Appendix H

Air Quality Analysis Report

MEMORANDUM

To: Brett Danner
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From: John Crawford, P.E., PTOE

Date: April 26, 2016

Subject: ***I-35W North Corridor Preliminary Design Project Air Quality Analysis***

INTRODUCTION TO TRANSPORTATION AIR QUALITY ANALYSIS

Motorized vehicles affect air quality by emitting airborne pollutants. Changes in traffic volumes, travel patterns, and roadway locations affect air quality as the number of vehicles and the congestion levels in a given area change. The adverse impacts this project could have on air quality have been analyzed by addressing criteria air pollutants, a group of common air pollutants that are regulated by the U.S. Environmental Protection Agency (EPA) on the basis of specific criteria that reflect the effects of pollution on public health and the environment. The criteria air pollutants identified by the EPA are ozone, particulate matter, carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide. Potential impacts resulting from these pollutants are assessed by comparing the project's projected concentrations to National Ambient Air Quality Standards (NAAQS).

In addition to the criteria air pollutants, the EPA also regulates a category of pollutants known as air toxics, which are generated by emissions from mobile sources. The Federal Highway Administration (FHWA) provides guidance for the assessment of Mobile Source Air Toxic (MSAT) effects for transportation projects in the National Environmental Policy Act (NEPA) process. A quantitative evaluation of MSATs has been performed for this project, as documented below. The scope and methods of the analysis performed were developed in collaboration with the Minnesota Department of Transportation (MnDOT), the Minnesota Pollution Control Agency (MPCA), and the Federal Highway Administration (FHWA).

Criteria Air Pollutant Analysis

Ozone

Ground-level ozone is a primary constituent of smog and is a pollution problem throughout many areas of the United States. Exposures to ozone can make people more susceptible to respiratory infection, resulting in lung inflammation, and aggravate preexisting respiratory diseases such as asthma. Ozone is not emitted directly from vehicles but is formed as volatile organic compounds (VOCs) and nitrogen oxides (NO_x) that react in the presence of sunlight. Transportation sources emit NO_x and VOCs and can therefore affect ozone concentrations. However, due to the phenomenon of atmospheric formation of ozone from chemical precursors, concentrations are not expected to be elevated near a particular roadway.

The Minnesota Pollution Control Agency (MPCA), in cooperation with various other agencies, industries, and groups, has encouraged voluntary control measures for ozone and has begun developing a regional ozone modeling effort. Ozone concentrations in the lower atmosphere are influenced by a complex relationship of precursor concentrations, meteorological conditions, and regional influences on background concentrations. MPCA states in *Air Quality in Minnesota: 2015 Report to the Legislature* (January 2015) that:

> *On November 24, 2014, the EPA announced proposed changes to the National Ambient Air Quality Standard for ozone. The proposal seeks to strengthen the ozone standard by lowering the standard from 75 ppb to a value between 65 ppb and 70 ppb. The proposal is based on scientific evidence that strongly indicates ozone impacts human health at levels below the existing standard of 75 ppb.*
>
> *Based on 2013 ozone monitoring results, all areas of Minnesota will meet the revised ozone standard if it is set at 70 ppb*. If the ozone standard is set at 66 ppb or lower, the Twin Cities metropolitan area will not meet the standard. The EPA is expected to finalize the revised ozone standard in October 2015. EPA plans to use monitoring data from 2014-2016 to determine compliance. The MPCA will closely monitor ozone levels over the summer of 2015 and 2016 to assess the likelihood of violating the revised ozone standard.*
>
> * Note that on October 1, 2015, the EPA set the ozone standard at 70 ppb. All areas of Minnesota will meet this new ozone standard.

Additionally, the State of Minnesota is classified by the EPA as an "ozone attainment area," which means that Minnesota has been identified as a geographic area that meets the national health-based standards for ozone levels. Because of these factors, a quantitative ozone analysis was not conducted for this project.

Particulate Matter

Particulate matter (PM) is the term for particles and liquid droplets suspended in the air. Particles come in a wide variety of sizes and have been historically assessed based on size, typically measured by the diameter of the particle in micrometers. $PM_{2.5}$ or fine particulate matter refers to particles that are 2.5 micrometers or less in diameter. PM_{10} refers to particulate matter that is 10 micrometers or less in diameter.

Motor vehicles (i.e., cars, trucks, and buses) emit direct PM from their tailpipes, as well as from normal brake and tire wear. Vehicle dust from paved and unpaved roads may be re-entrained, or re-suspended, in the atmosphere. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing;
- Decreased lung function;
- Aggravated asthma;
- Development of chronic bronchitis;
- Irregular heartbeat;
- Nonfatal heart attacks; and
- Premature death in people with heart or lung disease.[1]

On December 14, 2012, the EPA issued a final rule revising the annual health NAAQS for fine particles ($PM_{2.5}$). The EPA website states:

> *With regard to primary (health-based) standards for fine particles (generally referring to particles less than or equal to 2.5 micrometers (mm) in diameter, PM2.5), the EPA is strengthening the annual PM2.5 standard by lowering the level to 12.0 micrograms per cubic meter (µg/m3). The existing annual standard, 15.0 µg/m3, was set in 1997. The EPA is revising the annual PM2.5 standard to 12.0 µg/m3 so as to provide increased protection against health effects associated with long- and short-term exposures (including premature mortality, increased hospital admissions and emergency department visits, and development of chronic respiratory disease), and to retain the 24-hour PM2.5 standard at a level of 35 µg/m3 (the EPA issued the 24-hour standard in 2006). The EPA is revising the Air Quality Index (AQI) for PM2.5 to be consistent with the revised primary PM2.5 standards.*[2]

The agency also retained the existing standards for coarse particle pollution (PM_{10}). The NAAQS 24-hour standard for PM_{10} is 150 µg / m^3, which is not to be exceeded more than once per year on average over three years.

