APPENDIX F. AIR QUALITY TECHNICAL MEMORANDUM

Air Quality Technical Memorandum

Technical Memorandum No. MDOT – TM 50
January 25, 2019

Project Title: I-94 Detroit Modernization Project
MDOT JN: 122117
Control Section: 82023, 82024, 82025 (I-94); 82111, 82112 (M-10); 82251, 82252 (I-75)

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1 EXECUTIVE SUMMARY

This report evaluates the potential air quality impacts for the I-94 Detroit Modernization Project. It was prepared in compliance with the Clean Air Act and the 1990 Clean Air Act Amendments, and MDOT procedures which follow related Federal regulations and Federal Highway Administration (FHWA) Guidance. The analysis addresses regional and project level conformity in accordance with 40 CFR Part 93. The report presents the results of a carbon monoxide (CO) hot-spot analysis comparing the results to the National Ambient Air Quality Standards (NAAQS), discusses fine particulate matter ($PM_{2.5}$), and provides a qualitative discussion on Mobile Source Air Toxics (MSAT).

The I-94 Detroit Modernization Project consists of planned improvements to approximately 6.7 miles of interstate freeway in the city of Detroit, Michigan. These improvements add a travel lane in each direction, modernize system and service interchanges, reconstruct bridges crossing over the freeway, and change existing service drives to maximize efficiencies of connected local travel patterns. The purpose of the Project is to improve safety, capacity, local connectivity, and condition of the I-94 roadway, service drives, bridges, and interchanges between I-96 and Conner Avenue.

The I-94 Detroit Modernization Project corridor is located within the Metropolitan Detroit-Port Huron Intrastate Air Quality Control Region (AQCR #123). Wayne County is currently in attainment status for three of the six criteria pollutants. Although a portion of Wayne County has been classified as being in non-attainment for Sulfur Dioxide SO_2 (2010), the project is not located in this portion of the county.[1] Wayne County is considered a "Maintenance Area" for CO and $PM_{2.5}$. As such, the project is required to meet Transportation Conformity Rule requirements found in 40 CFR Part 93. This project is included in Southeast Michigan Council of Government's (SEMCOG) 2040 Regional Transportation Plan (RTP) for Southeast Michigan, RTP project #12931, 12927, and 13026, and FY 2017-2020 Transportation Improvement Program (TIP) for Southeast Michigan, TIP project #136, 137, 139, 145, 146, 147, 148, 149, 151, 242, 243, 244, 245, 246, and 313. SEMCOG's 2040 RTP was adopted on June 20, 2013 in conformance with the transportation planning requirements of Titles 23 and 49 USC, the Clean Air Act Amendments, and related regulation.

The results of the CO microscale air quality modeling indicate that none of the concentrations at the 36 receptors modeled around two intersections exceed the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS. Since the 1-hour analysis predicted CO concentrations are less than 9.0 ppm, a separate 8-hour analysis was not performed.

The I-94 Detroit Modernization Project is a project meets FHWA's definition of a project with low potential MSAT effects because it is a project that serves to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. The Michigan Transportation Conformity Interagency Workgroup (MITC-IAWG) determined that there would not be significant increase in the number of diesel trucks for this project. Therefore, the I-94 Detroit Modernization Project was determined to not be a project of air quality concern for $PM_{2.5}$.[2]

Based on the air quality analyses completed for the proposed improvements, this project will not contribute to any violation of the CO nor $PM_{2.5}$ NAAQS.

[1] https://www3.epa.gov/airquality/greenbook/tnp.html#SO2.2010.Detroit

[2] *Annual Work Program Completion Report,* SEMCOG, pages 8 and 57, September 2018, *Summary of May 21, 2018 Conference Call,* Michigan Transportation Conformity Interagency Workgroup, May 2018.

2 INTRODUCTION

2.1 PURPOSE

In compliance with the Clean Air Act and the 1990 Clean Air Act Amendments, the National Environmental Policy Act (NEPA), related federal regulations and Federal Highway Administration (FHWA) Guidance, along with MDOT procedures, this report discusses potential air quality impacts of the I-94 Detroit Modernization Project.

The process described will ultimately be used to:

- address the status of this projects conformity in accordance with 40 CFR Parts 51 and 93, "Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded or Approved Under Title 23 USC or the Federal Transit Act";
- provide the CO microscale analysis for the existing (2017) condition, the anticipated first year of operation (2036) and the design year (2040) and compare the results to the NAAQS;
- present a discussion on $PM_{2.5}$; and
- qualitatively discuss MSATs

3 BASICS OF AIR QUALITY POLLUTANTS

3.1 CRITERIA POLLUTANTS

Under the Clean Air Act of 1970 (last amended in 1990), the United States Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) to protect public health, safety, and welfare from known or anticipated effects of air pollutants. EPA has established NAAQS for six criteria pollutants:

- Sulfur dioxide (SO_2)
- Particulate matter (PM_{10}, 10 micrometers and smaller along with $PM_{2.5}$, 2.5 micrometers and smaller)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Ozone (O_3)
- Lead (Pb)

Table 1 presents the NAAQS. When concentrations of pollutants do not exceed the standards, an area is considered in attainment of the NAAQS. An area that exceeds NAAQS standards for one or more pollutants is designated by the EPA as a non-attainment area.

