Appendix I

Air Quality

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List of Acronyms

EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
MSAT	Mobile Source Air Toxics
NHI	National Highway Institute
NOx	nitrogen oxide
PM	evening
TTI	Texas Transportation Institute
VMT	vehicle miles traveled
VOCs	volatile organic compounds

An air quality analysis was prepared for the US 160 project. The analysis covers ozone precursors (volatile organic compounds [VOCs] and nitrogen oxide [NOx]) and formaldehyde. VOCs and NOx are the two pollutants typically analyzed as ozone precursors. The analysis was conducted for baseline conditions (2001), 2025 No Action, and the 2025 Preferred Alternatives.

1.1 TRAFFIC ANALYSIS

This analysis is based on traffic information from the US 160 Environmental Impact Statement (EIS) and some additional traffic analysis. A speed analysis was conducted to ensure that all scenarios were being modeled consistently and to generate speed estimates compatible with the methodology used for emissions modeling. The speed analysis used the Texas Transportation Institute (TTI) speed methodology presented in the Estimating Regional Mobile Source Emissions National Highway Institute (NHI) course and used in the Federal Highway Administration (FHWA) MOBILE6 training workshops. The TTI speed methodology requires estimates of traffic volumes and roadway capacities; current and future estimates of US 160 summer traffic volumes from the EIS were used, and roadway capacities are recommended TTI defaults for these road types and area types.

Roadway segment lengths were estimated from topographic maps for purposes of the analysis, with the total project length being used as a control total. Vehicle miles traveled (VMT) was calculated from reported segment volumes and estimated segment lengths. VMT was estimated to increase from 230,770 miles per day in 2001 to 631,580 miles per day; in 2025, an increase of 174 percent. Also, since “off-season” traffic data were not developed as part of the traffic analysis for the EIS, the tons per year emissions calculations assume that summer travel volumes persist all year long; a conservative assumption. Section 1.4.1, Travel Efficiency and Capacity, of the US 160 EIS estimates that summer traffic volumes are approximately 50% higher than during the remainder of the year.

The intersection analyses in the US 160 EIS were used as a source of delay information to calculate idle emissions at intersections. Because daily intersection traffic volumes were not available in all cases, the total daily intersection volume was assumed to be 10 times the evening (PM) peak hour volume for all scenarios (e.g., a peak hour factor of 0.1 was assumed). This is generally consistent with the reported ratios between the peak hour and daily roadway segment volumes.

1.2 MOBILE6.2 MODELING

MOBILE6.2 was used to generate formaldehyde, VOC, and NOx emission factors. The highway segments were modeled as high-speed arterials for the baseline and No Action Alternative scenarios (using the MOBILE6 “non-ramp” option); since the Preferred Alternative involves the construction of several interchanges, the highway segments in this alternative were modeled with the MOBILE6 “freeway” option, which includes ramps. As no off-peak travel data were available, the default 8 percent ramp VMT estimate in MOBILE6.2 was used in the freeway scenarios. MOBILE6.2 was also run at 2.5 mph to calculate idle emission rates at the signalized intersections, per EPA guidance. Because the MOBILE6.2 high-speed drive cycles do not include any idle time, separate calculation of idle emissions is needed to account for emissions at intersections.

Because mobile source air toxics (MSATs) were being modeled, the MOBILE6.2 modeling uses annual average input conditions, and emissions are report in tons per year. This also facilitates a comparison of the emissions associated with US 160 to those documented in the North San Juan Basin Coal Bed Methane EIS, which were reported on a tons per year basis. The MOBILE6.2 modeling used annual average temperatures for Grand Junction (the nearest location for which National Climatic Data Center data were available) and Denver gasoline parameters (the nearest location for which Environmental Protection Agency [EPA] fuel data were available). Other than temperatures and fuel inputs, the MOBILE6.2 modeling reflects national defaults. Refueling and start emissions calculations are disabled because they are not relevant for analyzing roadway operational emissions.

1.3 RESULTS

The results of the emissions analysis are presented in Table 1.1, Emission Results. The emissions changes as a result of the project are a function of both changes in travel speed and changes in intersection delay, along with the improvement in per-vehicle emission rates between 2001 and 2025. VMT increases 174 percent between 2001 and 2025; this increase has the effect of decreasing travel speeds and increasing intersection delay in the No Action Alternative. These factors lead to increased formaldehyde and VOC emissions in 2025 No Action Alternative compared to 2001, even though the per-vehicle emissions rates are lower; NOx emissions are lower in 2025 No Action Alternative because of the larger decline in NOx emission rates and because the NOx emission rates are not as sensitive to speed.

Table 1.1
Emission Results

	Formaldehyde tons/year			VOC tons/year			NOx tons/year		
	Roadways	Inter-sections	Total	Roadways	Inter-sections	Total	Roadways	Inter-sections	Total
2001 Baseline	0.99	0.02	1.01	71.2	3.5	74.7	278.0	1.2	279.2
2025 No Action	0.84	0.18	1.02	56.4	34.0	90.4	83.6	7.6	91.2
2025 Preferred	0.69	0.01	0.70	45.2	1.6	46.8	89.7	0.4	90.1

The Preferred Alternative has lower emissions than 2001 and 2025 No Action Alternative for all three pollutants, even with the large estimated increase in VMT from 2001 levels. The Preferred Alternative represents a 32 percent reduction in formaldehyde emissions, a 37 percent reduction in VOC emissions, and a 68 percent reduction in NOx emissions over 2001 baseline levels. The improved roadway speeds as a result of the Preferred Alternative reduce formaldehyde and VOC emissions over the No Action Alternative, and slightly increase NOx emissions. The 95 percent reduction in intersection delay as a result of replacing signalized intersections with interchanges provides a comparable reduction in idle emissions over the No Action Alternative.