

# *Appendix A – Air Quality*

## APPENDIX A - AIR QUALITY

### A.1 Regulations and Methodology

Air quality is regulated by the U.S. Environmental Protection Agency (EPA) at the federal level, and by the Utah Department of Environmental Quality, Division of Air Quality at the state level.

#### A.1.1 Regulations

##### Clean Air Act Amendments of 1990

The federal Clean Air Act Amendments of 1990 (CAAA) and the Final Transportation Conformity Rule (40 CFR Parts 51 and 93) direct the EPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. The Clean Air Act and the Final Transportation Conformity Rule affect proposed transportation projects. According to Title I, Section 176 (c) 2:

"No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program, or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act."

The Final Conformity Rule defines conformity as follows:

Conformity to an implementations plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not:

- cause or contribute to any new violation of any NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS in any area; or
- delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

##### Criteria Pollutants and Effects

The EPA has established national ambient air quality standards for "criteria air pollutants". The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. A brief description of each pollutant is given below.

**Ozone** – Ozone ( $O_3$ ) is a colorless toxic gas which enters the blood stream and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen.  $O_3$  also damages vegetation by inhibiting their growth. Although  $O_3$  is not directly emitted, it forms in the atmosphere through a chemical reaction between hydrocarbons (HC) and nitrogen oxides ( $NO_x$ ), which are emitted from industrial sources and from automobiles. Substantial  $O_3$  formations generally require a stable atmosphere with strong sunlight.

**Particulate Matter** – Particulate matter pollution is composed of solid particles or liquid droplets that are small enough to remain suspended in the air. In general, particulate pollution can include dust, soot, and smoke; these can be irritating but usually are not

poisonous.

Particulate pollution can also include bits of solid or liquid substances that can be highly toxic. Of particular concern are those particles that are smaller than, or equal to, 10 microns ( $PM_{10}$ ) and 2.5 microns ( $PM_{2.5}$ ) in size.  $PM_{2.5}$  is a part of  $PM_{10}$ , but the two are regulated separately. There are two categories of particulate emissions from mobile sources: primary and secondary. Primary emissions are those directly emitted from tailpipes, road dust, brake wear and decomposed rubber. Secondary emissions form in chemical reactions involving sulfur and nitrogen oxides.

**$PM_{10}$**  –  $PM_{10}$  refers to particulate matter less than 10 microns in diameter, about one-seventh the thickness of a human hair (Exhibit A-1). Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter also forms when industry and gases emitted from motor vehicles undergo chemical reactions in the atmosphere. Major sources of  $PM_{10}$  include motor vehicles; wood burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning, industrial sources, windblown dust from open lands; and atmospheric chemical and photochemical reactions. Suspended particulates produce haze and reduce visibility.

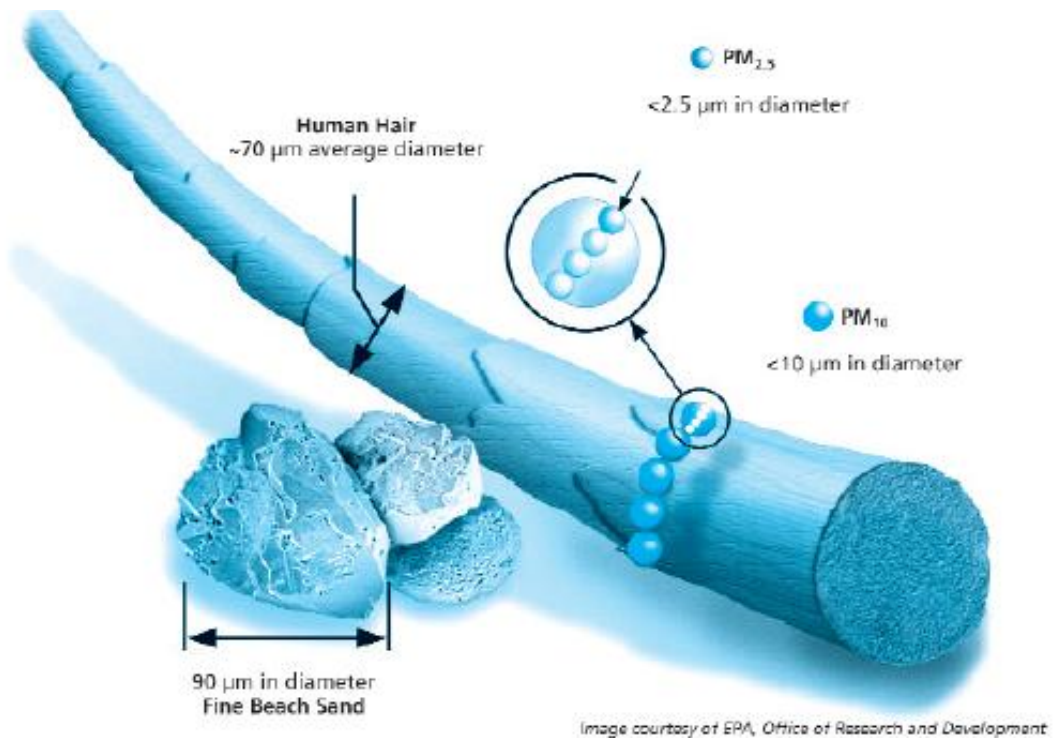


EXHIBIT A-1, RELATIVE PARTICULATE MATTER SIZE

Data collected through numerous nationwide studies indicates that most of the  $PM_{10}$  comes from:

- Fugitive dust;
- Wind erosion; and
- Agricultural and forestry sources.

**PM<sub>2.5</sub>** – PM<sub>2.5</sub> is a small portion of particulate matter is the product of fuel combustion processes. In the case of PM<sub>2.5</sub>, the combustion of fossil fuels accounts for a portion of this pollutant. The main health effect of airborne particulate matter is on the respiratory system. PM<sub>2.5</sub> refers to particulates that are 2.5 microns or less in diameter, roughly 1/28<sup>th</sup> the diameter of a human hair. PM<sub>2.5</sub> results from fuel combustion (from motor vehicles, power generation, or industrial facilities), residential fireplaces and wood stoves. In addition, PM<sub>2.5</sub> can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Like PM<sub>10</sub>, PM<sub>2.5</sub> can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Whereas, particles 2.5 to 10 microns in diameter tend to collect in the upper portion of the respiratory system, particles 2.5 microns or less are so tiny that they can penetrate deeper into the lungs and damage lung tissues.

**Carbon Monoxide** – Carbon Monoxide (CO), a colorless gas, interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO concentrations can vary greatly over relatively short distances. Relatively high concentrations of CO are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban “street canyon” conditions. Consequently, CO concentrations must be predicted on a localized, or microscale, basis.

