Draft

Air Quality Technical Report

Blue Water Bridge Plaza

St. Clair County, MI

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Air Quality Technical Report

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Air Quality Technical Report

1.0 INTRODUCTION

1.1 Purpose

In compliance with the Clean Air Act (CAA) and its amendments, related Federal regulations and FHWA Guidance, this report discusses the conformity status and the air quality impact of the Blue Water Bridge Plaza Project. This report is the technical document to support the Environmental Impact Statement of the proposed project.

This document addresses 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". It presents a qualitative discussion on Mobile Source Air Toxics, presents the carbon monoxide (CO) microscale analysis for the existing (2005) condition, the anticipated first year of operation (2013) for two (2) build alternatives, the design year (2030), along with the no build (2013 and 2030) and compares the results to the National Ambient Air Quality Standards (NAAQS), and a discussion on particulates.

2.0 BASICS OF AIR QUALITY POLLUTANTS

2.1 Air Quality - Criteria Pollutants

The Federal Clean Air Act of 1970 established the NAAQS. These were established in order to protect public health, safety, and welfare from known or anticipated effects of air pollutants. The most recent amendments to the NAAQS contain criteria for sulfur dioxide (SO_2), particulate matter (PM_{10}, 10-micron and smaller, $PM_{2.5}$, 2.5 micron and smaller), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). The National and Michigan Ambient Air Quality Standards are presented in Table 1.

The primary pollutants from motor vehicles are unburned hydrocarbons, NO_x, CO, and particulates. Hydrocarbons (HC) and Nitrogen oxides (NO_x) can combine in a complex series of reactions catalyzed by sunlight to produce photochemical oxidants such as ozone and NO_2. 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.

TABLE 1
National and Michigan Ambient Air Quality Standards (NAAQS)

Pollutant	Primary Standard[1]	Averaging Times	Secondary Standard[2]
Carbon Monoxide (CO)	9 ppm (10 mg/m^3)	8 – Hour[3]	None
	35 ppm (40 mg/m^3)	1 – Hour[3]	None
Lead (Pb)	1.5 µg/m^3	Quarterly Average	Same as Primary
Nitrogen Dioxide (NO_2)	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	Revoked[4)]	Annual[4)] (Arithmetic Mean)	
	150 µg/m^3	24 – Hour[5)]	
Particulate Matter ($PM_{2.5}$)	15 µg/m^3	Annual[6)] (Arithmetic Mean)	Same as Primary
	35 µg/m^3	24 – Hour[7)]	
Ozone (O_3)	0.08 ppm (157 µg/m^3)	8 – Hour[8]	Same as Primary
Sulfur Dioxides (SO_2)	0.03 ppm (80 µg/m^3)	Annual (Arithmetic Mean)	
	0.14 ppm (365 µg/m^3)	24 – Hour[3)]	
		3 – Hour[3]	0.5 ppm (1300 µg/m^3)

1) "Primary air standard" means the level of air quality, which provides protection for public health with an adequate margin of safety.
2) "Secondary air standard" means the level of air quality, which may be necessary to protect welfare from unknown or anticipated adverse effects.
3) Not to be exceeded more than once per year.
4) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).
5) Not to be exceeded more than once per year on average over 3 years.
6) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.
7) 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^3 (effective December 17, 2006).
8) 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.

Source: http://www.epa.gov/air/criteria.html, last updated March 2, 2007

Carbon monoxide is a colorless and odorless gas which is the product of incomplete combustion, and is the major pollutant from gasoline fueled motor vehicles. CO is a localized air quality issue.

Particulate matter includes both airborne solid particles and liquid droplets. These liquid particles come in a wide range of sizes. PM_{10} particulates are coarse particles, such as windblown dust from fields and unpaved roads. $PM_{2.5}$ particulates are fine particles generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Generally, particulates, as with ozone and NO_2, are presently considered to be regional issues.

The Clean Air Act Amendments (CAAA) of 1977 and 1990 required all states to submit to the United States Environmental Protection Agency (EPA) a list 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 which are shown by monitored data or air quality modeling to exceed the NAAQS for any criteria pollutant are designated "nonattainment" areas for that pollutant. The CAAA also established time schedules for the states to attain the NAAQS.

States that have nonattainment areas are required to prepare State Implementation Plans (SIP) that lay out a plan to show how the state will improve the air quality to attain the NAAQS. Both new and improvement highway projects must be contained in the area's Transportation Improvement Program (TIP). The modeling procedures for ozone and NO_2 require long term meteorological data and detailed area wide emission rates for all existing and potential sources. This modeling is performed by the Metropolitan Planning Organization (MPO) for the region to show that regional emissions plus projects in the TIP are in conformance with the SIP and the CAA amendments. The Southeast Michigan Council of Governments (SEMCOG) is the MPO for the region in which the Blue Water Bridge Plaza project is located and is responsible for this analysis. Once the MPO has completed their analysis, it is forwarded to the FHWA for final ruling on the TIP's conformance with the SIP and the CAA and its amendments.

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

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 (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Early in 2007 and under authority of CAA Section 202(l) EPA signed a final rule, Control of Hazardous Air Pollutants from Mobile Sources, which sets standards to control mobile source air toxics (MSATs). Under this rule, EPA is setting standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. Beginning in 2011, refineries will be required to limit the annual benzene content of gasoline to an annual average refinery average of 0.62%. The rule also sets a new vehicle exhaust emission standard for non-methane hydrocarbon (NMHC) including MSAT compounds, to be phased in between 2010 and 2013 for lighter vehicles and 2012 and 2015 for heavier vehicles. These new rules became effective on April 27, 2007.

2.2 Pollutant Trends

The Michigan Department of Environmental Quality (DEQ) reported in the most recent annual report, "Michigan's 2005 Annual Air Quality Report", published in August 2006, that the entire state has continued to stay in attainment for CO, Pb, NO_2 and SO_2 with "levels well below the NAAQS." The main contributing factors to Michigan's O_3 and $PM_{2.5}$ non-attainment areas are "on-road and non-road emission sources (O_3: 33% and 30%, respectively; $PM_{2.5}$: 18% and 32%, respectively). In addition, area sources also contribute 37% of $PM_{2.5}$ emissions. Therefore, with the new federal Clean Air Rules, along with Michigan's continued reduction efforts, both of these criteria pollutants levels should continue to decline."[1]

The Annual Air Quality Report also presents the following information:

- CO levels are estimated to be 20% less than the emission levels in 1990, which is slightly better than national trends. Motor vehicles on Michigan roads contribute approximately 69% of CO emissions.
- Pb emissions have decreased significantly over the last 25 years. The primary reason for the decline is the elimination of leaded gasoline. With no major point sources for Pb in Michigan, ambient concentrations are less than one tenth of the Pb NAAQS.
- NO_2 levels in Michigan have always been less than half the NO_2 NAAQS. Motor vehicles on Michigan roads contribute approximately 46% of NO_2 emissions.
- O_3 levels across the country have improved over the last 20 years. Year by year variations in O_3 are influenced by weather, population growth and emissions of VOCs and NO_x, the precursors to O_3 production. VOC and NO_x emissions have decreased 25% and 12% nationwide over the past 10 years. Michigan's O_3 levels have followed national trends. Using the three year average period of 2001-2003, only four locations in Michigan met the 8-hour NAAQS. The three year period from 2003-2005 resulted in 24 of the 27 monitoring sites having O_3 levels meeting or below the 8-hour O_3 NAAQS. Motor vehicles on Michigan roads contribute approximately 33% of VOC emissions.
- PM_{10} emissions on a nationwide base are primarily produced by area sources, agricultural and forestry activities, paved and unpaved roads. Motor vehicles on Michigan roads contribute approximately 14% of PM_{10} emissions.
- $PM_{2.5}$ source emissions decreased 17% between 1993 and 2002 across the country. In Michigan the primary source of $PM_{2.5}$ emissions are area sources, followed closely by the contribution of internal combustion engines, non-road and highway. The July 7, 2005 signing of the Clean Air Non-road Diesel Rule has the potential to reduce exhaust emissions of $PM_{2.5}$ from non-road diesel engines by more than 90%. Motor vehicles on Michigan roads contribute approximately 18% of $PM_{2.5}$ emissions.
- SO_2 levels in Michigan have been well below the NAAQS since achieving attainment status in 1982. Motor vehicles on Michigan roads contribute approximately 3% of SO_2 emissions.