The Clean Air Act Amendments of 1977 and 1990 required all states to submit a list to EPA identifying those air quality regions, or portions thereof, which meet or exceed the NAAQS or cannot be classified because of insufficient data. Portions of air quality control regions that exceed the NAAQS for any criteria pollutant are designated as non-attainment areas for that pollutant. The Clean Air Act Amendments also established time schedules for the states to attain the NAAQS.

The primary pollutants from motor vehicles are unburned hydrocarbons, nitrogen oxides, carbon monoxide and particulates. Volatile organic compounds and nitrogen oxides react in the presence of sunlight to create ozone. Because these reactions take place over a period of several hours, maximum concentrations of photochemical oxidants are often found far downwind of the precursor sources. These pollutants are regional problems. The modeling procedures for ozone require long-term meteorological data and detailed area-wide emission rates for all potential sources.

Table 1. National Ambient Air Quality Standards (NAAQS)

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3-month Average	0.15 $\mu g/m^3$ [a]	Not to be exceeded
Nitrogen Dioxide ($N0_2$)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb [b]	Annual mean
Ozone (0_3)		primary and secondary	8 hours	0.070 ppm [c]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	1 year	15 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24-hours	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years.
Sulfur Dioxide ($S0_2$)		primary	1 hour	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: https://www.epa.gov/criteria-air-pollutants/naaqs-table, accessed March 8, 2018

[a] In areas designated non-attainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar-quarter average) also remain in effect.

[b] The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

[c] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards. On April 23, 2018 the FHWA published a memorandum providing interim guidance on the reinstated 1997 8-hour ozone standard. The standard was revoked in April 2015 with the establishment of the 2008 80-hour ozone standard. A Federal court decision reinstated the 1997 standard.

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

Carbon monoxide is a colorless and odorless gas that is the by-product of incomplete combustion and is the major pollutant from gasoline-fueled motor vehicles. Carbon monoxide emissions are greatest from vehicles operating at low speeds and prior to complete engine warm-up (within roughly eight minutes after starting). Congested urban roads tend to be the principal problem areas for carbon monoxide.

PM includes microscopic solids or liquid droplets. Motor vehicles (for example, cars, trucks, and buses) emit direct PM in their exhausts, as well as from brake and tire wear. Vehicles also cause dust from paved and unpaved roads to be re-suspended in the atmosphere. Gaseous precursors in vehicle exhaust may react in the atmosphere to form PM, including nitrogen oxides (NO_x), volatile organic compounds, sulfur oxides (SO_x) and ammonia (NH_3). PM can penetrate deep into the lungs and cause health problems, such as heart attacks, aggravated asthma, coughing, or difficult breathing. People with heart or lung diseases, children, and older adults are the most susceptible to particle pollution exposure, although healthy people may also experience temporary symptoms from exposure to elevated levels of PM pollution.[3]

Exceeding the NAAQS pollutant level does not necessarily constitute a violation of the standard. Some of the criteria pollutants (including carbon monoxide) are allowed one exceedance of the maximum level per year, while for other pollutants, criteria levels cannot be exceeded. Violation criteria for other pollutants are based on recorded exceedances. **Table 1** lists the allowable exceedances for EPA criteria pollutants.

3.2 ATTAINMENT DESIGNATION

The I-94 Detroit Modernization Project corridor is located within the Metropolitan Detroit-Port Huron Intrastate Air Quality Control Region (AQCR #123). Wayne County is currently in attainment status for three of the six criteria pollutants. Although a portion of Wayne County has been classified as being in non-attainment for Sulfur Dioxide SO_2 (2010), the project is not located in this portion of the county.[4] Wayne County is considered a "Maintenance Area" for CO and $PM_{2.5}$. As such, the project is required to meet Transportation Conformity Rule requirements found in 40 CFR Part 93. This project is included in Southeast Michigan Council of Government's (SEMCOG) 2040 Regional Transportation Plan (RTP) for Southeast Michigan, RTP project #12931, 12927, and 13026, and FY 2017-2020 Transportation Improvement Program (TIP) for Southeast Michigan, TIP project #136, 137, 139, 145, 146, 147, 148, 149, 151, 242, 243, 244, 245, 246, and 313. SEMCOG's 2040 RTP was adopted on June 20, 2013 in conformance with the transportation planning requirements of Titles 23 and 49 USC, the Clean Air Act Amendments, and related regulation.

3.3 MOBILE SOURCE AIR TOXIC (MSAT)

In addition to establishing the NAAQS, EPA regulates air toxics. MSATs are compounds emitted from on-road vehicles, non-road vehicles and equipment that are known to cause serious health and environmental effects. They include on-road mobile sources, non-road mobile sources (for example, airplanes), area sources (for example, dry cleaners), and stationary sources (for example, factories or refineries).

In April 2007, under authority of the Clean Air Act Section 202(l), EPA signed a final rule, Control of Hazardous Air Pollutants from Mobile Sources, which sets standards to control MSATs. Under the rule, EPA set standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. Beginning in 2011, refineries were required to limit the annual benzene content of gasoline to an annual average refinery average of 0.62 percent. The rule also

[3] https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm, accessed January 5, 2018.
[4] https://www3.epa.gov/airquality/greenbook/tnp.html#SO2.2010.Detroit

sets a new vehicle exhaust emission standard for non-methane hydrocarbons including MSAT compounds, which were phased in between 2010 and 2013 for lighter vehicles and between 2012 and 2015 for heavier vehicles.

