Air Quality Impact Analysis
Technical Report

The Detroit River International Crossing Study

Michigan Department of Transportation

February 2008

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SUMMARY

The Detroit River International Crossing (DRIC) Study looks at the social, economic and environmental costs of improving the busiest trade corridor between the United States and Canada (Figure S-1). The study involves the governments of the United States, Michigan, Canada and Ontario, proposing ways to help their economies and address defense and homeland security needs over the next 30 years.

Example of Freight Flows

Source: Federal Highway Administration

Figure S-1
Existing Detroit River International Crossings
Detroit River International Crossing Study

Source: The Corradino Group of Michigan, Inc.

The purpose of the Detroit River International Crossing Study is, for the foreseeable future (i.e., at least 30 years), to:

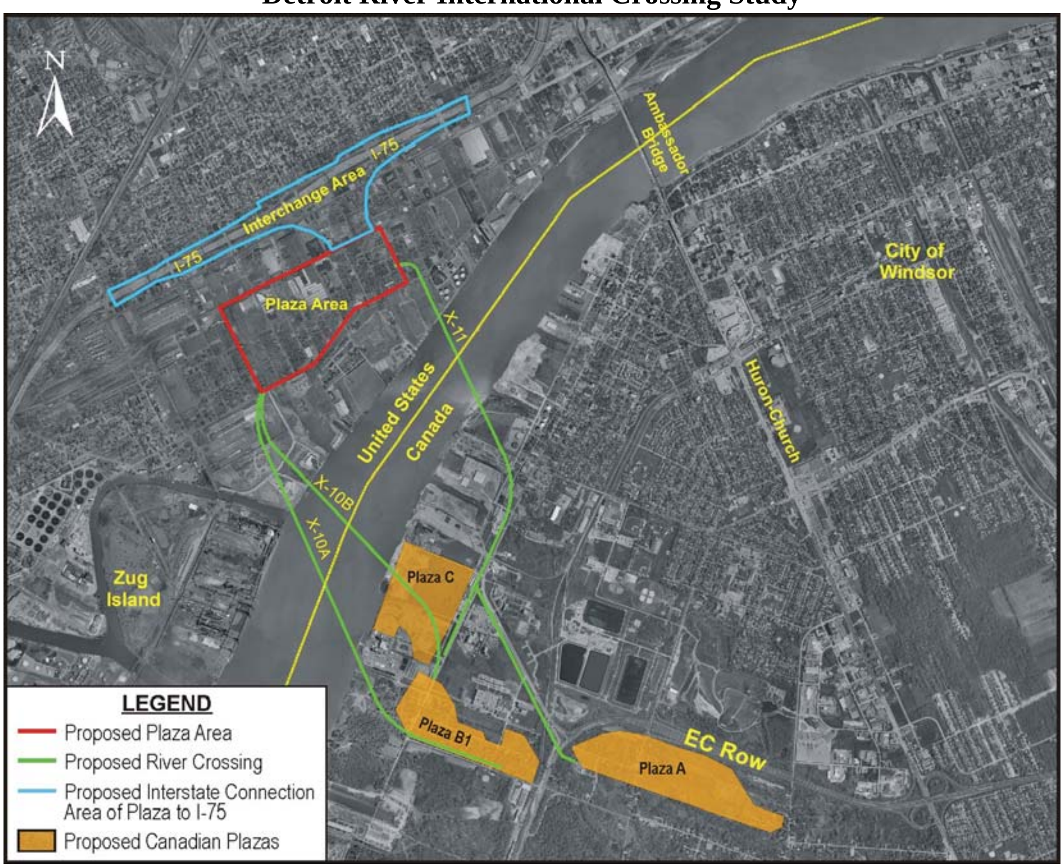
- Provide safe, efficient and secure movement of people and goods across the U.S.-Canadian border in the Detroit River area to support the economies of Michigan, Ontario, Canada and the United States.
- Support the mobility needs of national and civil defense to protect the homeland.

To address future mobility requirements (i.e., at least 30 years) across the U.S.-Canada border, there is a need to:

- Provide new border-crossing capacity to meet increased long-term demand;
- Improve system connectivity to enhance the seamless flow of people and goods;
- Improve operations and processing capability in accommodating the flow of people and goods; and,
- Provide reasonable and secure crossing options (i.e., redundancy) in the event of incidents, maintenance, congestion, or other disruptions.

Nine Practical Build Alternatives have been identified to satisfy the new border crossing requirements. Each consists of three elements (Figure S-2): an interchange connecting the plaza to the existing highway network, a Customs inspection plaza, and a bridge from the plaza that spans the Detroit River. This Air Quality Analysis Technical Report supports the Draft Environmental Impact Statement (DEIS) which analyzes the issues/impacts on the United State's side of the proposed new border crossing. A Canadian-produced set of technical reports analyzes the issues/impacts on the Canada side. Those are available on the project Web site (www.partnershipborderstudy.com).

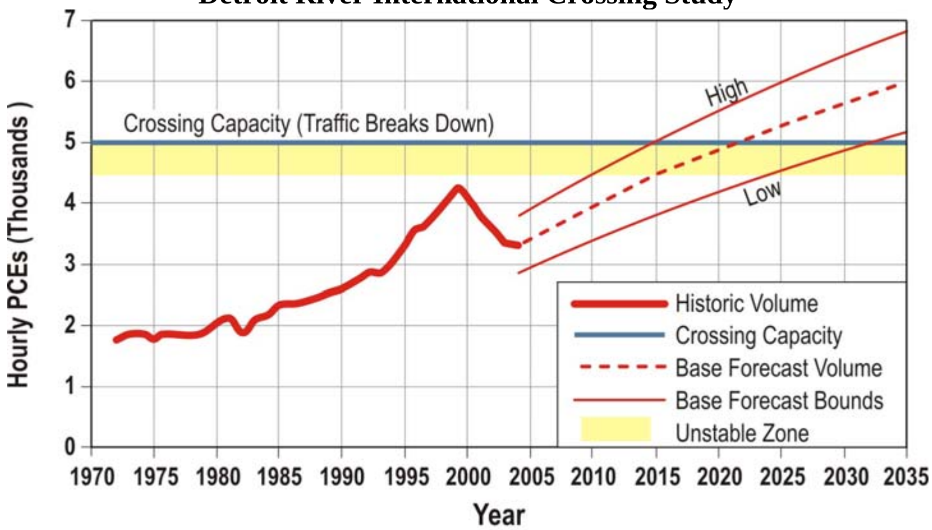
Figure S-2
U.S. Area of Analysis for Crossing System
Detroit River International Crossing Study



Source: The Corradino Group of Michigan, Inc.

Passenger car traffic across the border is projected to increase 57 percent over the next 30 years. Truck traffic is forecast to grow 128 percent. Detroit-Windsor area border crossings could overload as early as 2015 if high growth occurs, and by 2035, if traffic grows slowly (Figure S-3).

Figure S-3
Travel Demand vs. Capacity:
Combined Detroit River Crossings
Detroit River International Crossing Study



Note: Figure S-3 is from the DRIC Travel Demand Forecast Working Paper (September 2005), prepared by the IBI Group. The Passenger Car Equivalent factor (PCE) used in that report, and in Figure S-3, is 3.0 cars per truck to account for the grade leading to and from the bridge. SEMCOG calculates PCEs at a rate of 2.5 cars per truck in its regional roadway system. The DEIS calculates, on the ramps, the interstate system and other roadways, PCEs at 2.5 cars per truck.

Source: IBI Group

Studies indicate that there will be three kinds of capacity problems at the Detroit-Windsor border:

1) Along roads leading to the Ambassador Bridge and the Detroit-Windsor tunnel;
2) At Customs processing stations at the plazas; and,
3) On the crossings of the border themselves.

The planning, design and construction of any major international crossing take time. So, even with small adjustments to the plazas and adequate border crossing capacity today, it's wise to deal now with the future capacity of the crossing system described above.

Purpose of the Report

The purpose of this report is two-fold: 1) to provide insight into the differences among the Practical Alternatives consistent with the National Environmental Policy Act; and, 2) to support the determination that the project conforms to Michigan's State Implementation Plan (SIP). That document contains the regulations and other materials for meeting clean air standards and associated federal Clean Air Act requirements.

Findings

The U.S. Environmental Protection Agency (EPA) has continued to issue stricter requirements on new vehicle emissions and fuel content. Vehicle emission standards are being extended to diesel-powered, non-road engines, such as construction equipment and railroad locomotives. These and other actions will substantially reduce future emissions from "mobile" sources, even as travel increases.

The analysis of the Practical Alternatives examines vehicle miles and hours of travel (VMT and VHT) to compare air quality conditions with and without the proposed project. The DRIC Practical Alternatives provide an alternative path to cross the border between Detroit and Windsor, and, therefore, shorten the travel distance and time paths for some drivers. All practical alternatives "land" in Delray, a subsector of Southwest Detroit bounded by Zug Island and the Ambassador Bridge, and I-75 and the Detroit River (Figure S-2). This analysis examined peak and daily data for the base condition (2004), year of opening of the proposed DRIC project (2013), an intermediate year for purposes of comparing alternatives (2025), the year of SEMCOG's[1] *Regional Transportation Plan (RTP)* (2030), and the horizon year (2035). It is noted that 2013 represents the year of greatest project air quality emission because thereafter the effects of continuing air quality emission controls will outpace the anticipated increases in vehicle travel.

Air quality analysis was guided by an *Air Quality Protocol* (see Section 2) developed through interagency consultation. The results of the air quality analysis are presented in the following sections:

- General Air Quality Conditions
- Mobile Source Air Toxics (MSATs)
- Regional Analysis
- Hot-spot Analysis
  - Carbon Monoxide
  - $PM_{2.5}$[2]
  - PM_{10}

The findings on each of these topics are summarized in Table S-1 and discussed thereafter.

[1] SEMCOG is the Southeast Michigan Council of Governments, a multi-county agency that serves as the region's Metropolitan Planning Organization (MPO).

[2] $PM_{2.5}$ refers to particulate matter that is 2.5 micrometers or smaller in size. Sources of $PM_{2.5}$ include fuel combustion from automobiles, power plants, wood burning, industrial processes, and diesel-powered vehicles such as buses and trucks. These fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds (all of which are also products of fuel combustion) are transformed in the air by chemical reactions. Fine particles are of concern because they are so small they are able to penetrate to the deepest parts of the lungs, where the body has difficulty expelling them. PM_{10} refers to particulate matter that is up to 10 micrometers in size and includes roadway dust.

Table S-1
Detroit River International Crossing Study
Air Quality Impact Summary

	No Build Alternative	Build Alternatives
General	EPA measures will continue to improve air quality. Congestion builds at Ambassador Bridge and Detroit-Windsor Tunnel.	EPA measures will continue to improve air quality. Regionally Build Alternatives would shift some Blue Water Bridge traffic (and air pollution emissions) to the Detroit-Windsor Border Area, but at a rate less than the general decline in pollutants. Some pollution emissions would shift from the Ambassador Bridge, which is seeing continued residential expansion, to Delray, where residences are farther removed (west) of the proposed plaza. Shift is least with Alternative Set #7/911, which attracts less traffic to a new bridge. DRIC Build Alternatives would reduce truck traffic on Livernois-Dragoon one-way pair in residential area north of I-75.
MSAT	MSAT decline occurs even with increased VMT. Detroit's VMT will increase at a much lower rate than the national increase.	MSAT decline occurs even with increased VMT. Detroit's VMT will increase at a much lower rate than the national increase. Some traffic (air quality) shifts as noted above. Formaldehyde, 1,3 butadiene, and acetaldehyde would increase between 2013 and 2030 at a new bridge, but diesel exhaust would be substantially reduced.
Regional	Congestion builds at Ambassador Bridge and Detroit-Windsor Tunnel.	Build Alternatives provide congestion relief, but there is little difference from the standpoint of regional air quality conformity analyses. Conformity analysis will be performed by SEMCOG once a Preferred Alternative is identified – nonattainment for ozone and $PM_{2.5}$ maintenance for CO and PM_{10}.
Hot-spot	Carbon monoxide (CO) hot-spots are not anticipated. SEMCOG believes it will be in attainment of the $PM_{2.5}$ standards by 2010. No PM_{10} hot-spots are anticipated.	Carbon monoxide (CO) hot-spots are not anticipated. SEMCOG believes it will be in attainment of the $PM_{2.5}$ standards by 2010. The proposed project will not cause new air quality violations, worsen existing violations, or delay timely attainment of standards for $PM_{2.5}$. This applies to both the 24-hour and annual standards. No PM_{10} hot-spots are anticipated.

Source: The Corradino Group of Michigan, Inc.

General Air Quality Conditions

Examining each alternative's VMT and VHT offers a way of comparing how much air pollution is produced by each of the Practical Alternatives considered in this report. Because of their similarity, Alternatives #1, #2, #3, #14 and #16 are analyzed as a single set of alternatives. Similarities among Alternatives #7, #9 and #11 combine them into a single set. Reference is made to Section 3.1 for more detail on these groupings (and to Figures 1-4 and 1-5 for Practical Build Alternatives). The *Air Quality Protocol* calls for an examination of peak and off-peak conditions, so data from the travel demand model for the midday hour and the PM peak hour are presented (refer to Table 3-1). These data are for 2013, the year projected to have the most pollution before all the benefits of EPA's regulations have their full effect.

1. While a shift in traffic from the Blue Water Bridge to the Detroit-Windsor crossing area (defining that crossing area as the Ambassador Bridge, the Detroit-Windsor tunnel, and a DRIC bridge, if built) is expected, there would be virtually no difference in VMT and VHT in the SEMCOG region (refer to Figure 3-1) from one DRIC alternative to another in the midday peak or between them and the No Build Alternative (refer to Table 3-1). There would be a uniform decrease in truck VMT in the 2013 PM peak of all Build Alternatives over No Build. VHT would be the same for all alternatives.

2. With respect to the border crossing area (refer to Figure 3-1), Alternative Set #1/2/3/14/16 and Alternative #5 would carry substantially more traffic across a new bridge than Alternative Set #7/9/11. But, the longer movements on the plaza of Alternative Set #7/9/11 increase its VMT and VHT characteristics such that it falls between the No Build Alternative and other Build Alternatives. Because all Build Alternatives draw traffic from the Blue Water Bridge, each would slightly increase VMT and VHT in the border crossing area during the 2013 midday and PM peaks. Therefore, air pollution emissions in the border crossing area would increase. However, it is recognized that stricter vehicle emission controls and fuel standards being put into place will result in future mobile source (vehicular) pollution being less than it is now.

3. Along I-75 (refer to Figure 3-1), all Build Alternatives except #5 would have lower VMT and VHT than the No Build Alternative in the 2013 midday and PM peaks.

   The VMT and VHT data and the background traffic volumes on I-75 also lead to the conclusion that within the area of Southwest Detroit along I-75, there is no substantial difference expected among the DRIC alternatives compared to the No Build condition with respect to sensitive receptors (refer to Figure 3-2). The area of predominant, albeit sparse, residential development in Delray is west of the proposed plaza area where homes are spread over several blocks, with more vacant lots than homes. The densest population area is north of I-75.

Sensitive receptors include Southwestern High School, located on Fort Street (M-85), a state trunkline highway to the west of the proposed plaza area. The school fronts directly onto Fort Street. It would be separated from the project's plaza by ball fields, tennis courts, a railroad track, and a buffer zone around the plaza. Between the proposed project and the Ambassador Bridge on the north side of I-75 are the Amelia Earhart Middle School and Daniel Webster Elementary School. Farther west at Waterman is the Beard Early Education Center. There is little difference among the DRIC alternatives, from one another, or between them and the No Build condition with respect to sensitive receptors in the area of I-75 and south in Delray.

North of I-75 there is an opportunity to reduce truck traffic on the Livernois/Dragoon one-way pair that serves a dense residential area north to Vernor Avenue and beyond to Michigan Avenue. These streets carry substantial volumes of truck traffic and serve the Livernois-Junction Yard intermodal terminal north of Vernor Avenue (refer to Figure S-4). This intermodal terminal is where freight containers are exchanged between truck and rail. A proposed MDOT project would reorient the entrances to this intermodal yard to reduce the truck use of the Livernois/Dragoon one-way pair. With the DRIC Build Alternatives, direct access by heavy-duty diesel trucks via Livernois/Dragoon to this intermodal terminal would be significantly reduced by modifying the ramp system on I-75. This would improve air quality conditions in a heavily populated section of Southwest Detroit.

The Ambassador Bridge plaza does have a cluster of relatively dense residential units immediately to its east. This area, which is around Ste. Anne's Catholic Church, has seen strong redevelopment and infill housing in the last decade. The DRIC would divert traffic from this Ambassador Bridge plaza, reducing vehicular emissions in another area of Southwest Detroit.

Mobile Source Air Toxics

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined under the Clean Air Act. 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, as secondary combustion products, and from brake and tire wear. Metal air toxics also result form engine wear or from impurities in oil or gasoline.

The data reflect MSATs would shift to the area near the proposed new river crossing system from the Ambassador Bridge, compared to the no build condition.

For 2013, Alternative Set #1/2/3/14/16 and Alternative #5 show higher MSATs for the ramp connections between the plaza and I-75 than Alternative Set #7/9/11 because Alternative Set #1/2/3/14/16 and Alternative #5 would attract more traffic from the Ambassador Bridge and the Blue Water Bridge. Alternative Set #1/2/3/14/16 would carry a slightly higher proportion of trucks than Alternative #5 due to its comparative directness to southern destinations favored by trucks. Alternative #5 carries slightly more auto traffic.

Alternative Set #7/9/11 would have lower MSAT burden totals for ramps at the new crossing because the traffic volumes with the group are lower than the other build alternatives. The group has a higher amount of MSATs per vehicle on the plaza than the other alternatives because its plaza has a "double-back" layout which significantly increases the VMT traveled on the plaza (refer to Figure 5-9). So, whereas the ramp MSAT totals are roughly one-half of Alternative Set #1/2/3/14/16, the plaza plus crossing totals are more than three-quarters. Nonetheless, the overall MSAT burden for Alternative Set #7/9/11 is lower than Alternative Set #1/2/3/14/16 as there is less traffic diversion from the Ambassador Bridge.

For 2030, the same patterns hold. For benzene and acrolein, the increase in VMT is offset by the lower emission factors of the future. Formaldehyde, 1,3-butadiene, and acetaldehyde would increase in 2030 as compared to 2013; diesel exhaust would be significantly reduced.

The conclusion of the MSAT analysis is that the DRIC would shift MSATs from the Ambassador Bridge area to Delray. Denser populations exist nearer to the Ambassador Bridge. While some MSATs would increase between 2013 and 2030 on the new ramp/plaza system, the increase is limited to that system because its VMT is increasing faster than the emission rates for MSATs drop, whereas on I-75 (where the bulk of the traffic is), MSATs would be substantially reduced (as traffic on I-75 does not grow appreciably). So the overall effect is reduced MSATs, particularly diesel exhaust from trucks.

Regional Analysis

EPA is responsible under the Clean Air Act for establishing national air quality standards. The SEMCOG region is not in "attainment" of some standards and there are other standards which the region did not meet previously but now does. The proposed DRIC project is added to the long-range *Regional Transportation Plan* (RTP) to determine whether the DRIC causes problems in attaining or maintaining air quality relative to the air standards when considered in the context of the RTP. This "conformity" test will occur after a Preferred Alternative is identified and will be reported on in the Final Environmental Impact Statement (FEIS).

Hot-spot Conformity

Hot-spot conformity analysis is designed to evaluate whether there are air quality impacts on a smaller scale than an entire area. The hot-spot analysis applies to carbon monoxide (CO) and particulate matter ($PM_{2.5}$ and PM_{10}), each of which is a National Ambient Air Quality Standard (NAAQS) pollutant. To demonstrate that it "conforms" to the Clean Air Act, the project must not worsen air quality or delay timely attainment of the NAAQS.

The CO analysis is done on a <u>quantitative</u> basis, to determine whether estimated "with-project" concentrations of CO exceed the established one-hour and/or eight-hour standards. If they do not, the project conforms. Hot-spot conformity for $PM_{2.5}$ and PM_{10} is determined on a <u>qualitative</u> basis until appropriate methods and modeling guidance are available for quantitative analysis.

<u>CO Hot-spot Quantitative Analysis</u>

CO hot-spots were placed at the perimeter of the plaza (refer to Figure 5-1) at: Southwestern High School (Receptor No. 1), residences east of the proposed plazas (varies by Build Alternative) (Receptors No. 2 and No. 3), Fort Wayne (Receptor No. 4), and a residence west of the proposed plazas (Receptor No. 5). North of I-75, a house on the east side of Campbell Street was tested as a "worst case" (Receptor No. 6). At that location, the ramps to the new bridge and a relocated service drive would be very close to the residence.

There is virtually no congestion today along local streets in Delray at which people are exposed to roadway pollution. And, the changes proposed will shift traffic in such a way that the Level of Service (LOS) will only worsen in a very few instances. Per guidelines, the traffic analysis was reviewed to see whether the project would result in any intersections operating at LOS D or worse. There would be no such intersections.

The conclusion for CO is that the highest one-hour CO concentrations would be found at the residence along the north side of I-75 on Campbell. Forecasts of one-hour CO concentrations for 2013, 2025 and 2030 are 2.9, 3.5 and 3.8 ppm, respectively, compared to the standard of 35 ppm. (Values for eight hours are not presented as the one-hour value is less than the eight-hour standard.) The analysis of the home on Campbell Street addresses the closest approach of the DRIC alternatives to a dwelling unit combined with the highest ramp volume of any of the alternatives. Conditions at all other intersections in all years under all scenarios are less likely to aggravate CO concentrations. So, the project would not cause any air quality violations, worsen conditions or delay timely attainment of the NAAQS and would generate CO levels at only approximately one-tenth of the standard.

PM$_{2.5}$ and PM$_{10}$ Hot-spot Qualitative Analysis

The qualitative PM$_{2.5}$ and PM$_{10}$ hot-spot analysis covers the following topics in the main body of this report:

- Project Description
- Method Chosen (hybrid of A and B)
- Emissions Considered (PM$_{2.5}$ and separately PM$_{10}$)
- Background No Build Conditions – base (2004) and future (2013 and 2030)
- Project Conditions – future (2013 – 2030)
- Documentation of Public Involvement
- Mitigation
- Conclusions

The conclusion of the qualitative PM$_{2.5}$ and PM$_{10}$ hot-spot analyses is that the proposed project will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. This applies to both the 24-hour and annual standards. It is based on the following:

- SEMCOG and the Michigan Department of Environmental Quality (MDEQ) have been moving aggressively to address air quality concerns, in general, and PM$_{2.5}$, specifically.
  - This includes programs such as diesel locomotive retrofits, and
  - Controls on consumer products.

- EPA is addressing the non-local component of PM$_{2.5}$ pollution through programs such as the Clean Air Interstate Rule, stricter controls on vehicle emissions, and low-sulfur fuel mandated for use in 2007.

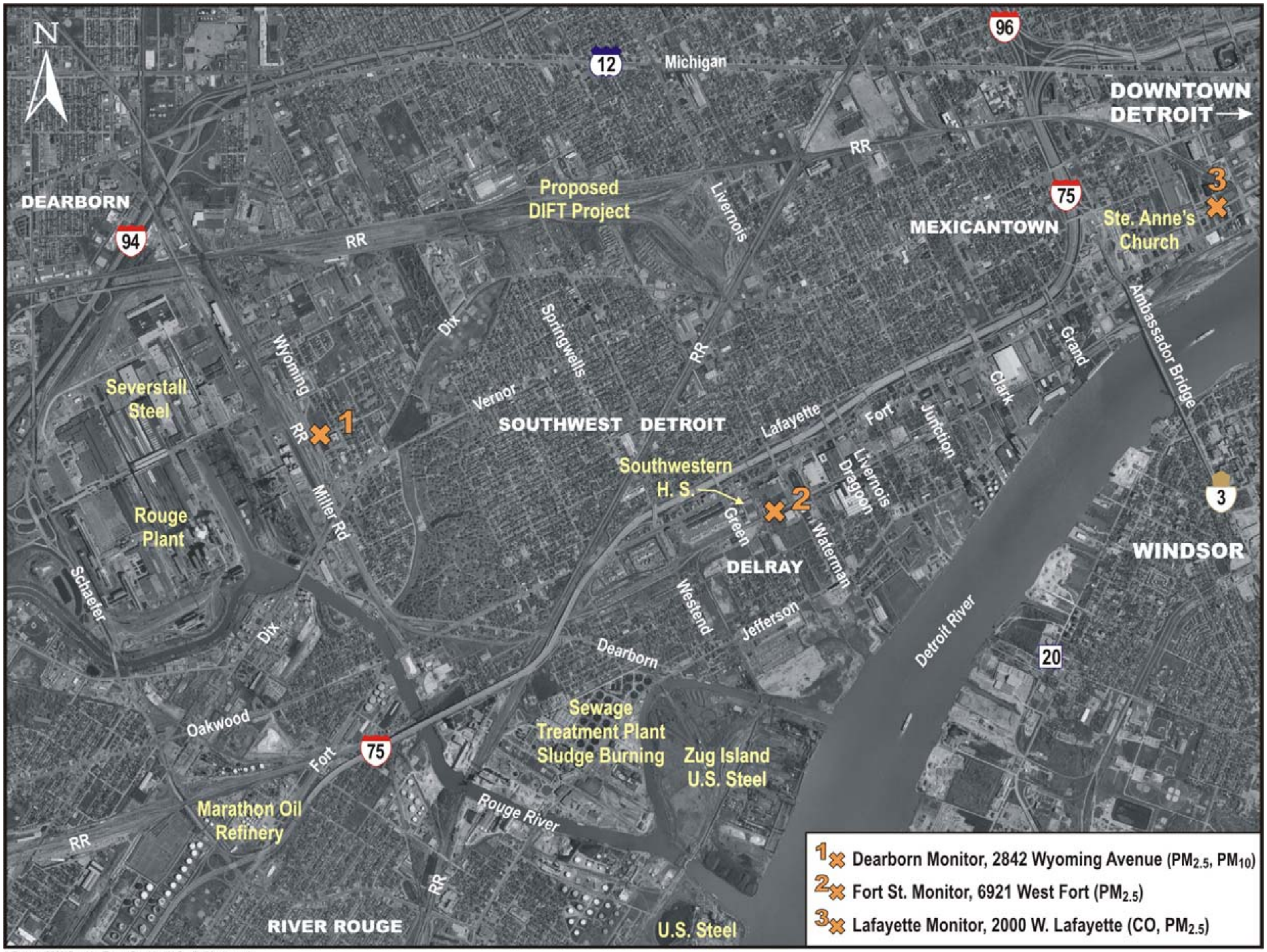
- A number of major polluters that were believed to be significant contributors to the PM emission problem have closed. Mandated enforcement controls are being applied at other local industries such as Severstal Steel, Marathon Oil[3] and U.S. Steel (Figure S-4). Marathon has announced additional air quality control measures as part of a proposed expansion.

- On a local, on-road basis in Southwest Detroit, provision of a new bridge to Canada will split on-road PM between the Ambassador Bridge and a new bridge. This will occur in 2013, three years after the 2010 date when the PM$_{2.5}$ annual standard is to be reached. If the SIP is successful, the SEMCOG region will be in attainment for the PM$_{2.5}$ annual standard before DRIC project implementation is open to traffic, while the 24-hour standard should be met in 2013.

- Information in Figure 5-8 demonstrates that vehicular activity in Southeast Michigan occurs without violation of standards. The Livonia monitor is in close proximity to some of the heaviest truck movements in the region and is not violating the PM$_{2.5}$ standards. And, this is occurring before the 2007 elimination of sulfur from fuels and more stringent diesel engine requirements.

[3] The Marathon Oil Company has applied for a permit to the Michigan Department of Environmental Quality (MDEQ) to substantially expand operations. The permit is under review. Marathon Oil believes it can meet the terms of the permit by balancing potential new emissions with shutdowns of other operations and improved pollution control. Detroit is one of several sites under consideration but is considered the frontrunner, if air quality permitting details can be worked out. On January 10, 2008, there was a public hearing on Marathon's plan.

Figure S-4
Detroit River International Crossing Study
Major Industries and Key Points



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Source: The Corradino Group of Michigan, Inc.

- Efficiencies can be expected from increased enrollment in the NEXUS (autos) and FAST (truck) programs when a clear lane through the border area becomes available with the DRIC project. This means trucks will move across the new bridge and plaza more expeditiously, with less delay and idling, and reduced use of secondary inspections.

- With a new plaza the number of Gamma Ray Inspection Technology (GRIT) lanes at the Detroit-Windsor border will increase, reducing queuing and idling. GRIT is part of the non-intrusive inspection of trucks coming into the U.S.