3.0 ALTERNATIVE COMPARISON

3.1 Project Description

The Michigan Department of Transportation (MDOT) is studying potential improvements to the United States Border Crossing Plaza at the Blue Water Bridge in Port Huron, Michigan. The general location of the project is shown on Figure 1. Several federal agencies inspect trucks, cars, passengers, and cargo on the plaza, which is owned and operated by MDOT. The Blue Water Bridge is the second busiest commercial border crossing between the United States and Canada and is the fourth busiest overall between the two countries.

Lengthy backups of commercial and passenger vehicles waiting to enter the United States at the Blue Water Bridge are common. During weekday afternoon peaks these traffic backups routinely exceed three miles in length. They interfere with local traffic using Highway 402 in Canada and are of great concern to Canadian officials.

The purpose of the study is to develop improvements to the Blue Water Bridge Plaza which will include, but not be limited to the following:

- Accommodate projected 30-year traffic growth and potential future facility needs.
- Minimize backups on Highway 402 and I-94/69.
- Accommodate the latest inspection technologies and procedures.
- Improve facility security.
- Reduce weave movements on the bridge, plaza, and I-94/69.

Alternatives being considered include the No-Build and three build alternatives; the City East Alternative (formerly PA-2), City West Alternative (formerly PA-4) and the Township Alternative (formerly PA-3). The City East and West Alternatives are in the City of Port Huron. The Township Alternative is located in Port Huron Township.

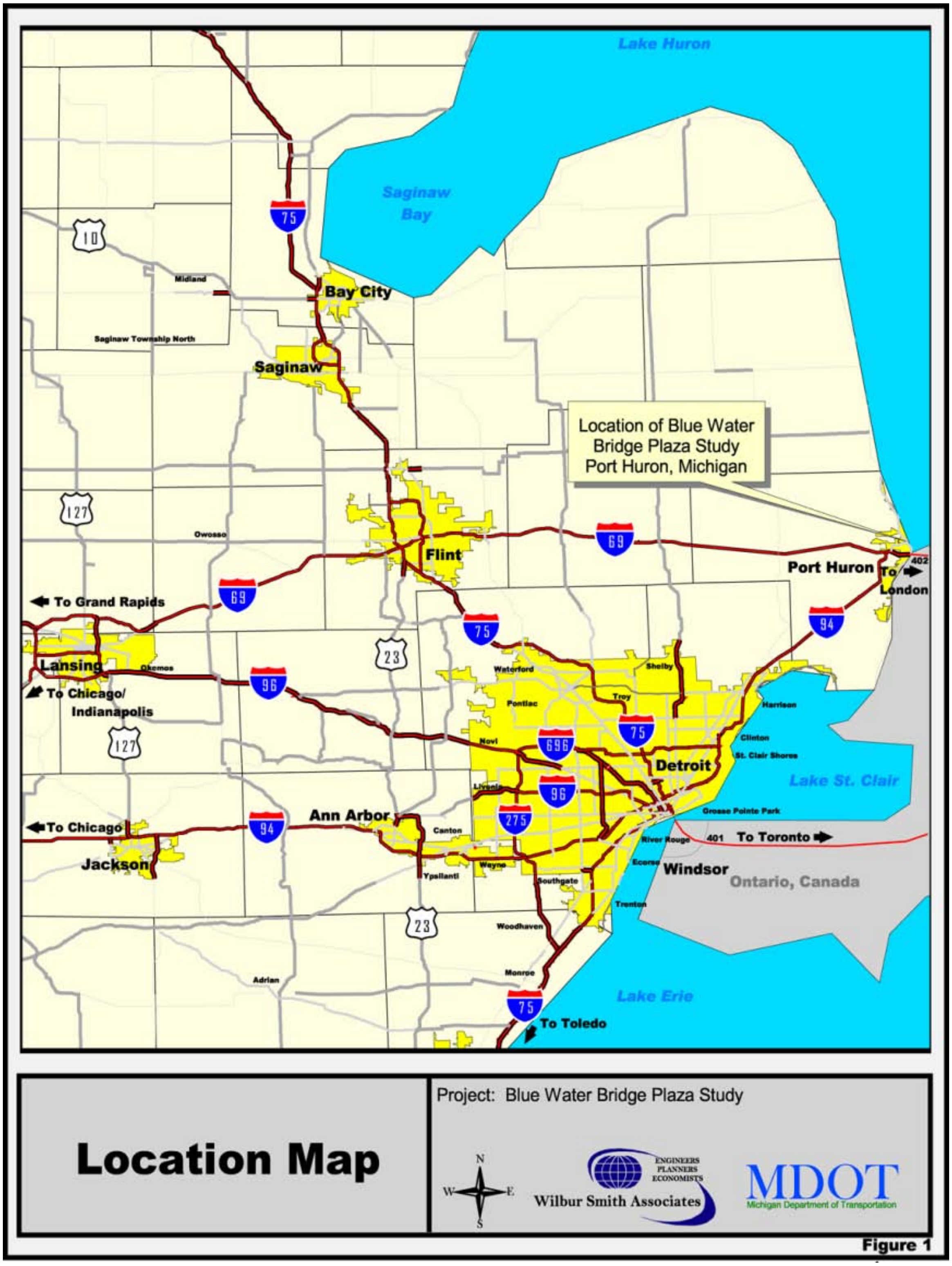
No-Build Alternative The No-Build Alternative would not involve any changes to the existing plaza configuration or ramps, nor would it include any improvements to the Black River Bridge or the I-94/I-69 Corridor. The Alternative would include continued maintenance and technology improvements as space allows, over the next 25 years. Accommodation of all of the required facilities for Customs and Border Protection (CBP) would not be possible on the existing plaza and substantial gridlock would occur on the plaza as new facilities are introduced and the limited existing parking and queuing space is reduced. There would be no expansion of the existing plaza footprint.

City East Alternative This alternative would bring most of the plaza down to street level expanding north and south of the existing plaza. Pine Grove Avenue would be re-routed to the east of the existing plaza, between Hancock Street and Scott Avenue. I-94/69 would be widened from 4 lanes to 6 lanes beginning west of the Lapeer Connector to the Plaza. The Lapeer Connector and Water Street interchanges would be rebuilt along with proposed improvements at the M-25/Hancock Street intersections and at the following intersections along Pine Grove Avenue: Scott Avenue, 10th Avenue/Elmwood Street, and Hancock Street. A new Welcome Center would be constructed along I-69/94 in Port Huron Township. The City East Alternative is superimposed on an aerial photo of the study area, Figure 2.

City West (Preferred) Alternative This alternative expands the existing plaza to the north and south within the City of Port Huron bringing most of the existing elevated plaza down the street level. The City West Alternative would require the relocation of Pine Grove Avenue to the west between 10th Avenue and Hancock Street. Heading north from 10th Avenue, the relocated Pine Grove Avenue would wrap around the south and west sides of the new plaza. The relocated Pine Grove Avenue would then turn back east and connect with the existing Pine Grove Avenue at approximately Riverview Street. This alternative would also include expansion of the Black River Bridge from four lanes to nine lanes, reconstruction of the Water Street interchange, reconstruction of the Lapeer Connector interchange, and a new Welcome Center along I-69/94 in Port Huron Township. West of the Black River, the City East and City West Alternatives are the same. There would also be improvements at the Pine Grove/10th Street intersection and new traffic signals or roundabouts at key locations along the relocated Pine Grove Avenue. The City West Alternative is superimposed on an aerial photo of the study area, Figure 3.