The Clean Air Act conformity requirements include the assessment of localized air quality impacts of federally-funded or federally-approved transportation projects that are deemed to be projects of air quality concern located within $PM_{2.5}$ nonattainment and maintenance areas. This project is not considered one of air quality concern. This is supported, in part, by the designation of the majority of the State of Minnesota as an unclassifiable/ attainment area for PM. A small part of St. Paul is classified as a maintenance area for PM_{10}. This means that Minnesota has been identified as a geographic area that meets or exceeds the national standards for the reduction of PM levels, and our project area is located outside of the maintenance area, and therefore is exempt from performing PM qualitative hot-spot analyses.

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[1] Source: http://www.epa.gov/air/particlepollution/health.html

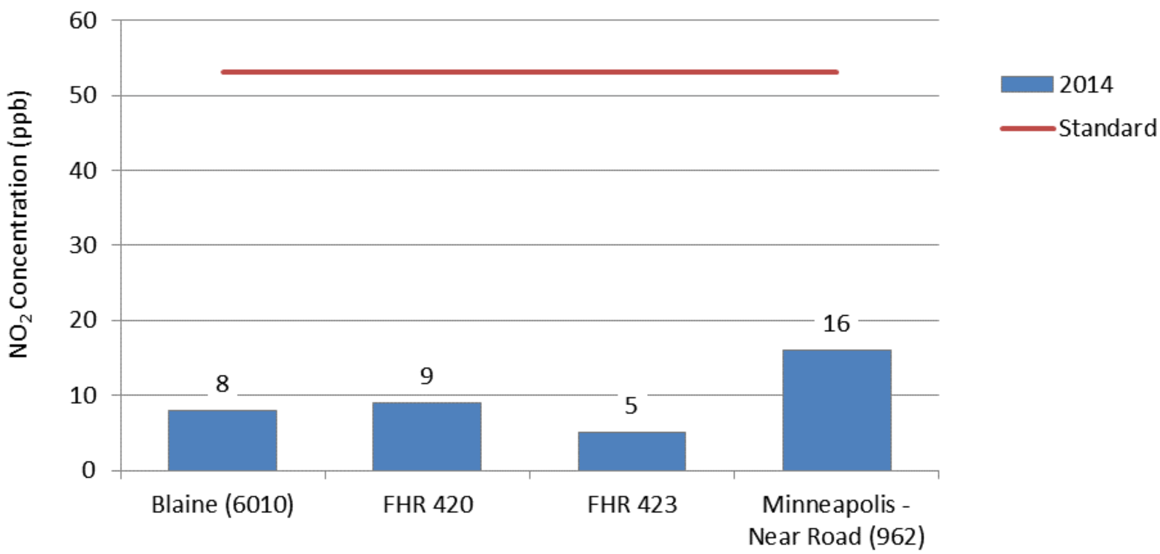
[2] Source: http://www.epa.gov/pm/actions.html

Nitrogen Dioxide (Nitrogen Oxides)

Nitrogen oxides, or NO_x, are the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. In addition to being a precursor to ozone, NO_x can worsen bronchitis, emphysema and asthma and increase risk of premature death from heart or lung disease.[3]

Minnesota currently meets federal nitrogen dioxide standards, as shown in Exhibit 1 from *2016 Annual Air Monitoring Network Plan* (October 2015). This document states: "A monitoring site meets the annual NAAQS for NO_2 if the annual average is less than or equal to 53 ppb. The 2014 Minnesota averages ranged from 5 ppb at Flint Hills Refinery (FHR) 423 to 16 ppb at Minneapolis – Near Road 962; therefore, Minnesota currently meets the annual NAAQS for NO_2."

Exhibit 1: Average Annual NO_2 concentrations compared to the NAAQS



In the *2016 Annual Air Monitoring Network Plan for Minnesota, October 2015*, it states the following with regard to the 1-hour NO_2 standard:

> *On January 22, 2010 the EPA finalized revisions to the NO2 NAAQS. As part of the standard review process, the EPA retained the existing annual NO2 NAAQS, but also created a new 1-hour standard. This new 1-hour NAAQS will protect against adverse health effects associated with short term exposures to elevated NO2. To meet this standard, the three-year average of the*

3 Source: 2015 Report to the Legislature, MPCA, January 2015

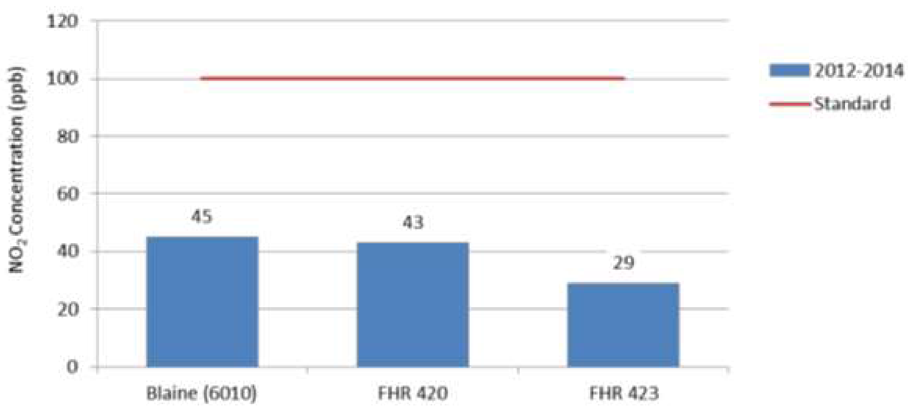
annual 98th percentile daily maximum 1-hour NO2 concentration must not exceed 100 ppb. Figure 22 shows the 2012-2014 average of the annual 98th percentile daily maximum 1-hour NO2 concentrations at Minnesota sites and compares them to the 1-hour standard. Minnesota averages ranged from 29 ppb at FHR 423 to 45 ppb at Blaine (6010); therefore, all Minnesota sites currently meet the1-hour NAAQS for NO2.