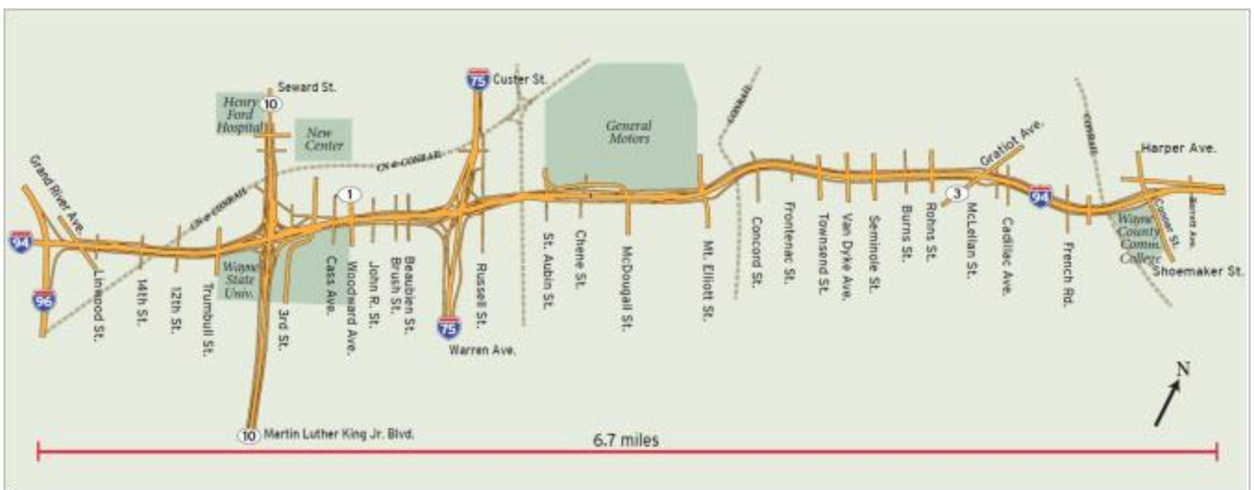
4 PROJECT DESCRIPTION

The I-94 Detroit Modernization Project consists of planned improvements to approximately 6.7 miles of interstate freeway in the city of Detroit, Michigan. These improvements add a travel lane in each direction, modernize system and service interchanges, reconstruct bridges crossing over the freeway, and change existing service drives to maximize efficiencies of connected local travel patterns.

The I-94 Detroit Modernization Project study area is shown in **Figure 1**. The Project also includes improvements to the service drives that extend along and outside the east and westbound lanes of I-94, M-10 and I-75 within the project limits.

The purpose of the Project is to improve safety, capacity, local connectivity, and condition of the I-94 roadway, service drives, bridges, and interchanges between I-96 and Conner Avenue.

Figure 1: I-94 Detroit Modernization Project Corridor



5 AIR QUALITY ANALYSIS

5.1 CARBON MONOIXDE (CO) HOTSPOT (MICROSCALE) ANALYSIS

CO emissions are greatest from vehicles operating at low speeds and prior to complete engine warm-up (within approximately eight minutes of starting). Congested urban roads, therefore, tend to be the principal problem areas for CO. Because the averaging times associated with the CO standards are relatively short (1 and 8 hours), CO concentrations can be modeled using simplified "worst-case" meteorological assumptions. Modeling is also simplified considerably by the stable, non-reactive nature of CO.

5.1.1 Methodology

The CO hot-spot analysis followed the modeling guidelines presented in EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections (1992)* and EPA's *Using MOVES in Project-Level Carbon Monoxide Analyses (2010)*. Morning and afternoon traffic operations were modeled at 95 intersections in the I-94 Detroit Modernization Project study area. The A.M. and P.M. conditions were sorted by total approach volumes to identify the top 20 intersections. Level of service (LOS) D occurred at only six intersections with no occurrence of LOS E or F. These six intersections are identified on **Appendix A**, **Figure 3**.

Only two of the six intersections were in the top 20 intersections. Therefore, two intersections were identified with the worst combination of poor level of service (LOS D) and high volumes for the screening dispersion analysis:

1. M-10 Northbound Service Drive & Forest Avenue, Intersection 86; and
2. Trumbull Avenue & I-94 Westbound Service Drive, Intersection 9.

The parameters identified in the FHWA *Carbon Monoxide Categorical Hot-Spot Finding Form* were entered for the two intersections. Since not all parameters of the form were within the acceptable range, both intersections failed the screening process and a project-specific CO hot-spot analysis was prepared to meet the requirements of 40 CFR 93.116(a) of the transportation conformity rule.

The EPA's MOVES2014a (MOVES)[5] and EPA's approved CAL3QHC 2.0 (CAL3QHC)[6] implemented using the FHWA Resource Center CAL3i[7] interface computer models were used to analyze vehicular emissions and the hourly dispersion of CO at two intersections in the I-94 Detroit Modernization Project study area. The intersections of M-10 NB Service Drive with Forest Avenue and Trumbull Avenue with I-94 WB Service Drive were included in the CO Microscale Analysis. Traffic and emissions for the existing (2017) condition, open year (2036) and build year (2040) were modeled. Weekday AM Peak Hour (7 – 8 am) was modeled for the M-10 Service Drive/Forest Avenue intersection and Weekday PM Peak Hour (4 – 5 pm) was modeled for the intersection of Trumbull Avenue/I-94 WB Service Drive.