Township Alternative This alternative would create a new plaza approximately 1.5 miles west of the current facility, on undeveloped land in Port Huron Township. South of the new plaza I-94/69 would be widened from 4 lanes to 6 lanes beginning near Lapeer Street. The I-94/69 lanes would become a walled secure route to take vehicles between the new plaza and the Blue Water Bridge. The M-25 Connector would be extended to provide a local access road parallel to the secured I-94/69 corridor with improved access to the Lapeer Connector and Water Street. The current plaza footprint would be unchanged and would be revised to serve as the Duty Free Shop. Improvements are also proposed for the M-25/Hancock Street intersections and the following intersections along Pine Grove Avenue; Scott Avenue at 10th Avenue and Hancock Street. The Township Alternative is superimposed on an aerial photo of the study area, Figure 4.

The three build alternatives expand the footprint of the plaza. However, the expanded plaza will not generate more cross-border traffic than the No-Build Alternative. Since the plaza will be constructed in stages, the ultimate build out will not occur until such time as existing cross-border capacity is reached without the project. Only at that point will the new capacity offered by the project allow more vehicles to cross the border.


Lake Huron
Saginaw Bay
Bay City
Midland
Saginaw Township North
Saginaw
Location of Blue Water Bridge Plaza Study Port Huron, Michigan
Owosso
Flint
Port Huron
To London
To Grand Rapids
Lansing
Okemos
To Chicago/ Indianapolis
Waterford
Shelby
Pontiac
Troy
Harrison
Novi
Clinton
St. Clair Shores
Detroit
Lake St. Clair
Livonia
Grosse Pointe Park
Ann Arbor
To Chicago
Canton
River Rouge
To Toronto
Jackson
Windsor
Ontario, Canada
Ypsilanti
Wayne
Ecorse
Southgate
Trenton
Woodhaven
Monroe
Adrian
Lake Erie
To Toledo
Location Map
Project: Blue Water Bridge Plaza Study
Wilbur Smith Associates
ENGINEERS PLANNERS ECONOMISTS
MDOT
Michigan Department of Transportation
Figure 1

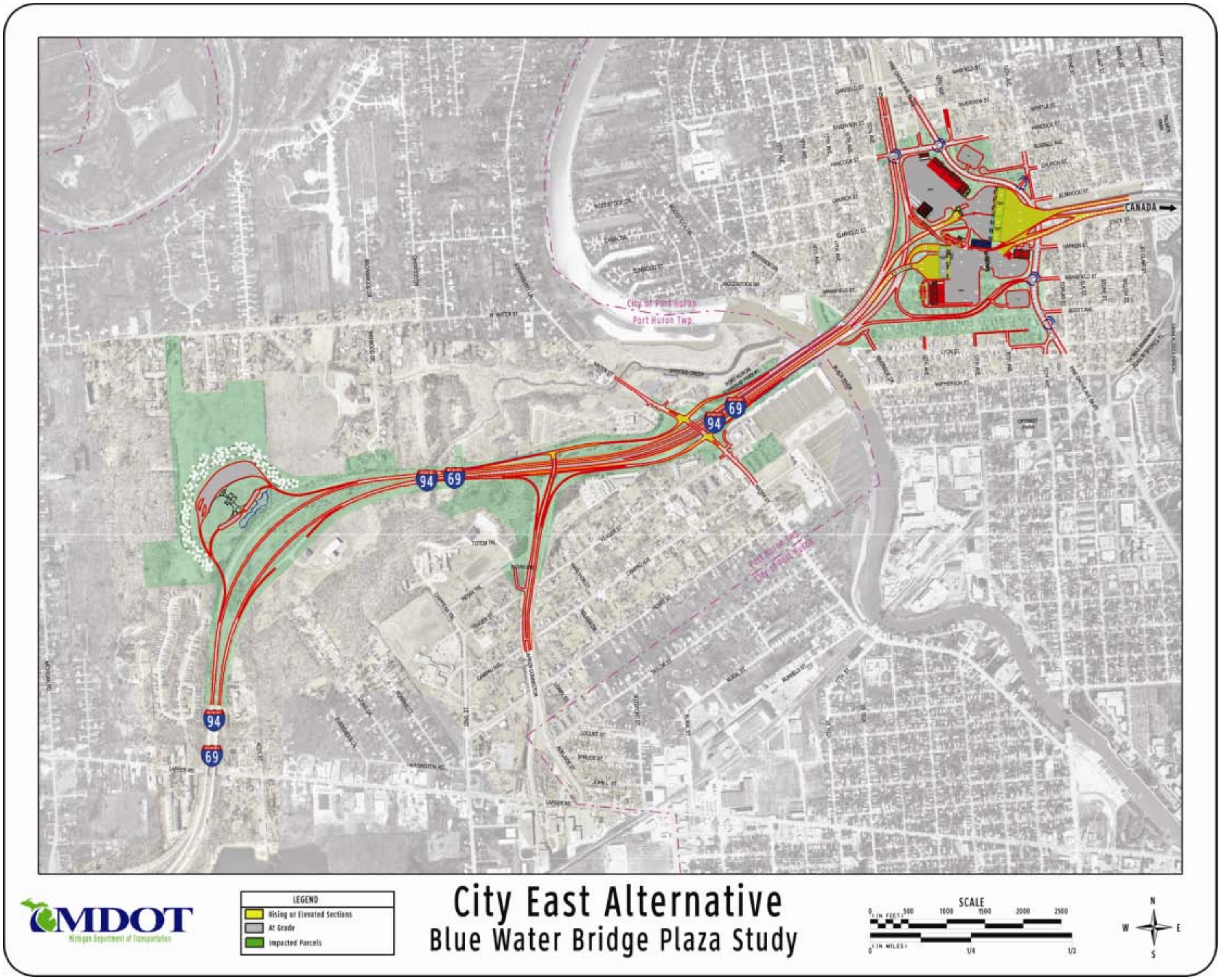

CANADA
MDOT
Michigan Department of Transportation
LEGEND
Rising or Elevated Sections
At Grade
Impacted Parcels
City East Alternative
Blue Water Bridge Plaza Study
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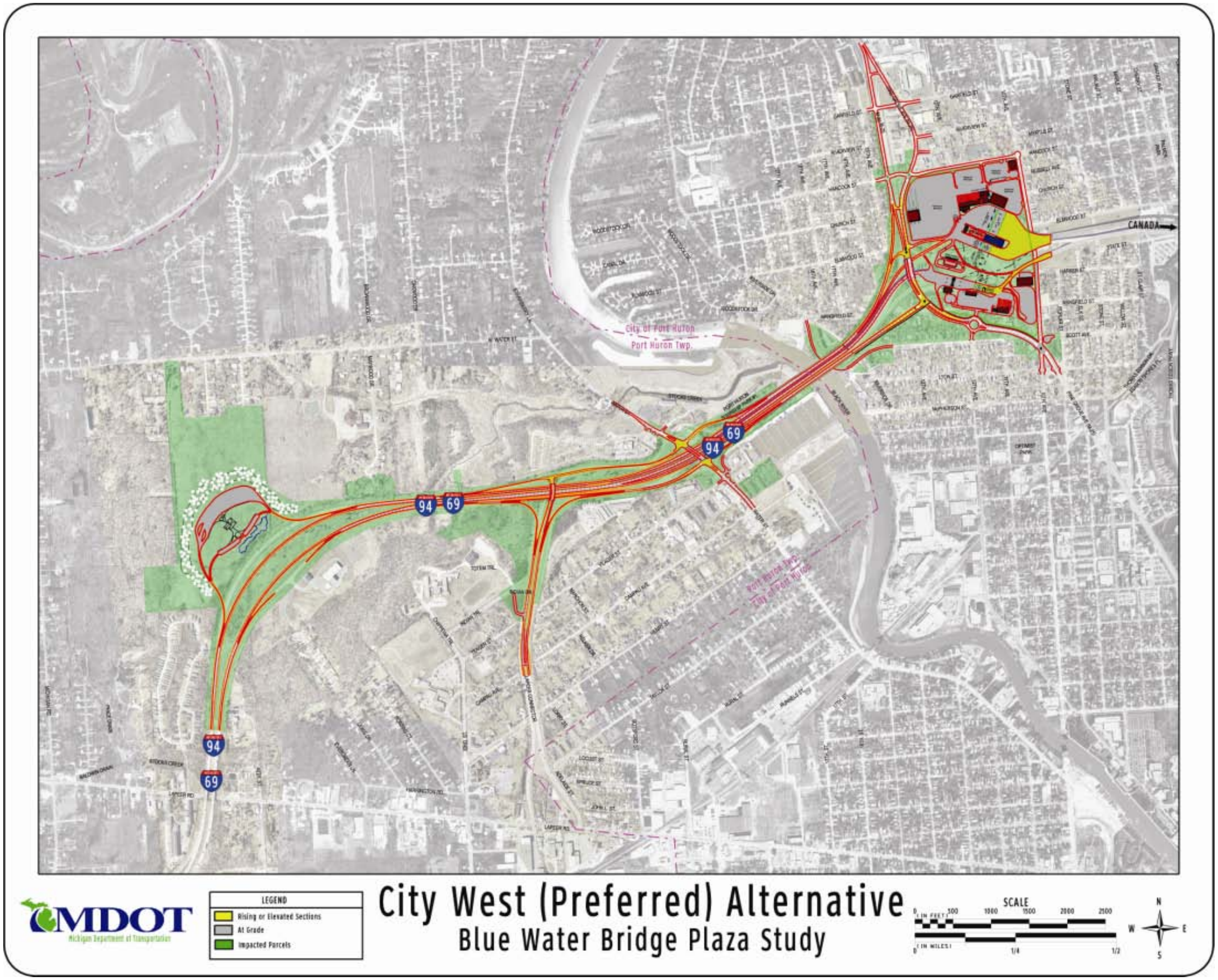
Figure 2