The EPA's regulatory announcement, EPA420-F-99-051 (December 1999), describes the Tier 2 standards for tailpipe emissions, and states:

The new tailpipe standards are set at an average standard of 0.07 grams per mile for nitrogen oxides for all classes of passenger vehicles beginning in 2004. This includes all light-duty trucks, as well as the largest SUVs. Vehicles weighing less than 6,000 pounds will be phased-in to this standard between 2004 and 2007.

As newer, cleaner cars enter the national fleet, the new tailpipe standards will significantly reduce emissions of nitrogen oxides from vehicles by about 74 percent by 2030. The standards also will reduce emissions by more than 2 million tons per year by 2020 and nearly 3 million tons annually by 2030.

Exhibit 2: 1-hour NO_2 concentrations compared to the NAAQS



Within the project area, it is unlikely that NO_2 standards will be approached or exceeded based on the relatively low ambient concentrations of NO_2 in Minnesota and on the long-term trend toward reduction of NO_x emissions. Because of these factors, a specific analysis of NO_2 was not conducted for this project.

Sulfur Dioxide

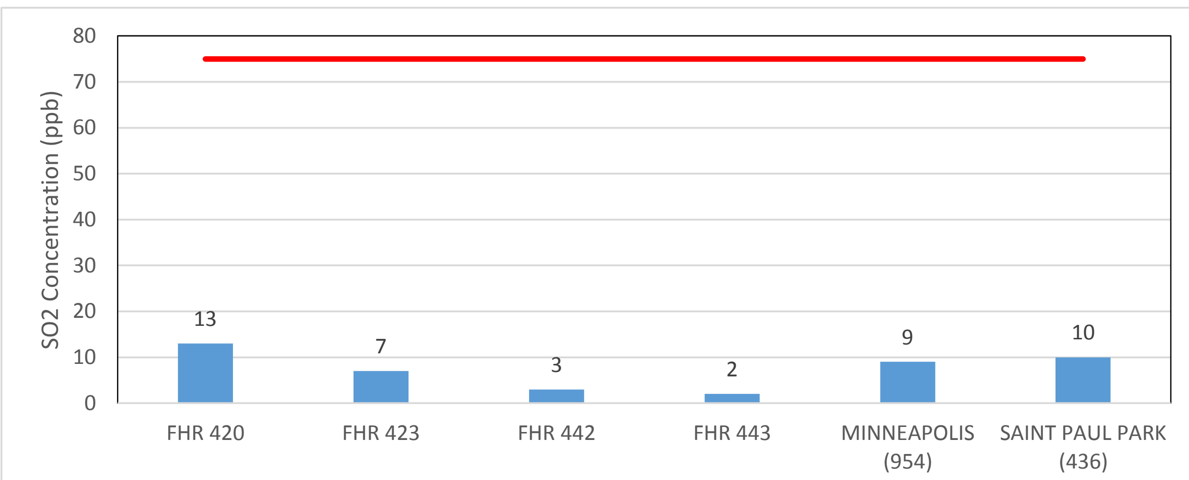
Sulfur dioxide (SO_2) and other sulfur oxide gases (SO_x) are formed when fuel containing sulfur, such as coal, oil, and diesel fuel is burned. Sulfur dioxide is a heavy, pungent, colorless gas. Elevated levels can impair breathing, lead to other respiratory symptoms, and at very high levels aggravate heart disease. People with asthma are most at risk when SO_2 levels increase. Once emitted into the atmosphere, SO_2 can be further oxidized to sulfuric acid, a component of acid rain.

MPCA monitoring shows that ambient SO_2 concentrations were at less than 20 percent of the federal standards over the 3-year period from 2012 through 2014, as shown in Exhibit 3 below.[4] The MPCA has concluded that long-term trends in both ambient air concentrations and total SO_2 emissions in Minnesota indicate steady improvement.

In the 2015 Annual Air Monitoring Network Plan for Minnesota, it states the following with regard to SO_2:

> *On June 2, 2010, the EPA finalized revisions to the primary SO2 NAAQS. EPA established a new 1-hour standard which is met if the three-year average of the annual 99th percentile daily maximum 1-hour SO2 concentration is less than 75 ppb. In addition to creating the new 1-hour standard, the EPA revoked the existing 24-hour and annual standards. Figure 24 describes the 2012 -2014 average 99th percentile 1-hour SO2 concentration and compares them to the 1-hour standard. Minnesota averages ranged from 2 ppb at FHR 443 to 13 ppb at FHR 420; therefore, all Minnesota sites currently meet the1-hour NAAQS for SO2.*

Exhibit 3: 1-hour SO_2 concentrations compared to the NAAQS



Emissions of sulfur oxides from transportation sources are a small component of overall emissions and continue to decline due to the desulphurization of fuels. Additionally, the project area is classified by the EPA as a "sulfur dioxide attainment area," which means that the project area has been identified as a geographic area that meets the national health-based standards for sulfur dioxide

[4] Source: Annual Air Monitoring Network Plan for Minnesota, 2016, October 2015

levels. Because of these factors, a quantitative analysis for sulfur dioxide was not conducted for this project.