**Nitrogen Dioxide** – Nitrogen Dioxide (NO<sub>2</sub>), a brownish gas, irritates the lungs. It can cause breathing difficulties at high concentrations. Like O<sub>3</sub>, NO<sub>2</sub> is not directly emitted, but is formed through a reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO<sub>2</sub> are collectively referred to as nitrogen oxides (NO<sub>x</sub>) and are major contributors to ozone formation. NO<sub>2</sub> also contributes to the formation of PM<sub>10</sub>, small liquid and solid particles that are less than 10 microns in diameter (see discussion of PM<sub>10</sub> above). At atmospheric concentration, NO<sub>2</sub> is only potentially irritating. In high concentrations, the result is a brownish-red cast to the atmosphere and reduced visibility. There is some indication of a relationship between NO<sub>2</sub> and chronic pulmonary fibrosis. Some increase in bronchitis in children (two and three years old) has also been observed at concentrations below 0.3 parts per million (ppm).

**Lead** – Lead (Pb), is a stable element which persists and accumulates both in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous, and renal systems. Lead levels in the urban environment from mobile sources have significantly decreased due to the federally mandated switch to lead-free gasoline.

**Sulfur Dioxide** – Sulfur Dioxide (SO<sub>2</sub>) is a product of high-sulfur fuel combustion. The main sources of SO<sub>2</sub> are coal and oil used in power stations, industry and for domestic heating. Industrial chemical manufacturing is another source of SO<sub>2</sub>. SO<sub>2</sub> is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. SO<sub>2</sub> can also yellow plant leaves and erode iron and steel.

**Volatile Organic Compounds (VOCs)** – VOCs are compound of carbon and hydrogen that react chemically to produce nitrogen dioxide and ozone. Their main sources are vehicle exhaust emissions and gasoline evaporation from fuel tanks, injectors and carburetors.

## Mobile Source Air Toxics

In addition to the criteria pollutants for which there are NAAQS, EPA also regulates air toxics. Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

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 EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest 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 listed in their Integrated Risk Information System (IRIS) (<http://www.epa.gov/ncea/iris/index.html>). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (<http://www.epa.gov/ttn/atw/nata1999/>). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050.

## National and State Ambient Air Quality Standards

As required by the Clean Air Act, NAAQS have been established for six major air pollutants. These pollutants, known as criteria pollutants, are: carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), sulfur dioxide and lead. The State of Utah has adopted the federal ambient air quality standards as the State standards. The federal standards are summarized in Table A-1. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation and other aspects of the public's general welfare.

TABLE A-1, FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m <sup>3</sup> )	8-hour <sup>(1)</sup>	None	
	35 ppm (40 mg/m <sup>3</sup> )	1-hour <sup>(1)</sup>		
Lead	0.15 µg/m <sup>3</sup>	Rolling three-month	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m <sup>3</sup> )	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM <sub>10</sub> )	150 µg/m <sup>3</sup>	24-hour <sup>(2)</sup>	Same as Primary	
Particulate Matter (PM <sub>2.5</sub> )	15.0 µg/m <sup>3</sup>	Annual <sup>(3)</sup> (Arithmetic Mean)	Same as Primary	
	35 µg/m <sup>3</sup>	24-hour <sup>(4)</sup>	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour <sup>(5)</sup>	Same as Primary	
	0.12 ppm	1-hour <sup>(7)</sup> (Applies only in limited areas)	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m <sup>3</sup> )	3-hour <sup>(1)</sup>
	0.14 ppm	24-hour <sup>(1)</sup>		

<sup>1)</sup> Not to be exceeded more than once per year.

<sup>2)</sup> Not to be exceeded more than once per year on average over 3 years.

<sup>3)</sup> To attain this standard, the 3-year average of the weighted annual mean PM<sub>2.5</sub> concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m<sup>3</sup>.

<sup>4)</sup> To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m<sup>3</sup> (effective December 17, 2006).

<sup>5)</sup> To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

<sup>6)</sup> To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

<sup>7)</sup> (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.  
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas

### Air Quality Levels and Compliance

Section 107 of the 1977 Clean Air Act Amendment requires that the EPA publish a list of all geographic areas in compliance with the NAAQS, as well as those not in attainment of the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment areas. Areas which have insufficient data to make a determination are unclassified, and are treated as being in attainment areas until proven otherwise. The designation of an area is made on a

pollutant-by-pollutant basis.

Tooele County is classified as an attainment area for all pollutants, with the exception of being classified as a partial nonattainment area for SO<sub>2</sub> and PM<sub>2.5</sub>. In 1978, the EPA designated Salt Lake and Tooele Counties as a nonattainment area for SO<sub>2</sub> based on ambient data collected at air monitoring locations in Magna (Salt Lake County) and Tooele County. In 1981, the EPA removed the nonattainment status for all of Tooele County except the eastern portion above 5,600 feet. Later in 1981, the State of Utah submitted an implementation plan (SIP) to the EPA that addressed the SO<sub>2</sub> violations. The primary control measure was replacement of Kennecott Copper Corporation's reverberatory smelter with a new and cleaner Noranda smelter. The EPA approved the State's SIP in 1994, and no violations of the standard have been recorded since the new smelter and the "tall stack" were constructed. In 2005, Utah requested that the EPA re-designate Tooele County to attainment. On October 8, 2009, parts of Tooele County were designated as nonattainment areas for PM<sub>2.5</sub>. The Tooele Midvalley Highway Project is located in an attainment area for all pollutants, with the exception of PM<sub>2.5</sub>, which is described in detail below.

## **A.1.2 Methodology**

### **A.1.2.1 Regional Analysis**

The regional or mesoscale analysis of a project determines a project's overall impact on regional air quality levels. A transportation project is analyzed as part of a regional transportation network developed by the County or State. Projects included in this network are found in the *State Transportation Improvement Plan (STIP)*. The STIP is the basis for the regional analysis which utilizes Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) within the region to determine daily "pollutant burden" levels. The results of this analysis determine if an area is in conformity with regulations set forth in the Final Conformity Rule.

### **A.1.2.2 Particulate Matter (PM<sub>10</sub> & PM<sub>2.5</sub>) Analysis**

On March 10, 2006, the EPA issued a Final Rule regarding the localized or "hot-spot" analysis of PM<sub>2.5</sub> and PM<sub>10</sub> (40 CFR Part 93). This rule requires that a PM<sub>10</sub> and/or a PM<sub>2.5</sub> hotspot analysis be performed only for transportation projects with compelling diesel traffic in areas not meeting PM<sub>2.5</sub> air quality standards. Tooele County is classified as an attainment area for PM<sub>10</sub> but is in partial nonattainment for PM<sub>2.5</sub>. Because the Midvalley Highway Project does not have compelling diesel traffic, neither a PM<sub>10</sub> nor PM<sub>2.5</sub> hotspot analysis was required. A brief discussion is provided in section 3.7.3.1.