CANADA
City of Port Huron
Port Huron Twp
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LEGEND
Rising or Elevated Sections
At Grade
Impacted Parcels
City West (Preferred) Alternative
Blue Water Bridge Plaza Study
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Figure 3

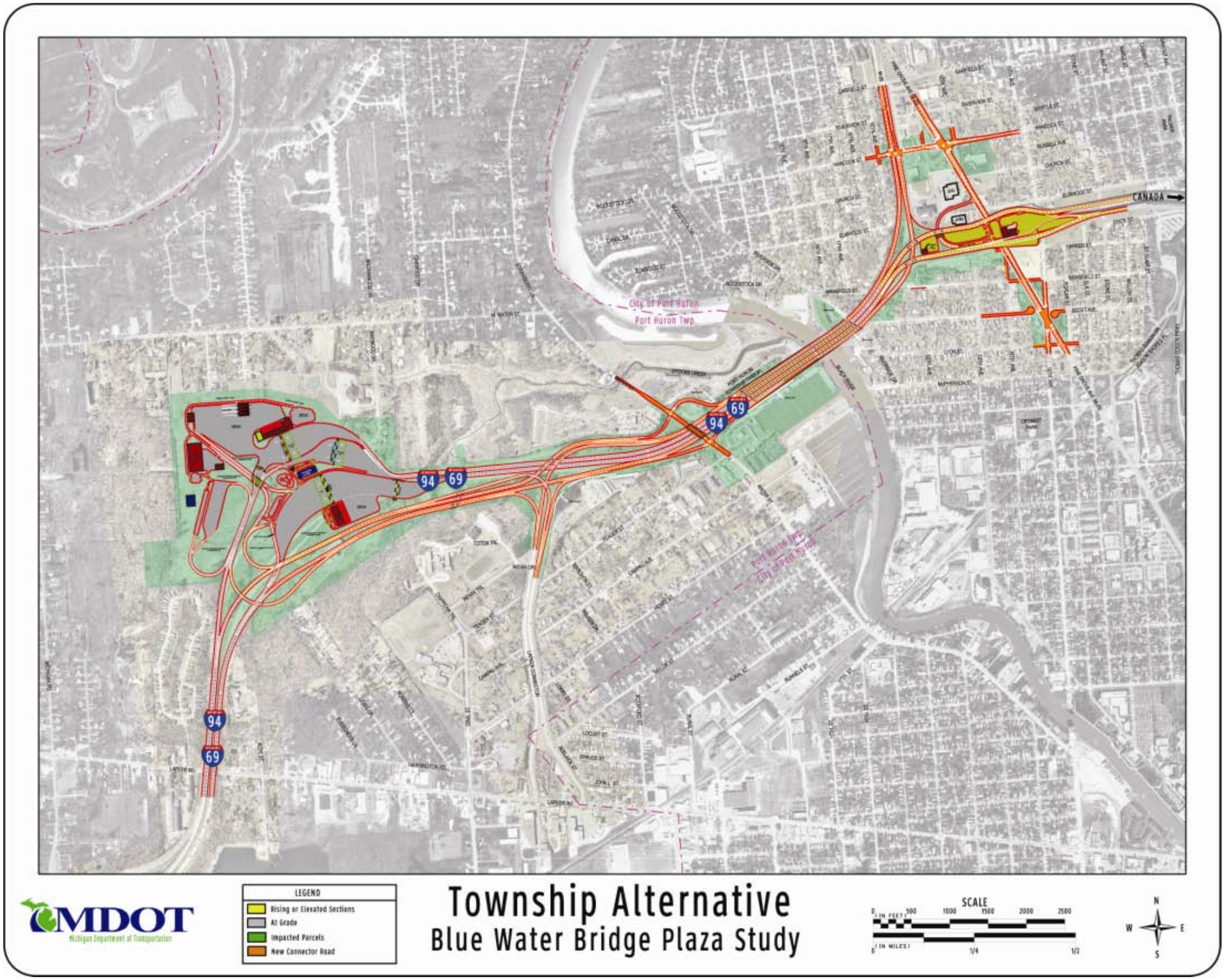
CANADA
City of Port Huron
Port Huron Twp.
94
69
LEGEND
Rising or Elevated Sections
At Grade
Impacted Parcels
New Connector Road
MDOT
Michigan Department of Transportation
Township Alternative
Blue Water Bridge Plaza Study
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Figure 4

4.0 MOBILE SOURCE AIR TOXICS

4.1 MSAT Analysis Guidance

FHWA's Interim Guidance on Air Toxics Analysis in NEPA Documents, on which the entire MSAT discussion presented below is based, presents a tiered approach for analyzing MSATs.[2] Depending on project specifics, FHWA has identified three levels of analysis:

- No analysis for projects with no potential for meaningful MSAT effects;
- Qualitative analysis for projects with low potential MSAT effects; or
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

4.1.1 Exempt Projects or Projects with No Meaningful Potential MSAT Effects.

The types of projects included in this category are:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117(c);
- 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(c), or are exempt under the Clean Air Act pursuant to 40 CFR 93.126, no analysis or discussion of MSATs is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. Projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is required. However, the project record should document the basis for the determination of "no meaningful potential impacts" with a brief description of the factors considered.

4.1.2 Projects with Low Potential MSAT Effects

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 emissions. Projects in this category include minor widening projects and new interchanges, such as those that replace a signalized intersection on a surface street or where design year traffic is not projected to meet the 140,000 to 150,000 AADT. A qualitative assessment of emission projections would be conducted for these projects. This qualitative assessment would compare, in narrative form, the expected effect of the project on traffic volumes, vehicle mix, or routing of traffic, and the associated changes in MSATs for the project alternatives, based on VMT, vehicle mix, and speed. It would 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 are low, it is expected that there would be no appreciable difference in overall MSAT emissions among the various alternatives.

4.1.3 Projects with Higher Potential MSAT Effects

This category includes projects that have the potential for meaningful differences among project alternatives. Projects must meet the two following criteria:

- 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; or
- Create new 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, or greater, by the design year;

And also

- Be proposed to be located in proximity to populated areas or in rural areas, in proximity to concentrations of vulnerable populations (i.e., schools, nursing homes, hospitals).

These projects would require a quantitative analysis of potential MSAT emissions for the six priority MSATs for each alternative.

As stated earlier in this report, the three build alternatives expand the footprint of the plaza. However, the expanded plaza will not generate more cross-border traffic than the No-Build Alternative. Since the plaza will be constructed in stages, the ultimate build out will not occur until such time as existing cross-border capacity is reached without the project. Only at that point will the new capacity offered by the project allow more vehicles to cross the border. As shown in Table 2, traffic volumes with the No-Build and all three build alternatives are almost identical and the maximum AADT on the corridor is well below 140,000 AADT. Therefore, the proposed Blue Water Bridge project is considered to be a project with “low potential MSAT effects”.