Lead

Due to the phase out of leaded gasoline, lead is no longer a pollutant associated with vehicular emissions.

Carbon Monoxide

Carbon monoxide (CO) is the traffic-related pollutant that has been of concern in the Twin Cities Metropolitan area. In 1999, the EPA re-designated all of Hennepin, Ramsey, Anoka, and portions of Carver, Scott, Dakota, Washington, and Wright Counties as a maintenance area for CO. This means the area was previously classified as a nonattainment area but has now been found to be in attainment. This area includes the project area, which is located in Ramsey and Anoka Counties. Evaluation of CO for assessment of air quality impacts is required for environmental approval in National Environmental Policy Act (NEPA) documents.

AIR QUALITY CONFORMITY

The EPA issued final rules on transportation conformity (40 CFR 93, Subpart A) which describe the methods required to demonstrate State Implementation Plan (SIP) compliance for transportation projects. It requires that transportation projects that meet the criteria to be classified as regionally significant be included in a regional emissions analysis and are approved as part of a conforming Long Range Transportation Policy Plan (LRTPP) and four-year Transportation Improvement Program (TIP). The project construction is not identified in the 2016 – 2019 STIP, however $1.1 million is set aside in 2016 for the EA and preliminary design.

On November 8, 2010, the EPA approved a limited maintenance plan request for the Twin Cities maintenance area. Under a limited maintenance plan, the EPA has determined that there is no requirement for project emissions over the maintenance period and that "an emission budget may be treated as essentially non-constraining for the length of the maintenance period. The reason is that it is unreasonable to expect that our maintenance area will experience so much growth within this period that a violation of CO National Ambient Air Quality Standard (NAAQS) would result."[5] Therefore, no regional modeling analysis for the LRTPP and TIP is required; however, federally funded and state funded projects are still subject to "hot-spot" analysis requirements. The limited maintenance plan adopted in 2010 determines that the level of CO emissions and resulting ambient concentrations will continue to demonstrate attainment of the CO NAAQS. This project does not interfere with implementation of any transportation control measure included in the SIP. The TIP was determined to conform to the requirements of the 1990 CAAA by MPCA. The project’s design concept and scope are not significantly different from that used in the TIP conformity analysis. As

[5] US EPA Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment Areas, October 6, 1995

demonstrated by the above information, this project conforms to the requirements of the CAAA and to the Conformity Rules, 40 CFR 93.

Hot-Spot Analysis

CO evaluation is performed by evaluating the worst-operating (hot-spot) intersections in the project area. The EPA has approved a screening method to determine which intersections need hot-spot analysis. The hot-spot screening method uses a traffic volume threshold of 79,400 entering vehicles per day. Intersection with traffic volumes above this threshold must be evaluated using EPA-approved emission and dispersion models. Intersections with traffic volumes below this threshold are not expected to result in CO concentrations that exceed state or federal standards, and detailed modeling is not required. The I-35W North Corridor Preliminary Design project does not significantly affect any intersections within the project corridor. Therefore, no hot-spot analysis or screening procedure was needed nor completed.

Improvements in vehicle technology and in motor fuel regulations continue to result in reductions in vehicle emission rates. The EPA MOVES 2010b emissions model estimates that emission rates will continue to decline from existing rates through year 2040. Consequently, year 2040 vehicle-related CO concentrations in the study area are likely to be lower than existing concentrations even considering the increase in development-related and background traffic.

Mobile Source Air Toxics (MSAT) Analysis

Background

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).[6]

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).[7] These are acrolein, benzene, 1,3-butidiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While the Federal Highway Administration (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.