### **A.1.2.3 Microscale CO Air Quality Analysis**

The project is located in Tooele County, which is in an attainment area and not a maintenance area for CO. While there is no requirement for additional carbon monoxide hot spot analysis under transportation conformity rules, NEPA requirements still apply; proving with reasonable certainty that the project will not cause an exceedance in CO levels. This will be done by conducting an air quality screening analysis, as per the guidelines in the UDOT *Air Quality Hot Spot Manual*. The screening analysis will focus on intersections within the project study area and the project mainline. The screening analysis will be based on level of service and overall intersection volume.

#### A.1.2.4 MSAT Analysis

On September 30, 2009 FHWA issued an Interim Guidance Update regarding MSAT analysis in NEPA documentation. Given the emerging state of the science and of project-level analysis techniques regarding MSAT, there are no established criteria for determining when MSAT emissions should be considered a substantial issue. FHWA has suggested a tiered approach in determining potential project-induced MSAT impacts. The 3 tiers are:

- Tier 1 – No analysis for projects with no potential for meaningful MSAT effects.
- Tier 2 – Qualitative analysis for projects with low potential MSAT effects.
- Tier 3 – Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

FHWA has developed this approach because currently available technical tools do not enable the predicted project-specific health impacts of the emission changes associated with the project alternatives. These limitations include:

- Emissions – The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of a highway project.
- Dispersion – The tools to predict MSAT dispersion into the environment are limited. The current dispersion models were developed for the purpose of predicting episodic concentrations of CO to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations rather than exposure patterns.
- Exposure Levels and Health Effects – Even if emissions levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude reaching any meaningful conclusion about project-specific health impacts. Exposure assessments are difficult because it is hard to accurately calculate annual concentrations of MSATs near roadways and determine the portion of a year that people are actually exposed to those concentrations at a specific location.

Even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences in MSAT emissions, if any, from the alternatives. The qualitative assessment, which will compare VMT between alternatives, is derived in part from the *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA, 2009).

## A.2 Affected Environment

### A.2.1 Local Meteorology

The Great Salt Lake is very influential on the climate of the region. This large inland body of water, which never freezes due to its high salt content, can moderate the temperatures of cold winter winds blowing from the northwest and helps drive a lake/valley wind system. The warmer lake water during the winter and spring also contributes to increased

precipitation in the valley downwind from the lake. The combination of the Great Salt Lake and surrounding mountains often enhance storm precipitation in the valley. Tooele County normally has a semi-arid continental climate with four well-defined seasons. Summers are characterized by hot, dry weather, but the high temperatures are usually not oppressive, since the relative humidity is generally low and the nights usually cool. July is the hottest month, with temperature readings in the 90's.

The mean diurnal temperature range is approximately 30 degrees in the summer and 18 degrees during the winter. Temperatures above 102 degrees in the summer or colder than -10 degrees in the winter are likely to occur one season out of four. Winters are cold, but typically not severe. The mountains to the north and east act as a barrier to frequent invasions of cold continental air. The average annual snowfall is less than 60 inches at the Salt Lake City International Airport, but much greater amounts fall in higher bench locations. Heavy fog can develop under temperature inversions in the winter and persist for several days. Precipitation, generally light during the summer and early fall, is heavy in the spring when storms from the Pacific Ocean are moving through the area more frequently than at any other time of the year.

Winds are usually light, although occasional high winds have occurred in every month of the year, particularly in March. The growing season is over five months in length. Yard and garden foliage generally are making good growth by mid-April. The last freezing temperature in the spring averages late April and the first freeze of the fall is mid-October (NOAA, 2008). Temperature inversions occur frequently in the Wasatch Front region, particularly between November and February, although inversions occur during summer as well. Inversions are responsible for air pollution problems that occur during the winter. Under a temperature inversion, high-pressure weather systems trap cold air near the surface, and pollutant concentrations build up near the ground surface.

### **A.2.2 Monitored Air Quality**

The project study area is classified as attainment for all pollutants. Ambient air quality monitor data for the years 2005-2008 are presented in Table A-2. Three monitoring locations were used; one within Tooele City, the other two in western Salt Lake County (West Valley City and Magna). These are shown in Exhibit A-2 (yellow dots).

As shown in Table A-2, carbon monoxide concentrations were lower in 2008 than for any of the previous three years, with no recorded days over the Federal standards in the past four years. Ozone concentrations remained relatively consistent throughout the past four years, with a range of 2 to 10 days exceeding the Federal standard each year. Sulfur dioxide levels were lower in 2008 than in any of the previous three years, with no recorded days over the Federal standards in the past four years. The highest concentration recorded for PM<sub>10</sub> was in 2005; this is also the only year that an exceedance of PM<sub>10</sub> Federal standards was recorded. The highest concentrations for PM<sub>2.5</sub> were recorded in 2005 at Tooele City and in 2007 at West Valley City and West Magna. Tooele City exceeded the Federal standard for PM<sub>2.5</sub> once in 2008, and West Valley City exceeded the Federal standard for PM<sub>2.5</sub> once in 2007 and once in 2008; no exceedances of the Federal standard were recorded at West Magna in the past four years.