Table 2
Traffic Volumes at Four Locations
Along Corridor

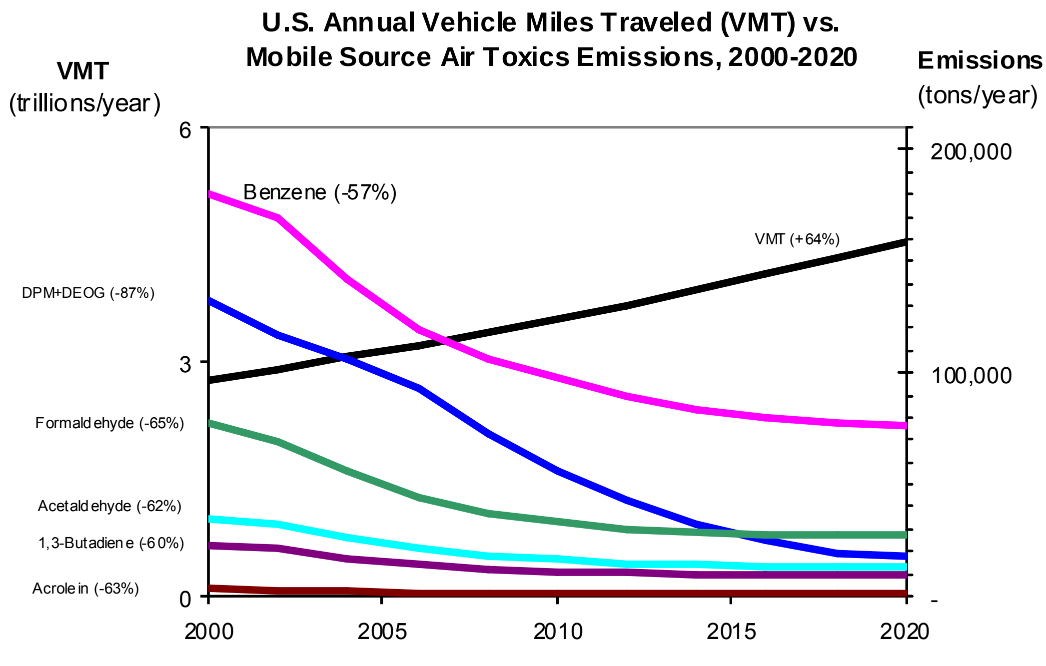
Roadway Segment	AADT Volumes				
	Alternative				
	Existing	No-Build	City East	City West	Township
	2005	2030	2030	2030	2030
I-94/69 north of I-94/69 Interchange	34,000	48,400	48,400	48,400	48,400
I-94/69 at Black River Bridge	46,000	61,200	61,200	61,200	65,800
Toll Plaza	16,000	18,600	18,600	18,600	18,600
M-25 S of Hancock Street	35,200	44,700	44,700	49,700	42,700

Source: WSA/HNTB Corporation, May 2007

4.2 MSAT Background

The Clean Air Act identified 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list of toxics and identified a group of 21 as mobile source air toxics, which are set forth in an EPA final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources (66 FR 17235).* The EPA also extracted a subset of this list of 21 that it now labels as the six priority MSATs. These are benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these 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, as shown in the following graph:



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: *Highway Statistics 2000*, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

4.2.1 Unavailable Information for Project Specific MSAT Impact Analysis

This air quality report includes a basic analysis of the likely MSAT emission impacts of the proposed Blue Water Bridge project. However, available technical tools do not enable the prediction of project-specific health impacts of the emission changes associated with the proposed alternatives. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

Information that is Unavailable or Incomplete Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

1. 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 highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 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 limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

   These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

2. Dispersion. The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

3. 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 accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes

in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. 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. 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 other project impacts that are better suited for quantitative analysis.

4.2.2 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 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 EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The 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 six prioritized MSATs was taken from the IRIS database Weight of Evidence Characterization summaries. This information is taken verbatim from EPA's IRIS database and 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.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust (DE)** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document 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. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, 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 final summary of the series is not expected for several years.

Some recent studies, such as the South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards by the Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); and the Environmental Law Institute's "NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles," 35 ELR 10273 (2005) which cited health studies, have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

4.2.3 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 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."

A qualitative analysis of MSAT emissions relative to the various alternatives is presented in this report and has acknowledged that some project 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 estimated.

4.3 Qualitative MSAT Analysis

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, 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 among MSAT emissions—if any—from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at:

www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

The amount of MSATs emitted for each Blue Water Bridge project would be proportional to the traffic projected for each alternative, assuming that other variables such as fleet mix are the same for each alternative. The traffic projected for the City East Alternative is identical to the No-Build Alternative. The traffic projected for the City West and Township Alternatives are slightly higher than the No Build Alternative. These changes are due to revised traffic patterns not as a result of increased capacity, see Table 2. The resulting MSAT emissions along the corridor are going to be very similar with only a slight increase expected along the section from the Black River Bridge to the new Township Alternative Plaza. The potential emissions increase with any of the proposed Alternatives is offset somewhat by lower MSAT emission rates. The overall change in MSAT emissions with the various alternatives cannot be reliably projected due to the inherent deficiencies of technical models.

Because the traffic projected for each Alternative is nearly the same and the project will not create additional cross border traffic, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, traffic growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for traffic growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The additional travel lanes contemplated as part of all Alternatives from the Lapeer Connector east to the area of the existing Plaza will have the effect of moving some traffic closer to nearby homes, and businesses; the Township Alternative will move the relocated Plaza closer to a church and pre-school, therefore, under each alternative there may be localized areas where ambient concentrations of MSATs could be higher under certain Build Alternatives than the No Build Alternative. This could also occur with the proposed relocation of Pine Grove with the City East and City West Alternatives. However, as discussed above, the magnitude and the duration of these potential increases compared to the No-Build Alternative cannot be accurately quantified due to the inherent deficiencies of current models. In sum, when a highway is widened and, as a result, moves closer to receptors, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

5.0 CONFORMITY TO THE CLEAN AIR ACT

The NAAQS are used as the basis for determining an area's air quality designation (i.e., status as "attainment" or "nonattainment"). Generally, a nonattainment area is one that does not meet a particular standard in the NAAQS. So, an area may be classified nonattainment for one or more pollutants and attainment for others. A nonattainment area is reclassified as attainment when it achieves the standard. Such areas are given a "maintenance" designation, requiring them to demonstrate continued compliance with a specific standard, but not requiring additional controls to reduce emissions.

EPA has promulgated two sets of regulations to implement the General Conformity Rule (40 CFR 93, subpart A): 1) Transportation Conformity Regulations, which apply to highways and mass transit and establish the criteria and procedures for determining whether transportation plans, programs, and projects funded under title 23 U.S.C. or the Federal Transit Act conform with the State Implementation Plan (58 FR 62188); and, 2) the General Conformity Regulations, which apply to everything else. The conformity tests and analyses will apply only to the preferred alternative and will be documented in the FEIS.

5.1 General Conformity

For General Conformity, de minimis (threshold) emission levels for fine particle pollution ($PM_{2.5}$) have been set to determine when General Conformity requirements apply (40 CFR 93.153). The Blue Water Bridge is a transportation project; therefore, it is logical that transportation conformity applies. But, the Blue Water Bridge is unique in that it has a customs plaza where trucks will idle as they queue for customs inspection - both primary and, potentially, secondary. Therefore, once a preferred alternative has been selected, plaza activity will be examined in terms of General Conformity to determine whether de minimis levels of 100 tons per year are exceeded for $PM_{2.5}$.

Because of the scale of the Blue Water Bridge project, the de minimis threshold will also be applied to construction activities to determine whether dust levels exceed 100 tons in any construction year.

5.2 Transportation Conformity

Transportation conformity is discussed at two levels, area and local. The area determination is referred to as regional transportation conformity. The local determination is referred to as hotspot conformity.