6 http://www.epa.gov/iris/
7 http://www.epa.gov/ttn/atw/nata1999/

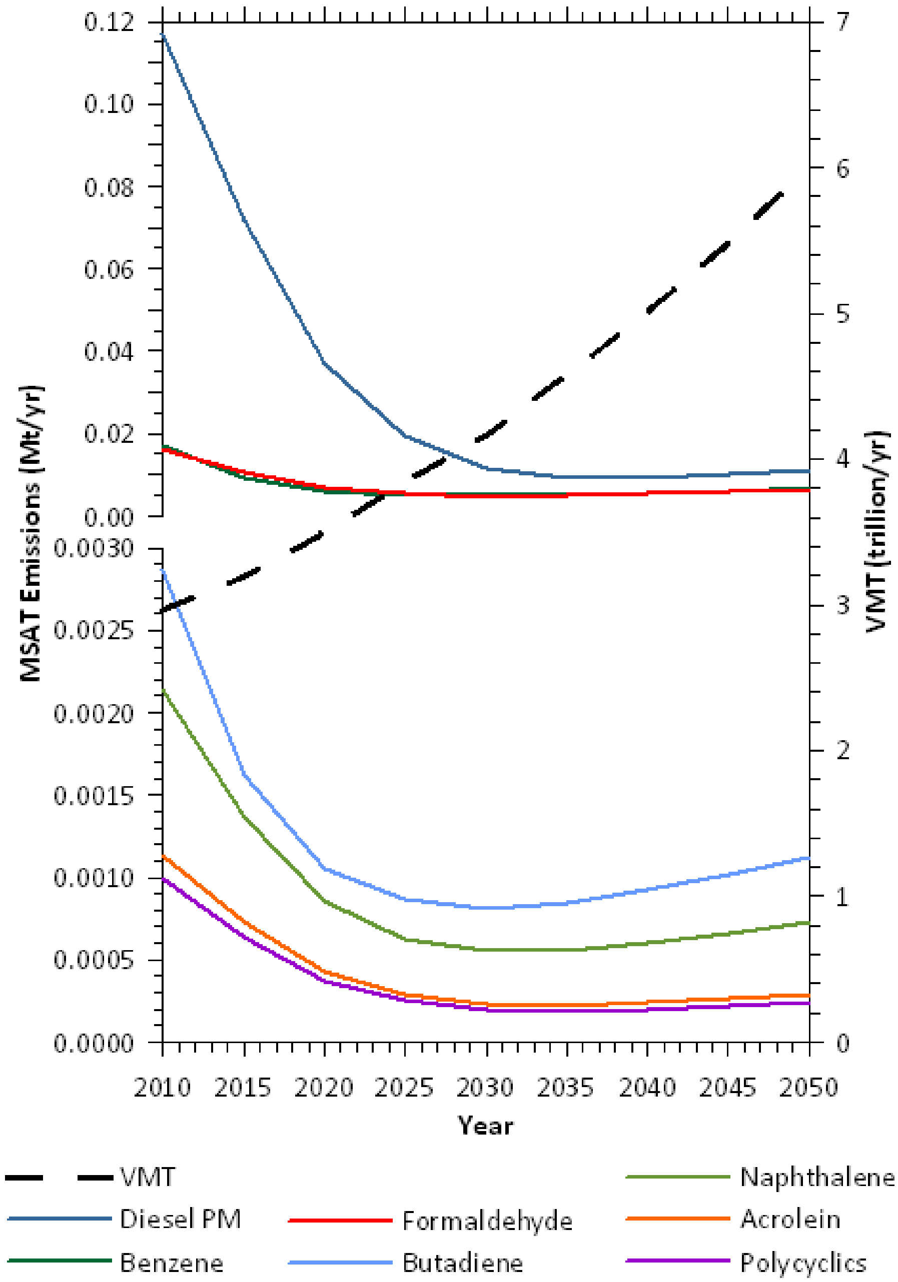
Motor Vehicle Emissions Simulator (MOVES)

According to EPA, MOVES improves upon the previous MOBILE model in several key aspects: MOVES is based on a vast amount of in-use vehicle data collected and analyzed since the latest release of MOBILE, including millions of emissions measurements from light-duty vehicles. Analysis of this data enhanced EPA's understanding of how mobile sources contribute to emissions inventories and the relative effectiveness of various control strategies. In addition, MOVES accounts for the significant efforts that vehicle speed and temperature have on PM emissions estimates, whereas MOBILE did not. MOVES2010b includes all air toxic pollutants in NATA that are emitted by mobile sources. EPA has incorporated more technology and modern fuels, plus additional data for older technology vehicles.

Based on FHWA analysis using EPA's MOVES2010b model, as shown in Exhibit 4, even if vehicle-miles traveled (VMT) increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.

The implications of MOVES on MSAT emissions estimates compared to MOBILE are lower estimates of total MSAT emissions; significantly lower benzene emissions; significantly higher diesel PM emissions, especially for lower speeds. Consequently, diesel PM is projected to be the dominant component of the emissions total.

Exhibit 4: National MSAT Emission Trends 1999 – 2050 for Vehicles Operating on Roadways Using EPA's MOVES2010b Model



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

MSAT Research

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

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

Under Council of Environmental Quality rules applicable to the NEPA process, in 40 CFR 1502.22, it is stated that agencies preparing NEPA documentation should disclose cases of incomplete or unavailable information. In the case of MSAT assessments for highways, it is FHWA's view that information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

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

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are: cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations[8] or in the future as vehicle emissions substantially decrease.[9]

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 encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

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

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI.[10] As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA and the HEI have not established a basis for quantitative risk assessment of diesel PM in ambient settings.[11]

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process does not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two step decision

[8] HEI, http://pubs.healtheffects.org/view.php?id=282
[9] HEI, http://pubs.healtheffects.org/view.php?id=306
[10] http://pubs.healtheffects.org/view.php?id=282
[11] http://www.epa.gov/risk/basicinformation.htm#g and http://pubs.healtheffects.org/getfile.php?u=395

framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable.

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

Quantitative Analysis

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the federal government be interpreted and administered in accordance with its environmental protection goals. The NEPA also requires federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. The NEPA requires, and FHWA is committed to the examination and avoidance of adverse impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, FHWA must also take into account the need for safe and efficient transportation for reaching a decision that is in the best overall public interest. FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771.

FHWA developed a tiered approach with three categories for analyzing MSAT in NEPA documents, depending on specific project circumstances:

1. No analysis for projects without potential for meaningful MSAT effects;
2. Qualitative analysis for projects with low potential for MSAT effects; or,
3. Quantitative analysis to differentiate alternatives for projects with higher potential for MSAT effects.

According to FHWA guidance for MSAT analysis, in order for a project to fall into category three (quantitative analysis), the project should: 1) Create new capacity or add significant capacity to urban highways, such as interstates, urban arterials, or urban collector-distributor routes, and should have traffic volumes where the AADT is projected to range from 140,000 to 150,000 or greater by the design year; and the project should: 2) Be located in proximity of populated areas.

