitting sources as well as land disturbance during construction, which will temporarily affect air quality conditions during construction. Therefore, the Project will need to follow the requirements of filing APENs with the CDPHE—APCD to fulfill USEPA's concerns regarding air quality impacts. Preparation of a Fugitive Dust Control Plan may also be required. This plan will specify mitigation methods to reduce dust emissions during construction. Adherence to this plan will reduce temporary air pollution resulting from construction.

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