5.2.1 Regional Conformity

The Blue Water Bridge Plaza project is located within the Metropolitan Detroit-Port Huron Intrastate Air Quality Control Region (AQCR #123). St. Clair County is currently in attainment status for five (5) of the seven (7) criteria pollutants, and has been classified as being in non-attainment for $PM_{2.5}$ and the 8-hour ozone standard. St. Clair County is not part of the AQCR's PM_{10} AND CO maintenance areas.

The Clean Air Act requires each state to have a State Implementation Plan (SIP) to demonstrate how it will attain and/or maintain federal air quality standards. The Southeast Michigan Council of Governments (SEMCOG) collaborates with the Air Quality Division of the Michigan Department of Environmental Quality (DEQ) on the work needed to prepare and/or update a SIP. SEMCOG is responsible for mobile source (transportation) emissions in Southeast Michigan. SEMCOG's 2030 Regional Transportation Plan (RTP) must undergo a quantitative analysis demonstrating that emissions levels associated with implementing planned transportation projects are below designated emissions level limits (budgets) set forth in the SIP. In so doing, SEMCOG is managing and facilitating the transportation air quality conformity process in Southeast Michigan.

SEMCOG's Executive Committee has approved the "Conformity Analysis for the Southeast Michigan 2006-2008 Transportation Improvement Program and Amendment of the 2030 Regional Transportation Plan". The Conformity Analysis, which includes the Blue Water Bridge Plaza Study, was analyzed for regional conformity and approved by FHWA on March 27, 2006.[3] FHWA's initial $PM_{2.5}$ conformity finding for the SEMCOG area was made on February 22, 2006.[4] These findings are in accordance with 40 CFR Part 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."

Air quality conformity analyses for mobile sources in Southeast Michigan currently involve: ozone (and its precursors, volatile organic compounds and nitrogen oxides), carbon monoxide (CO), and $PM_{2.5}$. Once the recommendation of the City West (Preferred) Alternative is approved, SEMCOG will re-analyze the approved Alternative in it's RTP and re-submit the analysis to the FHWA for a conformity determination. The consultant team will provide information to SEMCOG to be processed in SEMCOG's model.

5.2.2 Hotspot Conformity – CO, $PM_{2.5}$ and PM_{10}

Hotspot conformity analysis is designed to evaluate whether there are air quality impacts on a smaller scale than an entire nonattainment or maintenance area. It relates a project to the Standards on a more localized basis. Conformity to the purpose of the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the Standards. The carbon monoxide (CO) analysis is done on a quantitative basis, to determine whether estimated project concentrations of CO exceed the established one-hour and/or eight-hour standards. If they do not, the project conforms. Hotspot conformity for $PM_{2.5}$ and PM_{10} is done on a qualitative basis until appropriate methods and modeling guidance are available for quantitative analysis.

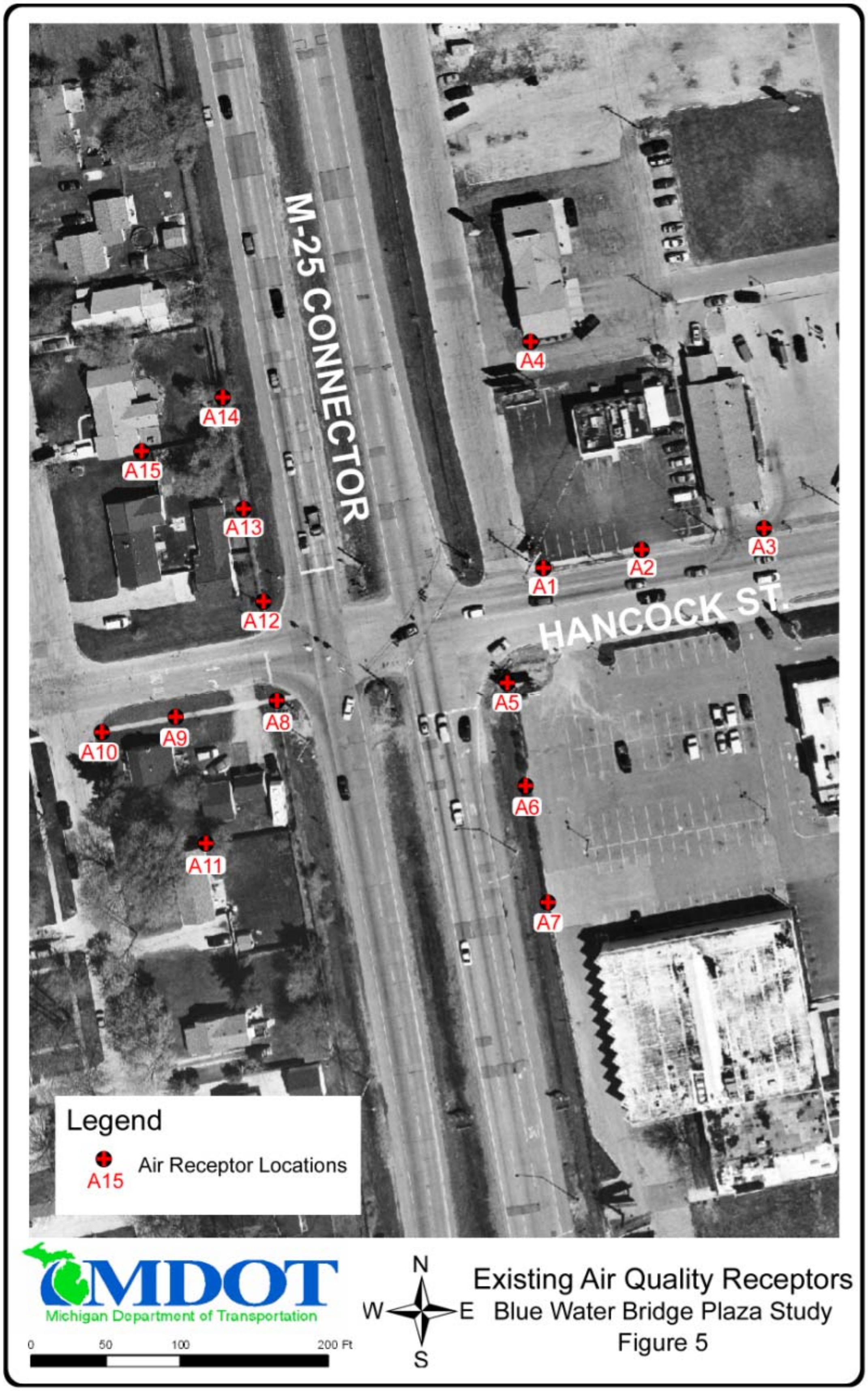
5.2.2.1 CO Hotspot (Microscale) Analysis

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.