This project proposes to construct a pair of lanes within the median of I-35W in the cities of Roseville, New Brighton, Arden Hills, Mounds View, Shoreview, Lexington, Blaine, and Lino Lakes with projected AADTs ranging from 140,000 to 180,000 in the affected freeway segments. This project meets the criteria for the third category, and therefore, a quantitative assessment of MSAT emissions has been conducted. According to the aforementioned 2007 EPA rule, the MSAT compounds evaluated in this analysis include:

- Acrolein
- Benzene
- 1,3-Butadiene

- Diesel Particulate Matter (Diesel PM)
- Formaldehyde
- Naphthalene
- Polycyclic Organic Matter (POM)

Methodology

This mobile source air toxic quantitative analysis uses the EPA's Motor Vehicle Emission Simulator (MOVES) tool. It is state-of-the-art software for estimation of roadway vehicle emissions, based on analyses of millions of emissions test results and empirical data. MOVES takes into account a variety of factors that affect vehicle emissions, including vehicle age and fleet composition, roadway system classification, weather conditions, fuel type and technology, and various operating characteristics. The table below lays out each input file and the origin of the information within each file.

File	Source
Fuel related supply files	Defaults for Ramsey County (verified with MPCA)
Month VMT Fraction	Received from MPCA
Day VMT Fraction	Received from MPCA
Hour VMT Fraction	Output from Travel Demand Model
Average Speed Distribution	Output from Travel Demand Model
Vehicle Age Distribution	Received from MPCA
Road Type Distribution	Received from the MPCA
VMT File	Output from Travel Demand Model

Following the guidance of the "Quick-start Guide for Using MOVES for NEPA MSAT Analysis" developed by the FHWA Resource center, a MOVES run specification for the I-35W North Corridor Preliminary Design project was developed with a list of key input data tables.

The methodology for this MSAT quantitative analysis includes the following steps:

1. Prepare inputs for all the future years from the regional travel demand model;
2. Conduct a trend analysis through multiple future years to identify the worst-year scenario;
3. Prepare inputs for Build alternatives in the worst-year condition identified in the previous step, based on the link based ADT forecasts;
4. Evaluate Build and No-Build alternative in the worst-year condition using a project impact analysis.

This evaluation provides a comparison of emission levels resulting from various future conditions, but because dispersion modeling is not included, results do not yield exposure levels or assess whether changes in emissions are significant.

Project Description

The project is located in the cities of Roseville, New Brighton, Mounds View, Arden Hills, Shoreview, Lexington, Blaine, and Lino Lakes in Anoka and Ramsey counties, Minnesota. The proposed project includes construction of a new MnPASS lane within the center median of I-35W from County Road (CR) C in Roseville to Lexington Avenue in Blaine. Pavement rehabilitation will be completed along

I-35W and I-35W interchange ramps from north of CR C to north of Sunset Avenue in Lino Lakes. The I-35W bridges over the BNSF Railway/Rosegate, CR C, and CR I will be replaced. Auxiliary lanes will be constructed between interchanges at various locations along the I-35W project corridor. An auxiliary lane along westbound Trunk Highway (TH) 10 will be constructed from I-35W west to the 93rd Avenue interchange. Stormwater ponds will also be constructed at various locations along the I-35W project corridor. The total project length is 12.8 miles. The project location is shown at the end of the document in **Figure 3**.

Trend Analysis

A trend analysis was completed for year 2015 to year 2040 in 5 year increments with an additional year of 2022, selected as the opening year. By analyzing the trend in emissions, the worst-year scenario was identified, and that year became the basis for comparison and evaluation of the No-Build and Build alternatives.

Model input for this evaluation was obtained from a variety of sources. Vehicle-type distribution and fleet mix for year 2010 was received from the MPCA. The Metropolitan Council's regional travel demand model was used to estimate traffic inputs for year 2040 conditions, assuming increased travel and congestion levels. Inputs for the years between 2015 and 2040 was estimated by linear growth interpolations by roadway facility. The difference in input datasets among all of the analysis years include: total VMT, vehicle age population, VMT fraction, hourly VMT fraction, and speed distribution.

The trend analysis results presented in **Table 1** below show that emission inventories for all the priority MSATs (Acrolein, Benzene, 1,3-Butadiene, Formaldehyde, Naphthalene, Polycyclic Organic Matte, Diesel PM) decrease significantly over the next three decades. In general, emissions will be 71 to 82 percent lower in Ramsey County for year 2040 as compared to year 2014. Improvements in vehicle technology and fuel formula mainly contribute to this reduction. The trend analysis results are also depicted graphically in **Figure 1 and Inset Figure 2**.

TABLE 1: MSAT EMISSION TREND

Pollutant Name	2015 NB	2020 NB	2022 NB	2025 NB	2030 NB	2035 NB	2040 NB	% Reduction 2015 to 2040
Acrolein	7,269	4,650	4,027	3,355	2,571	2,213	2,122	71%
Benzene	205,264	118,893	100,762	82,454	60,731	50,656	46,654	77%
Butadiene	32,422	19,195	16,203	13,151	9,543	7,933	7,231	78%
Formaldehyde	100,761	59,652	50,543	41,724	32,198	28,142	27,644	73%
Naphthalene	14,805	8,561	7,159	5,775	4,248	3,593	3,447	77%
POM	5,294	2,964	2,423	1,876	1,287	1,029	966	82%
Diesel PM	979,410	583,981	482,655	370,128	259,967	213,050	204,659	79%