TABLE A-2, AMBIENT AIR QUALITY MONITOR DATA 2005-2008

Air Pollutant	Standards and Exceedances	Tooele City (434 N. 50 W.)				West Valley City (3275 W. 3100 S.)				West Magna (2935 S. 8560 W.)			
		2005	2006	2007	2008	2005	2006	2007	2008	2005	2006	2007	2008
Carbon Monoxide (CO)	Max. 1-hr Concentration (ppm)	NM	NM	NM	NM	5.4	7.1	6.1	3.7	NM	NM	NM	NM
	Max. 8-hr Concentration (ppm)	NM	NM	NM	NM	4.3	3.2	3.3	1.8	NM	NM	NM	NM
	# Days>Federal 1-hr Std. of >35 ppm	-	-	-	-	0	0	0	0	-	-	-	-
	# Days>Federal 8-hr Std. of >9 ppm	-	-	-	-	0	0	0	0	-	-	-	-
Ozone (O <sub>3</sub> )	Max. 8-hr Concentration (ppm)	.087	.083	.077	.079	.098	.083	.090	NM	NM	NM	NM	NM
	# Days>Federal 8-hr Std. of >0.075 ppm	6	8	5	2	8	10	9	-	-	-	-	-
Nitrogen Dioxide (NO <sub>2</sub> )	Annual Arithmetic Mean (ppm) #>Federal Annual Mean Std. of >0.053 ppm	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -
Sulfur Dioxide (SO <sub>2</sub> )	3-hr Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	.027	.028	.024	.021
	24-hr Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	.011	.007	.007	.006
	Annual Mean Concentration (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	.002	.002	.002	.002
	# >Federal 3-hr Std. of .5 ppm	-	-	-	-	-	-	-	-	0	0	0	0
	# Days>Federal 24-hr Std. of .14 ppm	-	-	-	-	-	-	-	-	0	0	0	0
Suspended Particulates (PM <sub>10</sub> )	Max. 24-hr Concentration (µg/m <sup>3</sup> )	NM	NM	NM	NM	NM	NM	NM	NM	177	80	89	104
	Annual Mean (µg/m <sup>3</sup> )	NM	NM	NM	NM	NM	NM	NM	NM	22	20	22	24
	# Days>Fed. 24-hr Std. of >150 µg/m <sup>3</sup>	-	-	-	-	-	-	-	-	1	0	0	0
Suspended Particulates (PM <sub>2.5</sub> )	Max. 24-hr Concentration (µg/m <sup>3</sup> )	67	32	39	38	63	47	81	48	50	49	65	44
	Annual Mean Concentration (µg/m <sup>3</sup> )	9.0	6.6	7.2	6.5	12.0	10.6	12.1	10.8	9.3	7.9	9.4	8.0
	# Days>Fed. 24-hr Std. of >35 µg/m <sup>3</sup>	0	0	0	1	0	0	1	1	0	0	0	0
	#>Federal Annual Mean Std. of 15 µg/m <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0	0
Lead (Pb)	Max. Quarterly Avg. Concentration (µg/m <sup>3</sup> ) # Months Exceeding Federal Std. of 0.15 µg/m <sup>3</sup>	NM -	NM -	NM -	NM -	NM -	NM -	NM -	NM -	.08 0	NM -	NM -	NM -

Source: EPA Office of Air Quality Planning and Standards (AIRSDATA); <http://www.epa.gov/air/data/geosel.html>

Note: NM = Not Monitored

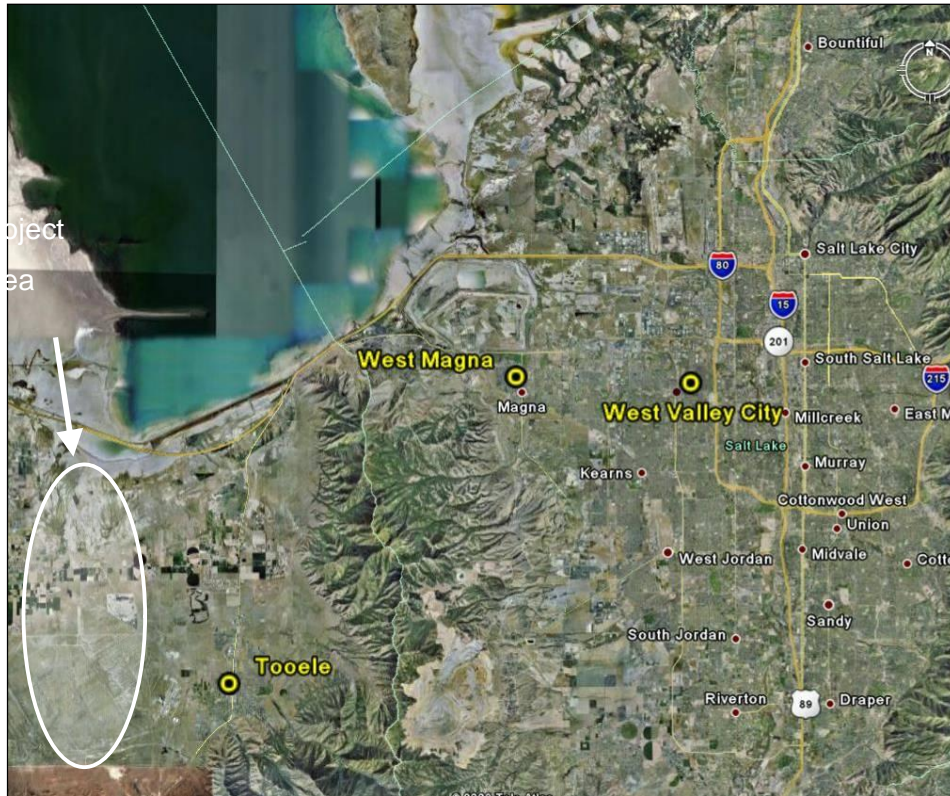


EXHIBIT A-2, LOCATION OF AIR QUALITY MONITORING SITES

### A.2.3 Sources of Emissions

Pollutants that can be traced principally to motor vehicles and buses are relevant to the evaluation of the project impacts; these pollutants include CO, HC, NO<sub>x</sub>, O<sub>3</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and MSATs. Transportation sources account for a small percentage of regional emissions of SO<sub>2</sub> and Pb; thus, a detailed analysis is not required.

Hydrocarbons (HC), also referred to as Volatile Organic Compounds or VOCs, and NO<sub>x</sub> emissions from automotive sources are a concern, primarily because they are precursors in the formation of ozone and particulate matter. Ozone is formed through a series of reactions, which occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels often are found many miles from sources of the precursor pollutants. Therefore, the effects of HC and NO<sub>x</sub> emissions generally are examined on a regional or "mesoscale" basis.

PM<sub>10</sub> and PM<sub>2.5</sub> impacts are both regional and local. In the Tooele Valley area, a large portion of particulate matter, especially PM<sub>10</sub>, comes from disturbed vacant land, construction activity and paved road dust. PM<sub>2.5</sub> also comes from these sources. Motor vehicle exhaust, particularly from diesel vehicles, is also a source of PM<sub>10</sub> and PM<sub>2.5</sub>. Therefore, it is appropriate to predict concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> on both a regional and a localized basis.

MSAT impacts are both regional and local. Through the issuance of EPA's Final Rule regarding emission control of *Hazardous Air Pollutants from Mobile Sources* (66FR17229), it was determined that many existing and newly transmitted mobile source emission control programs would result in a reduction of MSATs. FHWA projects that even with a 64 percent increase in VMT, the programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent.

CO impacts are generally localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited within a relatively short distance (300 – 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. Consequently, it is appropriate to predict concentrations of CO for the proposed project.

### **A.3 Environmental Consequences**

This section discusses the environmental impacts associated with the project alternatives. The discussion considers the No Build Alternative, Midvalley Highway East Alternative (both options), and Midvalley Highway West Alternative (both options). The Midvalley Highway alternatives environmental consequences are described together, due to both alternative having similar amounts of expected AADT.

The Midvalley Highway is included in the *Tooele Valley Regional Long Range Transportation Plan: 2007-2030* (WFRC, 2006). The project is also included in the *State Transportation Improvement Plan (STIP), 2008-2013* as an environmental document. As such, the project complies with conformity requirements.