EPA's MOVES2014a was used to develop vehicular emission rates based on peak traffic volumes and local data. SEMCOG provided project specific input variables for MOVES and a project level analysis was used to develop the emission rates.

CAL3QHC is a pollutant dispersion-modeling program for predicting pollutant concentrations from motor vehicles under free-flow conditions and in queues adjacent to roadway intersections. The MOVES emission factors along with the peak traffic volumes were used to analyze the intersections. Thirty-six (36) air quality receptors were located in the four quadrants of each intersection, as shown on **Appendix A, Figures 4 and 5**. The first receptor in each quadrant was located 10 feet from the intersection of the cross walk with the curb or 10 feet from the extended right-of-way to the curb. The remaining two receptors in each quadrant were located at 82-foot intervals from the first receptor or if a cross street intervened, equidistant between the cross streets. The location of the air quality receptors was based upon the recommendations presented in EPA's CO Modeling Guidelines.

[5] "MOVES2014a User Guide", EPA-420-B-15-095, U.S. Environmental Protection Agency, November 2015
[6] "User's Guide to CAL3QHC 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections (EPA-454/R-92-006)", U.S. Environmental Protection Agency, September 1995.
[7] Michael Claggett (Michael.Claggett@dot.gov), RE: MOVES and CAL3QHC. E-mail message to John Jaeckel, January 23, 2018.

In accordance with EPA procedure, average speeds for each link were used to develop the CO emission factors with MOVES. Worst-case meteorological variables and a background CO concentration obtained from EPA's *AirData Monitor Values Report* were used in the analysis.

- Meteorological conditions:
  - Wind speed: 1 m/s (2.2 mph), worst case.
  - Wind direction: Worst case for each receptor location, calculated every 10 degrees.
  - Atmospheric stability class: Pasquill Class "D"
- Surface roughness: 321 cm (126.4 in.), study area is Central Business District.
- Mixing height: 1,000 m (68.9 ft).
- Background CO concentration: 3.3 ppm 1-hour.[8]
- Existing (2017), open year (2036) and build (2040) CO winter emission factors from MOVES2014a.

5.1.2 Results

The results of the CO microscale air quality modeling are presented in **Table 2**. The maximum 1-hour CO concentration for the existing condition (2017) was 4.1 ppm at two receptors. The maximum open year (2036) concentration would be 3.6 ppm at one receptor. In the design year (2040) the maximum concentration would decrease to 3.5 ppm and would occur at one receptor. All CO concentrations include a background concentration of 3.3 ppm. None of these concentrations exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS. Since the 1-hour analysis predicted CO concentrations are less than 9.0 ppm, a separate 8-hour analysis was not performed.[9]

[8] U.S. AirData, https://www.epa.gov/outdoor-air-quality-data/monitor-values-report, Wayne County, MI, accessed March 6, 2016.
[9] "Manual for Air Quality Considerations in Environmental Documents", Federal Highway Administration, Southern Resource Center, January 2001.

Table 2: Microscale Air Quality Analysis (Maximum 1-Hour CO Concentrations (ppm)*)

Air Quality Receptor ID	2017 Existing 1 hour	2036 Opening Year 1 hour	2040 Build Year 1 hour
A1	**4.1**	**3.6**	3.4
A2	3.9	3.4	3.4
A3	3.7	3.4	3.4
A4	3.9	3.5	**3.5**
A5	3.9	3.4	3.4
A6	3.8	3.3	3.3
A7	3.9	3.4	3.4
A8	3.9	3.4	3.3
A9	3.8	3.3	3.3
A10	3.9	3.4	3.4
A11	3.7	3.4	3.4
A12	3.6	3.4	3.4
A13	3.9	3.5	3.4
A14	4.0	3.4	3.4
A15	3.7	3.4	3.4
A16	**4.1**	3.4	3.4
A17	4.0	3.4	3.4
A18	3.7	3.4	3.4

Air Quality Receptor ID	2017 Existing 1 hour	2036 Opening Year 1 hour	2040 Build Year 1 hour
A19	3.6	3.4	3.4
A20	3.6	3.4	3.4
A21	3.5	3.4	3.4
A22	3.6	3.4	3.4
A23	3.5	3.3	3.3
A24	3.5	3.3	3.3
A25	3.5	3.4	3.4
A26	3.5	3.4	3.4
A27	3.4	3.4	3.4
A28	3.5	3.4	3.4
A29	3.5	3.3	3.3
A30	3.5	3.3	3.3
A31	3.4	3.4	3.4
A32	3.5	3.3	3.3
A33	3.5	3.3	3.3
A34	3.5	3.4	3.4
A35	3.4	3.3	3.3
A36	3.3	3.3	3.3

*The National Ambient Air Quality Standard for CO is 35 ppm for a one-hour average.
Concentrations include an ambient background level of 3.3 ppm (1 hour)
[shaded] Indicates maximum concentration for each year of analysis.
Source: HNTB Corporation, October 2018

5.2 $PM_{2.5}$ HOT-SPOT ANALYSIS

EPA issued the final, amended *Transportation Conformity Rule* on March 10, 2006. The Rule requires a hot-spot analysis to determine project-level conformity in $PM_{2.5}$ and PM_{10} non-attainment and maintenance areas. A hot-spot analysis is an assessment of localized emissions impacts from a proposed transportation project and is only required for "projects of air quality concern."