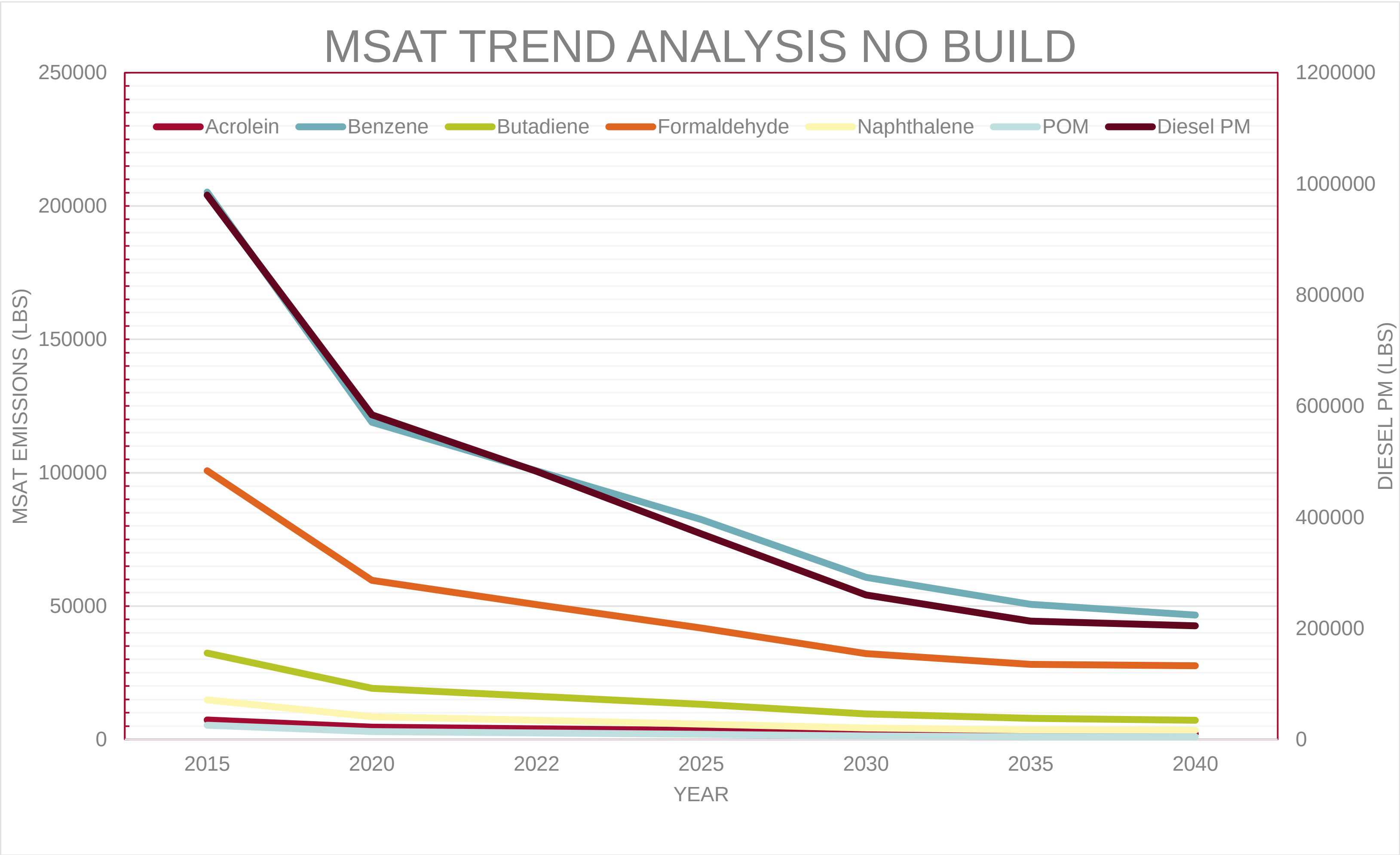


FIGURE 1: NO BUILD MSAT SUMMARY

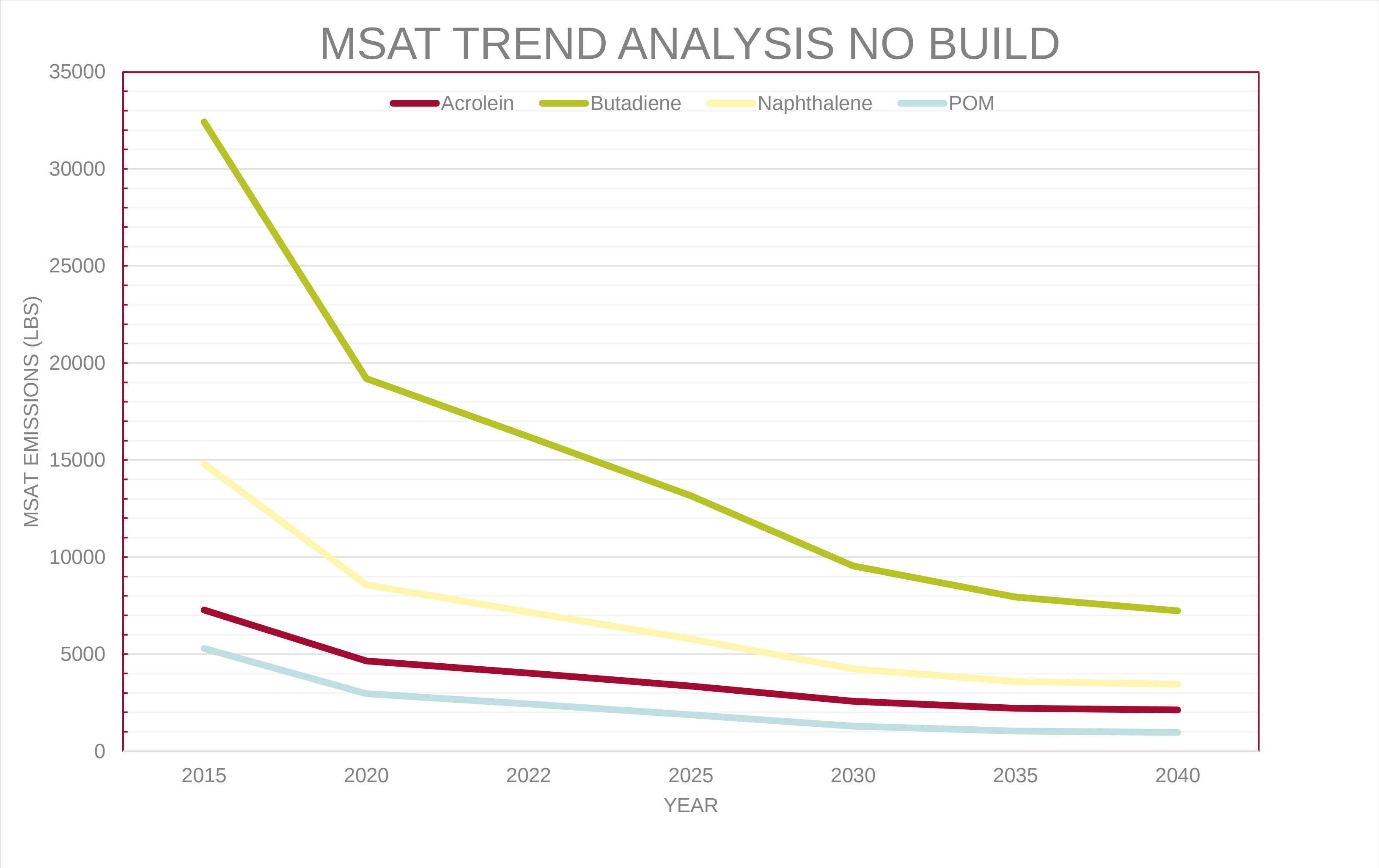


FIGURE 2: NO BUILD MSAT EMISSION INSET

Project Impact Analysis

The impact of this project on air quality has been analyzed for the worst-year scenario to reflect the worst-case conditions. The construction of the project will affect local traffic conditions, including traffic volumes, spatial distribution of traffic, and travel speed.

Forecasted ADTs were completed for 2040 No Build and Build conditions. ADT forecasts show increased traffic volumes on both Northbound and Southbound I-35W within the project limits. Motor Vehicle Emissions Simulator (MOVES) inputs for the Build Alternative are modified from No-Build inputs to reflect the project impacts. The ADT information was then modified to reflect VMT along the corridor. The hourly travel speeds were extracted from the regional travel demand model. The following trends were observed when comparing No Build to Build.

1. Overall VMT increases due to higher speeds and increased capacity.
2. Freeway speeds increase due to the new capacity provided by managed lanes.
3. Traffic shifts from the arterials to the freeway because of the speed and capacity improvement.
4. Arterial speeds increase due to decreased traffic.
5. Total VMT increases because traffic is attracted from alternative routes.

On the county scale, construction of the project is not anticipated to have a significant change in the overall emissions along the corridor. The worst case year in 2022 showed little change between No Build and Build emission levels.