The project is in an attainment area for CO, O<sub>3</sub> and PM<sub>10</sub>. Part of Tooele County is designated by the EPA as a non-attainment area for PM<sub>2.5</sub>. Under the FHWA Transportation Conformity Rule, PM<sub>2.5</sub> hot spot analyses are required for "projects of air quality concern". A new highway project could be considered a "project of air quality concern" if it is expected to carry traffic volumes of 125,000 per day, with 8% or more truck traffic (that is, 10,000 trucks per day). For the mainline segments, the predicted Average Daily traffic (ADT) is expected to be below 125,000 for each segment, as shown in Table A-5. Therefore, this is not considered a project of air quality concern.

#### **A.3.1 Microscale Assessment**

The Microscale Assessment includes both the Tooele Midvalley Highway alternatives and the No Build. These alternatives are discussed together for comparison purposes.

A screening evaluation was performed following the guidelines in UDOT's *Air Quality Hot Spot Manual*. Traffic data for the air quality analysis was derived from an overall traffic analysis for the Project using methodology accepted by UDOT. The three locations studied in the traffic analysis were screened based on changes in intersection volumes, delay, and levels of service (LOS) from the No Build to the Midvalley Highway alternatives (see Table A-3). In all cases, volume decreases and LOS improves from the No Build Alternative to the Midvalley Highway alternatives.

TABLE A-3, 2030 LEVEL OF SERVICE AT MAJOR INTERSECTIONS ON SR-36

Intersection on SR-36	Alternative					
	No Build		Midvalley Highway East (Options A and B)		Midvalley Highway West (Options A and B)	
	Intersection Volume (peak hour)	LOS	Intersection Volume (peak hour)	LOS	Intersection Volume (peak hour)	LOS
SR-112	4,190	D	3,710	D	3,800	D
Erda Way	4,520	E	2,610	B	2,850	B
SR-138	6,590	F	2,980	D	2,990	D

Source: Midvalley Highway EIS Traffic Report, April 2009

In response to EPA comments on the DEIS, a CO hot-spot analysis was performed for the intersection of SR-112 and the proposed Tooele Midvalley Highway. Traffic analysis indicates that this intersection would be the most congested intersection in 2030 for either the east or west Midvalley Highway alternative. Traffic volumes were input for the most congested option for each alternative, providing for a worst-case analysis. The results of the hot-spot analysis, presented in Table A-4, indicates that CO concentrations would be well below the National Ambient Air Quality Standards (NAAQS) of 9 ppm for the 8-hour concentration, and 35 ppm for the one-hour concentration (Table 3.7-1 in DEIS).

TABLE A-4, 2030 CO CONCENTRATIONS\* (PPM) SR-112 & TOOELE MIDVALLEY HIGHWAY

Alternative	One-Hour (ppm)	Eight-Hour (ppm)
Midvalley Highway East	5.5	2.8
Midvalley Highway West	5.6	2.8

\*Includes background value of 3 ppm for one hour and 1 ppm for eight hour concentrations.

For the mainline segments, the Average Daily Traffic (ADT) is shown in Table A-5. As stated in UDOT's *Air Quality Hot Spot Manual*, if the mainline traffic volume is below 50,000 ADT, the location is expected not to create hot spot concentrations near the NAAQS for CO. The mainline ADTs between SR-36 and SR-138 are predicted to be below 50,000 ADT; therefore these locations are not expected to create hot spot concentrations near the NAAQS for CO.

TABLE A-5, 2030 MAINLINE AVERAGE DAILY TRAFFIC (ADT)

Segment	Midvalley Highway West	Midvalley Highway East
SR-36 to SR-112	18,200	18,100
SR-112 to SR-138	48,900	49,100
SR-138 to I-80	58,700	58,300

Source: Midvalley Highway EIS Traffic Report, April 2009

Between SR-138 and I-80 however, the mainline ADTs are predicted to be above the 50,000 ADT threshold. To determine if a hotspot would be created at this location, a microscale CO analysis was conducted using EPA’s CAL3QHC program as described in the UDOT’s *Air Quality Hot Spot Manual*. The results of this analysis are shown in Table A-6. No violations of the applicable NAAQS are predicted.

TABLE A-6, CO MAINLINE CONCENTRATIONS\* (PPM) BETWEEN SR-138 AND I-80

Alternative	One- Hour	Eight-Hour
Midvalley Highway East	5.5	2.8
Midvalley Highway West	5.6	2.8

\*Includes background value of 3 ppm for one hour and 1 ppm for eight hour concentrations.

The NAAQS for CO is 35 ppm for the one-hour concentration and 9 ppm for the eight-hour concentration (see Table A-1). Based on the intersection and mainline screening analyses along with the detailed CO microscale analysis, the Midvalley Highway alternatives are not predicted to create hot spot concentrations near the NAAQS for CO.

Although the project will slightly increase traffic volumes over the No Build Alternative, it is unlikely that windblown dust generated by construction or traffic on the Midvalley Highway would cause PM<sub>10</sub> concentrations near the freeway to exceed the NAAQS. Many of the emission sources that emit PM<sub>10</sub> also contribute in varying degrees to elevated PM<sub>2.5</sub> concentrations as well; practically all PM<sub>10</sub> vehicle exhaust and nitrate particles formed from gaseous NO<sub>x</sub> emissions are in the PM<sub>2.5</sub> and smaller size range, while only a small fraction of brake wear, tire wear, and road dust are in that range. Note that the PM data in Table A-2 indicate four exceedances of the federal standard for PM<sub>10</sub> and PM<sub>2.5</sub>. One PM<sub>10</sub> exceedance occurred in 2005 in Magna and two PM<sub>2.5</sub> exceedances occurred in West Valley City in 2007 and 2008 – both Magna and West Valley City are more industrialized areas of Salt Lake Valley. One PM<sub>2.5</sub> exceedance occurred in 2008 in Tooele City. It is unlikely that either of the Midvalley Highway alternatives will increase PM emissions to, or close to the NAAQS.

### A.3.2 MSAT Assessment

Based on the recommended tiering approach, the Midvalley Highway project falls within the Tier 2 approach - qualitative analysis for projects with low potential MSAT effects. The amount of MSATs emitted would be proportional to the vehicles miles traveled (VMT) assuming the vehicle mix does not change.

As shown in Table A-7, the VMT under the Midvalley Highway alternatives is expected to increase in the range from 0.3% - 2.1% while the average regional speed is predicted to increase by approximately 36%. Under the Midvalley Highway alternatives, VMT is predicted to increase on the freeways and decrease on the arterials. The increased VMT would lead to higher MSAT emissions along the freeway routes with a corresponding decrease in MSAT emissions along the arterials routes. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds. According to EPA’s MOBILE6.2 emissions model, many MSAT emission rates decrease as vehicle speeds increase. The extent to which these speed-related emissions decreases will offset VMT-related emissions increases cannot be reliably projected due to the inherent deficiencies of

technical models. In addition, construction of the Project is predicted to decrease travel times, thus reducing idling, thereby reducing emissions.