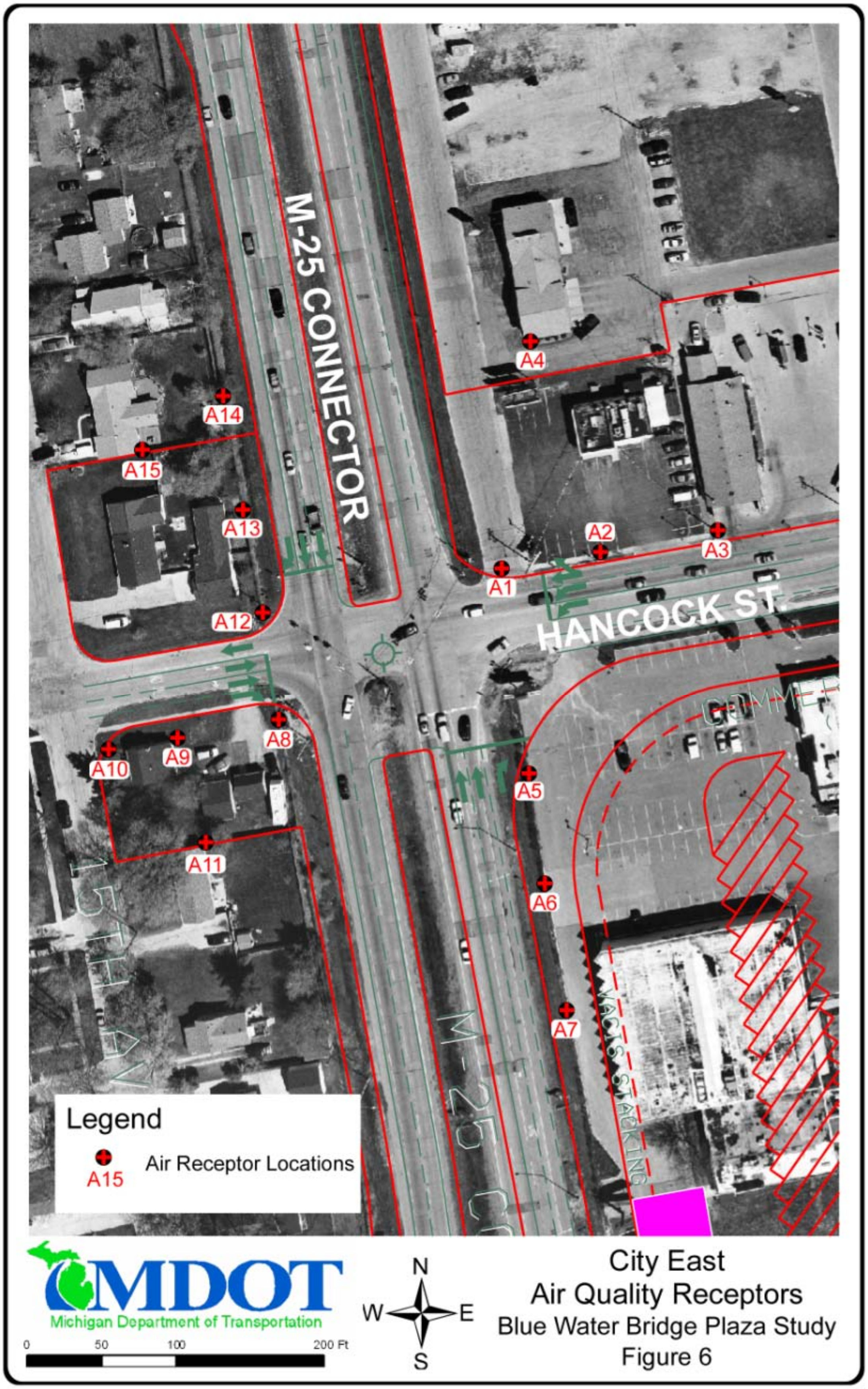
The EPA's MOBILE6.2[5] was used to develop vehicular emission rates and EPA's approved CAL3QHC 2.0 (CAL3QHC)[6] computer model was used to analyze the hourly dispersion of CO in the years 2005, 2013, and 2030.

Methodology

The M-25/Hancock Street intersection was selected as the worst case location for the microscale CO modeling because of the potential for queues to form at the signalized intersection for the City East, City West and Township Alternatives.[7,8] Fifteen air quality receptors, A1 through A15, were placed along all four (4) approach queues of the M-25/Hancock Street intersection and at two (2) nearby residences and one (1) commercial building for the City East and City West Alternatives. Six more receptors were added to account for the one-way pair proposed with the Township Alternative. Receptors were placed parallel to the roadways. The receptors along Hancock Street were located on existing and proposed sidewalks. The receptors along M-25 were located at the right-of-way. 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 were based upon the recommendations presented in EPA's CO Modeling Guidelines.[9] The location of the air quality receptors are presented in Figures 5, 6, 7 and 8.



Existing Air Quality Receptors
Blue Water Bridge Plaza Study
Figure 5


M-25 CONNECTOR
HANCOCK ST
15TH AV
M-25 CO
A1
A2
A3
A4
A5
A6
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A9
A10
A11
A12
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A14
A15
Legend
A15 Air Receptor Locations
MDOT
Michigan Department of Transportation
0 50 100 200 Ft
N
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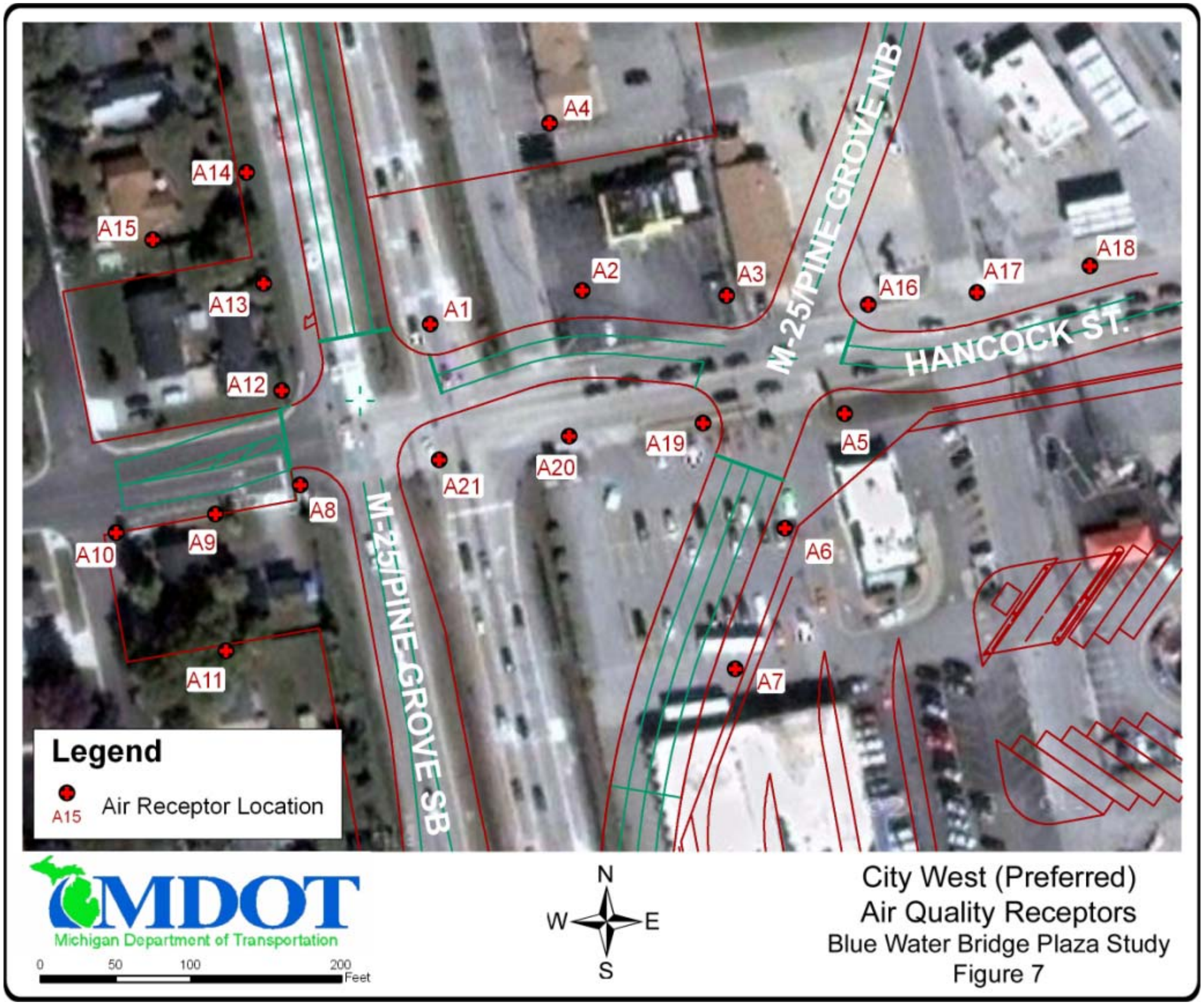
City East
Air Quality Receptors
Blue Water Bridge Plaza Study
Figure 6


A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
A21
M-25/PINE GROVE NB
M-25/PINE GROVE SB
HANCOCK ST.
Legend
Air Receptor Location
MDOT
Michigan Department of Transportation
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S
City West (Preferred)
Air Quality Receptors
Blue Water Bridge Plaza Study
Figure 7

Township
Air Quality Receptors
Blue Water Bridge Plaza Study
Figure 8

The EPA's MOBILE6.2[5] and EPA's approved CAL3QHC 2.0 (CAL3QHC)[6] computer models were used to analyze vehicular emissions and the hourly dispersion of CO at receptors A1 – A21 (Figures 5, 6, 7 and 8) for the intersection of the M-25 Connector and Hancock Street. SEMCOG provided the specific St. Clair County 2005, 2013, and 2030 input variables for MOBILE6.2. MOBILE6.2 is a computer program that estimates emission factors for highway motor vehicles.