- U.S. Customs and Border Protection has instituted a policy requiring trucks to turn off their engines when they pull into the secondary inspection area.

- The rate of reduction in PM emissions will substantial outpace the increase in truck traffic volumes on I-75, the existing Ambassador Bridge and the new bridge that will divert traffic from the Ambassador Bridge.

- Measurements of PM are uniformly trending downward. SEMCOG has compared "industrial" and "non-industrial" monitoring sites and found that it is the industrial monitor sites that have been in violation of the $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS). Targeted measures are being applied to these sources, including the consent actions noted above and retrofits of local locomotives. SEMCOG believes the combination of localized actions, in concert with EPA's regulatory actions, will bring Southeast Michigan's monitors into attainment by April 2010.

This, and other conclusions drawn in this report, are now subject to interagency consultation and public discussion.

1. INTRODUCTION

The Detroit River International Crossing (DRIC) Study is a bi-national effort to complete the environmental study processes for the United States, Michigan, Canada and Ontario governments for a new border crossing between Detroit and Windsor. The study proposes solutions that support the region, state, provincial and national economies while addressing civil and national defense and homeland security needs of the busiest trade corridor between the United States and Canada (Figure 1-1).

Figure 1-1
Detroit River International Crossing Study
Existing Detroit River International Crossings

The purpose of the Detroit River International Crossing Project is to: (for the foreseeable future, i.e., at least 30 years):

- Provide safe, efficient and secure movement of people and goods across the Canadian-U.S. border in the Detroit River area to support the economies of Michigan, Ontario, Canada and the U.S.

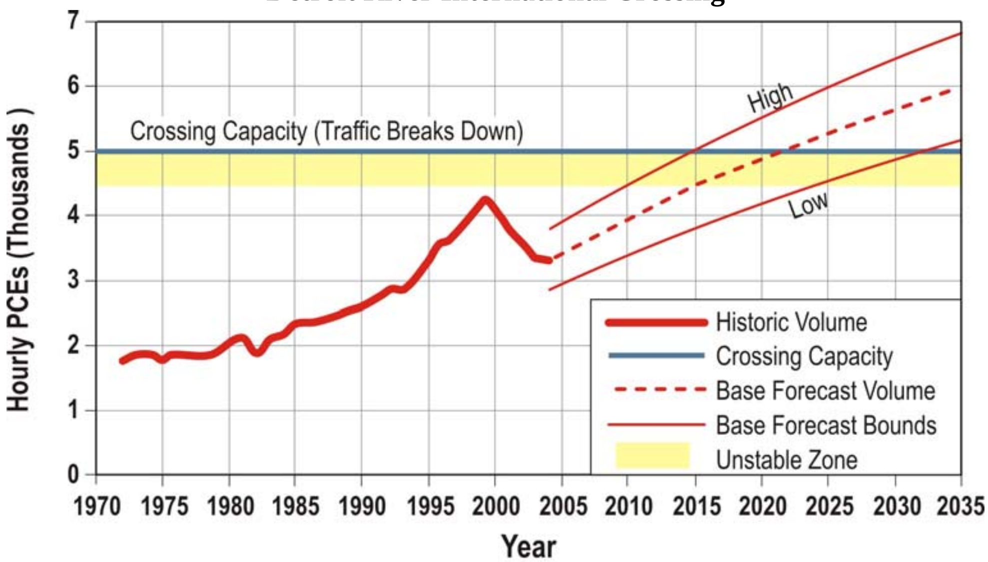
- Support the mobility needs of national and civil defense to protect the homeland.

To address future mobility requirements (i.e., at least 30 years) across the Canada-U.S. border, there is a need to:

- Provide new border crossing capacity to meet increased long-term demand;
- Improve system connectivity to enhance the seamless flow of people and goods;
- Improve operations and processing capability; and,
- Provide reasonable and secure crossing options in the event of incidents, maintenance, congestion, or other disruptions.

Over the next 30 years, Detroit River area cross-border passenger car traffic is forecast to increase by approximately 57 percent, and movement of trucks by 128 percent. Traffic demand could exceed the "breakdown" point for cross-border roadway capacity as early as 2015 under high growth scenarios. Even under "low" projections of cross-border traffic, the "breakdown" point for roadway capacity of the existing Detroit River border crossings (bridge and tunnel combined) will be exceeded by 2033 (Figure 1-2). Additionally, the capacity of the connections and plaza operations will be exceeded in advance of capacity constraints of the roadway. Without improvements, this will result in a deterioration of operations, increased congestion and unacceptable delays to the movement of people and goods in this strategic international corridor.

Figure 1-2
Travel Demand vs. Capacity:
Combined Detroit River Crossings
Detroit River International Crossing



Note: Figure 1-2 is from the DRIC Travel Demand Forecast Working Paper (September 2005), prepared by the IBI Group. The Passenger Car Equivalent factor (PCE) used in that report, and in Figure 1-2, is 3.0 cars per truck. SEMCOG calculates PCEs at a rate of 2.5 cars per truck in its regional roadway system. The DEIS uses SEMCOG's factor.

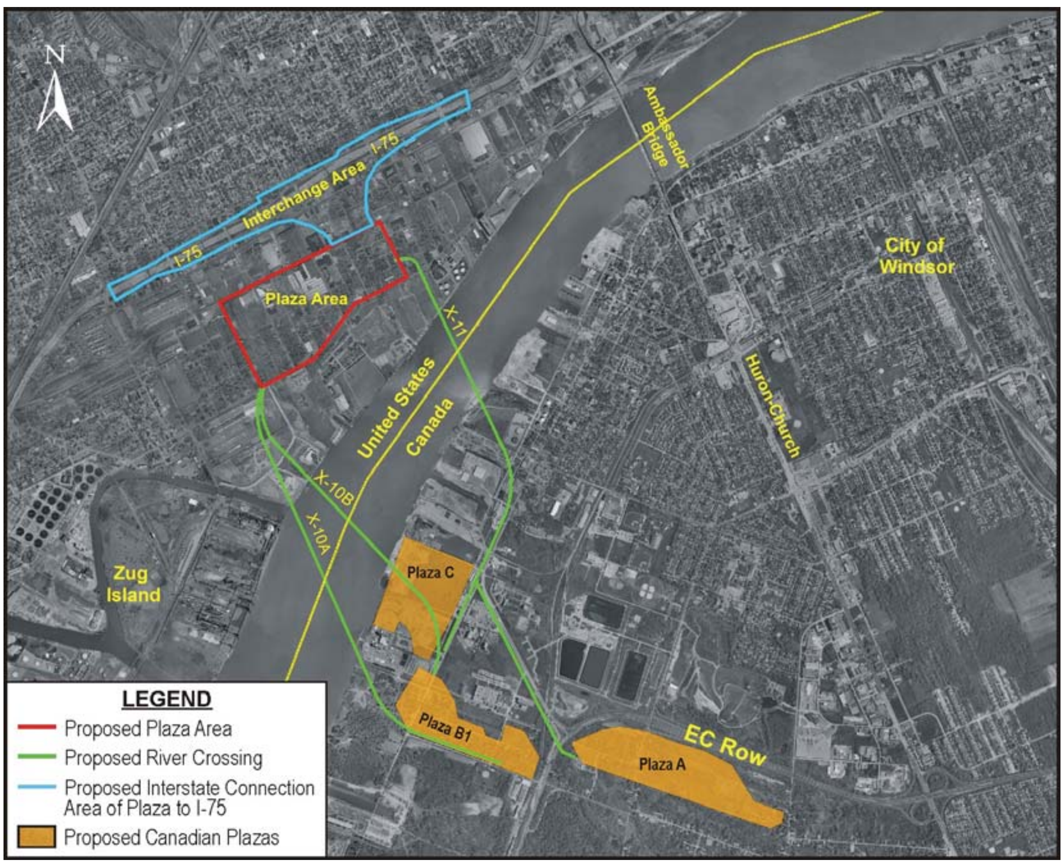
Source: IBI Group

The forecast of capacity of the border crossing system indicates that there will be inadequacies in: 1) the roads leading to the existing bridge and tunnel; 2) the ability to process vehicles through customs and immigration; and, 3) the capacities (number of lanes) of the Ambassador Bridge and Detroit-Windsor Tunnel themselves. The planning, design and construction of any international crossing take time. Even though incremental adjustments can and will be made to the plazas and despite adequate border crossing capacity today (bridge and tunnel combined), it is prudent to address how and when the future capacity need is to be satisfied at the crossing itself, as well as the connecting roads, long before it is required.

1.1 Practical Alternatives

The DRIC Draft Environmental Impact Statement (DEIS) analyzes issues/impacts on the U.S. side of the border of the end-to-end crossing system over the Detroit River between Detroit, Michigan, and Windsor, Ontario, Canada. The alternatives are comprised of three components: the crossing, plaza (where tolls are collected and Customs inspections take place), and interchange connecting the plaza to I-75 (Figure 1-3). Nine alternatives exist in the U.S. These options are listed on Table 1-1 and schematically presented in Figures 1-4 and 1-5.

Figure 1-3
Detroit River International Crossing Study
U.S. Area of Analysis for Crossing System



Source: The Corradino Group of Michigan, Inc.

Table 1-1
Detroit River International Crossing Study
Crossing System Alternatives Included in DRIC DEIS

Alternative	Interchange	Plaza	Crossing	Proposed Status
#1	A	P-a	X-10	Analyzed in DEIS
#2	B	P-a		Analyzed in DEIS
#3	C	P-a		Analyzed in DEIS
#5	E	P-a		Analyzed in DEIS
#14	G	P-a		Analyzed in DEIS
#16	I	P-a		Analyzed in DEIS
#7	A	P-c	X-11	Analyzed in DEIS
#9	B	P-c		Analyzed in DEIS
#11	C	P-c		Analyzed in DEIS

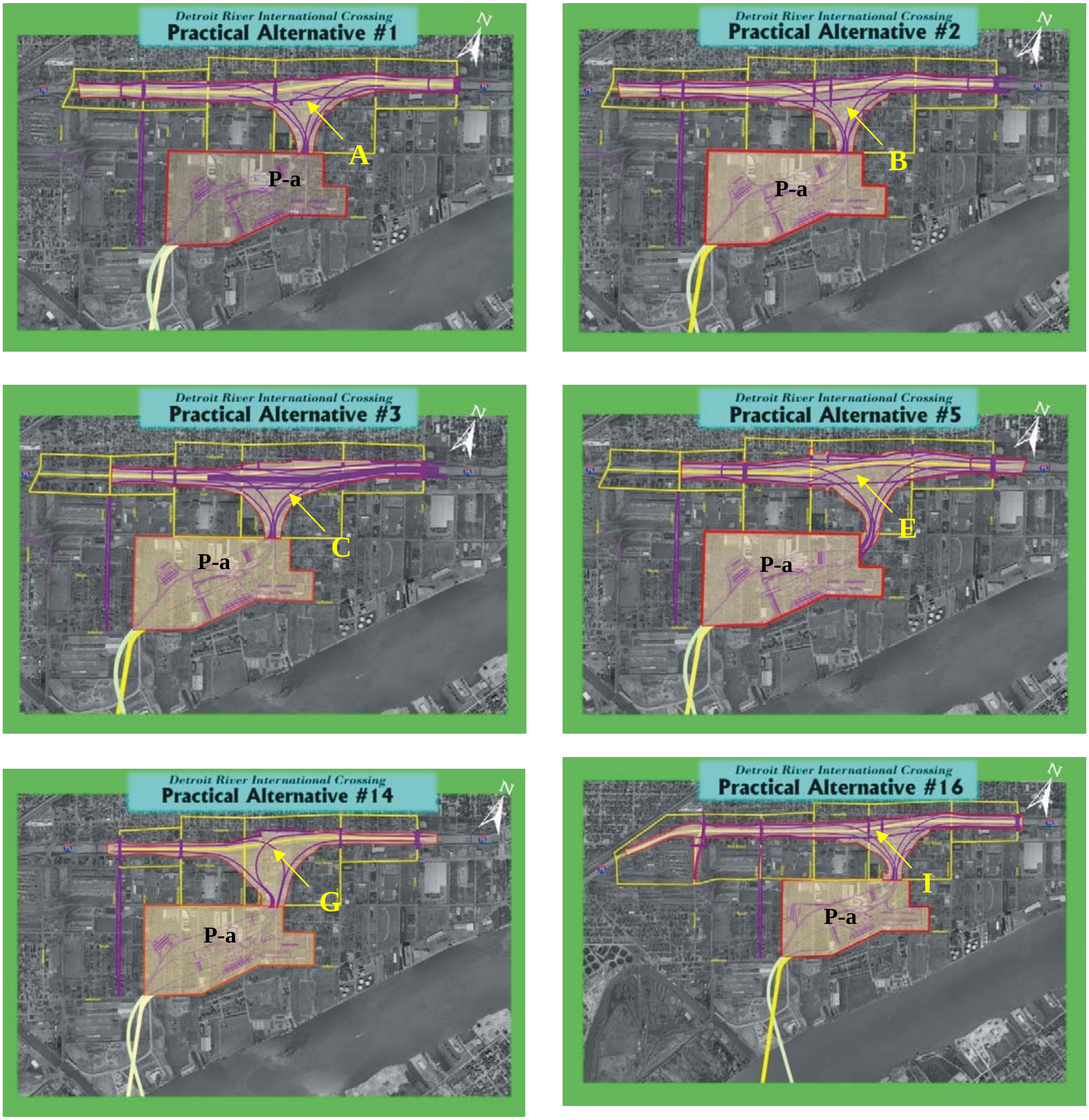
Source: The Corradino Group of Michigan, Inc.

1.2 Purpose of the Report

The purpose of this report is two-fold: 1) to provide insight into the differences among the Practical Alternatives consistent with the National Environmental Policy Act; and, 2) to support the determination that the project conforms to Michigan's State Implementation Policy (SIP) for Air Quality. That document contains the regulations and other materials for meeting clean air standards and associated federal Clean Air Act requirements.

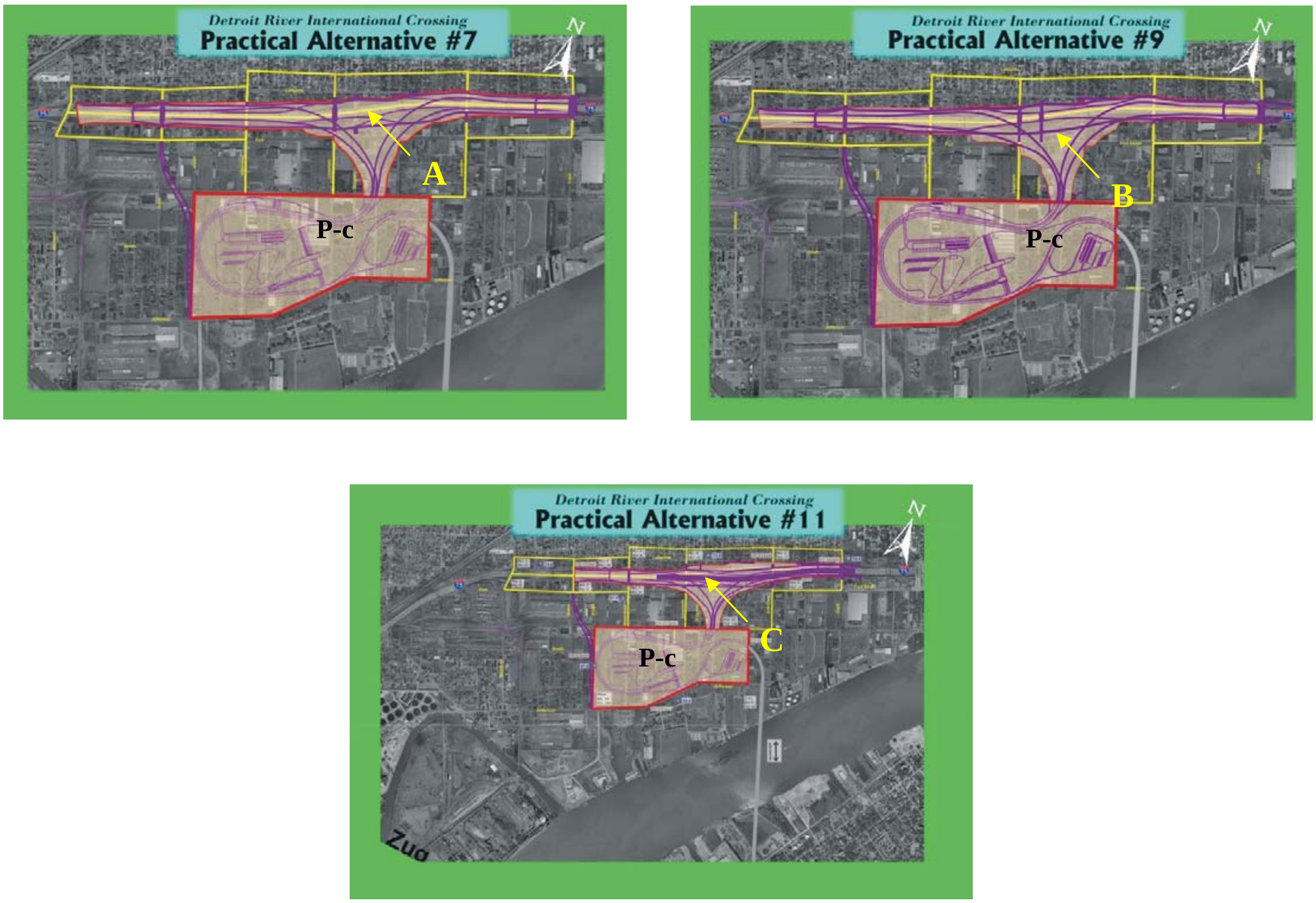
Impacts in the United States are covered in this report. Impacts in Canada are discussed in the "Indirect and Cumulative Impacts" section of the DEIS.

Figure 1-4
Detroit River International Crossing Study
Schematic Representation
of
X-10 Crossing Alternatives #1, #2, #3, #5, #14 and #16



Source: The Corradino Group of Michigan, Inc. and Parsons Transportation Group

Figure 1-5
Detroit River International Crossing Study
Schematic Representation
of
X-11 Crossing Alternatives #7, #9, #11



Source: The Corradino Group of Michigan, Inc. and Parsons Transportation Group

2. METHODOLOGY

The scope of and methodology used in this air quality analysis are consistent with current guidance from the Federal Highway Administration (FHWA) and MDOT. Additional interagency consultation was held with the Southeast Michigan Council of Governments (SEMCOG), the U.S. Environmental Protection Agency (EPA) Region 5, and the Michigan Department of Environmental Quality (MDEQ). Appendix A provides more information on the consultation process. Consultation resulted in the *DRIC Air Quality Analysis Protocol*,[4] which covers the following topics:

1. An explanation of recent steps to improve air quality and past and future trend data;
2. A comparative analysis of the air quality effects of the Practical Alternatives in the DEIS, consistent with the National Environmental Policy Act;
3. A quantitative analysis of Mobile Source Air Toxics (MSATs) consistent with the *Interim Guidance on Air Toxics in NEPA Documents* (FHWA, February 3, 2006);
4. The SEMCOG region's attainment status with respect to air quality standards - for this DEIS, an explanation of Clean Air Act conformity needs - for the FEIS, additional analyses that show project conformity to the Clean Air Act. Conformity analysis covers:
   - General conformity (as applicable; see 40 CFR 93.153(b)); and,
   - Transportation conformity. Project-level conformity determinations must meet several criteria (see 40 CFR 93.109(b)), including:
     - Regional analysis: ozone, carbon monoxide (CO), and particulate matter ($PM_{2.5}$ and PM_{10})[5] as demonstrated by the project coming from a currently conforming transportation plan and Transportation Improvement Program (TIP); and,
     - Hot-spot conformity (40 CFR 93.123 (b)(iii):
       - ✓ CO (quantitative)
       - ✓ $PM_{2.5}$ (qualitative)
       - ✓ PM_{10} (qualitative)
5. Construction impacts.

The need for the proposed project stresses not just additional cross-border capacity, but economic security and redundancy. A new bridge is called for prior to its need from a capacity point of view. This means, until the time when border capacity is reached, the proposed project will provide redundancy and security by offering another path for border-crossing traffic.[6] Those who choose to use the new bridge would tend to be those for whom it provides a shorter/quicker path. This means the existing traffic, and its related air pollution emissions, will be split, diverting vehicles primarily from the Ambassador Bridge, but also from the Detroit-Windsor Tunnel, and even the Blue Water Bridge at Port Huron (60 miles northeast). At the point that a new crossing is needed to meet capacity requirements, i.e., between 2015 and 2035, air quality emissions from individual newer vehicles will be substantially reduced.

[4] The Corradino Group, *Detroit River International Crossing Study Air Quality Protocol*, May 31, 2007.

[5] $PM_{2.5}$ refers to particulate matter that is 2.5 micrometers or smaller in size. Sources of $PM_{2.5}$ include fuel combustion from automobiles, power plants, wood burning, industrial processes, and diesel-powered vehicles such as buses and trucks. These fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds (all of which are also products of fuel combustion) are transformed in the air by chemical reactions. Fine particles are of concern because they are so small they are able to penetrate to the deepest parts of the lungs, where the body has difficulty expelling them. PM_{10} refers to particulate matter that is up to 10 micrometers in size and includes roadway dust.

[6] There would be a slight shift from Port Huron as the Detroit-Windsor route became more attractive to some.

As the new bridge diverts traffic from the Ambassador Bridge, it will tend to serve vehicles with destinations to the south, especially south on I-75. To the extent this occurs, those vehicles will be taking a "short cut" and avoid the section of I-75 between the proposed bridge and the Ambassador Bridge. This means a shorter distance and/or time path, which translates to less air pollution for those movements. Travel demand analyses are covered in Sections 3.1 and 3.2.

2.1 Recent EPA Actions and NAAQS Pollutant Trends

This section presents information about air quality trends for several National Ambient Air Quality Standards (NAAQS) pollutants (refer to Table 5-1), including measures EPA is taking to improve air quality and data from air quality monitoring stations nearest the project.

2.1.1 Air Quality Trends and EPA Measures to Improve Air Quality

EPA has issued a suite of motor vehicle and fuels regulations, including: 1) tailpipe emission standards for cars, SUVs, mini-vans, pickup trucks and heavy trucks and buses; 2) standards for cleaner-burning gasoline; 3) a national low-emission vehicle program; and, 4) standards for low-sulfur gasoline and diesel fuel. The seven-county SEMCOG region, plus Lenawee County, is subject to 7.0 low-vapor-pressure gasoline as a selected control measure to help control ozone formation, effective the summer of 2007. These requirements are expected to substantially reduce emissions.

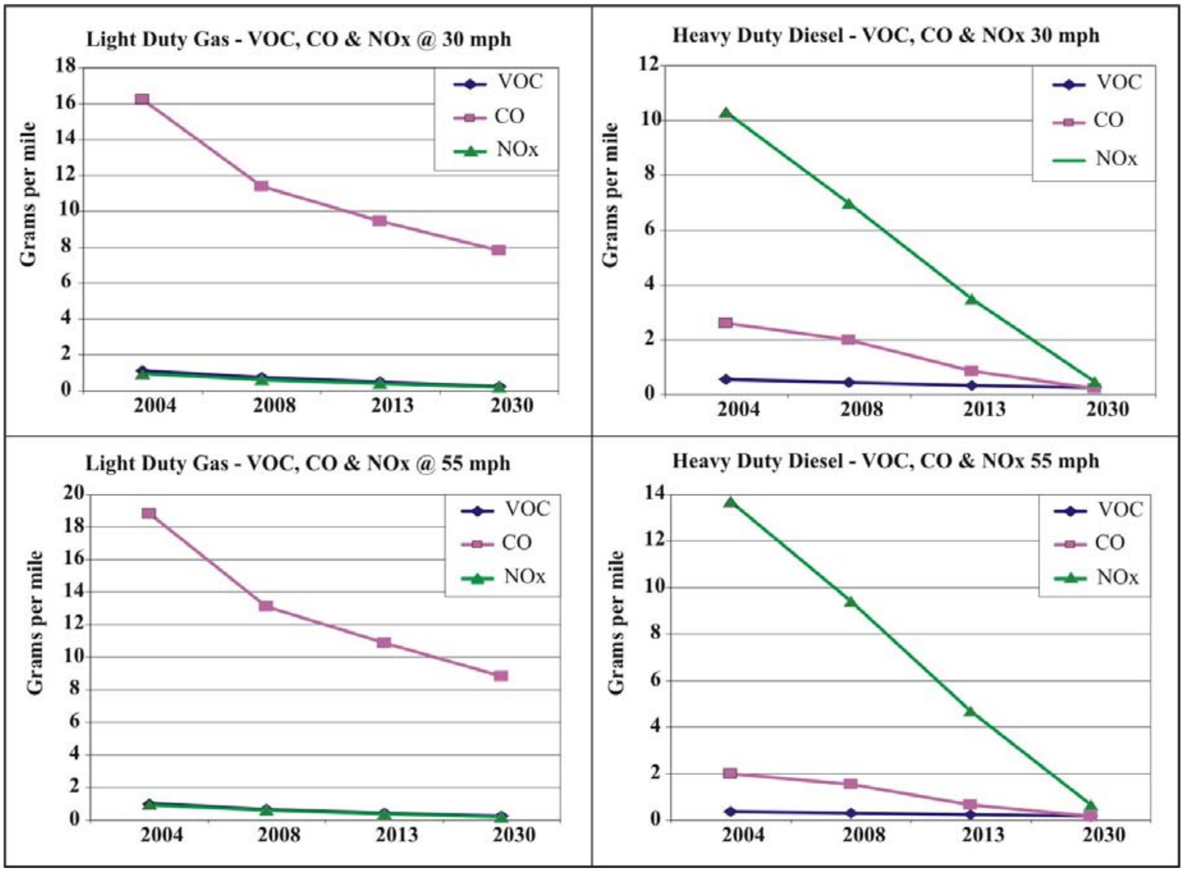
In addition, EPA issued a regulation in May 2004 to control emissions from diesel-powered non-road engines, such as construction equipment and railroad locomotives. EPA also provides assistance in identifying and implementing voluntary programs, such as diesel retrofits, to achieve additional reductions.

The EPA-approved MOBILE6.2 model incorporates future emission factors for the NAAQS pollutants associated with mobile sources. The model accounts for the recent EPA regulatory changes noted above. Emission factors vary by speed and type of vehicle. By focusing on representative vehicle types and speeds, future emission factors can be related to trends over time (i.e., 2004, 2008, 2013, and 2030). Figures 2-1a, b, c and d depict trends for carbon monoxide (CO), nitrogen dioxide (NO_2), and volatile organic compounds (VOCs) for the following example conditions (using SEMCOG-based data assumptions):

- Passenger vehicles and NAAQS pollutants at 30 and 55 mph (Figures 2-1a and 2-1b, respectively)
- Trucks and NAAQS pollutants at 30 and 55 mph (Figures 2-1c and 2-1d, respectively)

In each case, substantial pollutant reduction is the trend. This is true of passenger vehicles and trucks. Another positive factor with respect to future trends is that the vehicle mix will include an increasing proportion of very-low pollution-emitting vehicles, such as hybrids. This would appear even more likely in light of the April 2, 2007, Supreme Court ruling that EPA can regulate CO_2 as an air pollutant, which is expected to influence the market to move away from hydrocarbon-based fuels. And, the U.S. Congress passed new fuel efficiency standards in December 2007. The MOBILE6.2 emission factors used here and expressed in the graphs are conservative in that they continue to assume a contemporary fleet mix.

Figure 2-1a-d
Detroit River International Crossing Study
MOBILE6.2 Emission Factor Trends – VOC, CO and NOx



Note: See Section 5.3.2.2 for PM trends.
Source: The Corradino Group of Michigan, Inc. using MOBILE6.2 with SEMCOG inputs.

It is noted that information on ozone is not presented in Figure 2-1 because it does not come out of a tailpipe like the other pollutants shown here. It forms in the atmosphere from precursors such as VOCs and oxides of nitrogen (NOx). So ozone is monitored and reported in that way.