TABLE A-7, REGIONAL VMT AND AVERAGE SPEED

Alternative	Average Network Speed (mph)	VMT	% VMT Change from No Build	% Speed Change from No Build
No Build	33.2	2,951,000	-	-
Midvalley Highway East	45.1	2,959,000	0.3%	35.8%
Midvalley Highway West	45.3	3,012,000	2.1%	36.4%

In summary, under either of the Midvalley Highway alternatives, it is expected that there would be no quantifiable impact to MSAT emissions in the project study area, relative to the No Build Alternative. This is due to the changes in VMT and speed associated with the Midvalley Highway alternatives. In comparing various project alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. However, on a regional basis, the EPA's vehicle and fuel regulations, coupled with fleet turnover, over time will cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be lower than today.

### A.3.3 Unavailable Information for Project Specific Mobile Source Air Toxic (MSAT) Impact Analysis

This EIS includes a basic analysis of the likely MSAT emission impacts of this project. In FHWA's view, the lack of a national consensus on an acceptable level of risk and other air quality criteria assumed to protect the public health and welfare, as well as the reliability of available technical tools, do not enable us to predict with confidence the project-specific health impacts of the emission changes associated with the alternatives evaluated here. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process by the assumptions made rather than any real insight into the actual health impacts from MSAT exposure directly attributable to the proposed action. Due to these limitations, the following discussion is included in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

### A.3.4 Information that is Unavailable or Incomplete

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements; chief among them is what constitutes an "acceptable level" of risk. Incremental risk levels from a new source which are projected to be less than 1 in 1 million are generally considered to be negligible; while, incremental risk levels greater than 100 in 1 million are generally considered to be unacceptable. Indeed, the U.S. Environmental Protection Agency (EPA) prevailed in a recent U.S. Court of Appeals for the District of Columbia decision (Natural Resources Defense Council v. Environmental Protection Agency, No. 07-1053, June 8, 2008) that its 2006 hazardous organic NESHAPs (National Emission Standards for Hazardous Air Pollutants) rule reduced emissions to levels that present "an acceptable level of risk and protect public health with an ample margin of safety" at risks less than 100 in 1 million. The U.S. EPA's benzene NESHAPs is also based on reducing risks to less than 100 in 1 million.

There is also no national consensus on dose-response values for MSATs. For instance, the U.S. EPA provides ranges of air concentrations at specific risk levels for lifetime exposure to benzene, with uncertainty spanning perhaps an order of magnitude. The practical uncertainty is even greater, because the California Environmental Protection Agency (Cal/EPA) puts the air concentration risk levels for benzene at an order of magnitude less than equivalent U.S. EPA values. In addition, most notably, Cal/EPA has implemented an air concentration risk level for diesel PM; whereas, the U.S. EPA has not. The U.S. EPA states in their risk assessment of diesel PM entitled "Health Assessment Document for Diesel Exhaust" (Office of Research and Development, EPA/600/8-90/057F, May 2002, pp 8-15, <http://www.epa.gov/risk/basicinformation.htm#g>) that:

"an exploratory risk analysis shows that environmental cancer risks possibly range from  $10^{-5}$  to nearly  $10^{-3}$ , while a consideration of numerous uncertainties and assumptions also indicates that lower risk is possible and zero risk cannot be ruled out. These risk findings are only general indicators of the potential significance of the lung cancer hazard and should not be viewed as a definitive quantitative characterization of risk or be used to estimate an exposure-specific population impact".

The uncertainties in the unit risk value for diesel PM are exceptionally large, since epidemiological studies of diesel engine exhaust do not consistently find that exposure to diesel PM causes cancer (cohorts of underground miners exposed to the highest concentrations of diesel PM, for example, appear to have no excess risk of lung cancer). Thus, the U.S. EPA has found that the available epidemiological data do not support the development of any unit risk value for diesel PM. Prior to the U.S. EPA's risk assessment, an expert panel organized by the independent, non-profit Health Effects Institute (HEI) examined published diesel PM epidemiological studies. The HEI panel recommended against using current studies of occupationally exposed railroad workers and truck drivers as the basis of quantitative risk assessment in ambient settings ("Diesel Emissions and Lung Cancer: Epidemiology and Quantitative Risk Assessment", June 1999, <http://pubs.healtheffects.org/getfile.php?u=282>). Their examination of the data demonstrated a decrease in relative risk with increasing duration of employment for three broad categories of railroad workers, which is not consistent with an association between diesel PM exposure and lung cancer risk (refer to Exhibit A-3). In contrast to the U.S. EPA's risk assessment findings and HEI's expert panel recommendations, the Cal/EPA used the railroad workers studies to calculate a unit risk value for diesel PM, which ranged from  $1.3 \times 10^{-4}$  to  $2.4 \times 10^{-3}$  (lifetime –  $\mu\text{g}/\text{m}^3$ )<sup>-1</sup>.



EXHIBIT A-3, HEI PANEL ANALYSIS OF RAILROAD WORKER STUDY DATA

An association between an incremental increase in traffic volumes and the risk level generally considered unacceptable is implied in a screening-level risk analysis included in the National Cooperative Highway Research Program (NCHRP) report entitled *Analyzing, Documenting, and Communicating the Impacts of Mobile Source Air Toxic Emissions in the NEPA Process* (NCHRP 25-25 Task 18, March 2007, [http://www.trb.org/NotesDocs/25-25\(18\)\\_FR.pdf](http://www.trb.org/NotesDocs/25-25(18)_FR.pdf)). For freeways, an incremental increase in traffic volumes of 125,000 to 443,000 AADT is linked with an incremental 1 in 1 million risk level, based on the U.S. EPA's range of unit risk values for benzene. The analysis was conducted for an overly simplified exposure condition, assuming that emission levels associated with a 2008 vehicle fleet would persist for 70 years, discounting the recognized significant mitigation associated with EPA's Tier 2 and heavy-duty truck emissions standards and the 2007 MSAT rule. By extension, based on the same over-simplification, an incremental increase in freeway traffic volumes of 1,250,000 to 4,430,000 AADT are associated with a 10 in 1 million risk level and an incremental increase in freeway traffic volumes of 12,500,000 to 44,300,000 AADT are associated with a 100 in 1 million risk level – the level above which is generally considered unacceptable. The inherent assumption is that the U.S. EPA is correctly estimating benzene and diesel PM air concentration risk levels and Cal/EPA's estimates are incorrect. Different results and conclusions would be obtained if the reverse is true or if neither the U.S. EPA nor Cal/EPA is correct. Consequently, FHWA finds that there is considerable uncertainty associated with estimates of adverse residual risk after implementation of the U.S. EPA's 2007 MSAT rule and other control programs.