The Michigan Transportation Conformity Interagency Workgroup (MITC-IAWG) determined that there would not be significant increase in the number of diesel trucks for this project. Therefore, the I-94 Detroit Modernization Project was determined to not be a project of air quality concern for $PM_{2.5}$.[10]

5.3 CONSTRUCTION AIR QUALITY

I-94 construction will take place in different locations along the corridor over a number of construction seasons. During each construction season there would be localized increased emissions from construction equipment and particulate emissions from construction activities.

[10] *Annual Work Program Completion Report,* SEMCOG, pages 8 and 57, September 2018, *Summary of May 21, 2018 Conference Call,* Michigan Transportation Conformity Interagency Workgroup, May 2018.

Particulate emissions, whether from construction equipment diesel exhaust or dust from the construction activities, should be controlled as well as possible. Contractors should follow all MDOT's *Standard Specifications for Construction* that address the control of construction equipment exhaust or dust during construction. *Standard Specification for Construction* sections 107.15(A) and 107.19 will apply to control fugitive dust during construction and cleaning of haul roads. MDOT's anti-idling policy (Policy #10179) will address unnecessary engine idling of vehicles and equipment.

Even though construction mitigation measures are not required, there are several measures that could be considered to reduce engine activity or reduce emissions per unit of operating time. Operational agreements that reduce or redirect work or shift times to avoid community exposures can have positive benefits. Also, technological adjustments to construction equipment, such as off-road dump trucks and bulldozers, could be an appropriate strategy. The EPA recommends Best Available Diesel Retrofit Control Technology (BACT) to reduce diesel emissions. Typically, BACT requirements can be met through the retrofit of all diesel-powered equipment with diesel oxidation catalysts or diesel particulate filters, and other devices that provide an after-treatment of exhaust emissions.

Other strategies that could be considered during construction include:

- Apply water suppression to active construction areas to minimize dust.
- Tarp trucks hauling soil, sand, and other loose materials or require trucks to maintain at least two feet of freeboard.
- Pave, apply water as needed, or apply (non-toxic) soil stabilizers on unpaved access roads, parking areas and staging areas at construction sites.
- Use water sweepers to sweep paved access roads, parking areas and staging areas at construction sites.
- Use water sweepers to sweep streets if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
- Enclose, cover, water or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.
- Utilize appropriate erosion control measures to reduce silt runoff to public roadways.
- Replant vegetation as quickly as possible to minimize erosion in disturbed areas.
- Use alternative fuels for construction equipment when feasible.
- Minimize equipment idling time.
- Maintain properly tuned equipment.

5.4 MSAT QUALITATIVE ANALYSIS

In October 2016 FHWA issued updated guidance for the analysis of mobile source air toxics (MSATs) in the National Environmental Policy Act (NEPA) process for highway projects (*Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*) requiring the use of the most recent version of EPA's *Motor Vehicle Emissions Simulator* (MOVES2014a) model for air quality analysis on documents prepared in accordance with NEPA. The following language is taken from the guidance document and associated appendices.[11]

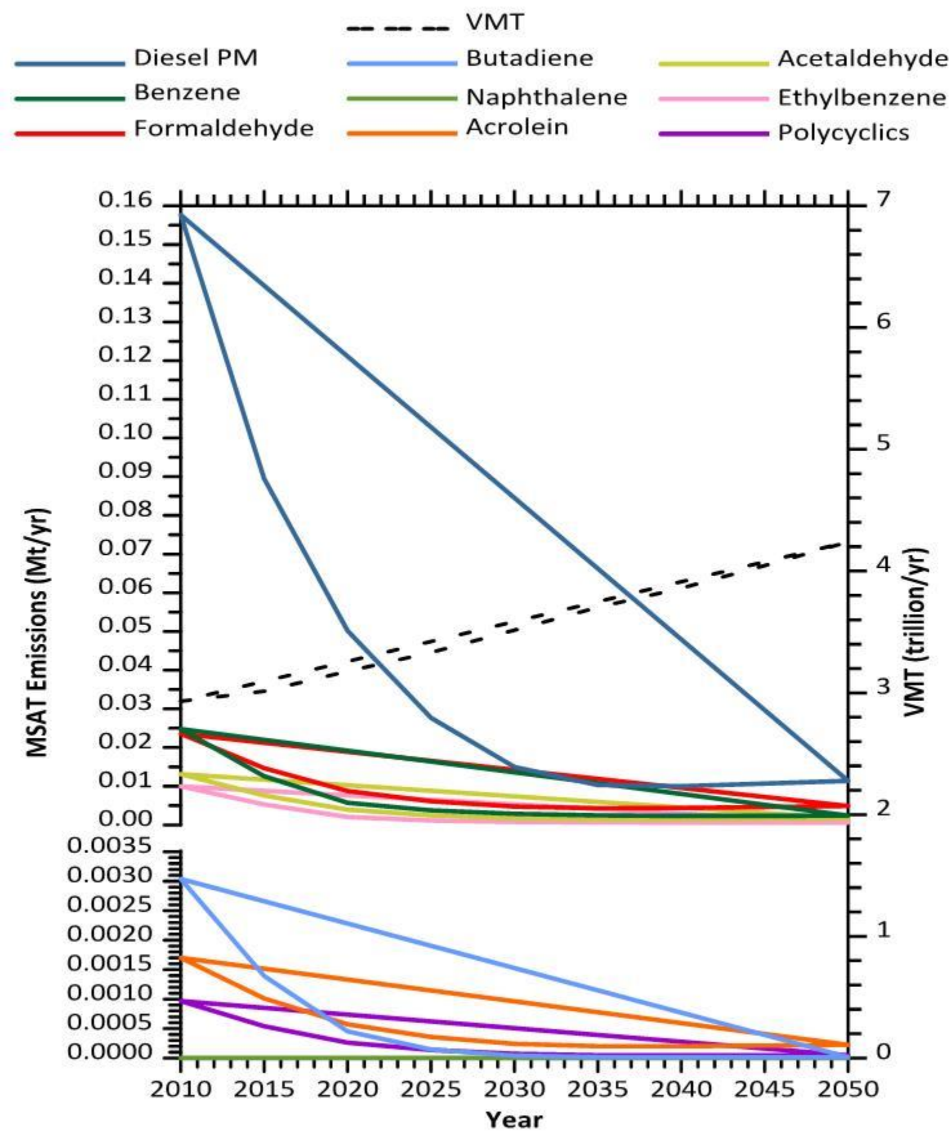
In addition to the criteria air pollutants for which there are the NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources, area sources and stationary sources.