2.1.2 Monitoring Station Data

Air quality monitoring station data for NAAQS pollutants (other than particulate matter) for collection points nearest to the project are displayed in Figures 2-2 through 2-6. (It is noted that trend data for particulate matter are presented in Section 5.2.) The locations and the pollutants monitored are:

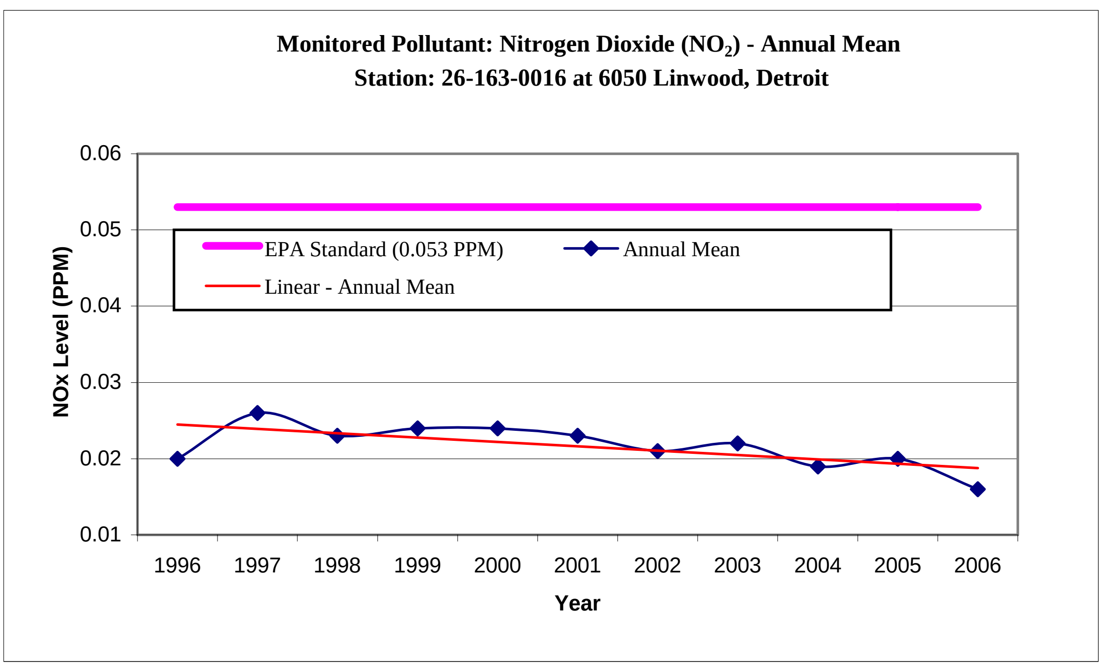
- West Lafayette (Station 26-163-0039 at 2000 West Lafayette) – CO
- Linwood (Station 26-163-0016 at 6050 Linwood) – CO, NO_2, and O_3

For a number of years, the measurement of NO_2 at the Linwood monitor has been less than half the annual standard. The trend continues downward (Figure 2-2).

The trend in CO is clearly down and has been for some time with all values well under the one- and eight-hour standards (Figures 2-3 and 2-4). (It is noted that only two years of data are available for the West Lafayette station.) As enough time passes, it is expected the region will advance from maintenance to full attainment. Starting in 2007, under amended Clean Air Act regulations, CO monitoring in Michigan is no longer required.

Ozone shows a downward trend in terms of the one-hour standard, but the eight-hour standard is now in effect (Figures 2-5 and 2-6). Eight-hour average values have been flat over the last several years and very near the standard. This is true at Linwood (Figure 2-6), the monitor closest to the project and the other monitors in the region. Attainment is based on a three-year average of the 4th highest 8-hour measurements. Data statewide show values very near the standard, even in the Upper Peninsula. However, the three-year average ending in 2006 shows progress is being made as all monitors, except one in Allegan County, meet the standard.[7]

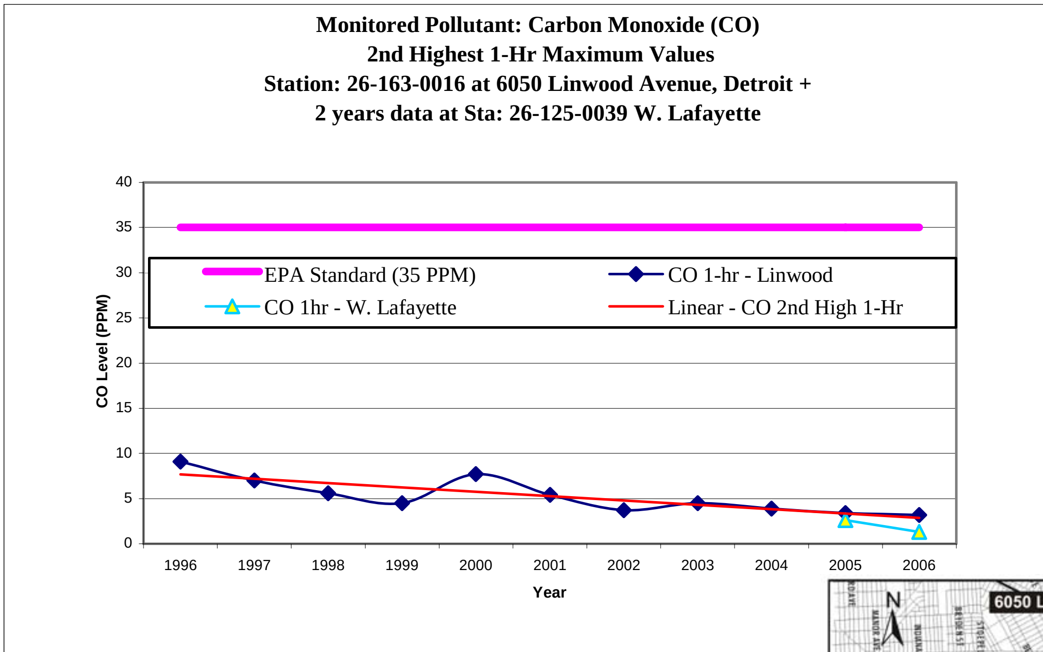
Figure 2-2
Detroit River International Crossing Study



Source: The Corradino Group of Michigan, Inc. using MDEQ data.

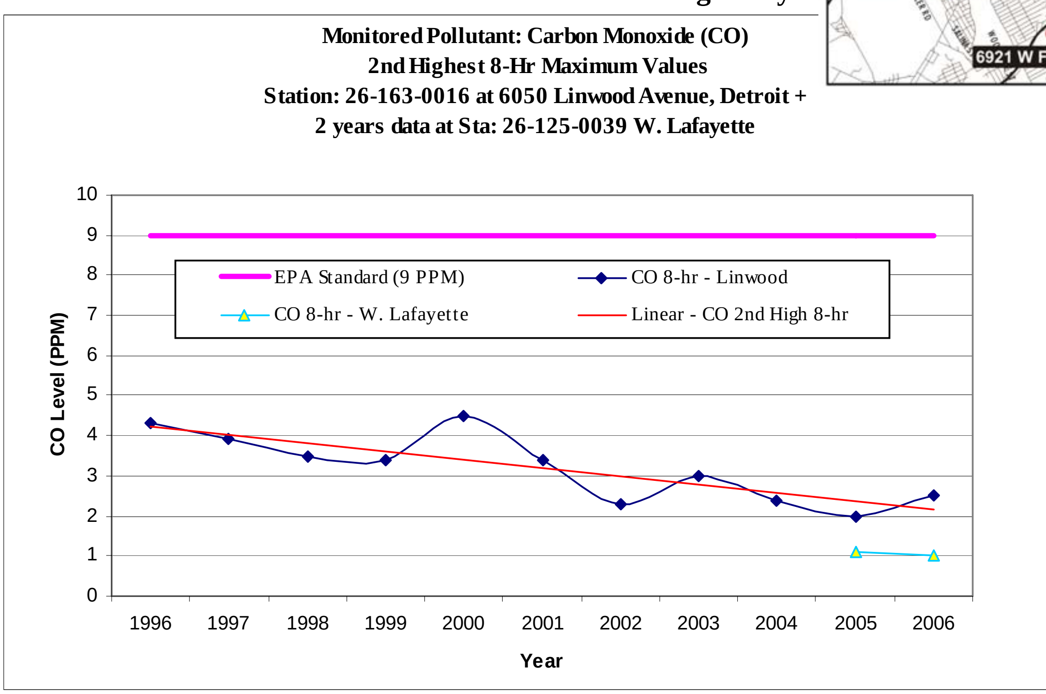
[7] Michigan Department of Environmental Quality, Air Quality Division, *2006 Air Quality Report*, December 2007.

Figure 2-3
Detroit River International Crossing Study



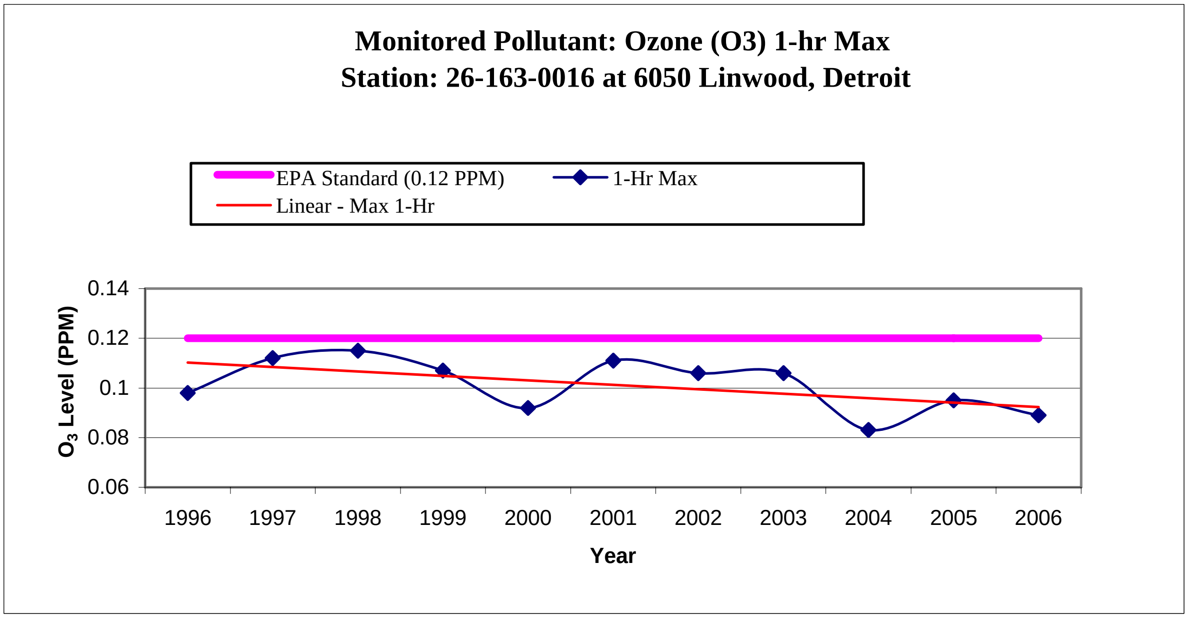
Source: The Corradino Group of Michigan, Inc. using MDEQ data.

Figure 2-4
Detroit River International Crossing Study



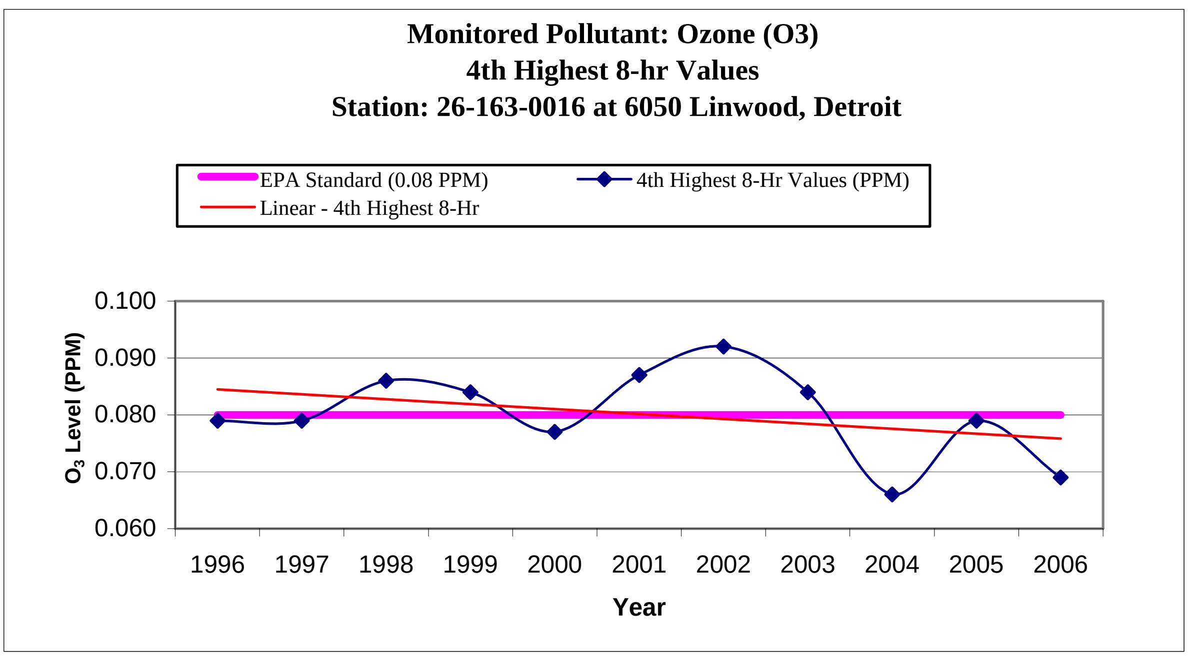
Source: The Corradino Group of Michigan, Inc. using MDEQ data.

Figure 2-5
Detroit River International Crossing Study



Source: The Corradino Group of Michigan, Inc. using MDEQ data.

Figure 2-6
Detroit River International Crossing Study



Source: The Corradino Group of Michigan, Inc. using MDEQ data.

3. COMPARATIVE ANALYSIS OF PRACTICAL ALTERNATIVES

The analysis of the Practical Alternatives examines vehicle miles and hours of travel (VMT and VHT) to compare air quality emissions. The DRIC Practical Alternatives provide an alternative path to cross the border between Detroit and Windsor, and, therefore, shorten the travel distance and time paths for some drivers. All practical alternatives "land" in Delray, a subsector of Southwest Detroit bounded by Zug Island and the Ambassador Bridge, and I-75 and the Detroit River (refer to Figure 1-3). This analysis examined peak and daily data for the base condition (2004), year of opening (2013), which is also the year of greatest project emissions, an intermediate year (2025), and horizon year (2035). The base year condition (2004) does not include the Ambassador Bridge Gateway project that will reconfigure the traffic patterns there by 2009 and greatly reduce localized congestion. The Gateway Project is included in the analyses of future conditions.

3.1 Travel Demand Modeling

Different travel demand modeling analyses were performed throughout the DRIC. The reader is referred to the *Traffic Analysis Report*[8] for details. The highest traffic volumes for the various Practical Alternatives were used in the air quality analysis to represent the worst-case air quality conditions.

Practical Alternatives #1, #2, and #3 are represented by a single set of model runs, as they include an X-10 crossing, Plaza P-a, and a similar trumpet-type interchange at I-75. Alternative #5, also with an X-10 crossing and including Plaza P-a, has a trumpet-type interchange shifted far enough east (i.e., towards the Ambassador Bridge on I-75) that a separate set of traffic analyses was produced. Practical Alternatives #7, #9 and #11 are represented as a single set of runs as they are variations of an X-11 crossing with Plaza P-c. No separate model runs were made for Practical Alternatives #14 or #16 as they are most like Practical Alternatives #1, #2, and #3, and are grouped with them for air quality analysis purposes.

The key to these groupings is their overall layout. Alternatives #1, #2, #3, #14 and #16 provide a relatively direct connection to I-75 through Plaza P-a. There is no "doubling back" or circular movements on the plaza. This means fewer miles of travel between the international boundary and I-75. Alternative #5 follows this same general pattern. Reference is made to Figure 5-9 for graphic representation of the plaza configurations.

Practical Alternatives #7, #9 and #11 have less direct routings via Plaza P-c. Within that plaza, traffic doubles back on itself.

The travel demand analyses were designed to provide traffic data for the AM peak, the Midday, and the PM peak. Daily traffic is derived by factoring the three daily periods to a 24-hour total. Those factors will be refined, as needed and as data are collected by various agencies in the U.S. and Canada. The travel demand model was applied for the years 2004, 2015, and 2035.

Because pollutant emissions are dropping faster than vehicle miles of travel are increasing, the earliest possible year of analysis represents the year of expected peak air pollutant emissions.

[8] The Corradino Group of Michigan, Inc., *Detroit River International Crossing Study Traffic Analysis Report,* December 2007.

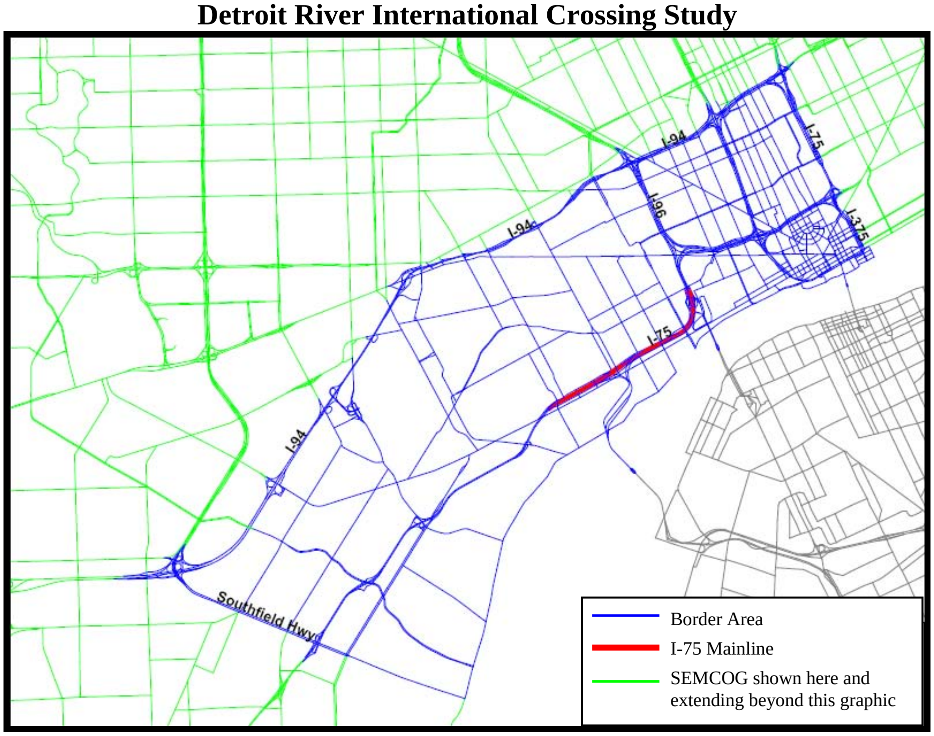
That year is 2013, when the new crossing is expected to be opened to traffic, so analysis was done for that year. The horizon year of SEMCOG's *Regional Transportation Plan* (RTP) is 2030. An intermediate year, 2025, was calculated for purposes of comparison. Because the travel demand modeling is for 2035, the values for VMT and VHT for 2025 and 2030 used here were interpolated from the 2015 and 2035 values. The values for 2013 were extrapolated from the 2015-to-2035 trend.

3.2 VMT and VHT Comparisons

The travel demand model was created specifically for the DRIC project and is a composite of detailed networks and trip tables representing the SEMCOG region, the state of Michigan, Windsor, and Ontario, with external zones and a road network representing more distant locations in the U.S. and Canada. The travel demand model runs treated all crossings equally in terms of delay related to toll collection and Customs inspections. Moreover, the travel model runs all used the same Canadian approach road and plaza alternatives, so these network components were held constant, as well. As a result, providing a new border crossing causes measurable travel shifts over a very wide area. A new crossing at Detroit-Windsor attracts travel from Port Huron, so shifts in VMT and VHT must take into account this broad regional area. At the same time, the close proximity of the proposed new border crossing to the Ambassador Bridge and the Detroit-Windsor Tunnel means the directness of a new crossing has an effect on the split of traffic among these local crossings.

Because of the sensitivity of the travel demand model to the configuration of a new crossing, VMT and VHT were examined from several perspectives (Figure 3-1).

Figure 3-1
VMT/VHT Analysis Area
Detroit River International Crossing Study



Source: The Corradino Group of Michigan, Inc.

- Region: This area is the SEMCOG seven-county region, including St. Clair County/Port Huron (Blue Water Bridge).

- Detroit-Windsor Border Crossing Area: This area includes the two existing crossings and the proposed new bridge and their immediate travel sheds. The area is bounded by the Southfield Freeway (M39), I-94, I-375 (east side of downtown Detroit) and the Detroit River (international border at the middle of the river).

- I-75: Traffic data for the I-75 link between Dearborn Avenue (Exit 44) and the I-96/I-75 split (Exit 48) were used to define changes in air quality at the most local level, near the project in Southwest Detroit.

It is noted that Table 3-1 provides data for the year of peak emissions, 2013. Two-way daily traffic estimates on the Ambassador Bridge and new bridge are provided at the top of the table to show the influence of the new bridge. The data are for international travel, i.e., vehicles that cross the border. One can see the new bridge would attract trucks in greater proportion than autos. Data for the AM peak, Midday, and PM peak, and for 2004, 2015, 2030, 2025, and 2035 are found in Appendix B. The data for 2015, 2025, 2030 and 2035 reflect similar patterns as the information presented in Table 3-1, which shows conditions for the midday and PM peak hours.

1. While a shift in traffic from the Blue Water Bridge to the Detroit-Windsor crossing area (defining that crossing as the Ambassador Bridge, the Detroit-Windsor tunnel, and a DRIC bridge, if built) is expected, there would be virtually no difference in VMT and VHT in the <u>SEMCOG region</u> (refer to Figure 3-1) from one DRIC alternative to another in the midday peak or between them and the No Build Alternative (refer to Table 3-1). There would be a uniform decrease in truck VMT in the 2013 PM peak of all Build Alternatives over No Build. VHT would be the same for all alternatives.

2. With respect to the <u>border crossing area</u>, Practical Alternative Set #1/2/3/14/16 and Alternative #5 would carry substantially more traffic across a new bridge than Practical Alternative Set #7/9/11. But, the longer movements on the plaza of Practical Alternative Set #7/9/11 increase its VMT and VHT characteristics such that it falls between the No Build Alternative and other Build Alternatives. Because all Build Alternatives draw traffic from the Blue Water Bridge, each would slightly increase VMT and VHT in the border crossing area during the 2013 midday and PM peaks. Therefore, air pollution emissions in the border crossing area would increase. However, it is recognized that stricter vehicle emission controls and fuel standards being put into place will result in future mobile source (vehicular) pollution being less than it is now.

3. <u>Along I-75</u>, all Build Alternatives except #5 would have lower VMT and VHT than the No Build Alternative in the 2013 midday and PM peaks.

   The VMT and VHT data and the background traffic volumes on I-75 also lead to the conclusion that within the area of Southwest Detroit along I-75, there is no substantial difference expected among the DRIC alternatives compared to the No Build condition with respect to sensitive receptors (refer to Figure 3-2). The area of predominant, albeit sparse, residential development in Delray is west of the proposed plaza area where homes are spread over several blocks, with more vacant lots than homes. The densest population area is north of I-75. That is why the I-75 section was identified for comparison.

Table 3-1
Detroit River International Crossing Study
Peak and Midday Vehicle Miles and Hours of Travel (VMT and VHT) Comparison – 2013

Build Alternative has fewer VMT or VHT than No Build

	2004		No Build		Alt 1/2/3/14/16		Alt 5		Alt 7/9/11	
2-way Amb. Bridge Daily Vol.										
Auto	**17,000**		**25,444**		**16,107**		**15,601**		**20,849**	
Truck	**9,000**		**15,077**		**3,154**		**3,016**		**9,623**	
2-way New Bridge Daily Vol.										
Auto	**NA**		**NA**		**13,215**		**13,744**		**7,479**	
Truck	**NA**		**NA**		**13,325**		**12,979**		**6,529**	
Total Daily Vol. – Both Bridges	**26,000**		**40,521**		**45,801**		**45,340**		**44,480**	
MIDDAY PEAK HOUR										
SEMCOG Region	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	52,723	964	77,251	1,416	77,497	1,423	77,652	1,425	77,521	1,423
Truck	46,612	763	63,321	1,035	62,954	1,034	63,116	1,038	63,226	1,035
Total	99,335	1,727	140,572	2,451	140,451	2,457	140,768	2,462	140,747	2,459
Border Crossing Area [a]	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	7,877	178	10,808	242	11,663	258	11,819	260	11,552	256
Truck	5,463	111	7,584	155	8,785	178	8,851	180	8,074	164
Total	13,340	289	18,392	397	20,447	435	20,670	440	19,626	420
I-75 Mainline [b]	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	656	11	1,051	18	893	15	993	17	889	15
Truck	786	13	1,165	19	1,010	17	1,100	19	778	13
Total	1,442	24	2,215	37	1,903	32	2,093	35	1,666	28
United States	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	94,550	1,610	128,391	2,205	128,091	2,204	128,269	2,206	128,266	2,207
Truck	151,150	2,400	204,372	3,245	202,590	3,223	202,843	3,228	203,391	3,232
Total	245,700	4,010	332,763	5,450	330,681	5,427	331,113	5,434	331,657	5,439
PM PEAK HOUR										
SEMCOG Region	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	76,566	2,553	108,691	3,292	109,834	3,298	110,129	3,293	109,932	3,302
Truck	47,096	824	64,234	1,136	63,151	1,129	63,343	1,130	63,726	1,135
Total	123,662	3,377	172,925	4,428	172,985	4,427	173,472	4,423	173,657	4,437
Border Crossing Area [a]	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	14,045	359	19,262	516	21,248	527	21,543	526	21,369	532
Truck	5,354	117	7,666	165	8,623	195	8,747	194	8,575	189
Total	19,399	476	26,929	682	29,871	722	30,290	721	29,944	722
I-75 Mainline [b]	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	1,145	20	1,721	31	1,772	34	1,921	36	1,607	29
Truck	852	15	1,265	23	960	17	1,080	19	783	14
Total	1,997	36	2,986	53	2,732	51	3,000	56	2,391	42
United States	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**	**VMT**	**VHT**
Auto	119,377	3,231	157,094	4,069	157,154	4,061	157,491	4,056	157,495	4,068
Truck	161,738	2,636	219,475	3,595	215,441	3,549	215,736	3,551	216,671	3,563
Total	281,115	5,867	376,569	7,664	372,595	7,610	373,227	7,607	374,166	7,631

[a] An area bounded by the Southfield Freeway (M39), I-94, I-375, and the Detroit River

[b] Between Dearborn Street (Exit 44) and the I-96/I-75 interchange (Exit 48).

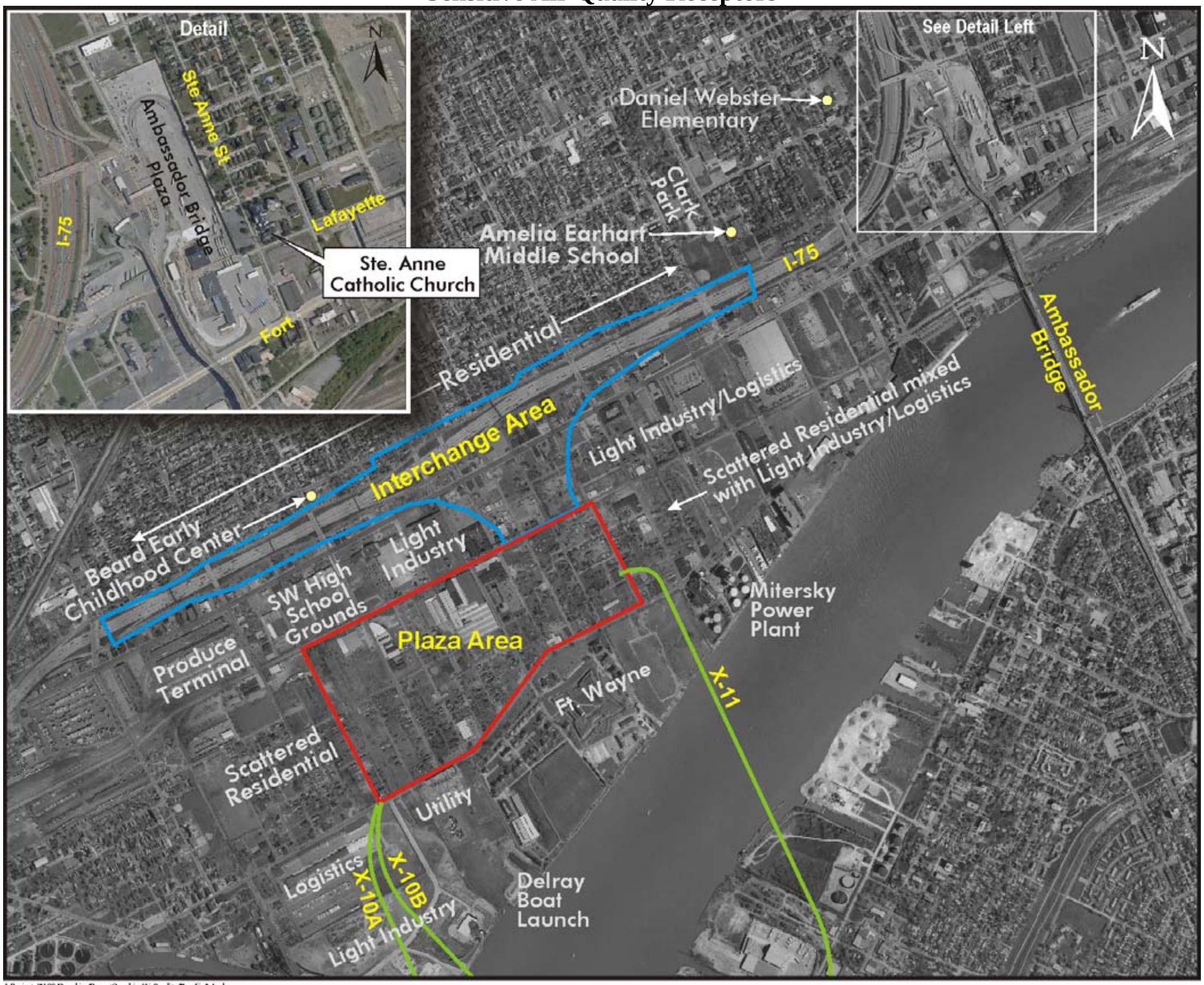
Source: The Corradino Group of Michigan, Inc.