According to the U.S. EPA in their Air Toxics Risk Assessment Reference Library, risk and hazard estimates are typically reported as one significant figure. Based on the NCHRP screening-level risk analysis model, the ability to discern between a 1 in 1 million risk level and a 2 in 1 million risk level is associated with a freeway traffic volume increase of 125,000 to 443,000 AADT. In FHWA's view, risk assessment methodologies applied to highway projects are a blunt instrument.

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 building on the model predictions obtained in the previous step. All are also encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

Emissions: The U.S. EPA characterizes their MOBILE6.2 emission factor model as a regional model and not a project-level model. It is a trip-based model, where emission factors are projected based on a “typical” trip of 7.5 miles and vehicle speeds averaged over the trip. MOBILE6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this, it has limited applicability at the project level. The U.S. EPA will be addressing this limitation in its MOVES model, a replacement to MOBILE6.2. The implication of this limitation is illustrated and noted by the University of California, Davis (UCDavis) in Exhibit A-4, i.e., “Smooth flow reduces emissions by a factor of nearly 20”, which cannot be reflected in a trip-based or link-based model. Similar results have been found in analyses by UCRiverside (Barth, for CO<sub>2</sub>) and NC State (Frey, for multiple pollutants).

Even within the confines of regional emissions modeling, the U.S. EPA and Cal/EPA have a different view of what MSAT emissions would look like from a future vehicle fleet required to meet identical vehicle emission standards. Although the same basic concepts were used in developing their respective mobile source emission factor models, widely disparate results are produced for MSATs. The U.S. EPA’s MOBILE6.2 model generally predicts higher emission factors for benzene compared to Cal/EPA’s Emfac2007 model. Emfac2007 generally predicts higher emission factors for diesel PM compared to MOBILE6.2. Exhibit A-5 provides a comparison of emission factors produced by the models for benzene and diesel PM for the 2030 calendar year. Notice that diesel PM emission factors from MOBILE6.2 do not vary with speed; in Emfac2007 they do. In part, because of this, the U.S. EPA has concluded that (71 FR 12498):

“we continue to believe that appropriate tools and guidance are necessary to ensure credible and meaningful PM<sub>2.5</sub> and PM<sub>10</sub> hot-spot analyses. Before such analyses can be performed, technical limitations in applying existing motor vehicle emission factor models must be addressed, and proper federal guidance for using dispersion models for PM hotspot analysis must be issued. With the release of MOBILE6.2, state and local transportation agencies now have an approved model for estimating regional PM<sub>2.5</sub> and PM<sub>10</sub> emission factors in SIP [State Implementation Plan] inventories and regional emissions analyses for transportation conformity. However, MOBILE6.2 has significant limitations that make it unsatisfactory for use in microscale analysis of PM<sub>2.5</sub> and PM<sub>10</sub> emissions as necessary for quantitative hot-spot analysis.”

The MOBILE6.2 limitations noted by the U.S. EPA also apply to diesel PM emission factors.

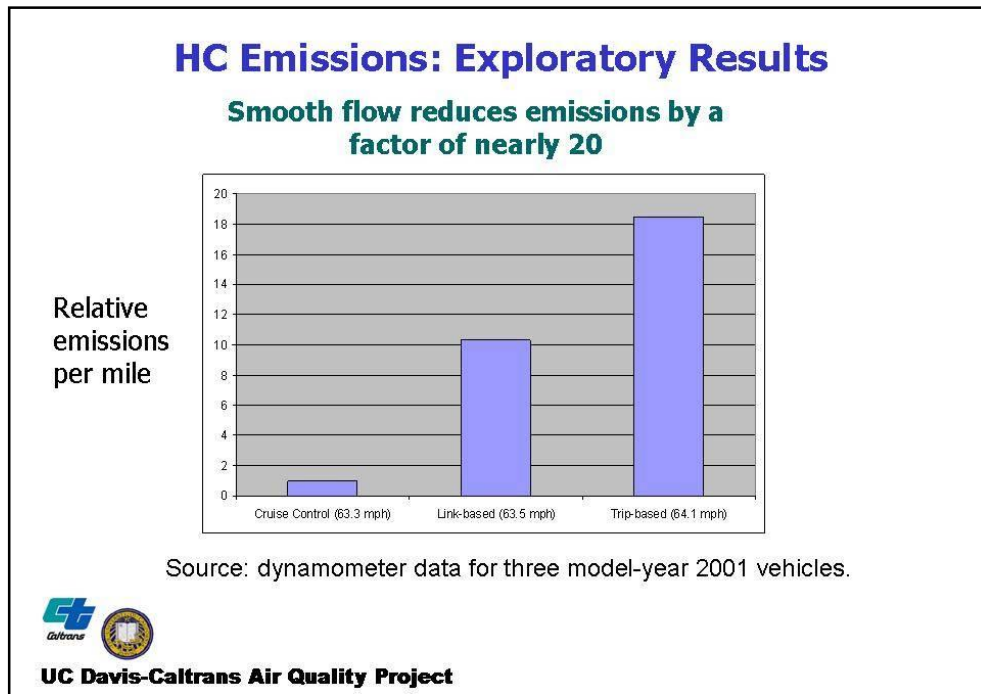


EXHIBIT A-4, UCDAVIS COMPARISON OF EMISSIONS (TRIP-BASED VERSUS LINK-BASED VERSUS CRUISE)

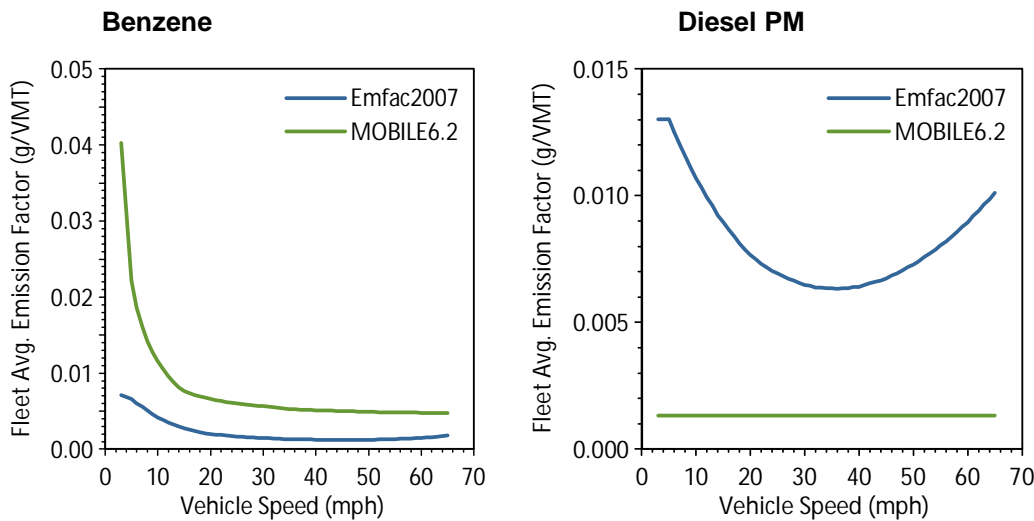


EXHIBIT A-5, MOBILE6.2/EMFAC2007 COMPARISON OF EMISSIONS (CALENDAR YEAR 2030)

**Dispersion:** The tools to predict how MSATs disperse are also limited. The U.S. EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated with emission rates from the MOBILE4 model more than a decade ago. Based on updated emission rates to MOBILE5, an extensive evaluation of the CAL3QHC model was conducted in an NCHRP study as part of the development of the HYROAD model. The study report documents poor model performance at ten sites across the country, 3 where intensive CO monitoring was conducted plus an additional 7 with less intensive monitoring.