Model outputs show an increase of less than 0.04% for all air toxics in year 2022 resulting from the construction of this project. **Table 2** below shows the comparison between 2022 No-Build and 2022 Build. Model outputs show an increase of less than 0.1% for all toxics in Year 2040 resulting from the construction of the project. **Table 3** shows the comparison between 2040 No-Build and 2040 Build.

Table 2: MSAT Emission (Lbs.) - Project Impact Analysis (2020)

Pollutant	2022 No-Build	2022 Build	Difference	Change
Acrolein	4027.0	4027.3	0.38	0.009%
Benzene	100761.5	100776.6	15.04	0.015%
1,3 - Butadiene	16203.0	16203.4	0.48	0.003%
Formaldehyde	50542.5	50548.7	6.23	0.012%
Naphthalene	7158.8	7159.6	0.85	0.012%
POM	2423.5	2424.1	0.61	0.025%
Diesel PM	482654.9	482846.9	192.06	0.040%

TABLE 3: MSAT Emission (Lbs.) - Project Impact Analysis (2040)

Pollutant	2040 No-Build	2040 Build	Difference	Change
Acrolein	2121.8	2121.7	-0.08	-0.004%
Benzene	46653.5	46668.0	14.48	0.031%
1,3 - Butadiene	7231.0	7231.0	-0.03	0.000%
Formaldehyde	27643.8	27641.5	-2.33	-0.008%
Naphthalene	3447.1	3447.2	0.11	0.003%
POM	965.6	966.2	0.59	0.061%
Diesel PM	204658.9	204890.0	231.09	0.113%

Conclusions

The trend analysis showed a general emission increase of less than 0.1% in all of the analyzed air toxics from year 2014 to 2040. This trend for Ramsey County, Minnesota is consistent with the national trend. Better fuel efficiency, improvements in vehicle technology, and strict regulation dramatically decrease the total MSAT emissions, even with increased vehicle activities.

The air quality project impact analysis shows no meaningful difference between the No-Build and Build alternatives. On a regional level, the project's projected air quality impacts are too small to be considered meaningful.