Sensitive receptors include Southwestern High School, located on Fort Street, a state trunkline highway to the west of the proposed plaza area. The school fronts directly onto Fort Street. It would be separated from the project's plaza by ball fields, tennis courts, a railroad track, and a buffer zone around the plaza. Between the proposed project and the Ambassador Bridge on the north side of I-75 are the Amelia Earhart Middle School and Daniel Webster Elementary School (Figure 3-2). Further west at Waterman is the Beard Early Childhood Center. There is little difference among the DRIC alternatives from one another or from the no build condition with respect to sensitive receptors in the area of I-75 and south in Delray.

North of I-75 there is an opportunity to reduce truck traffic on the Livernois/Dragoon one-way pair that serves a dense residential area. These streets carry a substantial volume of truck traffic and serve the Livernois-Junction intermodal terminal one mile to the north (refer to Figure S-4). This intermodal terminal is where freight containers are exchanged from truck to rail or rail to truck. A proposed project called the Detroit Intermodal Freight Terminal (DIFT) Study would reorient the major entrance to this intermodal yard and would greatly reduce the truck use of the Livernois/Dragoon one-way pair. All DRIC Practical Alternatives virtually eliminate direct access by heavy-duty diesel trucks via Livernois/Dragoon to this intermodal terminal, and the residential area south of it, by modifying the ramp system on I-75. This will improve air quality conditions in a section of Southwest Detroit.

The Ambassador Bridge plaza does have a cluster of relatively dense residential units immediately to its east. This area, which is around Ste. Anne's Catholic Church, has seen strong redevelopment and infill housing in the last decade. The DRIC would divert traffic from this Ambassador Bridge plaza, reducing vehicular emission in another area of Southwest Detroit (see detail on Figure 3-2).

Figure 3-2
Detroit River International Crossing Study
Sensitive Air Quality Receptors



Source: The Corradino Group of Michigan, Inc.

4. MOBILE SOURCE AIR TOXICS (MSATS)

This mobile source air toxic (MSAT) analysis is based on the *Interim Guidance on Air Toxics in NEPA Documents* (FHWA, February 3, 2006).

4.1 Guidance and Trends

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA regulates air toxics. Most 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).

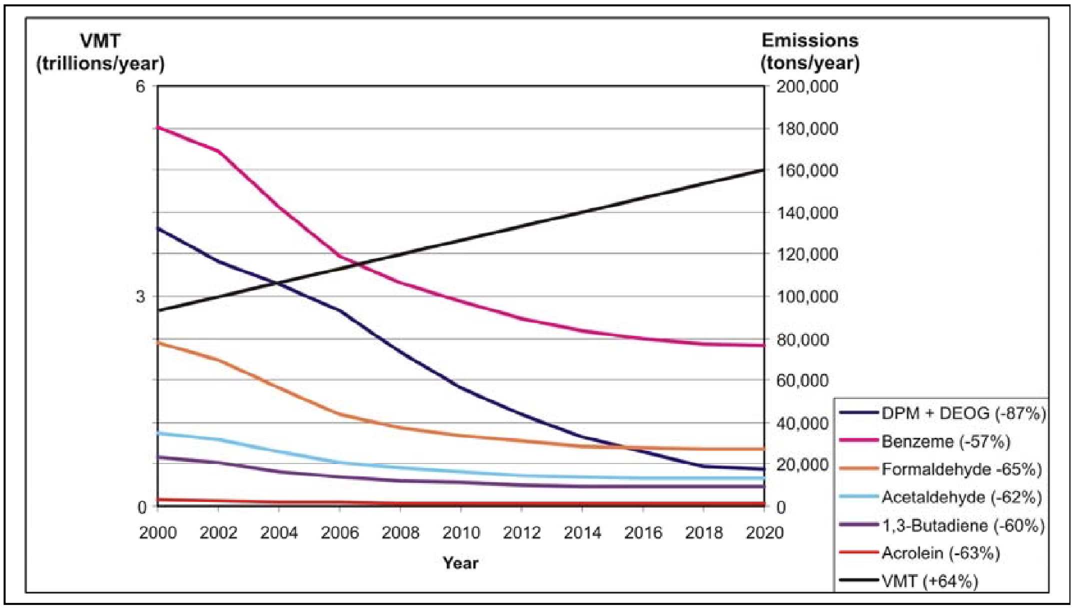
Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels, as secondary combustion products, and from brake and tire wear. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

EPA is the lead federal agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The Agency issued a Final Rule on *Controlling Emissions of Hazardous Air Pollutants from Mobile Sources* (66 FR 17229, March 29, 2001) 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: 1) reformulated gasoline (RFG) program; 2) national low-emission vehicle (NLEV) standards; 3) Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements; and, 4) 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 (national average), these programs will result in reductions of on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde ranging from 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in Figure 4-1. (It is noted that in this time frame VMT growth in the SEMCOG region will be substantially less, so MSATs reductions in the region will be even greater than this national example.)

In February 2007, EPA finalized a rule to reduce hazardous air pollutants from mobile sources (*Control of Hazardous Air Pollutants from Mobile Sources*, February 9, 2007). The rule will limit the benzene content of gasoline and reduce toxic emissions from passenger vehicles and portable gas cans. EPA estimates that in 2030 this rule would reduce total emissions of mobile source air toxics by 330,000 tons and VOC emissions (precursors to ozone and $PM_{2.5}$) by over 1 million tons.

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

Figure 4-1
Detroit River International Crossing Study
U.S. Annual Vehicle Miles Traveled (VMT) vs. MSAT Emissions
2000-2020



Notes: For on-road mobile sources emissions factors were generated using MOBILE6.2. The MTBE proportion of the market for oxygenates is held constant at 50%. Gasoline RVP and oxygenate content are held constant. VMT is drawn from "*Highway Statistics 2000*," Table VM-2 for 2000. Analysis assumes an annual national 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.
Source: FHWA

This DRIC technical report follows the *Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA, February 3, 2006). It includes a basic analysis of the likely MSAT emission impacts of the DRIC project. The DRIC project is being treated as a Tier 3 "Project with Higher Potential MSAT Effects" under that guidance because it is near a school and accesses a freeway (I-75) that carries volumes near to the triggering criteria in the guidance of 140,000 to 150,000 vehicles per day, though it will not increase the capacity of that road. (I-75's existing daily volume near the project is approximately 107,000, with 12,000 of these being trucks).[9]

Available technical tools do not enable a prediction of the project-specific health impacts of the emission changes associated with the alternatives. Due to these limitations, the following discussion is included in accordance with Council of Environmental Quality (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: 1) emissions modeling; 2) dispersion modeling, in order to estimate ambient concentrations resulting from the estimated emissions; 3) exposure modeling, in order to estimate human exposure to the estimated concentrations; and, then, 4) final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical

[9] MDOT 2006 Average Daily Traffic Volume Map.

shortcomings or uncertain science that prevent a more complete determination of the MSAT health impacts of this project.

- **Emissions**. The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining these emissions in the context of highway projects. While MOBILE6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE6.2 is a trip-based model with emission factor projections based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE6.2 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 MOBILE6.2, 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 MOBILE6.2 to estimate MSAT emissions. So, while MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses among alternatives for very large projects, it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

- **Dispersion**. The tools to predict how MSATs disperse are also limited. 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 in order to assess potential health risk. 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. The National Cooperative Highway Research Program (NCHRP) is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also focuses on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. But, the products are not available for use here.

- **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 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.

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.

EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. EPA's Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. IRIS is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken verbatim from the IRIS "Weight-of-Evidence Characterization" summaries and represents FHWA'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 noncancer 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.

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. Because of 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 the reasonable prediction of relative emissions changes among 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 quantitative analysis of MSAT emissions relative to the various alternatives is presented in Section 4.3 of this report. It acknowledges that the build alternatives may shift exposure to MSAT emissions in certain locations, but the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

4.2 Other Studies

Some recent studies have addressed MSAT health impacts in proximity to roadways. For example, 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. But, the final summary of the series is not expected for several years.

Other studies have reported that proximity to roadways is related to adverse health outcomes – particularly respiratory problems.[10] Much of this research is not specific to MSATs, instead surveying the full spectrum of both NAAQS and other pollutants. 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 FHWA to perform a more comprehensive evaluation of the health impacts specific to this project.

The Michigan Department of Environmental Quality, Air Quality Division (AQD), undertook to develop an air toxics monitoring strategy in 1992[11] and EPA established national monitoring programs. Detroit is one of several cities where air toxics are being monitored on an ongoing basis. The following are summaries of two recent and ongoing studies that have been conducted to evaluate particulates and air toxics in the Detroit area. They are drawn from MDEQ's *2006 Air Quality Report*.

[10] South Coast Air Quality Management District, *Multiple Air Toxic Exposure Study-II*. 2000; The Sierra Club, *Highway Health Hazards*, 2004 summarizing 24 Studies on the relationship between health and air quality); Environmental Law Institute, *NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, 35 ELR 10273. 2005, with health studies cited therein.

[11] MDEQ, Air Quality Division, *The Development of an Air Toxics Monitoring Strategy for Michigan*, June 1992.

DATI: The Detroit Air Toxics Initiative (DATI) was initiated by MDEQ's Air Quality Division (AQD), and funded by a grant from EPA's Fiscal Year 2003 Community Assistance and Risk Reduction Initiative. The DATI project was a risk assessment and risk reduction project based on the Detroit Air Toxics Pilot Project's air toxics monitoring data from April 2001 through April 2002. A total of 224 air toxics were monitored at seven sites in the Detroit area: Allen Park, Dearborn, W. Jefferson Avenue, W. Fort Street, Southfield, River Rouge, and northeast Detroit (E. Seven Mile).

The AQD finalized in 2005 the *DATI Risk Assessment Report*, along with a Technical Summary and Public Summary of that report.[12] The AQD is continuing to monitor air toxics in the Detroit area in response to the DATI findings. This monitoring will determine whether the levels of air toxics have changed since the DATI monitoring in 2001 and 2002 or remain at levels of concern. Updated information may be available in the spring of 2008 as data currently being collected are synthesized. Meanwhile, the Risk Reduction Phase efforts continue, including the retrofit of a locomotive in Southwest Detroit (see SEMCOG Weight of Evidence in Section 5).

DEARS: In 2004, the AQD and EPA's National Exposure Research Laboratory and National Health and Environmental Effects Research Laboratory began conducting the Detroit Exposure Aerosol Research Study (DEARS). DEARS is a three-year field monitoring effort that is designed to measure exposure and describe exposure relationships for air toxics, PM components, PM from specific sources, and criteria pollutants in Detroit. The study includes monitors at the Allen Park site, indoor/outdoor monitors at participant's houses, and personal exposure monitors.[13] Among the DEARS objectives are to:

- Determine the associations between concentrations measured at central site monitors and outdoor residential and indoor residential and personal exposures.
- Identify the human activity factors that influence personal exposures to selected pollutants.
- Investigate and apply source apportionment models to evaluate the contribution of specific ambient sources to residential concentrations and personal exposure to PM constituents and air toxics.
- Determine the associations between ambient concentrations of criteria gases (O_3, NO_2, and SO_2) and personal exposures for these gases.

4.3 Quantitative MSAT Analysis

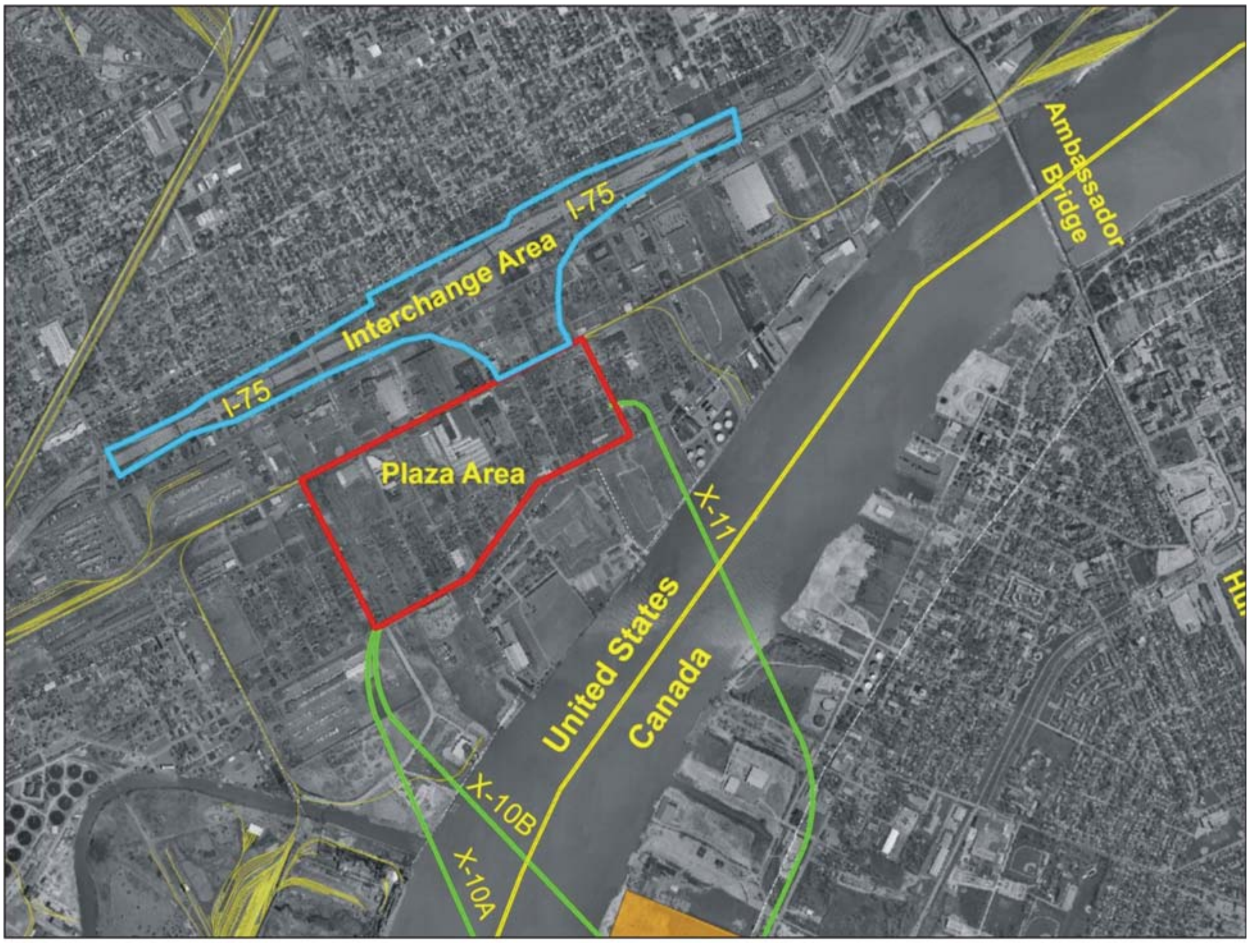
The quantitative analysis presented here provides a means of comparing alternatives, consistent with the guidance cited above. The most important point, as noted in Section 3, is that any new river crossing system would split the traffic and, hence, split vehicular emissions that are concentrated today in large part at the Ambassador Bridge. Traffic in lesser amounts would be diverted by the proposed DRIC project from the Detroit-Windsor Tunnel and the Blue Water Bridge.

From an overall perspective, the discussion of the travel demand modeling and project-related changes in vehicle miles and hours of travel discussed in Section 3.2, are relevant here. The project would shift a portion of the MSATs at the Ambassador Bridge to a section of Southwest Detroit farther downstream (west of the Ambassador Bridge). The area around the Ambassador

[12] The DATI reports are available on the MDEQ Air Quality Division's website at http://www.michigan.gov/deqair.
[13] DEARS information is available at http://www.epa.gov/dears/.

Bridge has a greater concentration of sensitive receptors in the immediate plaza vicinity (refer to Section 5.3.2.2 under the subsection $PM_{2.5}$ Project Conditions). Major concentrations of people are on the north side of I-75, where the proposed DRIC project offers the opportunity to reduce heavy truck traffic that now uses the Livernois/Dragoon one-way pair north of I-75 by eliminating the direct connection to I-75 (Figure 4-2).

Figure 4-2
Detroit River International Crossing Study
MSAT Burden Analysis Area



Source: The Corradino Group of Michigan, Inc.

For a more specific focus, a daily MSAT pollutant burden analysis[14] was performed for Practical Alternatives for 2013 and 2030 (2013 data were extrapolated from the 2015 and 2035 model runs and 2030 data were interpolated from the same runs). The year of DRIC project opening, 2013, represents the year of highest overall project emissions. The *Regional Transportation Plan* has 2030 as its horizon. Data for the AM peak, Midday and PM peak for each analysis year are found in Appendix B. They reflect similar patterns as the information presented in Table 4-1.

[14] A pollutant burden analysis means multiplying the amount (mass) of a pollutant coming out a tailpipe in one mile times the number of miles traveled.

Table 4-1
Detroit River International Crossing Study
MSAT Practical Alternative Comparison
2013 and 2030 Daily Pollutant Burden Emissions
(grams)

2013 Daily	Alt #1/2/3/14/16		Alt #5		Alt #7/9/11	
	Ramps	Plazas and Crossing	Ramps	Plazas and Crossing	Ramps	Plazas and Crossing
Auto						
Benzene	124	423	124	463	70	366
Acrolein	11	34	11	38	6	30
Formaldehyde	24	77	24	85	14	68
1,3-butadiene	12	40	12	43	7	35
Acetaldehyde	1	4	1	5	1	4
Diesel exhaust	0	0	0	0	0	0
Truck						
Benzene	25	117	22	125	13	89
Acrolein	14	68	13	73	7	51
Formaldehyde	182	871	167	931	94	660
1,3-butadiene	67	321	61	343	35	243
Acetaldehyde	8	39	7	42	4	30
Diesel exhaust	724	1,842	662	2,029	372	1,493
Auto + Truck						
Benzene	148	540	146	588	83	455
Acrolein	25	102	24	110	13	81
Formaldehyde	206	949	191	1,016	107	727
1,3-butadiene	79	360	74	386	42	277
Acetaldehyde	9	43	9	46	5	33
Diesel exhaust	724	1,842	662	2,029	372	1,493
Daily 2-way Bridge Traffic						
Auto	13215		13744		7479	
Truck	13325		12979		6529	
Total	26541		26723		14008	
Daily 2-way Bridge VMT						
Auto	27601		29906		22651	
Truck	27747		27892		20004	
Total	55349		57798		42655	

Table 4-1 (continued)
Detroit River International Crossing Study
MSAT Practical Alternative Comparison
2013 and 2030 Daily Pollutant Burden Emissions
(grams)

2030 Daily	Alt #1/2/3/14/16		Alt #5		Alt #7/9/11	
	Ramps	Plazas and Crossing	Ramps	Plazas and Crossing	Ramps	Plazas and Crossing
Auto						
Benzene	92	321	91	345	59	308
Acrolein	8	26	8	28	5	25
Formaldehyde	18	60	18	64	12	58
1,3-butadiene	9	31	9	33	6	30
Acetaldehyde	1	3	1	3	1	3
Diesel exhaust	0	0	0	0	0	0
Truck						
Benzene	27	128	25	141	17	124
Acrolein	16	74	15	82	10	72
Formaldehyde	200	954	188	1,047	130	920
1,3-butadiene	74	351	69	386	48	339
Acetaldehyde	9	43	8	47	6	41
Diesel exhaust	177	451	167	512	116	467
Auto + Truck						
Benzene	119	449	116	485	76	432
Acrolein	24	100	22	110	15	97
Formaldehyde	218	1,014	206	1,111	142	979
1,3-butadiene	83	382	78	419	54	369
Acetaldehyde	10	46	9	50	6	44
Diesel exhaust	177	451	167	512	116	467
Daily 2-way Bridge Traffic						
Auto	14740		15071		9607	
Truck	19655		19760		12502	
Total	34395		34831		22109	
Daily 2-way Bridge VMT						
Auto	30829		32839		28556	
Truck	40917		42428		37554	
Total	71746		75266		66110	

Source: The Corradino Group of Michigan, Inc.

The DRIC Air Quality Protocol calls for segregating the emissions of the crossing and plaza from connections to I-75, so this analysis has focused only on the crossing/plaza/I-75 ramp system (refer to Figure 4-2), rather than the larger roadway network analyzed in Section 3. With that, the MSAT values for 2004 and for the No Build condition are "normalized" to zero, as there would be no new plaza or connections to I-75 without the project, and the MSATs would remain in the Ambassador Bridge area.

It should be noted that MOBILE6.2 inputs were obtained from SEMCOG. MOBILE6.2 provides emission factors for a number of vehicle types: light-duty gas vehicles of three types, heavy-duty gasoline, light-duty diesel, light-duty diesel truck, heavy-duty diesel, and motorcycle. Vehicle registration data are then typically used to weight the emission factors and generate a "composite" emission factor representing the entire vehicle fleet. However, the distribution of vehicle types crossing the Detroit-Windsor border is different from that typical in the SEMCOG region. So, for purposes of this analysis, "auto" and "truck" emission factors have been used, rather than composite emission factors.

The MOBILE6.2 model data were combined for the three categories of light-duty gas vehicles into a single emission factor. This combined factor was used for DRIC "autos." Based on registration data, these three vehicle types comprise almost 90 percent of the vehicles on the road today. The emission factor for heavy-duty diesel was used directly for DRIC "trucks." Heavy-duty diesel vehicles represent less than ten percent of current registered vehicles in the region, but they are projected to comprise about half the traffic under the DRIC Practical Alternatives.

Emission "burden" calculations were developed using the emission factors for MSATs from the MOBILE6.2 model, the traffic projections from the travel demand model, and the lengths of the links in the travel demand model. (Though emission factors produced by MOBILE6.2 for MSATs, except diesel exhaust, are in milligrams [1000ths of a gram], Table 4-1 expresses MSATs in grams.)

For the burden analysis, the number of vehicles by DRIC alternative was used in conjunction with the time these vehicles would be at idle as they move through the river crossing system. The same volumes were used in conjunction with the link lengths in the crossing/plaza/ramp system to estimate the vehicle miles of travel within that system. VMT is segregated by speed range so the appropriate MOBILE6.2 emission factor for that speed is applied to the VMT to obtain the pollutant burden. The worksheets in Appendix C show the calculations. In summary they are:

(Traffic Volume) **x** (Idle Emission Factor) **=** Idle Burden

(Traffic Volume (by speed)) **x** (System Link Lengths) **x** (EF @ those speeds) **=** Running Burden

(Idle Burden) **+** (Running Burden) **=** Total Burden

For 2013, Practical Alternative Set #1/2/3/14/16 and Practical Alternative #5 show higher MSATs for the ramp connections between the plaza and I-75 than Practical Alternative Set #7/9/11 because Practical Alternative Set #1/2/3/14/16 and Practical Alternative #5 would attract more traffic from the Ambassador Bridge and the Blue Water Bridge. Practical Alternative Set #1/2/3/14/16 would carry a slightly higher proportion of trucks than Practical Alternative #5 due to its comparative directness to southern destinations favored by trucks. Practical Alternative #5 carries slightly more auto traffic. As Table 4-1 shows, autos emit little diesel exhaust, but emit benzene at higher levels than trucks.

Practical Alternative Set #7/9/11 would have lower MSAT burden totals for ramps at the new crossing because the traffic volumes with the group are lower. The group has a higher amount of MSATs per vehicle on the plaza than the other alternatives because Plaza P-c has a "double-back" layout which significantly increases the VMT traveled on the plaza. So, whereas the ramp MSAT totals are roughly one-half of Practical Alternative Set #1/2/3/14/16, the plaza plus crossing totals are more than three-quarters. Nonetheless, the overall MSAT burden for Practical Alternative Set #7/9/11 is lower than Practical Alternative Set #1/2/3/14/16.

For 2030, the same patterns hold. For benzene and acrolein, the increase in VMT is offset by the lower emission factors of the future. While the total vehicle MSAT values for formaldehyde, 1,3-butadiene, and acetaldehyde would increase in 2030 compared to 2013, diesel exhaust would be significantly reduced. Also an examination of the data in Figure 4-1 shows that much of the reduction in MSATs will occur before 2013. So, though 2030 values may be higher than 2013 values for three MSATs, the emission rates for MSATs will be lower in 2013 than today.

The data in Table 4-1 reflect the MSATs would shift to the area near the proposed new river crossing system from the Ambassador Bridge compared to the no build condition.

The conclusion of the MSAT analysis is that the DRIC would shift MSATs from the Ambassador Bridge area to Delray. Denser populations exist nearer to the Ambassador Bridge. While some MSATs would increase between 2013 and 2030 on the new ramp/plaza system, the increase is limited to that system because its VMT is increasing faster than the emission rates for MSATs drop. But, on the rest of the system, such as I-75 where the bulk of the traffic is, MSATs would be substantially reduced (as traffic on I-75 does not grow appreciably). So the overall effect is reduced MSATs, particularly diesel exhaust from trucks.

5. ATTAINMENT STATUS/AIR QUALITY CONFORMITY

This section of the technical report describes the “attainment status” of the area with respect to National Ambient Air Quality Standard (NAAQS) pollutants. To demonstrate that it “conforms” to the Clean Air Act, the proposed project must not worsen air quality or delay the timely attainment of the NAAQS. Conformity needs are discussed in this document which supports the DEIS; however, conclusions related to conformity will be included only in the FEIS, when a Preferred Alterative is determined.

EPA has promulgated two sets of regulations to implement the conformity requirements of the Clean Air Act: 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) General Conformity Regulations, which apply to other Federal projects. These two regulatory approaches are discussed below.

5.1 NAAQS and Regional Attainment Status

The Clean Air Act requires Michigan (and all other states) to have a *State Implementation Plan* (SIP) to demonstrate how it will attain and/or maintain NAAQS (Table 5-1). SEMCOG collaborates with the Air Quality Division of the Michigan Department of Environmental Quality (MDEQ) to prepare and/or update a SIP. SEMCOG is responsible for evaluating mobile source (vehicular) emissions in Southeast Michigan when projects are proposed for inclusion in its long-range transportation plan. SEMCOG’s *2030 Regional Transportation Plan* (RTP) must undergo a quantitative analysis demonstrating that emissions levels associated with implementing planned transportation projects are equal to, or lower than designated emissions limits (budgets) set forth in the SIP. In doing so, SEMCOG is managing the transportation air quality conformity process in Southeast Michigan. The DRIC project is subject to air quality transportation conformity review through SEMCOG. This will occur following the public hearing on the DEIS, when a Preferred Alternative is determined.

“Hot-spot” analyses of carbon monoxide (CO) and particulate matter are also a part of project-level transportation conformity and are discussed below.

Air quality conformity analyses for mobile sources required in Southeast Michigan currently involve three major pollutants: carbon monoxide (CO), ozone (and its precursors - volatile organic compounds and nitrogen oxides), PM_{10} and $PM_{2.5}$. The following paragraphs report on the attainment status of the region.

Carbon monoxide – In 1999, parts of Wayne (including all of the city of Detroit), Oakland, and Macomb counties were redesignated from nonattainment to maintenance for CO. A positive conformity determination for CO requires that emissions in any future year remain at or below the approved mobile source emissions budget of 1946 tons/day. Progress in addressing CO has advanced to the point that, starting in 2007, under amended 2006 air quality monitoring regulations, CO monitoring is no longer required.