CAL3QHC is a pollutant dispersion-modeling program for predicting pollutant concentrations from motor vehicles under free-flow conditions, or in the vicinity of roadway intersections. Peak traffic volumes and operating characteristics were used to analyze each intersection. In accordance with EPA procedure, idle emission rates (in grams/hr) were calculated by multiplying MOBILE6.2's average vehicle emission rate for 2.5 mph by 2.5. Worst-case meteorological variables and an urban background CO concentration obtained from the MDEQ were used in the CAL3QHC model. Variables used in CAL3QHC included:

- 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 "E"

- Surface roughness: 108 cm (42.5 in.), study area is primarily single family residential.

- Mixing height: 1000 m (3280.83 ft).

- Background CO concentration: 3.4 ppm.[10]

- CO emission factors from MOBILE6.2.

The MOBILE6.2 and CALINE3 input and output files have been provided to MDOT on a CD.

Results

The results of the CO microscale air quality modeling are presented in Table 3. The maximum 1-hour CO concentrations were 6.2 ppm for existing conditions (2005). The maximum No-Build concentrations decreased to 4.9 ppm for both the 2013 and 2030 study years. The City East Alternative would create 1-hour CO concentrations ranging from 3.8 to 4.7 ppm in 2013 and 3.9 to 5.1 ppm in 2030. CO concentrations for the City West Alternative would range from 4.0 ppm to 5.1 ppm in 2013 and from 4.0 to 4.9 ppm in 2030. The Township Alternative would create 1-hour concentrations ranging from 3.9 to 5.1 ppm in 2013 and from 4.0 to 5.2 ppm in 2030. All concentrations include a background concentration of 3.4 ppm. None of these concentrations exceed either the 1-hour (35 ppm) or 8-hour (9 ppm) NAAQS. Therefore, since the 1-hour analysis predicted CO concentrations are less than 9.0 ppm, a separate 8-hour analysis was not performed.[11,12]

TABLE 3

MICROSCALE AIR QUALITY ANALYSIS
MAXIMUM 1-HOUR CO CONCENTRATIONS (ppm)*

Air Quality Receptor ID	2005	2013				2030			
	Existing	City East	City West	Town-ship	No-Build	City East	City West	Town-ship	No-Build
	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour
A1	6.1	4.4	4.7	4.4	4.6	4.6	4.7	4.7	4.7
A2	6.1	4.7	5.0	4.3	4.8	5.0	4.8	4.1	4.7
A3	5.7	4.1	5.1	4.7	4.9	5.1	4.7	4.7	4.6
A4	4.8	3.8	4.0	3.9	3.9	3.9	4.0	4.0	4.0
A5	6.2	4.6	4.5	4.7	4.6	4.7	4.6	4.6	4.9
A6	5.8	4.5	4.5	5.0	4.5	4.4	4.5	4.8	4.7
A7	6.0	4.5	4.6	4.8	4.6	4.5	4.5	4.9	4.7
A8	5.6	4.6	4.9	4.4	4.7	4.7	4.9	4.8	4.6
A9	5.4	4.4	4.4	4.3	4.6	4.4	4.4	4.3	4.2
A10	4.9	4.1	4.4	4.1	4.4	4.4	4.3	4.1	4.0
A11	4.8	4.0	4.1	4.0	4.0	4.1	4.1	4.2	4.1
A12	5.7	4.4	5.0	4.6	4.6	4.5	4.7	5.0	4.6
A13	5.5	4.4	4.8	4.9	4.6	4.5	4.7	5.0	4.6
A14	5.9	4.3	4.7	4.8	4.5	4.5	4.7	5.0	4.6
A15	4.8	4.0	4.4	4.2	4.1	4.0	4.1	4.2	4.0
A16				5.1				4.6	
A17				4.9				4.4	
A18				4.6				4.1	
A19				5.1				5.2	
A20				4.5				4.5	
A21				4.5				4.9	

*The National Ambient Air Quality Standard for CO is 35 ppm for a one hour average.

Concentrations include an ambient background level of 3.4 ppm (1 hour)

Indicates maximum concentration for each alternative and year of analysis.

Source: HNTB Corporation, August 2005

5.2.2.2 $PM_{2.5}$ Qualitative Hotspot Analysis

The EPA and the FHWA issued a joint guidance on March 29, 2006 on how to perform qualitative hot-spot analyses in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas. This guidance was developed to provide information for State Highway Administrations, local air control agencies and Metropolitan Planning Organizations (MPO) to meet the $PM_{2.5}$ and PM_{10} hot-spot analysis requirements established in the March 10, 2006, final transportation conformity rule (71 FR 12468). Once the selection of the City West (Preferred) Alternative has been approved and as part of the preparation for the FEIS, this guidance will be applied to the preferred Blue Water Alternative as the Interagency Working Group (IAWG) has made a preliminary determination that this project is considered as one of the "projects of air quality concern" as defined in the final rule by 40 CFR 93.123(b)(1).

5.2.2.3 PM_{10} Qualitative Hotspot Analysis

St. Clair County, Michigan is attainment for PM_{10}. Therefore, a PM_{10} hotspot analysis is not required for transportation conformity. However, because of the size of the proposed project, the general conformity de minimis threshold will be applied to construction activities to determine whether PM_{10} levels exceed 100 tons in any construction year. This analysis will take place prior to construction and will address the duration and nature of construction, which will represent a series of projects spread over time – interchange ramps, plaza, and bridge. Not all the booths will be developed initially. MDOT's Standard Construction Specification Sections 107.15(A) and 107.19 will apply to control fugitive dust during construction and cleaning of haul roads.

6.0 CONCLUSION

Based on the air quality analysis completed for the proposed improvements, this project will not contribute to any violation of the NAAQS.

6.0 REFERENCES

1 Michigan's 2005 Annual Air Quality Report, Summary, Page 2, Air Quality Division, Lansing, MI, August 2006.

2 Interim Guidance on Air Toxic Analysis in NEPA Documents, FHWA Memorandum to Division Administrators, February 3, 2006.

3 E-mail correspondence dated June 4, 2007, Joan Weidner, SEMCOG, to John Jaeckel, HNTB confirming status of conformity determination.

4 E-mail correspondence dated June 7, 2007, James Cramer, FHWA, to John Jaeckel, HNTB confirming status of $PM_{2.5}$ conformity determination.

5 U.S. Environmental Protection Agency. User's Guide to MOBILE6.1 and MOBILE6.2, Mobile Source Emission Factor Model. Assessment and Standards Division, Office of Transportation and Air Quality, Ann Arbor, Michigan: August 2003.

6 U.S. Environmental Protection Agency. User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 1995.

7 Project Meeting at MDOT's Secondary Complex, representing MDOT - Thomas Hanf, Frank Spica, and Tom Zurburg, representing HNTB – John Jaeckel and Suheil Acra, July 26, 2004.

8 E-mail correspondence dated January 18, 2005, Thomas Hanf, MDOT, to John Jaeckel, HNTB confirming CO modeling location for Township Alternative.

9 U.S. Environmental Protection Agency. Guidelines for Modeling Carbon Monoxide from Roadway Intersections, Office of Air Quality Planning and Standards, Technical Support Division, Research Triangle Park, North Carolina, November 1992.

10 Michigan's 2005 Annual Air Quality Report, Appendix A, Criteria Pollutant Summary for 2005, 1-hr 2nd highest in Oakland Park, Oakland County, Air Quality Division, Lansing, MI, August 2006.

11 Manual for Air Quality Considerations in Environmental Documents, Federal Highway Administration, Southern Resource Center, January 2001.

12 E-mail correspondence dated February 2, 2005, Thomas Hanf, MDOT, to John Jaeckel, HNTB confirming criteria for 8-hour CO modeling.