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments 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 *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)[12]. In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the *2011 National Air Toxics Assessment* (NATA)[13]. These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future EPA rules.

Based on an FHWA analysis using EPA's MOVES2014a model, as shown in **Figure 2**, even if VMT increases by 45 percent between 2010 to 2050 as forecasted, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same time period.

[11] http://www.fhwa.dot.gov/Environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm, accessed January 5, 2018.
[12] EPA, https://www.epa.gov/iris
[13] EPA, https://www.epa.gov/national-air-toxics-assessment

Figure 2: National MSAT Emission Trends, 2010-2050, for Vehicles Operating on Roadways Using EPA's MOVES2014a Model



Source: EPA MOVES2014a model runs conducted by FHWA, September 2016.
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, meteorological, and other factors.

Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES2014a will notice some differences in emissions compared with MOVES2010b. MOVES2014a is based on updated data on some emissions and pollutant processes compared to MOVES2010b, and reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES2014a emissions forecasts are based on lower VMT projections than MOVES2010b, consistent with recent trends suggesting reduced nationwide VMT growth compared to historical trends.

5.5 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. 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 arise on highway projects during the NEPA process. Even as the science emerges, the public and other agencies expect FHWA to address MSAT impacts in its 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.

5.5.1 Consideration of MSAT in NEPA Documents

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

(1) no analysis for projects with no potential for meaningful MSAT effects;

(2) qualitative analysis for projects with low potential MSAT effects; or

(3) quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

For projects warranting MSAT analysis, all nine priority MSATs should be analyzed.

(1) Projects with No Meaningful Potential MSAT Effects, or Exempt Projects.

The types of projects included in this category are:

- projects qualifying as a categorical exclusion under 23 CFR 771.117(c) (subject to consideration whether unusual circumstances exist under 23 CFR 771.117(b));
- projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126; or
- other projects with no meaningful impacts on traffic volumes or vehicle mix.

For projects that are categorically excluded under 23 CFR 771.117, or are exempt from conformity requirements under the Clean Air Act pursuant to 40 CFR 93.126, no analysis or discussion of MSAT is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. For other projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is recommended. However, the project record should document in the SEIS the basis for the determination of no meaningful potential impacts with a brief description of the factors considered.

(2) Projects with Low Potential MSAT Effects

The types of projects included in this category are those that serve to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. This category covers a broad range of projects.

The FHWA anticipates that most highway projects that need an MSAT assessment will fall into this category. Any projects not meeting the criteria in category (1) or category (3) (below) should be included in this category. Examples of these types of projects are minor widening projects; new interchanges, replacing a signalized intersection on a surface street; or projects where design year traffic is projected to be less than 140,000 to 150,000 AADT.

For these projects, a qualitative assessment of emissions projections should be conducted. This qualitative assessment should compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSAT for the project, including no-build, based on VMT, vehicle mix, and speed. It should also discuss national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by EPA. Because the emission effects of these projects typically are low, we expect there would be no appreciable difference in overall MSAT emissions.

The I-94 Detroit Modernization Project is a project with low potential MSAT effects because it is a project that serves to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions.[14]

(3) Projects with Higher Potential MSAT Effects

This category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. We expect a limited number of projects to meet this two-pronged test. To fall into this category, a project should:

- create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, involving a significant number of diesel vehicles for new projects or accommodating with a significant increase in the number of diesel vehicles for expansion projects; or
- create new capacity or add significant capacity to urban highways such as Interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000[15] or greater by the design year; and
- proposed to be in proximity to populated areas.

Projects falling within this category should be more rigorously assessed for impacts.

[14] Annual Work Program Completion Report, SEMCOG, pages 8 and 57, September 2018, Summary of May 21, 2018 Conference Call, Michigan Transportation Conformity Interagency Workgroup, May 2018.
[15] FHWA, https://www.fhwa.dot.gov/environMent/air_quality/air_toxics/policy_and_guidance/msat/

5.5.2 Qualitative Assessment Results

The amount of MSAT emissions emitted for the build alternative would be proportional to the VMT. The I-94 Detroit Modernization Project serves to improve operations of the highway and does not add substantial new capacity. Therefore, it is likely to have no meaningful increase in MSAT emissions.