Table 5-1
Detroit River International Crossing Study
National Ambient Air Quality Standards

Pollutants	Averaging Time	Primary Standard [a]	Secondary Standard [b]
Carbon Monoxide	1-hr	35 ppm (40mg/m^3)	No Secondary Standard
	8-hr	9 ppm (10mg/m^3)	No Secondary Standard
Lead	Quarter	1.5 μg/m^3	Same as Primary
Nitrogen Dioxide	Annual	0.053 ppm (100μg /m^3)	Same as Primary
Ozone	1-hr	0.12 ppm (235μg/m^3)	Same as Primary
	8-hr	0.08 ppm (157μg/m^3)	Same as Primary
Respirable Particulate Matter (10 microns or less) (PM_{10})	24-hr	150 μg/m^3	Same as Primary
	Annual	Revoked[c]	Same as Primary
Respirable Particulate Matter (2.5 microns or less) ($PM_{2.5}$)	24-hr	35 μg/m^3 [d]	Same as Primary
	Annual	15.0 μg/m^3	Same as Primary
Sulfur Dioxide	3-hr	–	0.5 ppm (1300μg/m^3)
	24-hr	0.14 ppm (365μg/ m^3)	–
	Annual	0.03 ppm (235μg/ m^3)	–

Note: ppm is parts per million; mg is milligrams; µg is micrograms.
[a] Primary NAAQS: the levels of air quality that the EPA judges necessary, with an adequate margin of safety, to protect the public health.
[b] Secondary NAAQS: the levels of air quality that the EPA judges necessary to protect the public welfare from any known or anticipated adverse effects.
[c] Due to lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard effective December 17, 2006.
[d] EPA reduced the 24-hour standard from 65 to 35 µg/m^3 effective December 17, 2006.

Source: Code of Federal Regulations, Title 40, Part 50.

One-hour ozone – In 1995, the seven-county SEMCOG region was redesignated from nonattainment to maintenance for the one-hour ozone standard. At that time, a maintenance plan was approved establishing emissions budgets for the two precursors of ozone: volatile organic compounds (VOCs) and nitrogen oxides (NOx). In order for a conformity determination to be made with regard to the one-hour ozone standard, VOCs emissions cannot exceed the mobile source emissions budgets of 218 tons/day for years 2004-2014, and 173 tons/day thereafter. NOx emissions cannot exceed the budget of 413 tons/day in any analysis year. The 8-hour ozone standard (see below) now supplants the 1-hour standard, but until an 8-hour emissions budget is established, conformity will be the same as for 1-hour.

Eight-hour ozone – On April 15, 2004, the EPA officially designated the seven-county SEMCOG region, plus Lenawee County, a moderate nonattainment area for the 8-hour ozone standard. In September 2004, EPA approved the reclassification of the area from moderate to marginal ozone nonattainment. A SIP demonstrating how the region will attain the 8-hour ozone standard is to be completed by June 15, 2007. Meanwhile, SEMCOG and MDEQ have actively pursued implementation of the control measures laid out in the region's *2005 Ozone Attainment Strategy*. These include a decrease in the allowable vapor pressure of summertime gasoline from 7.8 PSI (pounds per square inch) to 7.0 PSI, and a reduction in allowable VOC emissions from consumer and commercial products. Both of these measures went into effect in 2007.

PM_{10} – A portion of Southwest Detroit (and stretching downriver to Trenton) that includes the proposed DRIC project is a maintenance area for PM_{10}. In the maintenance plan, SEMCOG, MDEQ and EPA concluded that mobile source PM_{10} emissions are not a significant contributor to regional PM_{10} emissions, and SEMCOG is not required to consider PM_{10} in its regional conformity analyses. However, because no similar determination was made with respect to whether mobile source PM_{10} emissions contributed to localized hot-spot problems, a PM_{10} hot-spot analysis is required, and is presented below.

$PM_{2.5}$ – EPA designated seven counties in Southeast Michigan as nonattainment for the annual $PM_{2.5}$ standard on December 15, 2004. A SIP for $PM_{2.5}$, which will include emission budgets for this pollutant, is required by April 2008. Until these new budgets are approved, regional conformity for $PM_{2.5}$ is determined by ensuring that future annual emissions do not exceed 2002 levels (2,766 tons/year for $PM_{2.5}$ and 151,540 tons/year for NOx). SEMCOG and MDEQ are currently developing an emissions control strategy to bring the region into compliance with the annual standard by 2010.

5.2 General Conformity

General conformity normally applies to non-transportation projects. Threshold (*de minimus)* emission levels have been set for particle pollution ($PM_{2.5}$ and PM_{10}) to determine when general conformity determinations are necessary (40 CFR 93.153(b)). Because the DRIC deals with a transportation project, it would be logical to assume that only transportation conformity applies. But, DRIC is unique in that it has a plaza. There, trucks will idle as they queue for toll payment and customs inspection - both primary and, potentially, secondary. Therefore, plaza activity has been examined to determine whether *de minimus* levels of 100 tons per year for $PM_{2.5}$ or PM_{10} are exceeded during system <u>operations</u>. The year of highest emissions, 2013, has been analyzed and compared to the *de minimus* thresholds.

Because of the scale of the DRIC project, the *de minimus* threshold was also applied to <u>construction</u> activities to determine whether PM_{10} dust levels exceed 100 tons in any construction year.

5.2.1 $PM_{2.5}$ and PM_{10} Operations *de minimus* Analysis

The *de minimus* analysis for $PM_{2.5}$ and PM_{10} used an approach similar to the calculations of MSATs (except that <u>only the plazas</u> were analyzed), i.e., traffic volumes were multiplied by plaza link lengths to determine VMT, then emission factors (EFs) were applied. The year of analysis was 2013, the anticipated year of greatest emissions, so, again, the worst case could be compared to the *de minimus* values (Table 5-2). Practical Alternative Set #1/2/3/14/16 was as it represents the heaviest traffic volumes.

Table 5-2
Detroit River International Crossing Study
General Conformity Operations *de minimus* Test – Daily 2013 – $PM_{2.5}$ and PM_{10}
(*de minimus* Operations are for Plaza Only)

PM 2.5 **Alternative Set #1/2/3/14/16**	**Link Length (mi.)**	**Daily 2013 Traffic**	**Daily 2013 VMT**	**Idle (min/ veh)**	**Emis at idle (daily grams)**	**Emis in motion (daily grams)**	**Daily Grams**	**Annual Tons**
Autos to US	0.91	4,602	4,188	5	11	48	59	0.024
Autos to Canada	0.93	8,613	8,010	2	8	91	100	0.040
Trucks to US	0.89	5,604	4,988	10	897	454	1351	0.543
Trucks to Canada	0.93	7,721	7,181	3	371	653	1024	0.412
Totals		26,541	24,367				2533	**1.02**
Alternative #5								
Autos to US	0.97	4,557	4,421	5	11	50	61	0.025
Autos to Canada	0.99	9,187	9,095	2	9	104	113	0.045
Trucks to US	0.94	5,616	5,279	10	898	480	1379	0.554
Trucks to Canada	0.99	7,364	7,290	3	353	663	1017	0.409
Totals			26,084				2570	**1.03**
Alternative Set #7/9/11								
Autos to US	1.63	3,107	5,064	5	8	58	65	0.026
Autos to Canada	1.68	4,372	7,345	2	4	84	88	0.035
Trucks to US	1.64	2,630	4,312	10	421	392	813	0.327
Trucks to Canada	1.68	3,900	6,552	3	187	596	783	0.315
Totals		14,008	23,273				1750	**0.70**
PM 10 **Alternative Set #1/2/3/14/16**								
Autos to US	0.91	4,602	4,188	5	24	104	128	0.051
Autos to Canada	0.93	8,613	8,010	2	18	199	217	0.087
Trucks to US	0.89	5,604	4,988	10	953	623	1576	0.634
Trucks to Canada	0.93	7,721	7,181	3	394	898	1291	0.519
Totals		26,541	24,367				3213	**1.29**
Alternative #5								
Autos to US	0.97	4,557	4,421	5	24	110	134	0.054
Autos to Canada	0.99	9,187	9,095	2	19	226	245	0.099
Trucks to US	0.94	5,616	5,279	10	955	660	1614	0.649
Trucks to Canada	0.99	7,364	7,290	3	376	911	1287	0.517
Totals			26,084				3280	**1.32**
Alternative Set #7/9/11								
Autos to US	1.63	3,107	5,064	5	16	126	142	0.057
Autos to Canada	1.68	4,372	7,345	2	9	183	192	0.077
Trucks to US	1.64	2,630	4,312	10	447	539	986	0.396
Trucks to Canada	1.68	3,900	6,552	3	199	819	1018	0.409
Totals		14,008	23,273				2338	**0.94**

Notes: Idle assumes 3 minutes outbound and 10 minutes inbound for commercial.
See FHWA http://www.ops.fhwa.dot.gov/freight/freight_analysis/ambass_brdg/ambass_brdge_ovrvw.htm
where delta between free flow crossing time and average crossing time is 3.1 minutes outbound and 7.5 inbound.
To this should be added 2 minutes of processing time at Customs for inbound, for a total of 10 minutes.
Idle Emission Factor for Autos $PM_{2.5}$ = 0.029 g/hr and for PM_{10} = 0.062 g/hr; Heavy Duty Diesel $PM_{2.5}$ = 0.96 g/hr and for PM_{10} = 1.02 g/hr;
Running Emission Factor for Autos $PM_{2.5}$ = 0.011 g/hr and for PM_{10} = 0.025 g/hr; Heavy Duty Diesel $PM_{2.5}$ = 0.091 g/hr and for PM_{10} = 0.125 g/hr.
Source: The Corradino Group of Michigan, Inc.

The calculations were performed as follows. First, daily car and truck traffic (Heavy Duty Diesel or HDD) on the plaza links was estimated by factoring the AM, Midday, and PM peak traffic for 2013. The daily volumes for cars and trucks were then multiplied times the plaza link lengths to get daily VMT. The link lengths for cars and trucks are different as they follow separate paths through the plazas. VMTs on the plaza for cars and trucks in a day's time were multiplied by the emission factors (EF) (grams per mile). Particulate matter EFs do not vary with speed. Truck EFs include total exhaust PM, plus brake wear, plus tire wear. So, daily grams of $PM_{2.5}$ emissions were estimated for vehicles while in motion and, when at rest, idle emission factors were applied to the number of vehicles moving through the plaza. "In motion" and idle emissions were then annualized for comparison to the 100-ton *de minimus* levels.

Though the link lengths on the plaza are longer for Practical Alternative Set #7/9/11, creating more miles of travel, the traffic volumes are lower than with Practical Alternative Set #1/2/3/14/16 and Practical Alternative #5, so the vehicles miles of travel on the different plazas are within ten percent of one another. Practical Alternative Set #7/9/11 would have less truck traffic than Practical Alternative Set #1/2/3/14/16, so its particulate emissions are less than the other alternatives. Nonetheless, the totals for $PM_{2.5}$ and PM_{10}, in all cases, are on the order of one ton annually, well below the 100-ton annual trigger for general conformity. Therefore, the provisions of 40 CFR 93.153 related to general conformity do not apply.

5.2.2 $PM_{2.5}$ and PM_{10} Construction *de minimus* Analysis

Consistent with 40 CFR 93.153(b), particulate material generated by construction has been estimated. This project represents a series of projects spread over time – interchange, ramps, plaza and bridge (see Section 6).

Using reasonable construction assumptions and methodologies available in EPA's "Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources," revised November 2006, the maximum yearly estimate of PM_{10} dust from site preparation is calculated at approximately 11 tons (see calculations in Appendix D). $PM_{2.5}$ is a reduced fraction of construction dust, estimated at 0.6 tons. The estimates assume 150 acres of proposed plaza to be cleared of major buildings/structures and graded flat. This would occur in a one-year period. Emission factors from AP-42 for earthmovers and/or graders were 3.1 lbs/VMT for PM_{10} and 0.2 lbs./VMT for $PM_{2.5}$. The resulting estimates of construction particulate emissions of 11 tons for PM_{10} and 0.6 tons for $PM_{2.5}$ are well below the threshold *de minimus* levels governing general conformity. Therefore, the provisions of 40 CFR 93.153 related to general conformity do not apply.

5.3 Transportation Conformity

5.3.1 Regional Conformity

After the public hearing on the DEIS, when a Preferred Alternative is determined, DRIC project elements that cause changes to the transportation network will be evaluated by SEMCOG for air quality conformity. When analyzed together with other plan elements, the air pollution generated must not exceed "budgets" established in the SIP (noted in Section 5.1). This will be the case for carbon monoxide, ozone, and $PM_{2.5}$. (It is noted that budgets await finalization of the $PM_{2.5}$ SIP due to EPA April 2008.) The project must then be included in SEMCOG's cost-feasible RTP and Transportation Improvement Program (TIP) to advance to design. The Final EIS for the DRIC cannot be signed until the conformity determination is complete.

5.3.2 Hot-spot Analysis

Hot-spot analysis is designed to evaluate whether there are air quality impacts on a smaller scale than an entire nonattainment or maintenance area. Conforming 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 NAAQS.

The hot-spot analysis applies to carbon monoxide (CO), $PM_{2.5}$, and PM_{10} consistent with 40 CFR 93.116.

The CO analysis is done on a quantitative basis per 40 CFR 93.123(a) to determine whether estimated "with-project" concentrations of CO exceed the established one-hour and/or eight-hour standards. If they do not, the project conforms. Hot-spot conformity for $PM_{2.5}$ and PM_{10} is determined on a qualitative basis per 40 CFR 93.123(b)(4) and until appropriate methods and modeling guidance are available for quantitative analysis.

Regarding PM_{10}, a portion of Detroit that includes the proposed new DRIC project is a maintenance area. In the Maintenance Plan, SEMCOG, MDEQ and EPA concluded that mobile source (vehicular) PM_{10} emissions are not a significant contributor to regional PM_{10} emissions, and SEMCOG is not required to consider PM_{10} in its regional conformity analyses. However, because no similar determination was made with respect to whether mobile source PM_{10} emissions contribute to localized hot-spot problems, a PM_{10} hot-spot qualitative analysis is required.

5.3.2.1 CO Hot-spot Quantitative Analysis

Guidance for CO hot-spot analysis (40 CFR §93.123(a)) states that, if there are no violations of the CO standards in the area affected by the project, then the project's future effect is compared to the standard because the test is whether the project causes an exceedance of the standard at a sensitive receptor. Based on available local monitoring data, there are no current violations in the area, as noted in Figures 2-3 and 2-4. So, the test is whether the project could cause a new violation. Modeling has been performed for: 1) the year of opening, 2013, which is also the year of highest emissions; and, 2) the Regional Transportation Plan horizon year, 2030. Values for 2025 were interpolated from 2013 and 2030.

Carbon monoxide is a colorless, odorless, poisonous gas produced by incomplete combustion. Advances in engine design have substantially reduced CO emissions since the 1990s. To determine the concentrations of CO at sensitive receptors, i.e., hot-spots, traffic information for each alternative is combined with information about roadway geometry and traffic flow conditions. Sensitive receptors are locations where humans might be expected to be present. Analysis is done with a computer program called CAL3QHC, which requires as input emission factors for various types of vehicles operating at various speeds and conditions (such as ambient temperature and fuel type), expressed in grams per mile. These emission factors are generated using the U.S. EPA-approved model, MOBILE6.2. Input parameters to the MOBILE6.2 model, such as the vehicle fleet mix and age, are provided by SEMCOG, which develops these data in consultation with EPA and MDEQ.

CAL3QHC modeling receptors have been located per EPA guidance[15] (Table 5-3). Points at the perimeter of the plaza are: Southwestern High School (Receptor No. 1), residences east of the proposed plazas (varies by alternative) (Receptor No. 2 and No. 3), Fort Wayne (Receptor No. 4), and a residence west of the proposed plazas (Receptor No. 5). North of I-75, a house on the east side of Campbell Street was tested as a worst case (Receptor No. 6). That location is close to the high background traffic volumes on I-75, and the ramps to the new bridge and a relocated service drive would be very close to the residence (Figure 5-1).

Table 5-3
Detroit River International Crossing Study
CAL3QHC CO Analysis Results
(1-hr standard = 35 ppm)

Plaza Perimeter	**2006[a] 1-hr Back-ground**	**2013 w/Background 1-hr**	**2025 w/Background 1-hr**	**2030 w/Background 1-hr**
Alternative Set #1/2/3/5/14/16				
1 SW High School	1.3	1.5	1.7	1.7
2 East Plaza perimeter (Campbell)	1.3	1.7	1.6	1.6
4 Ft. Wayne (south of plaza)	1.3	1.7	1.7	1.7
5 Post Street residential (west of plaza)	1.3	2.1	2.1	2.1
Alternative Set #7/9/11				
1 SW High School	1.3	1.4	1.4	1.4
3 East Plaza perimeter (Junction)	1.3	1.4	1.4	1.4
4 Ft. Wayne (south of plaza)	1.3	1.4	1.5	1.5
5 Post Street residential (west of plaza)	1.3	1.5	1.5	1.5
North Side of I-75 – Residence (worst case)				
Alternative Set #1/2/3/5/14/16	1.3	2.9	3.5	3.8

[a] Background values drawn from 2006 2nd max readings at the West Lafayette (26-1630039) monitoring station.
Note: ppm = parts per million

Source: The Corradino Group of Michigan, Inc.

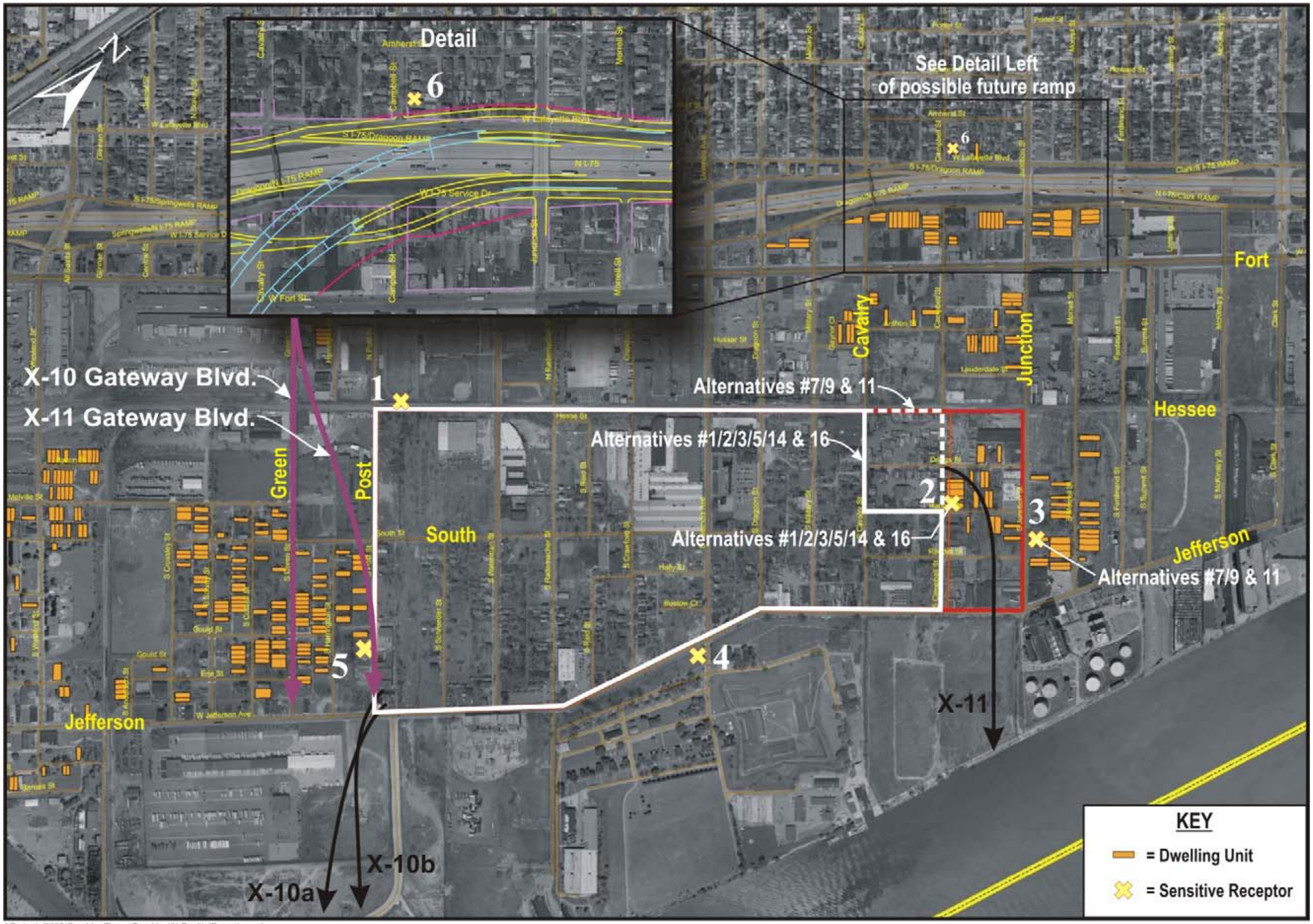
The guidelines direct that intersections expected to be at Level of Service (LOS) D or worse be included in the analysis. The *Traffic Analysis Report* finds there would be no such intersections.[16] There is virtually no congestion today along local streets in Delray at which people are exposed to roadway pollution. And, the changes proposed will shift traffic in such a way that the LOS will only worsen in a very few instances. The traffic microsimulation model known as VISSIM was used to detect such changes.

A one-hour CO background concentration of 1.3 parts per million (ppm) was used in the analysis. That value represents the second highest one-hour concentration measured at the West Lafayette (26-1630039) monitoring station (the closest to the project) in 2006. The one-hour CO standard is 35 ppm.

CAL3QHC input parameters and CAL3QHC model runs are found in Appendix E.

[15] EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections, EPA-454/R-92-005,* November 1992.
[16] The Corradino Group of Michigan, Inc., *Detroit River International Crossing Study Traffic Analysis Report,* December 2007.

Figure 5-1
Detroit River International Crossing Study
CO Hot-spots



I:Projects/3600/Graphics/ReportGraphics/AirQuality/Receptors.cdr

Source: The Corradino Group of Michigan, Inc.

The conclusion for CO is that the highest one-hour CO concentrations would be found at the residence along the north side of I-75 on Campbell (Table 5-3) due to traffic on I-75. This is true for 2013, 2025 and 2030. Forecasts of one-hour CO concentrations for these years are 2.9, 3.5, and 3.8 ppm, respectively, compared to the standard of 35 ppm. All these values, considered worst case, are well below standards. The analysis of the home on Campbell Street addresses the closest approach to a dwelling unit with the highest ramp volume of any of the alternatives. Conditions at all other intersections in all years under all scenarios are less likely to aggravate CO concentrations. Values for eight hours are not presented, as guidance in FHWA Technical Advisory T6640.8A says that is not necessary when the one-hour value is less than the eight-hour standard of 9 ppm, as is the case here. So, the project would not cause any air quality violations, worsen conditions or delay timely attainment of the NAAQS and would generate CO levels at only approximately one-tenth of the standard.

5.3.2.2 $PM_{2.5}$ Hot-spot Qualitative Analysis

This subsection addresses the change in the air quality regulatory background resulting from the publication of the "Final Rule for $PM_{2.5}$ and PM_{10} Hot-spot Analyses in Project-Level Transportation Conformity Determinations," which appeared in the March 10, 2006, *Federal Register*. Subsequent to the publication of the Final Rule, EPA and FHWA jointly issued "Transportation Conformity Guidance for Qualitative Hot-spot Analysis in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas," March 29, 2006. The DRIC project is of "air quality concern" (*Transportation Conformity Guidance*, Chapter 1.3) for $PM_{2.5}$ because it would represent a transfer point that has "a significant number of diesel vehicles congregating at a single location." (40 CFR 93.123(b)(1)(iii).

This $PM_{2.5}$ air quality analysis uses a hybrid of Methods A and B, as outlined in the March 2006 Joint Guidance. Method A compares the project and project location to a similar site(s). Method B uses information from many sources that may be available.

The analysis begins with a description of the background conditions (current and future) without the proposed project, followed by an analysis of change introduced by the proposed project. The analysis has also relied on air quality studies and data from available sources, as identified through the interagency consultation process. Some elements of the analysis are area-wide and general in nature; other elements are site specific. The analyses of future conditions focus on the year of peak emissions, 2013, the intermediate year, 2025, and the horizon year of SEMCOG's RTP, 2030.

The qualitative $PM_{2.5}$ hot-spot analysis covers:

- Project Description
- Method Chosen (hybrid of Methods A and B)
- Emissions Considered ($PM_{2.5}$)
- Background No Build Conditions – base (2004) and future (2013, 2025, and 2030)
- Project Conditions – future (2013, 2025, and 2030)
- Documentation of Public Involvement
- Conclusions

The elements are discussed below.

Project Description

The Practical Alternatives are described in Section 1. The Preferred Alternative will be described in the FEIS. The next subsection summarizes base conditions in the project area and the $PM_{2.5}$ attainment status. Local areas of housing and points of interest such as Southwestern High School, the Beard Early Childhood Center, and Fort Wayne are shown in Figure 5-2.

Background

No Build Conditions - Base (2004) and Future (2013, 2025, and RTP Horizon Year - 2030)

A series of technical reports was developed to support the EIS. Most germane to this hot-spot analysis are those that cover traffic, the inventory of the community, and the indirect and cumulative impacts analysis. The last of these discusses air quality in Canada.

The *Community Inventory Technical Report* covers the history of the area and key characteristics, including community facilities, major employers, and infrastructure. Land use trends are outlined and data on key population groups are provided. The immediate Delray area, between I-75 and the Detroit River, peaked in population in the 1920s at approximately 24,000 and is now a few thousand people, most of whom live in the area west of Post Street, which is the west limit of the proposed plaza alternatives. Historically, the city of Detroit's land use planning for the Delray area has promoted residential conversion to industrial and distribution/logistics land uses in an area where housing originally developed around industry in a "company town" pattern. Some 1,500 parcels in Delray are now vacant property, most owned by the city of Detroit as a result of non-payment of taxes. Further, the impact on Delray from nearby industrial activities, such as Zug Island, and the Detroit Wastewater Treatment Plant, to name just two, makes it difficult to see Delray as anything but industrial. Nonetheless, the Delray community has come together to create a vision for the area's future as a revitalized mixed use area much like the area north of I-75.

So, while there is hope, the future of Delray is uncertain. Under No Build conditions in 2013, 2025, and 2030, there is a greater likelihood that the pattern of decline will not stop and land will continue to convert from residential properties to industrial and commercial/distribution uses. An example of the continuing trend is the approval in March 2007 of a yard-waste recycling center in west Delray near the sewage treatment plant. In other words, sensitive hot-spot receptors (residences) could continue to be lost.

$PM_{2.5}$ Trends and Outlook

EPA notes in its *Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003,* that regional pollution in the eastern U.S. contributes more than half of total $PM_{2.5}$ concentrations. These regional concentrations come from emission sources such as power plants, natural sources, and urban pollution, which can be transported hundreds of miles. As a result, EPA has pursued a variety of programs aimed at point sources, as well as efforts to control mobile sources (Table 5-4).

Figure 5-2
Detroit River International Crossing Study
Project Area for PM $_{2.5}$ Hot-spot Analysis

Source: The Corradino Group of Michigan, Inc.

Table 5-4
Detroit River International Crossing Study
Selection of Emission Control Rules and Programs Contributing to PM Emission Reductions from 1995-2015

Program	Sector	Direct PM[a] Reductions	SO_2 Reductions	PM Precursors NOx Reductions	VOC Reductions	Implementation Date
Clean Air Nonroad Diesel Rule	Mobile sources	X	X	X		2004-2015
Clean Air Interstate Rule (proposed December 2003)	Electric Utilities	X	X	X		2010-2015
Acid Rain Program	Electric Utilities		X	X		1995-2010
Regional Haze Rule/Best Available Retrofit Technology	Electric Utilities[b]	X	X	X		2013-2015
$PM_{2.5}$ Implementation[c]	Stationary/Area/ Mobile sources	X	X	X	X	2008-2015
Maximum Achievable Control Technology (MACT) Standards[d]	Stationary/Area	X			X	1996-2003
Various Mobile Source Programs[e]	Mobile sources	X	X	X	X	Ongoing

[a] Includes elemental and organic carbon, metals, and other direct emissions of PM.
[b] Also applies to industrial boiler and the other source categories also covered under Prevention of Significant Deterioration (PSD).
[c] Includes Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM).
[d] Includes a variety of source categories such as boilers and process heaters, pulp and paper, petroleum refineries, various minerals and ores, and others. While these standards are for hazardous air pollutants (HAPs) such as metals, measures to reduce HAPs in many cases also reduce PM emissions.
[e] Includes such programs as onroad diesel and gasoline engines, nonroad gasoline engines, Low Sulfur Diesel and Gasoline Fuel Limits for onroad and offroad engines, motorcycles, land-based recreational vehicles and marine diesel engines.