The report is available online from the U.S. EPA at [www.epa.gov/scram001/dispersion\\_alt.htm#hyroad](http://www.epa.gov/scram001/dispersion_alt.htm#hyroad).

Exposure Levels and Health Effects: Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to reliably forecast long-term concentrations of MSATs near roadways, and to determine the portion of time that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for lifetime, 70-year risk assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by the Health Effects Institute.

For example, consider the exposure-response relationship for alcoholic beverages. Alcoholic beverages are established causes of cancer in humans; about 3% of all cancers world-wide are thought to be caused by over-consumption of alcoholic beverages. There is a clear dose-response relationship for alcoholic beverages, with risk of cancer death increasing (essentially) linearly for exposures ranging from 2 drinks per day through 6-plus drinks per day. But there is neither evidence nor reason to suppose that, for example, one or a half a drink per day also increase people's risk of cancer death. Indeed, the exposure-response data, interestingly enough, show a "J-shaped" dose response relationship, such that people consuming 1 drink per day are significantly *less* likely to die of cancer than those who drink no alcoholic beverages. If one were to make the standard "regulatory style" assumption about low-level exposure to alcohol, one would both vastly overestimate the cancer risk, and also miss entirely what turns out to be a low-level protective effect. In such a case, it would hardly be "erring on the side of public health" to estimate that exposures that are orders of magnitude smaller than the 2 drinks-per-day cancer-effect-level put people at risk of cancer. This is not to say, of course, that very-low-level exposures to MSAT emissions prevent cancer; nor is it to assert that such exposures are demonstrably or obviously safe. It is only to point out that extrapolation beyond observable exposures and responses are at best an uncertain business and become increasingly uncertain the farther one strays from the empirical data.

Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating 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 on SR-36 and improved access to lands not currently accessible) that are better suited for quantitative analysis.

### **A.3.5 Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs**

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels

found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of U.S. EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or state level.

The U.S. EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The U.S. EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the seven prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries, which represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

**Benzene** is characterized as a known human carcinogen.

The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

**Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.

**1,3-butadiene** is characterized as carcinogenic to humans by inhalation.

**Naphthalene** and **polycyclic organic matter** are probable human carcinogens, via the oral and inhalation routes.

**Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust is the combination of diesel particulate matter and diesel exhaust organic gases. **Diesel exhaust** also represents chronic respiratory effects, possibly the primary non-cancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Some recent studies have reported that proximity to roadways is related to adverse health outcomes – particularly respiratory problems.<sup>1</sup> Many health studies use an epidemiological approach to relate the possibility of harm due to the proximity to the roadway. FHWA has concerns about reaching conclusions regarding health impacts from highway emissions based on proximity studies in areas known to exceed ambient air quality standards, such as the recent study by Dr. James Gauderman, et al., entitled “Effect of Exposure to Traffic on Lung development from 10 to 18 Years of Age: A Cohort Study”. These studies do not measure specific pollutants but only roadway proximity, so any reported negative health

<sup>1</sup> South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-III (2007); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air

impacts may be due to either the criteria pollutants or MSATs. Epidemiological studies suffer from the limitation that they cannot by their very nature establish causality. They may indicate statistical associations, but other confounding factors may be missed and may represent the true cause of the impact. Furthermore, not all studies show a negative impact. For example, the “Long term Effects of Traffic-Related Air Pollution on Mortality”, Beelen et al., only found weak associations between proximity to major roadways and health effects. This fact was also reported as a major shortcoming in health studies of this nature in, “Does Traffic-Related Air Pollution Contribute to Respiratory Disease Formation in Children”, M. Jerritt, ERJ 2007, Vol. 29. In his review, Jerritt also points out another shortcoming in recent health studies dealing with determining the effect of proximity. He points out that most of these studies utilize a basic measure of distance to roadway as a proxy of exposure; however, because of the variable nature of particles and gaseous pollutants, the true variability of air pollutants within the neighborhood scale needs to be captured to identify the health effects of specific components of the air pollution mixture. Additionally, he states “exposures assigned on distance to traffic or traffic counts near the home are prone to . . . errors . . . and biased results”.

Because analytical methodologies vary greatly between individual health studies, and all studies have limitations, it is not practical to draw definitive conclusions based solely on individual studies. Rather the total body of literature needs to be consulted before conclusions can be made. To that end, the Health Effects Institute has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The first study was completed and the findings published last year in Special Report 16 – *Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects*, available online at [www.healtheffect.org](http://www.healtheffect.org). For each of the MSATs reviewed, the analysis answers three questions:

- To what extent are motor vehicles a significant source of exposure?
- Does it affect human health?
- Does it affect human health at environmental concentrations?

HEI concludes that exposure to many MSATs comes from sources other than vehicles and that mobile sources are the primary sources of exposure for only a few of the 21 MSATs listed by the U.S. EPA in its 2001 Rule. For many of the MSATs reviewed, HEI concluded that there is insufficient data for an assessment of ambient exposures on human health.

#### **A.3.6 Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based Upon Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community**

Given the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be reliably made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a

meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

However, the EPA noted that several transportation projects have included human health risk assessments in the DEIS for on-road mobile sources. However, a health risk assessment was not done as part of the Midvalley Highway project.

In this document, FHWA has provided a qualitative analysis of MSAT emissions relative to the various alternatives, and has acknowledged that the Midvalley Highway alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be reliably estimated.

### **A.3.7 Indirect Impacts**

The Midvalley Highway alternatives would have no indirect impacts to the air quality of the Tooele Valley.

### **A.4 Mitigation**

The air quality analysis presented in this section does not indicate that significant air quality impacts will result from the implementation of either the Midvalley Highway East Alternative (both options) or the Midvalley Highway West Alternative (both options). Therefore, no air quality mitigation measures (other than compliance with applicable regulations) are warranted.



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