Emissions will likely decrease for the future design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 90 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The I-94 Detroit Modernization Project may have localized areas where ambient concentrations of MSAT could be higher under the build alternative than the no-build scenario. However, the magnitude and the duration of these potential increases compared to the no-build scenario cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts as discussed in Section 5.5.3.

In sum, under the build alternative in the design year it is expected that there would be little appreciable differences in overall MSAT emissions relative to the no-build alternative. However, EPA's vehicle and fuel regulations will bring about significantly lower MSAT levels for the area in the future than today.

5.5.3 Incomplete or Unavailable Information for Project Specific MSAT Impacts Analysis

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

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the 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".[16] Each report in the IRIS 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*.

[16] *Source: EPA, https://www.epa.gov/iris*

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 are the adverse human health effects of MSAT compounds at current environmental concentrations (HEI Special Report 16, (https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process 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 (70-year or greater) assessments since such information is unavailable. Unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology, which affects emissions rates over that time frame.

It is particularly difficult to reliably forecast 70-year or more 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 MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose- response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (EPA IRIS database, Diesel Engine Exhaust, Section II.C. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal)."

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the 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 do not guarantee that cancer risks from exposure to air toxics are less than one in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than safe or acceptable (https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf).

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

6 CONCLUSION

Based on the air quality analyses completed for the proposed improvements, this project will not contribute to any violation of the CO nor $PM_{2.5}$ NAAQS.

FHWA and MDOT have provided a qualitative analysis of MSAT emissions relative to the No-Build Alternative of the I-94 Detroit Modernization Project. The FHWA and MDOT have acknowledged that a future project in the study area may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain. Because of this uncertainty, the health effects from these emissions cannot be reliably estimated.

7 REFERENCES

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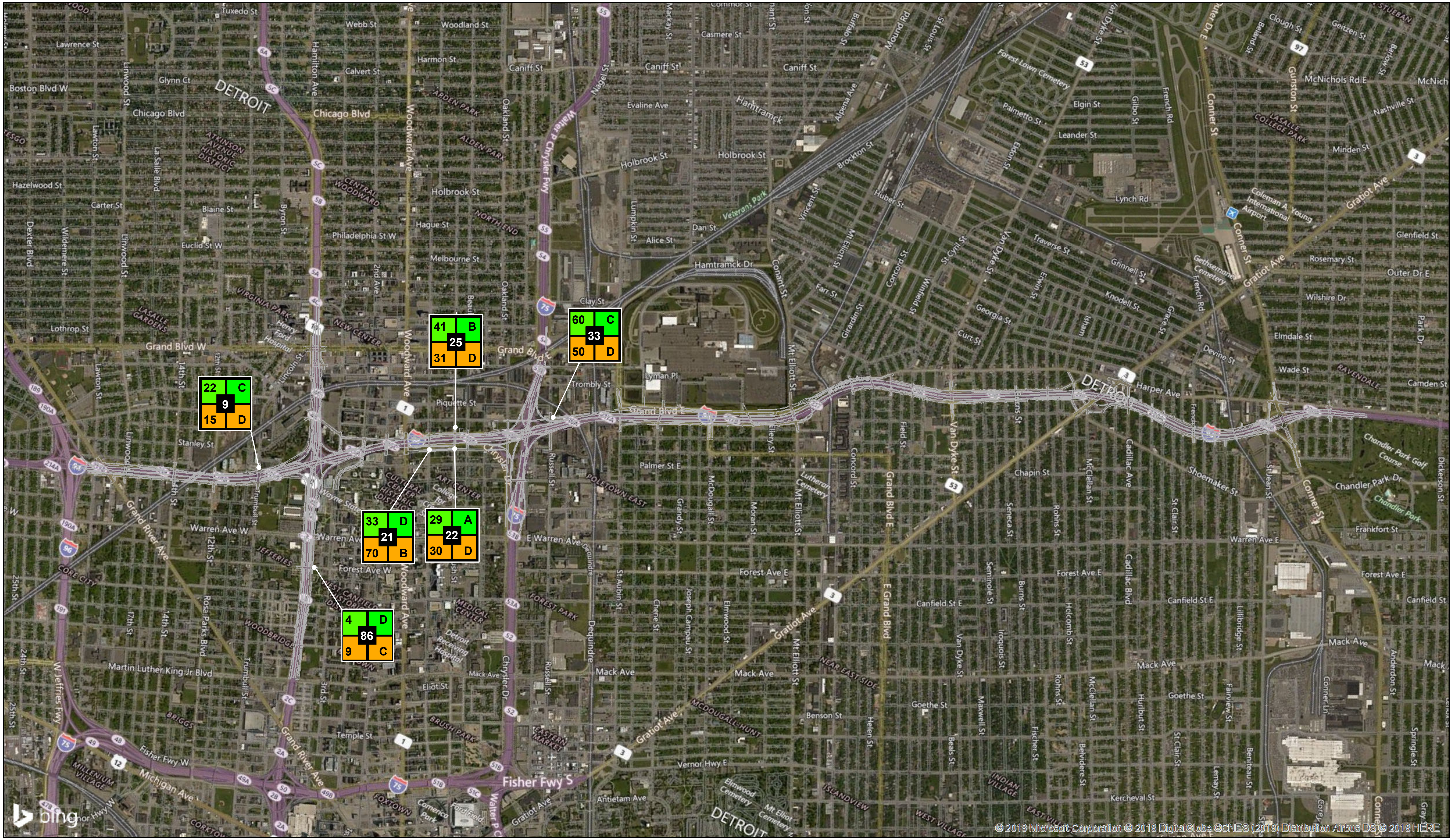
Appendix A: Air Quality Exhibits