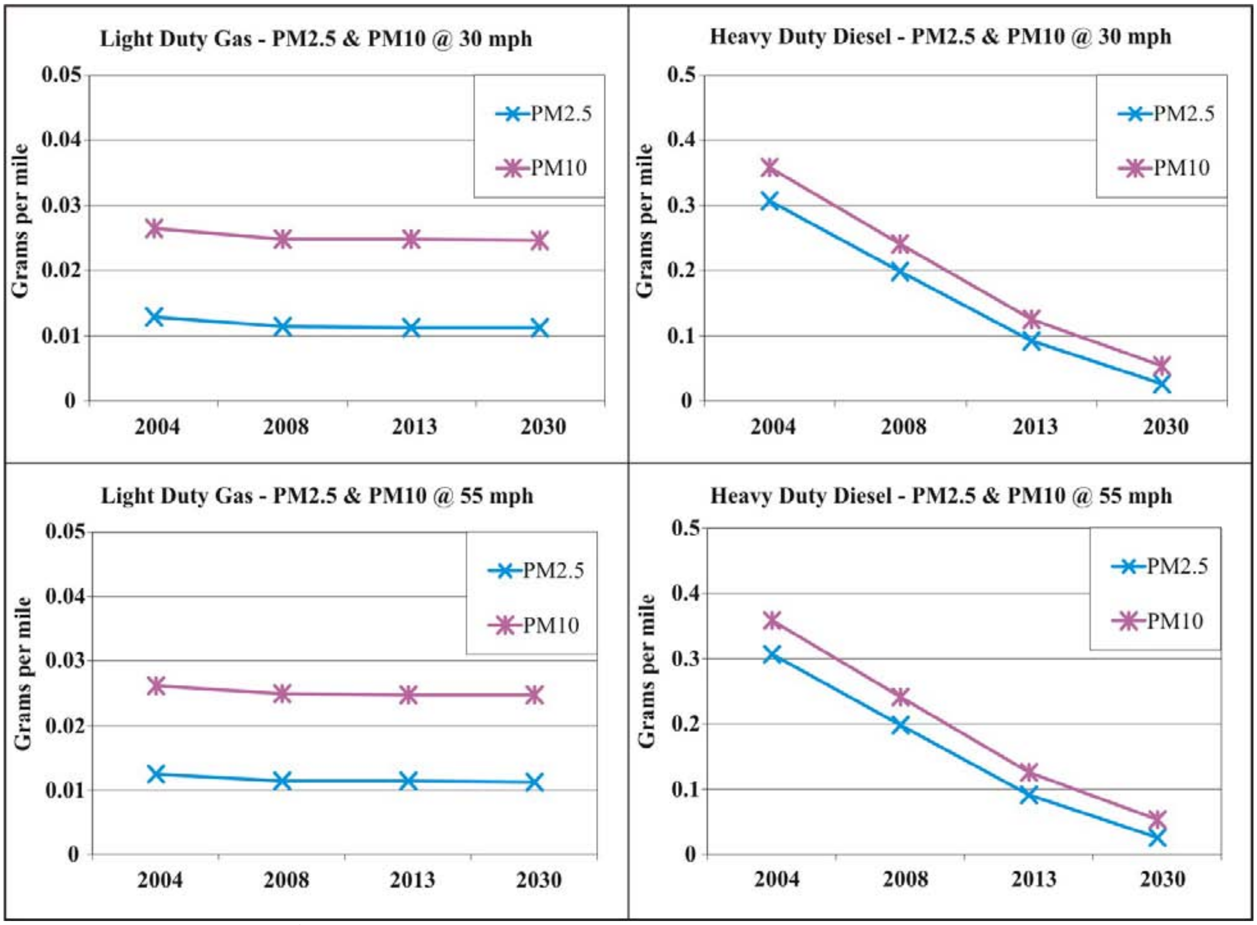
Source: Derived from EPA as presented in MDEQ's *2006 Annual Air Quality Report for Michigan.*

The EPA-approved MOBILE6.2 model emission factors show that mobile source emissions of particulate matter are expected to decline substantially (Figure 5-3), especially for trucks. The examples shown are for 30 and 55 miles per hour in 2004, 2008, 2013 and 2030.

In the Midwest, EPA is assisted in addressing air quality concerns by the Lake Michigan Air Directors Consortium (LADCO), which works with its member states in the upper Midwest to develop the necessary technical support for new State Implementation Plans (SIPs) for regional haze, $PM_{2.5}$, and 8-hour ozone. In Michigan, the Michigan Department of Environmental Quality (MDEQ) works to improve air quality, including the reduction of $PM_{2.5}$.

MDEQ's *2006 Air Quality Report* indicates that EPA 2002 data show area sources, such as farm fields and residential wood-burning, represent the largest share of $PM_{2.5}$ emissions (37%), while non-road vehicles, such as construction equipment, add another 32 percent. On-road (vehicular) sources contribute 18 percent and point sources represent 13 percent. EPA estimates the Clean Air Non-road Diesel Rule, signed July 7, 2005, will reduce the engine emissions of non-road vehicles by more than 90 percent.

Figure 5-3
Detroit River International Crossing Study
MOBILE6.2 Emission Factor Trends – $PM_{2.5}$ and PM_{10}



Source: The Corradino Group of Michigan, Inc. using MOBILE 6.2 with SEMCOG inputs.

MDEQ coordinates with EPA in its Speciation Trends Network (STN), which is designed to provide: 1) annual and seasonal spatial characterization of aerosols; 2) trends and tracking of control program progress; 3) integration of chemical speciation data with data related to the visual environment; and, 4) development of emission control strategies. Several programs measure particulates in Michigan.

In a report entitled "Midwest Urban Organics Study: Lessons Learned,"[17] LADCO addressed some relationships between $PM_{2.5}$ and organic carbon mass (OM).[18] The following paragraphs summarize LADCO's findings.

- Based on the source-apportionment approaches considered in this study, the major sources of OM are: 1) mobile sources, including on-road and non-road, gasoline and

[17] Sonoma Technology, Inc. and University of Wisconsin-Madison for Lake Michigan Air Directors Consortium, *Midwest Urban Organics Study: Lessons Learned*, March 31, 2006.
[18] OM is defined as 1.8 times the measured organic carbon (OC).

diesel, and smoking (high-emitting) and non-smoking vehicles; 2) burning (both residential wood combustion and wildfires); 3) industrial sources; and, 4) secondary organic aerosol.

- Analysis of the data from monitors in Cleveland and Detroit (Allen Park, Dearborn) showed significant intra-city variation, illustrating the important influence of emissions from local sources on $PM_{2.5}$ and OM. These are generally more important to OM than transport or secondary sources in urban areas.

Near the DRIC study area, $PM_{2.5}$ speciation data are being collected at Monitor 26-163-0001 in Allen Park and 26-163-0033 in Dearborn. MDEQ finds that $PM_{2.5}$ from mobile sources can, to a degree, be differentiated from non-mobile sources, but that differentiating among mobile sources, such as trucks, is difficult. LADCO and others continue to research this topic. MDEQ is doing further work on source apportionment (what proportion of a measured pollutant comes from the various contributing sources) for the Dearborn site with potential results in early 2008.

<u>Monitoring of $PM_{2.5}$</u>

The Dearborn pollutant monitoring station (26-163-0033) at 2842 Wyoming Avenue has the highest $PM_{2.5}$ readings in Michigan and among the highest readings in the eastern U.S. (Figure 5-4). It is among the five sites in Michigan recording annual mean concentrations that exceed the <u>24-hour</u> NAAQS for $PM_{2.5}$ of 35 $\mu g/m^3$. (Note that one µg = one millionth of a gram and m^3 = cubic meter.) However, project conformity must be measured against the 65 $\mu g/m^3$ standard for 24 hours, the standard in effect when the non-attainment determination was made. So, the standard shown in Figure 5-4 is 65 $\mu g/m^3$. All monitoring locations shown are well under the 65 $\mu g/m^3$ 24-hour standard.

Two monitors in Michigan continue to exceed the <u>annual</u> NAAQS of 15 $\mu g/m^3$ (three year average): Dearborn and Southwestern High School on West Fort Street (although Southwestern High School has been under the standard for the last two years). The Dearborn monitor is included in the discussion because it is important to the understanding of the industrial source of much of the PM in Southwest Detroit, including Delray.

Another monitor close to the DRIC project area is on West Lafayette Avenue, east of the Ambassador Bridge. $PM_{2.5}$ values at the West Fort and West Lafayette stations are lower than at Dearborn and trending down. The values at the West Lafayette monitor, which is most distant from the concentration of industry that is to the west of the DRIC project area, are much lower than at Wyoming, which is very close to the Rouge Auto Plant, Severstal Steel, and the Marathon Oil refinery (Figures 5-5 and 5-6).[19] The $PM_{2.5}$ values at the West Fort monitor are between those of the Dearborn and West Lafayette monitors. Of note is the fact that the West Fort monitor is between the proposed plaza location and I-75 (approximately 400 feet from I-75), the closest highway carrying significant traffic – approximately 95,000 cars and 12,000 trucks daily.[20] The wind rose in Figure 5-7 shows the prevailing winds are from the southwest indicating, for most of the year, the area of heavy industry south and west of the project area is contributing directly to the measurements of particulates at Dearborn and, to a lesser extent, West Fort Street.

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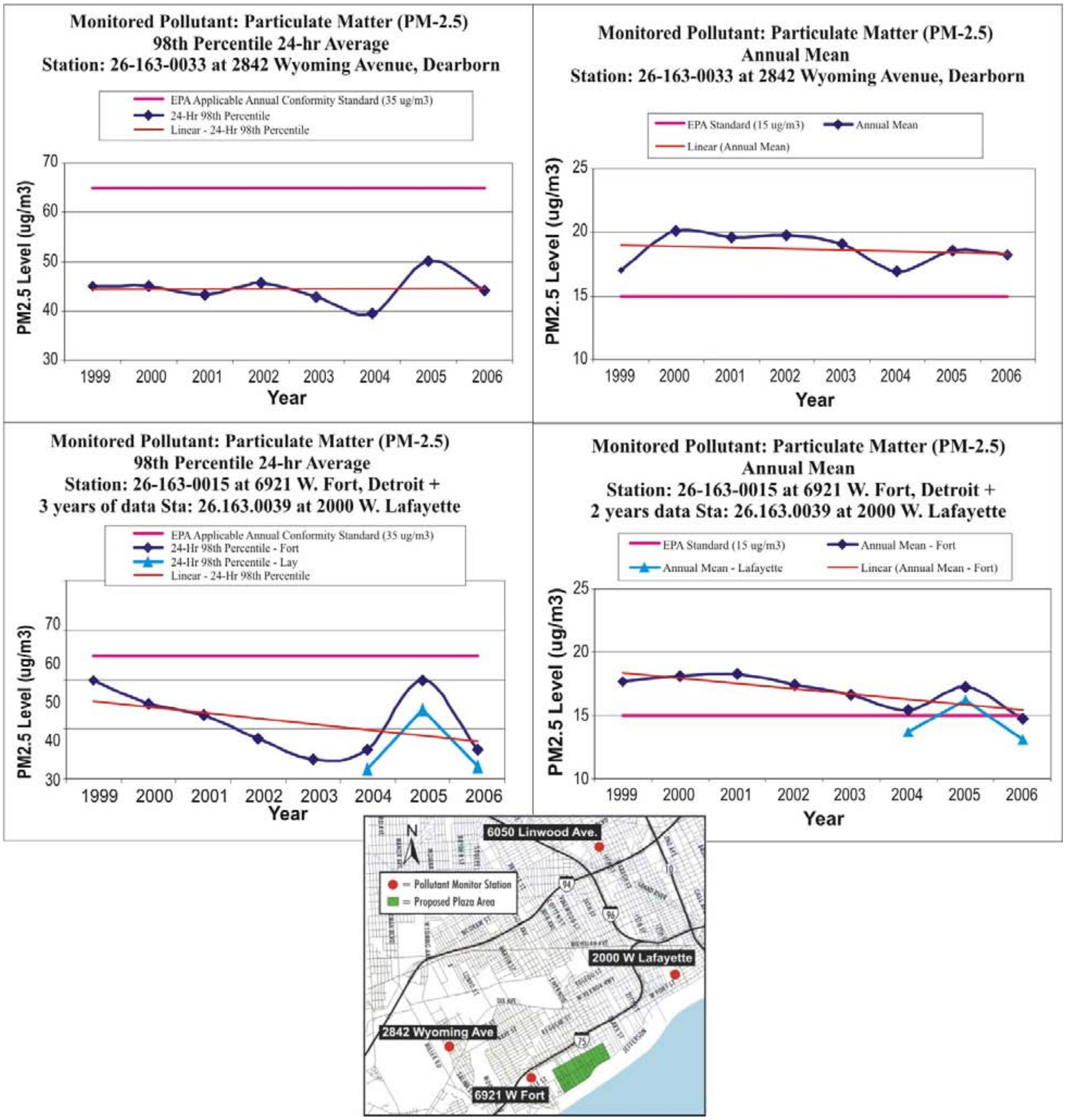
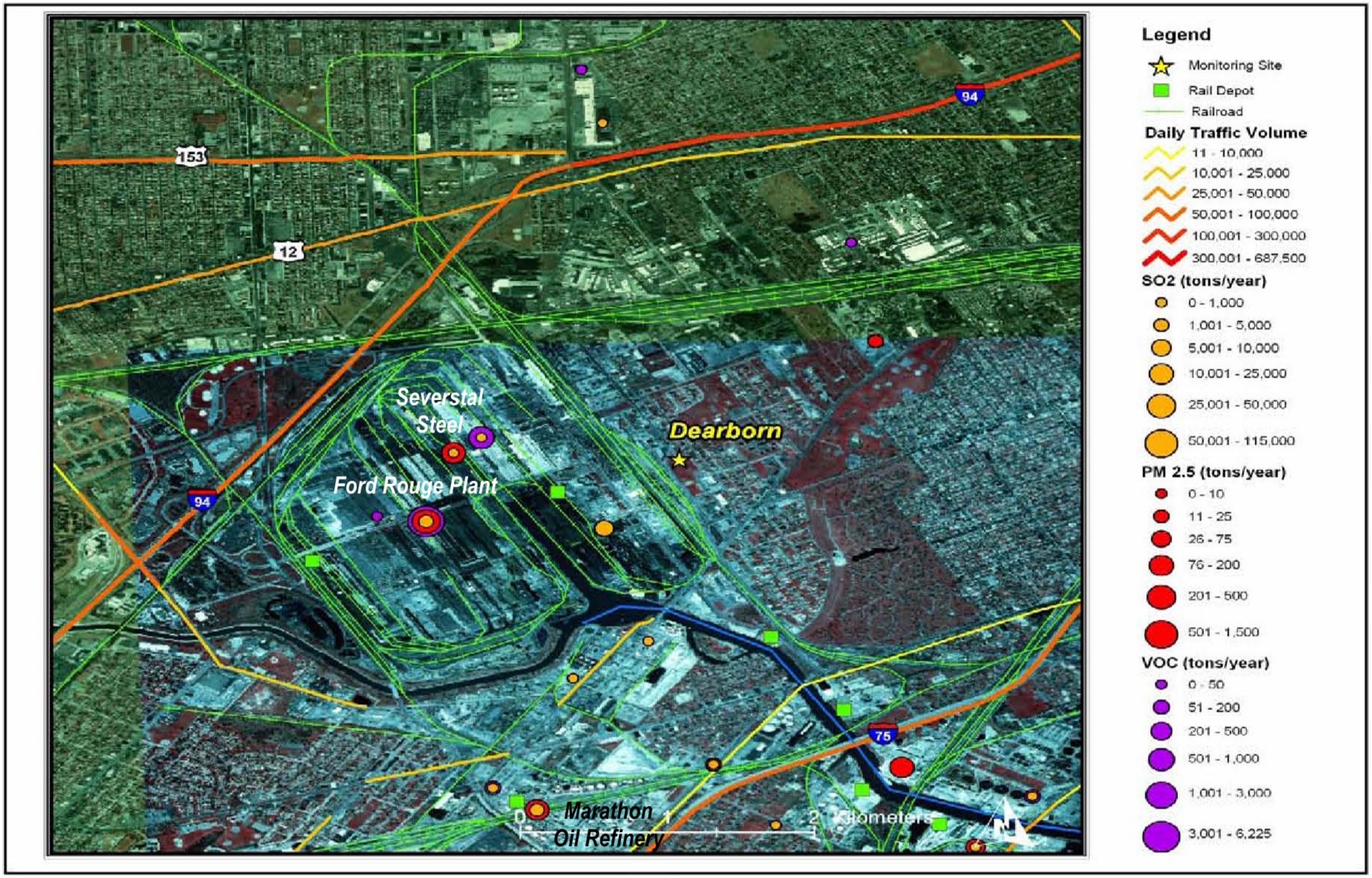
[19] Figure 5-4 is adapted from MDEQ's *Recommended Attainment/Nonattainment Boundaries in Michigan for the PM 2.5 National Ambient Air Quality Standards*, as provided to EPA February 13, 2004.
[20] MDOT 2006 Average Daily Traffic Map.

Figure 5-4
Detroit River International Crossing Study
$PM_{2.5}$ Values and Trends at Nearby Monitors



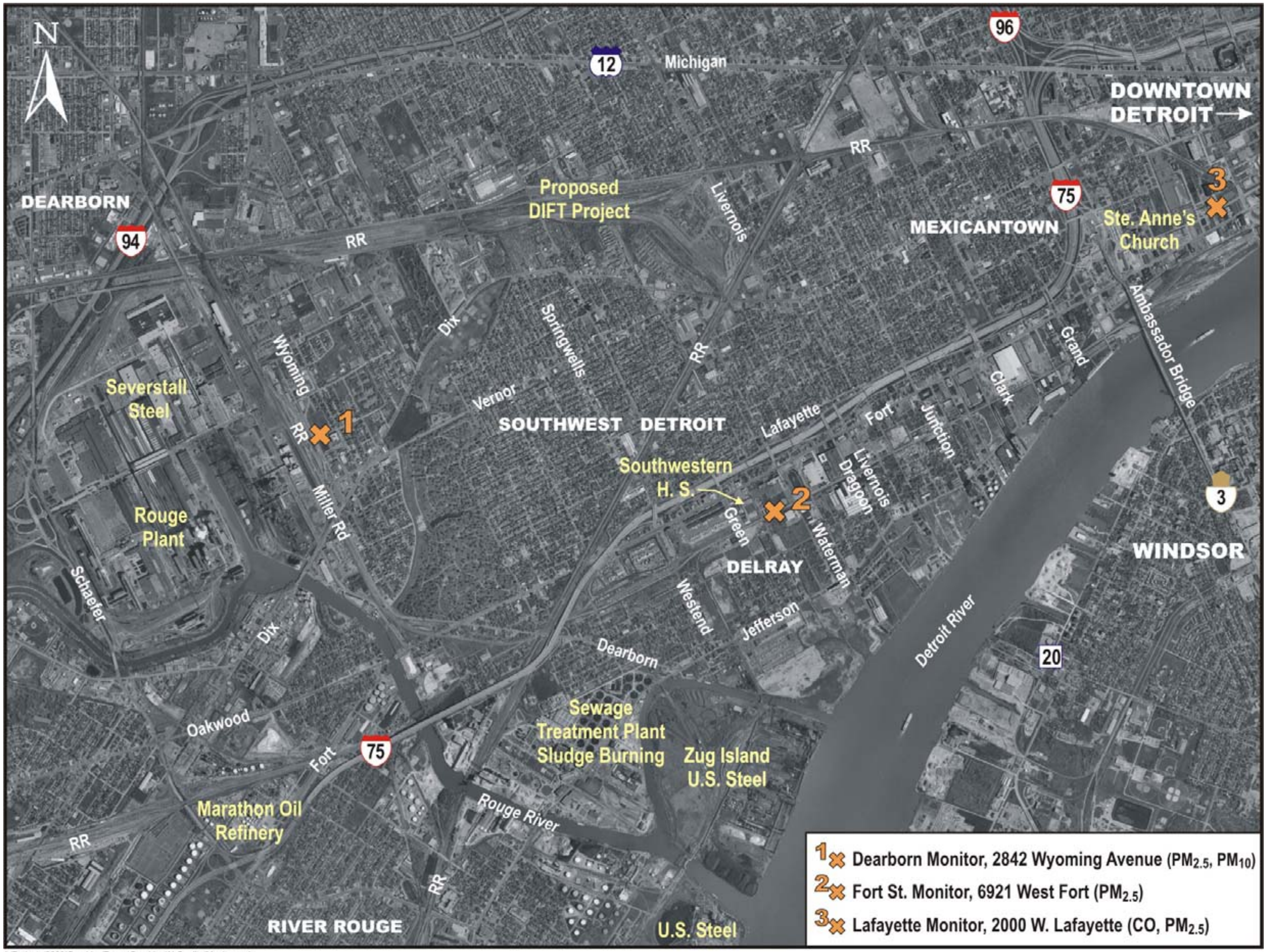
Source: The Corradino Group of Michigan, Inc. using MDEQ data.

Figure 5-5
Detroit River International Crossing Study
MDEQ Graphic of Heavy Industry Near Dearborn Monitor on Wyoming Avenue



Source: MDEQ, 2004 as modified for place names by The Corradino Group of Michigan, Inc.

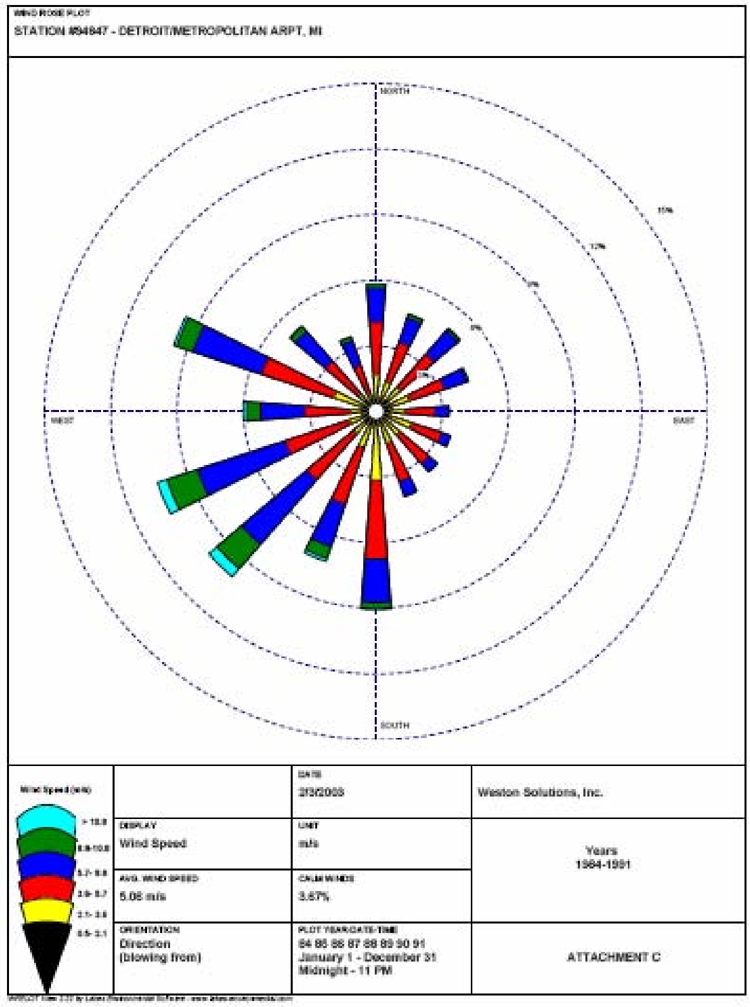
Figure 5-6
Detroit River International Crossing Study
Major Industries and Key Points



I:/Projects/3600/Graphics/ReportGraphics/AirQuality/Monitors.cdr

Source: The Corradino Group of Michigan, Inc.

Figure 5-7
Detroit River International Crossing Study
Wind Rose for Detroit Metropolitan Airport



Source: http://www.deq.state.mi.us/documents/deq-rrd-DS-DetroitLead.pdf

A comparison with other monitor-collected data in Southeast Michigan points out how important industrial and point sources are to the problem of $PM_{2.5}$. Figure 5-8 shows the freeway system in Southeast Michigan and monitors near those freeways (freeways are in red). The table accompanying the graphic shows 24-hour and annual mean values of $PM_{2.5}$, averaged over three years (the standards for $PM_{2.5}$ are in terms of a three-year rolling average). The Livonia monitor, with the highest adjacent daily truck volume (15,600 on I-275), has the lowest 24-hour and annual average mean values of $PM_{2.5}$. The Livonia monitor, like other monitors in Wayne County, is situated in a flat open area without substantial concentrations of high-rise buildings. Compared to Dearborn, measurements are 10 $\mu g/m^3$ (22%) lower on a 24-hour basis, and 4 $\mu g/m^3$ (24%) lower on an annual mean basis. The fact that the prevailing winds are from the southwest does not have a large effect at Livonia because, from an air quality standpoint, the worst case is winds parallel to a road, so vehicular emissions accumulate. Figure 5-7 shows there are many days when the region's winds are north or south, parallel to I-275. And, when they are from the prevailing southwest direction, they carry pollutants from I-96 to the Livonia monitor. Trucks pass very close to the Livonia monitor (0.1 mile), compared to the Dearborn monitor, where I-94 and I-75 are 1.2 and 1.3 miles away, respectively. All this is a clear indication that industry is the key player in the higher readings at the Dearborn monitor. The Lafayette monitor, close to the project (and the Ambassador Bridge's plaza), has lower $PM_{2.5}$ values because it is further removed from the industrial sources.

<u>SEMCOG Draft Weight of Evidence (WOE)</u>

The most comprehensive information available on $PM_{2.5}$ for Southeast Michigan is found in the "Draft Weight of Evidence (WOE) for the Southeast Michigan $PM_{2.5}$ Attainment Strategy," November 6, 2007. This is a "working document" being developed by SEMCOG in support of its work on the SIP. The information below is drawn from that draft document (which is included as Appendix F). It is noted that SEMCOG's base year is 2002 for developing their contribution to the SIP. So, 2002 is a reference point in some of the following information. And, the date the region is to reach attainment for $PM_{2.5}$ is 2010. The dates of analysis for the DRIC are 2004, as the base year; 2013, which represents the year of project opening and the year of highest emissions; 2025, as an intermediate year; and, 2030, which is the horizon year of SEMCOG's *Regional Transportation Plan*.

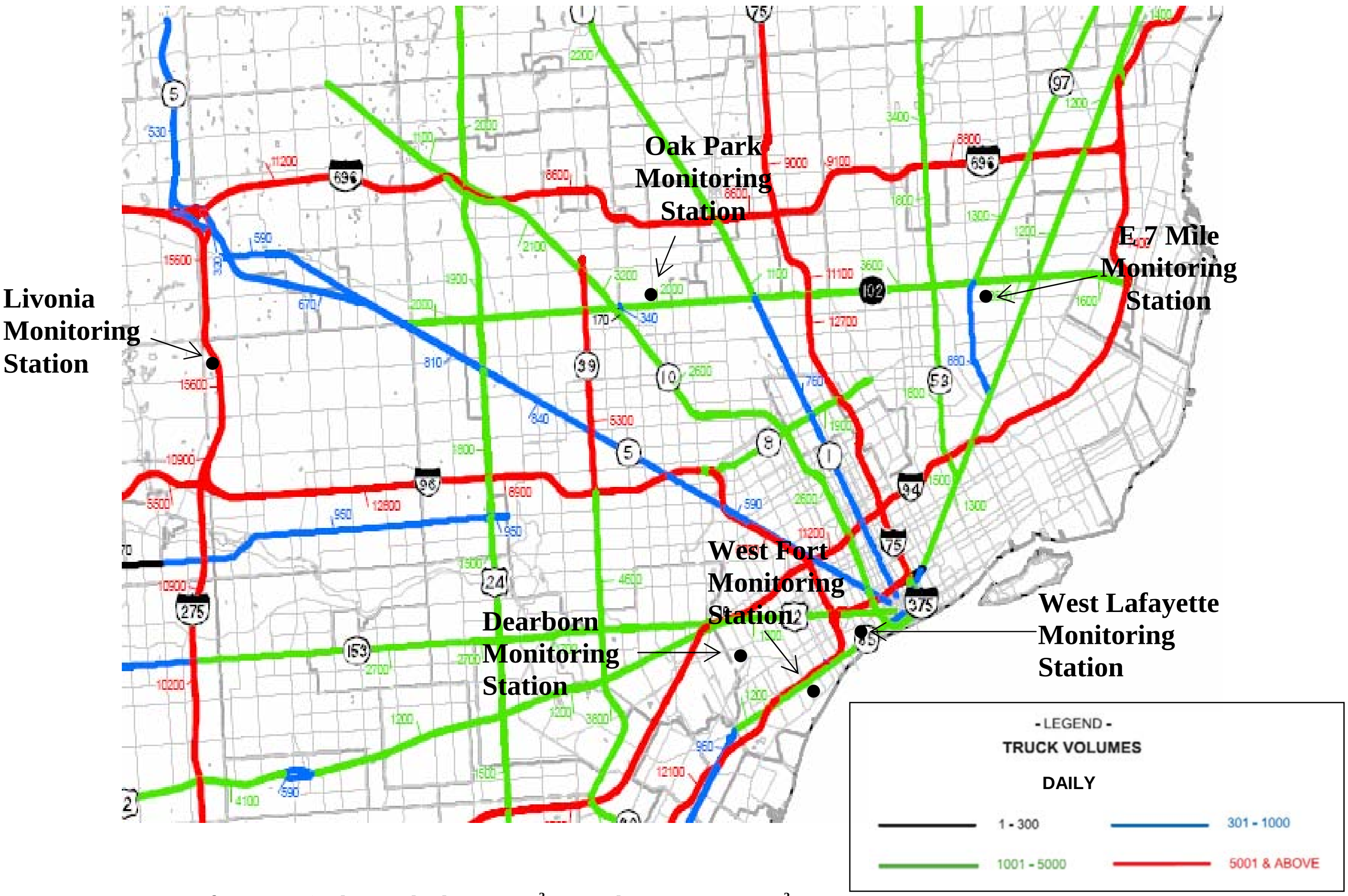
WOE observations for the Southeast Michigan region that relate to $PM_{2.5}$ not covered in earlier discussions follow:

- The Lake Michigan Air Directors Consortium (LADCO) finds the vast majority of $PM_{2.5}$ measured in Southeast Michigan comes from outside the region (75% +). Within the region, the vast majority of the "urban excess" comes from Wayne County.