MDOT Michigan Department of Transportation

HNTB

Legend

Alternative

AM INTERSECTION RANKING	4	D	AM INTERSECTION LOS
	2		INTERSECTION ID
PM INTERSECTION RANKING	2	D	PM INTERSECTION LOS

0 0.5 1
Miles

Level of Service (LOS) for Carbon Monoxide (CO) Analysis
I-94 Detroit Modernization Project
Detroit, Michigan

Figure 3

Legend

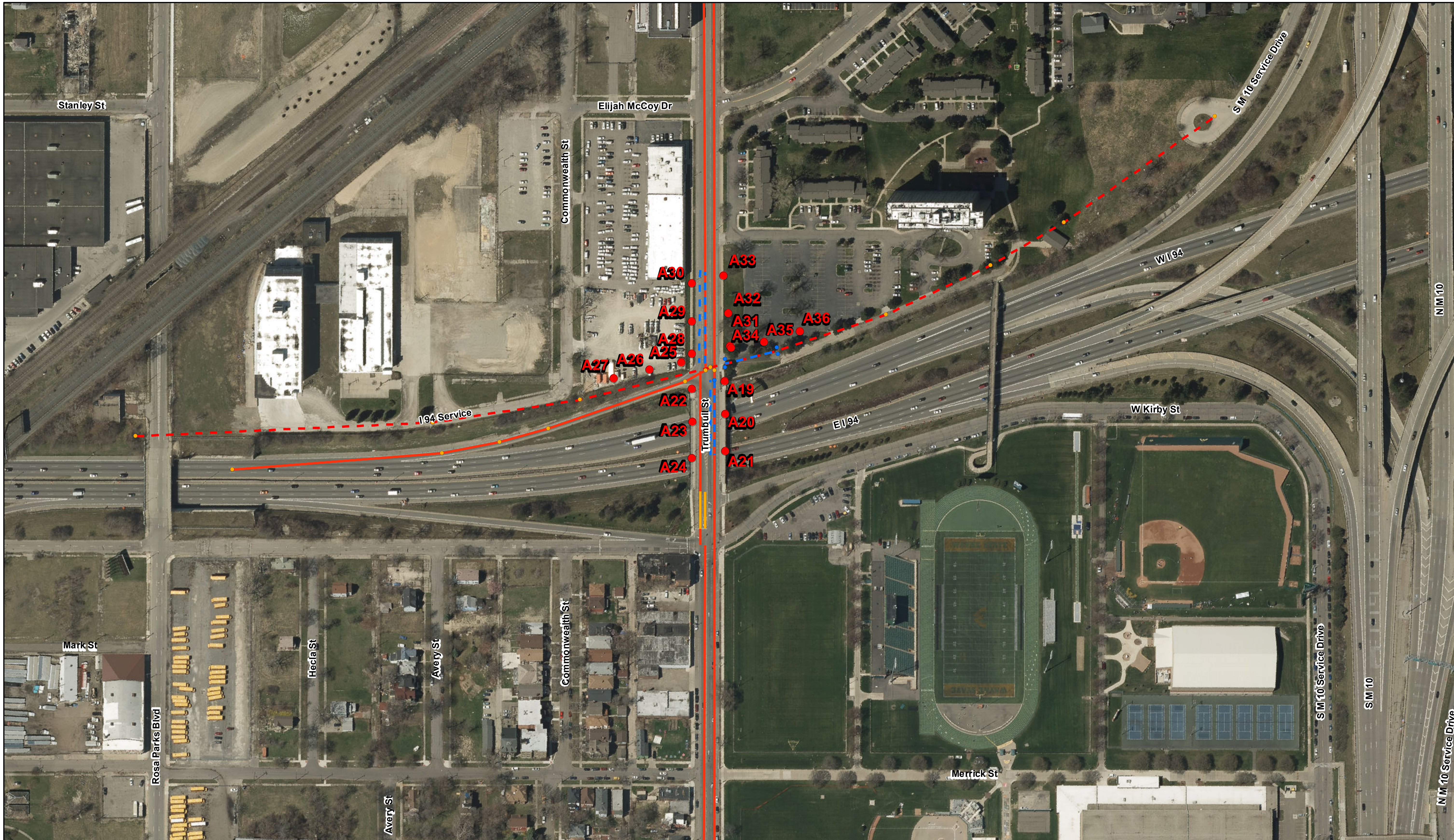
- Receptor
- Free Flow Points
- Queue Points
- Existing, Free Flow
- Future, Free Flow
- Existing, Queue
- Existing and Future, Queue
- Future, Queue

0 200 400
Feet

CO Hot-Spot Analysis
I-94 Detroit Modernization Project

M-10 Northbound Service Drive & Forest Avenue
Detroit,Michigan

Figure 4



Legend

- Receptor
- Free Flow Points
- Queue Points
- Existing, Free Flow
- Future, Free Flow
- Existing, Queue
- Existing and Future, Queue
- Future, Queue

0 200 400
Feet

CO Hot-Spot Analysis
I-94 Detroit Modernization Project
Trumbull Avenue & I-94 Westbound Service Drive
Detroit, Michigan

Figure 5