- $PM_{2.5}$ concentrations were high in 2005 throughout the Midwest (see Figure 5-4). This increase was caused by something other than changes in local emissions.

- The area surrounding the Dearborn and Southwestern High School monitors includes many $PM_{2.5}$ sources that are exempt from MDEQ emissions reporting, but their emissions may be significant because they occur close to the ground and/or near a monitor.

Figure 5-8
Detroit River International Crossing Study
$PM_{2.5}$ Values Relative to Daily Truck Volumes



Comparison of Monitors (24-hr Standard = 35 μg/m^3; Annual Mean = 15.0 μg/m^3)

Name	Address	Monitor ID #	2004-06 $PM_{2.5}$ 24-hr.	2004-06 $PM_{2.5}$ Annual	Nearest Major Roads	Distance to Monitor (miles)	Daily 2-way Truck
Dearborn	2842 Wyoming	261630033	44.2	17.2	I-94	1.2	10,000
					I-75	1.3	12,000
					Fort St.	1.2	1,200
West Fort	6721 West Fort	261630015	40.6	15.8	I-75	0.2	12,000
					Fort Street	0.1	1,200
West Lafayette	2000 W. Lafayette	261630039	32.4[a]	13.1[a]	I-75	0.3	12,000
					Fort Street	0.1	1,200
Livonia	38707 W 7 Mile	261630025	34.3	13.1	I-275	0.1	15,600
					I-96	3.0	12,800
					I-696	4.0	11,200
					Grand River	2.5	1,260
Oak Park	13701 Oak Park Dr.	261250001	39.2	13.4	I-696	0.6	6,600
					8 Mile Road	1.5	2,000
					Lodge Freeway (M10)	1.7	3,200
					Woodward (M1)	2.0	1,100
E 7 Mile	11600 E 7 Mile Rd.	261630019	41.2	14.1	I-94	2.5	7,400
					I-75	4.0	12,700
					I-696	4.0	8,800
					8 Mile Road	1.0	3,600

[a] Only one year of data.
Source: MDEQ and The Corradino Group of Michigan, Inc.

- Numerous storage piles, unpaved lots, and barren lands exist near the Dearborn and Southwestern High School (West Fort) monitors. Their collective impact on PM2.5 is a concern. Only some facilities have fugitive dust plans.

- Industrial facilities near the Dearborn and Southwestern High School monitors have closed or scaled back their operations (as measured since 2002) (refer to Table 1 in Appendix F); examples are Carmeuse/Detroit Lime, Daimler Chrysler McGraw Glass, Frito Lay, IPMC, Gutter Suppliers, Inc., Darling International, and Honeywell.

- Available data show that targeting local organic carbon emission reductions, coupled with the iron reductions resulting from planned steel mill controls, will be the most cost-effective way to bring the region into attainment; but, source apportionment studies for organic carbon are inconclusive. Therefore, more needs to be done to identify the source(s) of organic carbon excess at Dearborn and determine controls.

- Significant local $PM_{2.5}$ reductions will be achieved from controls underway at the Severstal and U.S Steel facilities, as well as the Marathon oil refinery (refer to Figure 5-6). All are within three miles of the monitors measuring the highest $PM_{2.5}$ concentrations in the region - Dearborn and Southwestern High School. Based on a recent EPA study and permit application data, MDEQ estimates a combined $PM_{2.5}$ emission reduction of 330 tons per year. This means a significant decrease in $PM_{2.5}$ concentrations at the Dearborn monitor (over $2\mu g/m^3$), and, to a lesser extent, at Southwestern High School. These reductions are based on:

  - A Consent Order issued by MDEQ to Severstal North America, Inc. that operates steel production facilities just west of the Dearborn monitor.
  - A Consent Decree entered into by EPA with Marathon Oil Company, which will substantially reduce nitrogen oxides and sulfur dioxide emissions at their Detroit refinery southwest of the DRIC project area.
  - Improvements planned at U.S. Steel on Zug Island and south.

- As reported January 9, 2008,[21] Marathon Oil announced it will commit $260 million for pollution control in its proposed $1.9 billion onsite expansion. Targeted pollutants are sulfur dioxide, nitrogen oxide and PM. Also proposed are $2 million to install air quality monitors around the refinery and $1 million to reduce PM waste in neighborhoods around the plant, including street sweeping.

- Emission reductions are expected from retrofitting (basically rebuilding with horsepower reduction) four diesel switch engine locomotives (using Congestion Mitigation/Air Quality funding through SEMCOG together with MDEQ funding) at the Rougemere Rail yard just west of the Dearborn monitor (in some cases only hundreds of feet).

- The Dearborn monitor is close to several rail yards, one of which is immediately upwind of the monitor. LADCO recommended that locomotive emission reduction strategies, such as anti-idling and engine retrofits, be evaluated. As part of a federal Supplemental Environmental Project (SEP), DaimlerChrysler will provide $1.5 million to install anti-idling equipment on approximately 40 switch engine locomotives operating in rail yards

[21] *Detroit News*, January 9, 2008.

and industrial sites near the Dearborn and Southwestern High School monitors. Based on a similar project in Chicago, this project is expected to reduce NOx emission by 96 tons/year and PM by 2.8 tons/year.

Monitoring data has led SEMCOG to a number of conclusions (figures and tables are found in Appendix F):

- $PM_{2.5}$ in Southeast Michigan is comprised largely of sulfates, nitrates, and organic carbon (Figure 4 in Appendix F). At the Dearborn monitoring site, there is also a significant "crustal" component, which is largely iron (Figure 5 in Appendix F).

- Recent source apportionment studies show that the source contributions to $PM_{2.5}$ on an annual average basis are similar to those on high $PM_{2.5}$ concentration days. This suggests that a strategy designed to reduce annual average $PM_{2.5}$ concentrations will also be effective in reducing high daily $PM_{2.5}$ concentrations.

- Since 2000, $PM_{2.5}$ concentrations at all sites in the region have steadily declined. The 3-year average concentration dropped 1.6 $\mu g/m^3$ between 2002 and 2006 (Table 2 in Appendix F). The largest decreases have occurred at the sites with the highest concentrations: Dearborn (2.69 $\mu g/m^3$), SWHS (2.16 $\mu g/m^3$), and Wyandotte (3.04 $\mu g/m^3$).

- $PM_{2.5}$ concentrations at monitoring sites in the industrial core of Southeast Michigan's nonattainment area (Dearborn, SWHS & Wyandotte) have been decreasing faster than other sites (Figure 7 in Appendix F). This is likely due to changes in emissions in the industrial area.

- Despite a rise in 2005 $PM_{2.5}$ concentrations in southeast Michigan and the entire Midwestern United States as a whole, there has been a strong downward trend in Southeast Michigan's $PM_{2.5}$ concentrations over the last six years (Figure 8 in Appendix F).

- Every monitor in Southeast Michigan recorded its lowest annual average $PM_{2.5}$ concentration in 2006 (Table 4 in Appendix F).

- The area where the two remaining violating monitors (Dearborn and SWHS) are located is one with a history of particulate matter problems, associated with local industrial sources. Figure 10 in Appendix F shows the location of these monitors relative to the former PM_{10} nonattainment area. As the map illustrates, the areas are nearly identical. The primary source of the former PM_{10} problem was determined to be a few local industrial sources. Emissions from these sources were reduced and the region came into compliance in 1996.[22]

- Various analyses of both local and regional monitoring data all indicate that Southeast Michigan's nonattainment problem is caused by a combination of regional transport and local emissions from sources in the vicinity of the violating monitors.

[22] These emission reductions probably also helped lower PM2.5 concentrations in the area. However, no long-term PM2.5 monitoring data exist to determine the degree of improvement.

- All $PM_{2.5}$ monitors in other parts of the designated Southeast Michigan nonattainment area are meeting the standard and have shown a downward trend since 2000 (Figure 11 in Appendix F).

- Analysis of monitoring data shows that counties north of Wayne do not contribute to $PM_{2.5}$ nonattainment at the violating monitors. The analysis shows that the vast majority of the urban excess at these monitors on days when winds are from the northeast, north or northwest, comes from within Wayne County. Little increase is attributable to Oakland and Macomb counties. And in all cases, average concentrations at the violating monitors are well below the standard when winds are from these directions (Figures 12 and 13 in Appendix F).

- A wind rose for the iron component of $PM_{2.5}$ at Dearborn points directly to the southwest (Figure 17 in Appendix F). Conversely, the iron wind rose for Allen Park, while measuring much lower levels, points to the northeast. The Allen Park monitor is approximately five miles southwest of Dearborn. Additional wind direction analysis shows that, when winds are from the southwest average crustal concentrations at Dearborn are over 2.5 $\mu g/m^3$ higher than those at Allen Park and are sometimes as much as 6 $\mu g/m^3$ higher (Figure 18 in Appendix F). This clearly indicates a significant local iron source directly between these two sites (which are approximately five miles apart) and closer to the Dearborn monitor.

  The Severstal Steel facility lies in exactly this position (Figure 19 in Appendix F). As part of a consent order and permit with the State, this facility is in the process of installing new bag houses on its blast and basic oxygen furnaces, as well as other control equipment. These changes are expected to reduce $PM_{2.5}$ emissions at this facility by 166 tons per year.

- The Dearborn wind rose for organic carbon indicates a more even distribution than iron but still shows noticeably higher concentrations when the wind is from the west, southwest or south (Figure 17 in Appendix F). However, the specific sources(s) of this excess have yet to be identified.

* Unlike ozone, $PM_{2.5}$ is composed of many different components that can come from a wide variety of sources. Lack of speciated $PM_{2.5}$ data at the Linwood, Southwestern High School, and Wyandotte monitoring sites makes identification of specific local source contributors in these areas very difficult. One must make assumptions based on their proximity to neighboring monitors that do have detailed data available.

Information presented in Section 4 (Mobile Source Air Toxics) from the Detroit Exposure and Aerosol Research Study (DEARS) and the Detroit Air Toxics Initiative (DATI) Risk Assessment Report is also relevant to $PM_{2.5}$, and the reader is referred to that section for additional information.

$PM_{2.5}$ Project Conditions - Future (2013, 2025 and RTP Horizon Year - 2030)

The qualitative "hot-spot" analysis in this section is in addition to the process SEMCOG has used in past years to determine <u>regional transportation conformity</u> (see Section 4.3). The qualitative hot-spot analysis is designed to determine the effect of $PM_{2.5}$ on a localized basis, i.e., <u>project-level conformity</u>. This hot-spot analysis is designed to consider direct emissions only, not secondary particles, as these take several hours to form in the atmosphere, giving emissions time to disperse beyond the immediate area of concern.

The SIP for $PM_{2.5}$ is now under development by SEMCOG and MDEQ and is due to EPA April 2008. Consequently, there are no “budgets” for $PM_{2.5}$. The qualitative hot-spot analysis in this section addresses both the 24-hour and annual standards for $PM_{2.5}$. It includes the river crossing, the plaza operations and the connections to I-75. It does not include activity at key intersections where the LOS drops to D or worse as traffic analysis found there are none. It considers construction activity as dust could be a consideration in the SIP.

It is important to again note that splitting traffic between the proposed DRIC project and the Ambassador Bridge also splits the vehicular emissions. Up to the date when existing capacity is exceeded (2015 to 2035), a new bridge would divert traffic from other crossings. After that date, a new crossing would accommodate net new traffic beyond that which the existing crossings could accommodate. The date at which this will occur is uncertain but will be after 2015 at the earliest. More likely it would occur after 2020, well after the region is to be in $PM_{2.5}$ attainment. With that in mind, the qualitative hot-spot analysis for particulates compares overall truck volumes and the change with a new crossing. Provision of a new bridge would ensure that congestion resulting from a lack of roadway capacity does not occur. Congestion will occur under the No Build Alternative.

<u>Bridge/Plaza</u> – Travel is designed to be free flow across the Detroit River on the proposed new crossing and then from the plaza to I-75. The project design would provide adequate capacity to achieve Level of Service (LOS) C or better. There would be delay at the plaza because of the need to pay tolls and deal with Customs processing/inspections. The assumption is that the tolling function and U.S. Customs processing and inspections would operate in a manner similar to the operations at the Ambassador Bridge. Reduced congestion and truck delay is expected through increased use of the Free and Secure Trade Program (FAST) program and NEXUS program as explained below.

The Free and Secure Trade (FAST) program applies to trucks. It is a joint Canada–United States initiative involving the Canada Border Services Agency (CBSA) and U.S. Customs and Border Protection (CBP). FAST supports moving pre-approved eligible goods across the border quickly and verifying trade compliance away from the border. Shipments for approved companies, transported by approved carriers using registered drivers, are cleared into either country with greater speed and certainty, and at a reduced cost of compliance.

The NEXUS program applies to passenger vehicles. It is designed to expedite the border clearance process for low-risk, pre-approved travelers. It is also sponsored by CBSA and CBP. Currently, NEXUS program users experience limited benefits due to general congestion on bridges and bridge approaches.

FAST and NEXUS program expansions would be expected with a new DRIC crossing. On the Ambassador Bridge, FAST and NEXUS program participants now must wait in line with other vehicles. The DRIC Build Alternatives would provide three lanes in each direction, rather than two, so program users could advance in their own uncongested lane. The result would be faster processing time over the border for all, and less delay/idling by trucks and cars on the bridge and plaza. An extension of this would be that with more trucks registered in the program, secondary inspections (which are more lengthy) could also potentially be reduced.

The DRIC is a project of air quality concern because large numbers of diesel trucks are involved. An examination of forecast heavy truck traffic in 2013 (year of project opening and year of greatest project air pollution) and 2030 (*Regional Transportation Plan* year) provides a way to understand how truck volumes would change with the project (Table 5-5). Data are presented for the peak hours of the AM, midday, and PM, and for 24 hours. These data show the midday is generally the period of heaviest truck activity. Practical Alternative Set #1, #2, #3, #14, and #16 diverts the most truck traffic from the Ambassador Bridge. The “2-Bridge Total” in the last column shows higher totals with the DRIC Build Alternatives as trucks are attracted from the Blue Water Bridge crossing 60 miles to the north.

A perspective on likely project effects on $PM_{2.5}$ concentrations can be gained by looking at changes in future emission factors and in truck traffic volumes on the major transportation facilities framing the Delray area: I-75, the Ambassador Bridge with its plaza, and the new bridge and its plaza.

Using the data that support Figure 5-3 one finds that for the 30 mph speed that represents bridge and plaza operations to the point of connection (ramps) to the interstate, emission factors for 2004 and the reduction over time from 2004 are:

- 2004 – 0.3066 grams/mile
- 2013 – 0.0914 grams/mile = 30 % of 2004
- 2030 – 0.0257 grams/mile = 8 % of 2004

The result for the 55 mph operations of I-75 is the same as the MOBILE6.2 emission factors for particulates are the same for all speeds.

Two-way daily truck volumes on the Ambassador Bridge plus the new bridge (Table 5-5) show the following pattern of growth:

- 2004 – 11,639 trucks
- 2013 – 16,493 trucks = 141 % of 2004
- 2030 – 25,516 trucks = 219 % of 2004

Taking the increase in truck traffic versus the decrease in the emission factors, one finds:

- 2013 – 141 % x 30 % = 0.42
- 2030 – 219 % x 8% = 0.17

This means that in terms of the truck volumes on the two bridges taken together, the amount of $PM_{2.5}$ in 2013 would be less than half (0.42) of the base year, and the 2030 amount would be one sixth.

Domestic truck traffic on I-75 (as compared to the international trucks passing to and from Canada) is expected to grow more slowly. The travel demand model indicates only 2 percent growth from 2004 to 2035. Assuming 1 percent growth for 2013 and a second percent for 2030, one finds:

- 2013 - 101 % x 30 % = 0.30
- 2030 – 102 % x 8% = 0.08

Table 5-5
Detroit River International Crossing Study
Truck Volumes for PM Hot-spot Analysis
Peak Hours – 2013 and 2030

Year	Period	Alternative	Total AMB	Total NEW	2-Bridge Truck Total
2013	AM	No Build	574	0	574
		#1, #2, #3, #14, #16	75	566	641
		#5	64	570	634
		#7, #9, #11	268	362	629
	Mid	No Build	824	0	824
		#1, #2, #3, #14, #16	191	707	898
		#5	186	675	860
		#7, #9, #11	594	284	879
	PM	No Build	745	0	745
		#1, #2, #3, #14, #16	129	698	827
		#5	119	702	821
		#7, #9, #11	329	479	808
	24-Hour	No Build	15,077	0	15,077
		#1, #2, #3, #14, #16	3,154	13,338	16,493
		#5	3,016	12,984	16,000
		#7, #9, #11	9,623	6,529	16,152
2030	AM	No Build	841	0	841
		#1, #2, #3, #14, #16	116	874	990
		#5	124	862	986
		#7, #9, #11	323	646	968
	Mid	No Build	1,147	0	1,147
		#1, #2, #3, #14, #16	360	1,040	1,400
		#5	349	1,044	1,393
		#7, #9, #11	753	605	1,357
	PM	No Build	1,060	0	1,060
		#1, #2, #3, #14, #16	260	1,003	1,263
		#5	237	1,025	1,262
		#7, #9, #11	481	763	1,243
	24-Hour	No Build	21,235	0	21,235
		#1, #2, #3, #14, #16	5,858	19,658	25,516
		#5	5,666	19,761	25,427
		#7, #9, #11	12,351	12,502	24,853

Source: The Corradino Group of Michigan, Inc.

This means that in terms of the truck volumes on the I-75, the amount of $PM_{2.5}$ in 2013 would be less than one third (0.30) of the base year, and the 2030 amount would be one twelfth.

These data again point out that 2013 is the reasonable worst case year in considering air quality.

These data show a substantial reduction in emissions from the principal on-road mobile source of $PM_{2.5}$, heavy duty diesel trucks. The three-year annual mean data for Southwestern High School show a concentration of 15.8 $\mu g/m^3$, just over the annual standard of 15.0. At Lafayette, only two years of data are available and they average 14.7 $\mu g/m^3$ - within the standard. As noted the Lafayette monitor is further from industrial emitters. To the extent that mobile sources contribute to the concentrations at these monitors, the project, due to overall emission reductions, will contribute less $PM_{2.5}$.

Plaza-a (Practical Alternative Set #1, #2, #3, #14, and #16 and Alternative #5) is more streamlined and carries roughly twice the truck traffic of Plaza-b (Figure 5-9). But, nearby homes are more distant from the truck traffic flow (refer to Figure 5-1). For example, accounting for relocations related to the Gateway Boulevard and plaza construction (Figure 5-1), only about ten homes would remain within 500 feet of the active zones of the plaza along the west side of the plaza. About 20 would remain on the east. With Plaza-c (Practical Alternative Set #7, #9, and #11) there would be approximately 30 homes to the west and 15 to the east remaining. Housing more distant than 500 feet does not exist to the east and is very dispersed to the west. At the Ambassador Bridge approximately 50 homes are within 500 feet, with multifamily housing just beyond that distance.

As noted earlier, north of I-75 there is an opportunity to reduce truck traffic on the Livernois/Dragoon one-way pair that serves a dense residential area. Each of these streets can carry more than 100 trucks an hour 50 feet from residents' front doors. All DRIC Practical Alternatives offer the greatest opportunity to eliminate direct access by heavy-duty diesel trucks via Livernois/Dragoon to this intermodal terminal and, in general, by modifying the ramp system on I-75. This will improve air quality conditions in another section of Southwest Detroit.

Intersections - There is little traffic on streets in Delray, and almost no congestion. The exceptions are Fort Street and Clark Street, on Delray's east side, where all heavy truck traffic entering the U.S. by way of the Ambassador Bridge now accesses the U.S. freeway system. That congestion will be eliminated by the Ambassador Bridge Gateway Project which, by 2009, will provide direct ramp connections to the interstate highway system. The Gateway Project will eliminate roadway congestion on Fort and Clark streets in Delray.

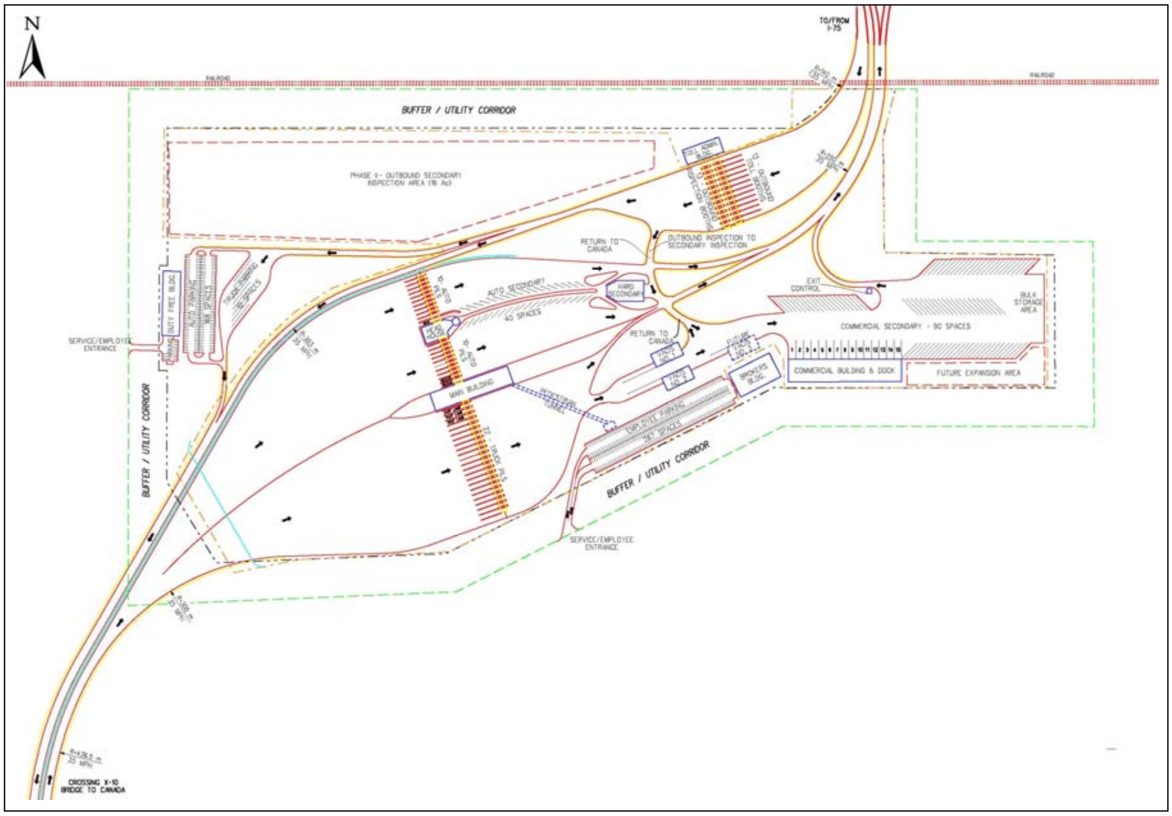
The DRIC project would close some streets that cross over I-75, and the Livernois/Dragoon interchanges would be closed and others will be reconfigured. These actions would shift traffic. However, traffic analysis indicates that shifts would not cause service level reductions to LOS D or worse. So, no further analysis of intersections as $PM_{2.5}$ hot-spots is required.

Documentation of Public Involvement

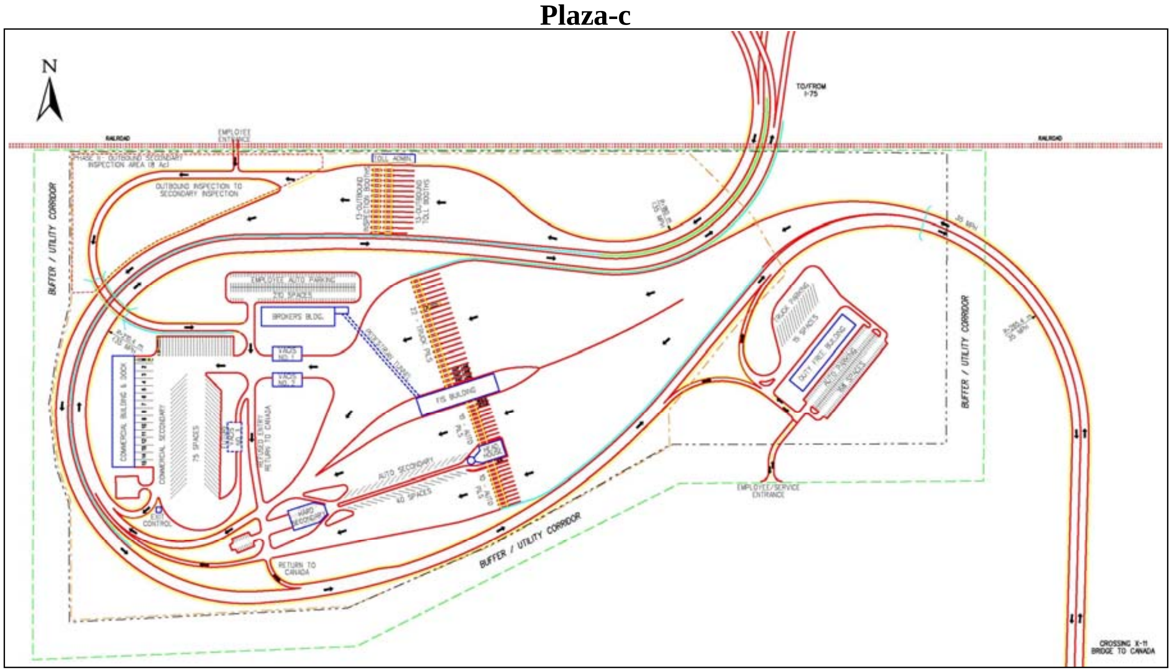
There has been and will continue to be extensive public involvement for the DRIC project. It is documented in Section 6 of the EIS. Air quality has been a recurrent topic at public meetings. Early coordination with agencies has been reinforced and augmented by the interagency consultation involved in preparing the *Air Quality Protocol* that has guided the development of this technical report.

Figure 5-9
Detroit River International Crossing Study
Preliminary Alternative Plaza Layouts

Plaza-a



Plaza-c



Source: The Corradino Group of Michigan, Inc. and Parsons Transportation Group

A comprehensive set of notes of Local Advisory Council (LAC) meetings and public meetings and workshops is available at http://www.partnershipborderstudy.com/meetings_us.asp. LAC meetings are held monthly and the general public is invited to attend and comment. Many other meetings have been held to keep the public informed and to solicit information from them, including community planning workshops.

Conclusions

The conclusion of this qualitative $PM_{2.5}$ hot-spot analysis is that the proposed project will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. Therefore, no mitigation is required. This applies to both the 24-hour and annual standards. This conclusion, subject to interagency consultation, is based on the following:

- SEMCOG and MDEQ have been moving aggressively to address air quality concerns, in general, and $PM_{2.5}$, specifically.
  - This includes programs such as diesel locomotive retrofits, and
  - Controls on consumer products.

- EPA is addressing the non-local component of $PM_{2.5}$ pollution through programs such as the Clean Air Interstate Rule, stricter controls on vehicle emissions, and the low-sulfur fuel introduced in 2007.

- A number of major polluters that were believed to be significant contributors to the $PM_{2.5}$ emission problem have closed. Mandated enforcement controls are being applied at other local industries such as Severstal Steel, Marathon Oil and U.S. Steel. Marathon Oil has announced additional air quality control measures as part of a proposed expansion.

- On a local, on-road basis in Southwest Detroit, provision of a new bridge to Canada will split on-road $PM_{2.5}$ between the Ambassador Bridge and a new bridge. This will occur in 2013, three years after the 2010 date when $PM_{2.5}$ standards are to be reached. If the SIP is successful, the SEMCOG region will be in attainment for the $PM_{2.5}$ 24-hour and annual standards before the DRIC project is open to traffic.

- Information in Figure 5-8 demonstrates that vehicular activity in Southeast Michigan can occur without violation of standards. The Livonia monitor is in close proximity to some of the heaviest truck movements in the region and is not violating the $PM_{2.5}$ standards. And, this is occurring before the 2007 elimination of sulfur from fuels and more stringent diesel engine requirements.

- Efficiencies can be expected from increased enrollment in the NEXUS (auto) and FAST (truck) programs when a clear lane through the border area becomes available with the DRIC project. This will lessen the time that trucks idle within the system, through reduced queuing and more preprocessed paperwork.

- With a new plaza the number of Gamma Ray Inspection Technology (GRIT) lanes at the Detroit-Windsor border will increase, reducing queuing and idling. GRIT is part of the non-intrusive inspection of trucks coming into the U.S.

- U.S. Customs and Border Protection has instituted a policy requiring trucks to turn off their engines when they pull into the secondary inspection area.

- A comparison of project and on I-75 truck traffic trends to emission factor reductions shows that the product of the two trends shows emission reductions of at least one half (58%) by 2013 and five sixths (83%) by 2030.

Summary: SEMCOG believes it will reach attainment of the annual standard by 2010, three years in advance of the date of the DRIC project opening. Substantial reductions are expected from industrial sources and monitors near these sources have been trending down (see Appendix F). The monitor next to some of the highest truck volumes in the region (Livonia) is not violating standards. Plaza operations and the FAST program will reduce truck queuing and delay. Finally, emission factors are trending down faster than truck traffic is increasing. Monitors closest to the proposed bridge corridor and the existing Ambassador Bridge and plaza are at Southwestern High School and on Lafayette. These monitors are slightly over and just under the annual $PM_{2.5}$ standard and well within the 24-hour standard. Every indication is that concentrations at these monitors will continue to trend downward as they are today. Therefore, it is concluded that the proposed project will not cause new air quality violations, worsen existing violations, or delay timely attainment of the annual or 24-hour NAAQS for $PM_{2.5}$.

5.3.2.3 PM_{10} Hot-spot Qualitative Analysis

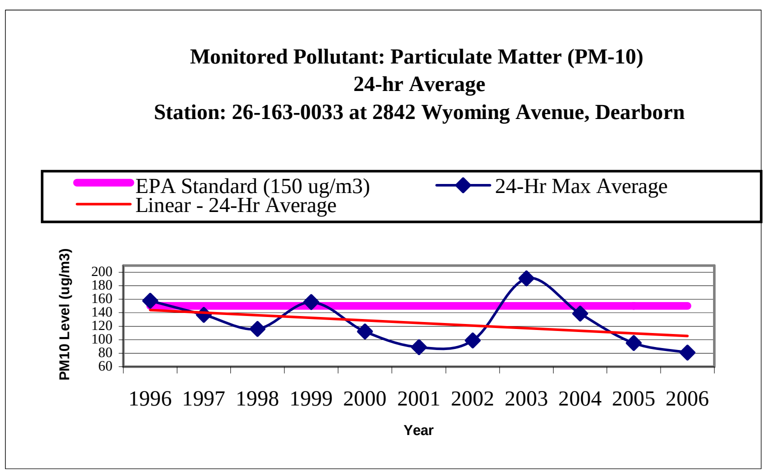
The PM_{10} hot-spot analysis is substantially the same as the $PM_{2.5}$ hot-spot analysis. The project description is presented in Section 1. The hybrid of Methods A and B is used. The documentation of public involvement is that presented for the $PM_{2.5}$ analysis. The DRIC project is of "air quality concern" (*Transportation Conformity Guidance*, Chapter 1.3) for PM_{10} because it would represent a transfer point that has "a significant number of diesel vehicles congregating at a single location." (40 CFR 93.123(b)(1)(iii).

Background Conditions

MDEQ's *2006 Air Quality Report* presents 2002 EPA data showing that for PM_{10} Michigan's sources are: point sources 34 %, area sources 32%, non-road vehicles 20%, and on-road vehicles 14%. Figure 5-3 shows that MOBILE6.2 emission factors for PM_{10} substantially decline over time.

From 1996 to 2005, there were five exceedances of the 24-hour PM_{10} standard in Michigan. Each occurred at the Dearborn monitoring station (the closest $\underline{PM_{10}}$ monitor to the proposed project). The two exceedances in 2003 and the one in 2004 happened when construction occurred near the Dearborn monitor. However, only the 2004 exceedance was considered an "exceptional event" under federal criteria. That concentration was not used for attainment/nonattainment purposes, but the high value for 2003 was used, as the trend depicted in Figure 5-10 illustrates. In spite of that, the decline in PM_{10} is

Figure 5-10
Detroit River International Crossing Study
PM_{10} at Dearborn Monitor



Source: The Corradino Group of Michigan, Inc. using MDEQ data.

clearly evident. Many of the actions related to $PM_{2.5}$ and point sources that are being pursued by MDEQ will have beneficial effects on PM_{10}, as well.

PM_{10} Project Conditions - Future (2013 and RTP Horizon Year - 2030)

As with $PM_{2.5}$, A perspective on likely project effects on PM_{10} concentrations can be gained by looking at changes in future emission factors and in truck traffic volumes on the major transportation facilities framing the Delray area: I-75, the Ambassador Bridge with its plaza and the new bridge and its plaza.

Using the data that support Figure 5-3 one finds that for the 30 mph speed that represents bridge and plaza operations to the point of connection (ramps) to the interstate, emission factors for 2004 and the reduction over time from 2004 are:

- 2004 – 0.3585 grams/mile
- 2013 – 0.1251 grams/mile = 35 % of 2004
- 2030 – 0.0536 grams/mile = 15 % of 2004

The result for the 55 mph operations of I-75 is the same as the MOBILE6.2 emission factors for particulates are the same for all speeds.

Two-way daily truck volumes on the Ambassador Bridge plus the new bridge (Table 5-5) show the following pattern of growth:

- 2004 – 11,639 trucks
- 2013 – 16,493 trucks = 141 % of 2004
- 2030 – 25,516 trucks = 219 % of 2004

Take the increase in truck traffic versus the decrease in the emission factors, one finds:

- 2013 – 141 % x 35 % = 0.49
- 2030 – 219 % x 15% = 0.33

This means that in terms of the truck volumes on the two bridges taken together, the amount of PM_{10} in 2013 would be less than half (0.49) of the base year, and the 2030 amount would be one third.

Domestic truck traffic on I-75 (as compared to the international trucks passing to and from Canada) is expected to grow more slowly. The travel demand model indicates only 2 percent growth from 2004 to 2035. Assuming 1 percent growth for 2013 and a second percent for 2030, one finds:

- 2013 – 101 % x 35 % = 0.35
- 2030 – 102 % x 15% = 0.15

This means that in terms of the truck volumes on the I-75, the amount of PM_{10} in 2013 would be one third (0.35) of the base year, and the 2030 amount would be one seventh.

These data show a substantial reduction in emissions from the principal on-road mobile source of PM_{10}, heavy duty diesel trucks. To the extent that mobile sources contribute to the concentrations at these monitors, the project, due to overall emission reductions, will contribute less PM_{10}.

The project conditions in terms of affected intersections are the same as for the $PM_{2.5}$ qualitative analysis. That is, there would be no intersections at Level of Service D or worse. A difference of the PM_{10} hot-spot analysis from that of $PM_{2.5}$ relates to roadway dust, which, consistent with the PM hot-spot guidance cited earlier, must be considered in all PM_{10} hot-spot analyses. Roadway dust is not in the SEMCOG inventory for PM_{10} emissions. Re-entrained dust (the dust stirred up by moving vehicles) is considered here in terms of vehicle miles of travel (VMT). The same conclusions that have been drawn previously in Section 3.2 apply. That is, the project will improve regional roadway network efficiency. The project would attract some traffic from Port Huron, so, on a sub-regional basis, VMT will go up slightly; but, on a local level, the PM_{10} burden will be split between the Ambassador Bridge and the proposed new bridge.

Roadway dust has been considered consistent with the hot-spot guidance. It would be no worse at the new crossing plaza and connectors to I-75 than it would be over the Ambassador Bridge. Re-entrained dust for operations over the new bridge, plaza and connection system to I-75 is shown in Table 5-6.

The PM_{10} hot-spot analysis has considered construction. However, in accordance with 93.123(c)(5), emissions from construction-related activities can be considered temporary, if they occur only during the construction phase and last five or fewer years at any individual site. This is expected to be the case on the DRIC. Temporary emissions are not required to be included in hot-spot analyses. As a measure of the temporary burden, the reader is referred to Appendix D.

Conclusions

The conclusion of this qualitative PM_{10} hot-spot analysis is that the proposed project will not cause new air quality violations. There are no existing violations. This applies to both the 24-hour standard and the revoked annual standard. This conclusion, subject to interagency consultation, is based on the following:

- If there are no existing violations at Dearborn, in the heart of the industrial area that SEMCOG, LADCO, and MDEQ have identified as a problem source of PM, it is logical to assume there are no localized, hot-spot violations closer to the project area, which is further removed from these industrial sources.

- SEMCOG and MDEQ have been moving aggressively to address air quality concerns in general and PM_{10} specifically.
  - This includes programs such as diesel locomotive retrofits, and
  - Controls on consumer products.

- EPA is addressing the non-local component of PM_{10} pollution through programs such as the Clean Air Interstate Rule, stricter controls on vehicle emissions, and the low-sulfur fuel introduced in 2007.

- A number of major polluters that were believed to be significant contributors to the PM_{10} emission problem have closed. Mandated enforcement controls are being applied at other local industries such as Severstal Steel, Marathon Oil and U.S. Steel. Marathon Oil has announced additional air quality control measures as part of a proposed expansion.

Table 5-6
Detroit River International Crossing Study
PM_{10} Dust Generated during Operation of DRIC Bridge, Plaza and I-75 Connectors

		Alt #1/2/3/14/16			Alt #5			Alt #7/9/11		
		24-hr VMT	24-hr lbs	Annual lbs	24-hr VMT	24-hr lbs	Annual lbs	24-hr VMT	24-hr lbs	Annual lbs
Auto	2013 VMT	27601	0.025	9.1	29906	0.027	9.8	22651	0.020	7.4
	2025 VMT	29880	0.027	9.8	31976	0.029	10.5	26819	0.024	8.8
	2030 VMT	30829	0.028	10.1	32839	0.030	10.8	28556	0.026	9.4
Truck	2013 VMT	27747	0.790	289	27892	0.795	290	20004	0.570	208
	2025 VMT	37043	1.055	385	38152	1.087	397	32392	0.923	337
	2030 VMT	40917	1.166	425	42428	1.209	441	37554	1.070	390

Auto Example Calculation

Formula 1 - for vehicles traveling on paved surfaces is: E = k(sL/2)0.65(W/3)1.5-C [1-P/4N]

$$E = k(sL/2)^{0.65}(W/3)^{1.5}\text{-}C\ [1\text{-}P/4N]$$

E=	size-specific emission factor (lb/VMT)		
k=	particle size multiplier (from Table 13.2-1.1		
sL=	road surface silt loading (g/m^2)	0.015	g/m^2
P=	number of wet days per year	134	Detroit 2003
N=	days in period	365	
W=	mean vehicle weight (tons)	2	assumed
C=	emission factor for 1980s vehicle fleet exhaust, brake wear and tire wear (from Table 13.2.1-2)		

For PM_{10} C=	0.00047					PM10 (lbs/24 hrs)	PM10 (lbs/yr)
k=	0.016			VMT			
PM10 Emissions =	0.000329	lbs/VMT	x	27601	=	0.025	9.1

Truck Example Calculation

Formula 1 - for vehicles traveling on paved surfaces is: E = k(sL/2)0.65(W/3)1.5-C [1-P/4N]

$$E = k(sL/2)^{0.65}(W/3)^{1.5}\text{-}C\ [1\text{-}P/4N]$$

E=	size-specific emission factor (lb/VMT)		
k=	particle size multiplier (from Table 13.2-1.1		
sL=	road surface silt loading (g/m^2)	0.015	g/m^2
P=	number of wet days per year	134	Detroit 2003
N=	days in period	365	
W=	mean vehicle weight (tons)	20	assumed
C=	emission factor for 1980s vehicle fleet exhaust, brake wear and tire wear (from Table 13.2.1-2)		

For PM_{10} C=	0.00047					PM10 (lbs/24 hrs)	PM10 (lbs/yr)
k=	0.016			VMT			
PM10 Emissions =	0.010398	lbs/VMT	x	27747	=	0.790	289

Source - AP 42, Section 13.2.1 Paved Roads and The Corradino Group of Michigan, Inc.

- On a local, on-road basis in Southwest Detroit, provision of a new bridge to Canada would split on-road PM_{10} between the Ambassador Bridge and a new bridge. This split includes re-entrained roadway dust.

- Roadway dust would be expected to be no different on a new bridge system than it is at the Ambassador Bridge crossing.

- Efficiencies can be expected from increased enrollment in the NEXUS (auto) and FAST (truck) programs when a clear lane through the border area becomes available with the DRIC project. This will lessen the time that trucks idle within the system, through reduced queuing and more preprocessed paperwork.

- With a new plaza the number of Gamma Ray Inspection Technology (GRIT) lanes at the Detroit-Windsor border will increase, reducing queuing and idling. GRIT is part of the non-intrusive inspection of trucks coming into the U.S.

- U.S. Customs and Border Protection has instituted a policy requiring trucks to turn off their engines when they pull into the secondary inspection area.

- A comparison of project and on I-75 truck traffic trends to emission factor reductions shows that the product of the two trends shows emission reductions of at least one half (51%) by 2013 and two-thirds (67%) by 2030.

Summary: Substantial reductions in PM_{10} are expected from industrial sources and monitors near these sources have been trending down (see Appendix F). Plaza operations and the FAST program will reduce truck queuing and delay. Finally, emission factors are trending down faster than truck traffic is increasing. Every indication is that concentrations at the Dearborn monitor will continue to trend downward as they are today. Therefore, it is concluded that the proposed project will not cause new air quality violations of the annual or 24-hour NAAQS for PM_{10}.

6. CONSTRUCTION IMPACTS

Construction for the DRIC would represent a series of projects spread over time – interchange ramps, plaza, and bridge. (Note the plaza will be constructed incrementally. Not all the booths would be developed initially.) Therefore, the provisions of 40 CFR 93.153 regarding general conformity do not apply. It is anticipated that most construction related to ground disturbance would occur in one year, as explained in Section 5.2.2.

The project schedule is as follows:

2008 – Complete environmental process – Record of Decision
2009 – Begin property acquisition
Begin final design
2010 – Begin construction
2013 – Complete construction

So, construction is expected over four seasons. The bridge is expected to take 41 to 46 months to complete.

MDOT's Standard Construction Specification Sections 107.15(A) and 107.19 would apply to control fugitive dust during construction and cleaning of haul roads.

Construction mitigation is not required, but several measures may be taken anyway that include strategies that 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. For example, agreements that stress work activity outside normal hours of an adjacent school campus would be operations-oriented mitigation. Also, technological adjustments to construction equipment, such as off-road dump trucks and bulldozers, could be an appropriate strategy. These technological fixes could include particulate matter traps, oxidation catalysts, and other devices that provide an after-treatment of exhaust emissions. The use of ultra-low sulfur diesel will be in effect for non-road vehicles in 2010, so it is reasonable to advance this schedule for all construction vehicles to the beginning of construction.

7. MITIGATION

Apart from construction mitigation noted in the last section, U.S. and Customs and Border Protection will institute an anti-idling policy applying to all trucks entering secondary inspection.

Hot-spot analysis has not indicated the need for additional formal mitigation measures.

REFERENCES

Lake Michigan Air Directors Consortium, "Integration of Results for the Upper Midwest Urban Organics Study, Final Report" (March 2006).

Lake Michigan Air Directors Consortium, "Midwest Urban Organics Study, Lessons Learned" (March 2006).

MDEQ, 2006. "2005 Annual Air Quality Report." Air Quality Division.

MDEQ, 2007. "2006 Annual Air Quality Report." Air Quality Division.

FHWA, 2006. "Interim Guidance on Air Toxic Analysis in NEPA Documents." February 3, 2006.

FHWA, 1987. Technical Advisory 6680.8A.

FHWA and EPA, 2006. "Transportation Conformity Guidance for Qualitative Hot-spot Analysis in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas." March 29, 2006.

SEMCOG and MDEQ, 2007. "Draft Weight of Evidence for the Southeast Michigan $PM_{2.5}$ Attainment Strategy."

U.S. EPA, 1995. "Compilation of Air Pollutant Emission Factors, Volume I: Stationary and Area Sources." EPA AP-42, Fifth Edition, January 1995.

U.S. EPA, 2000. "Taking Toxics Out of the Air." Office of Air Quality Planning and Standards. EPA-425/K-00-002. August 2000.

U.S. EPA, 2002. "Health Assessment Document for Diesel Engine Exhaust." Prepared by the National Center for Environmental Assessment, Washington, DC for the Office of Transportation and Air Quality. EPA/60018-8-90/057F. May 2002.

U.S. EPA, 2006. "Transportation Conformity Guidance for Qualitative Hot-spot Analysis in PM2.5 and PM10 Nonattainment and Maintenance Areas," EPA-410-B-06-902. March 2006.

U.S. EPA AirData Monitor Values Report, available on the internet at http://oaspub.epa.gov /pls/airsdata/

Appendix A

Interagency Consultation

Appendix A
Interagency Consultation

The Air Quality Protocol that guided the air quality analysis in this technical report grew out of two efforts: early air quality planning sponsored by the Border Partnership[23] during the Planning/Need and Feasibility Study, and work drafts of the Air Quality for an ongoing project in that same area of Southwest Detroit called the Detroit Intermodal Freight Terminal (DIFT) project.

A draft Air Quality Scope for the Planning/Need and Feasibility Study was prepared March 15, 2004. Work on the DIFT Air Quality Protocol began in the fall of 2002 and extended to fall of 2006.

At that point the focus shifted to the DRIC project. The major milestones for the DRIC project follow:

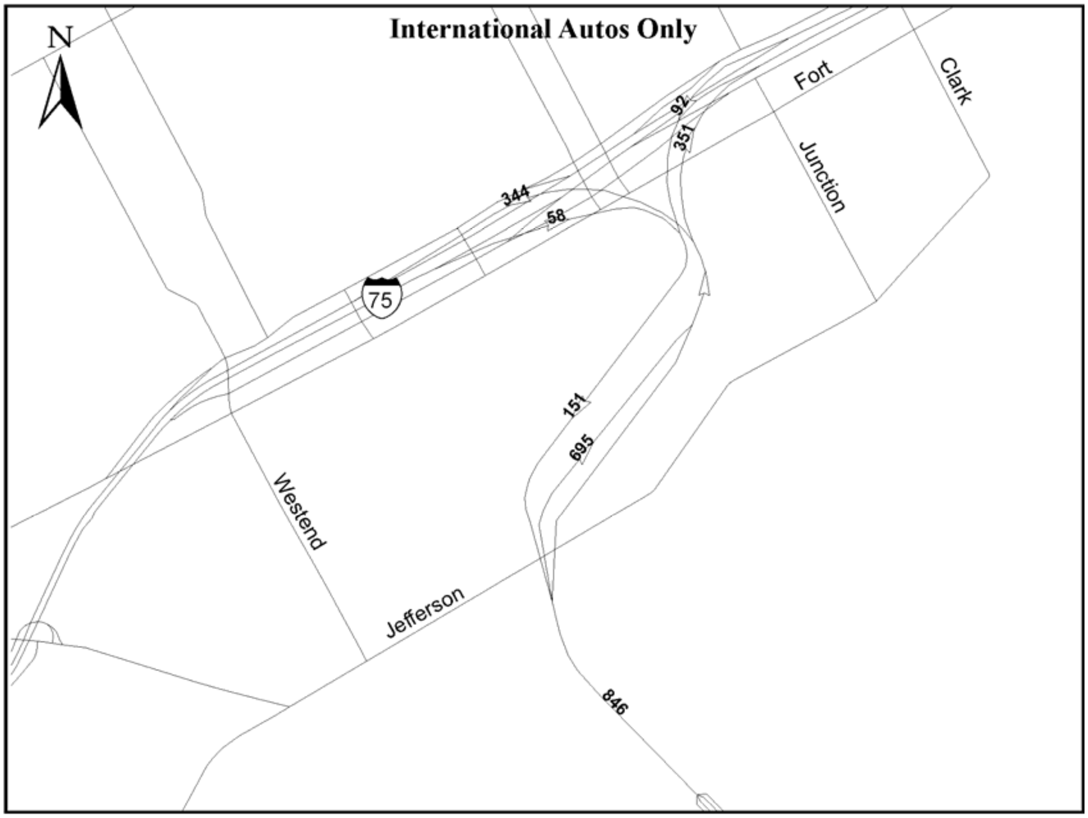
- August 31, 2005 – Formal project Scoping Meeting with local and state agencies, elected officials and the public - US EPA, the Michigan Department of Environmental Quality (MDEQ), and the Southeast Michigan Council of Governments (SEMCOG) in attendance
- December 2, 2005 – Coordination Meeting including EPA and MDEQ covering multiple topics including the DRIC air quality analysis
- April 7, 2006 – teleconference with EPA discussing $PM_{2.5}$ hot-spot analysis
- December 2, 2006 – Air quality scope discussion with EPA and MDEQ
- March, April, May, 2007 – Multiple iterations of the draft Air Quality Protocol
- May 31, 2007 – draft Air Quality Protocol circulated
- August 16, 2007 – date of EPA letter with comments on the draft Protocol
- September 12, 2007 – teleconference with EPA, MDEQ and SEMCOG discussing the EPA comments
- September 21, 2007 – MDOT response to EPA letter of August 16, 2007
- November 30, 2007 – teleconference with EPA discussing EPA comments
- January 17, 2008 – teleconference with EPA discussing EPA comments

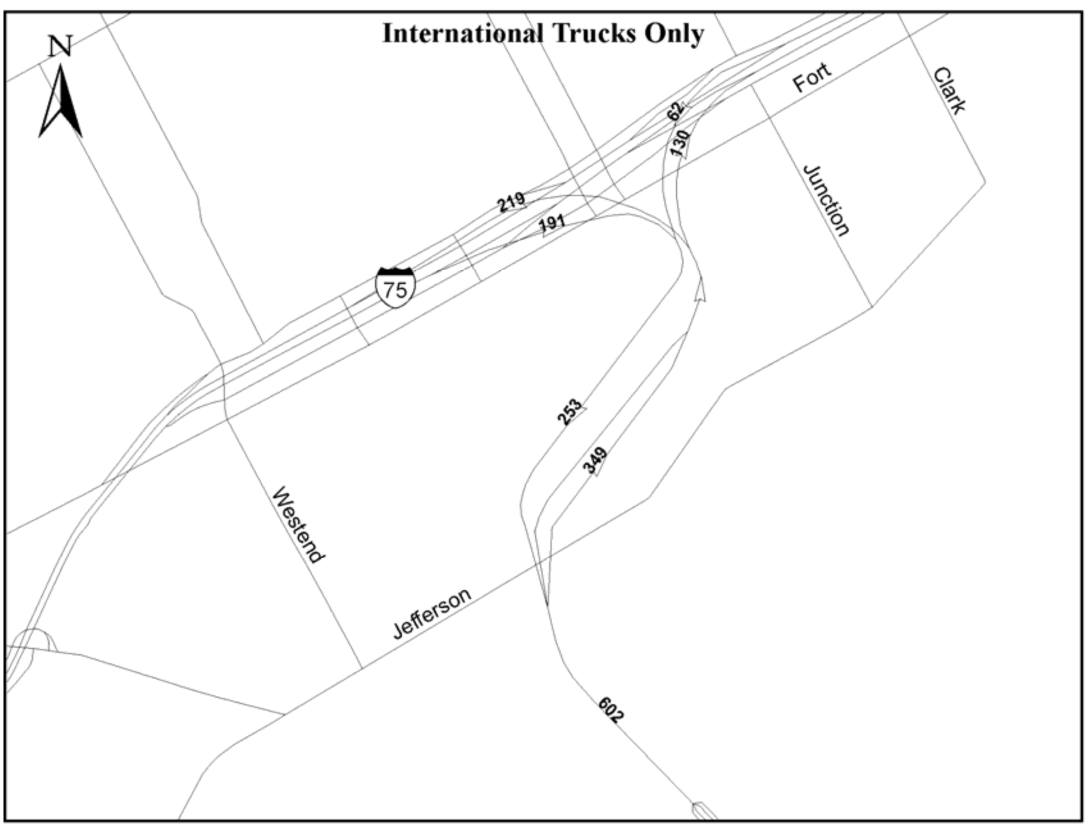
[23] The Federal Highway Administration (FHWA), the Michigan Department of Transportation (MDOT), the Ontario Ministry of Transport (MTO) and Transport Canada (TC).

Appendix B

Travel Demand Model Volumes and VMT and VHT Results by Area of Analysis

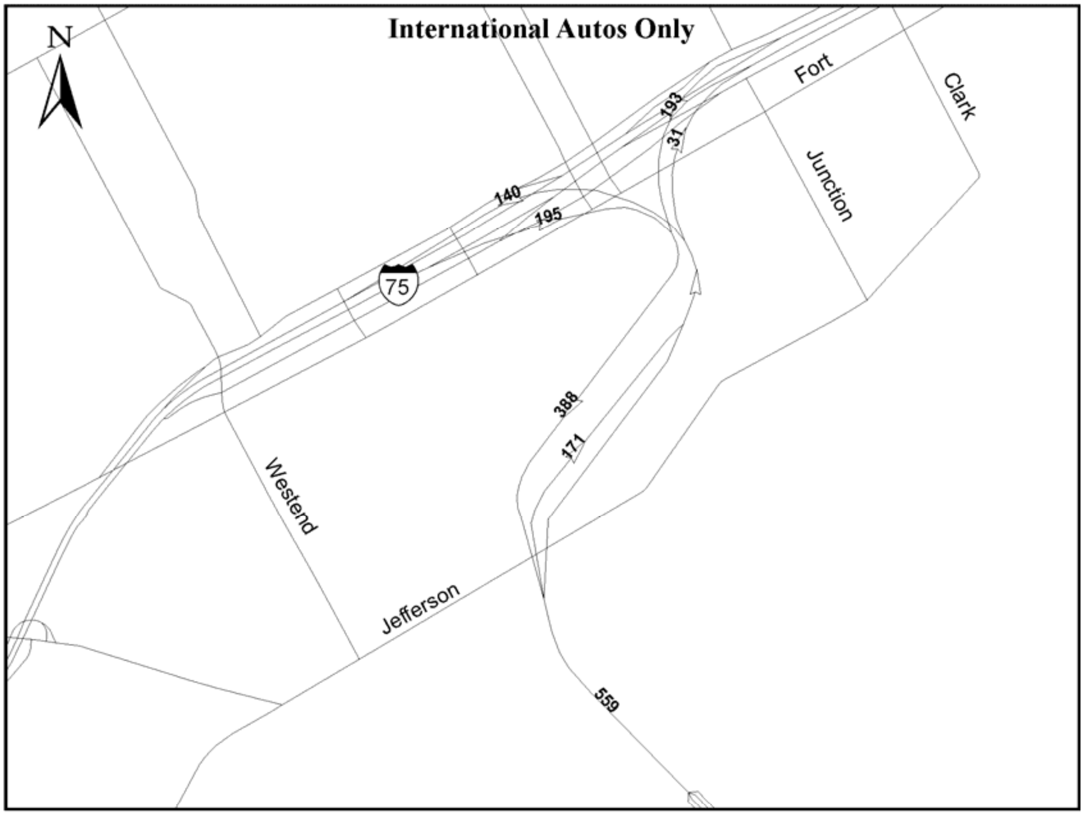
Alternatives #1/2/3/14 and 16
2015 AM Peak Hour Traffic Volumes

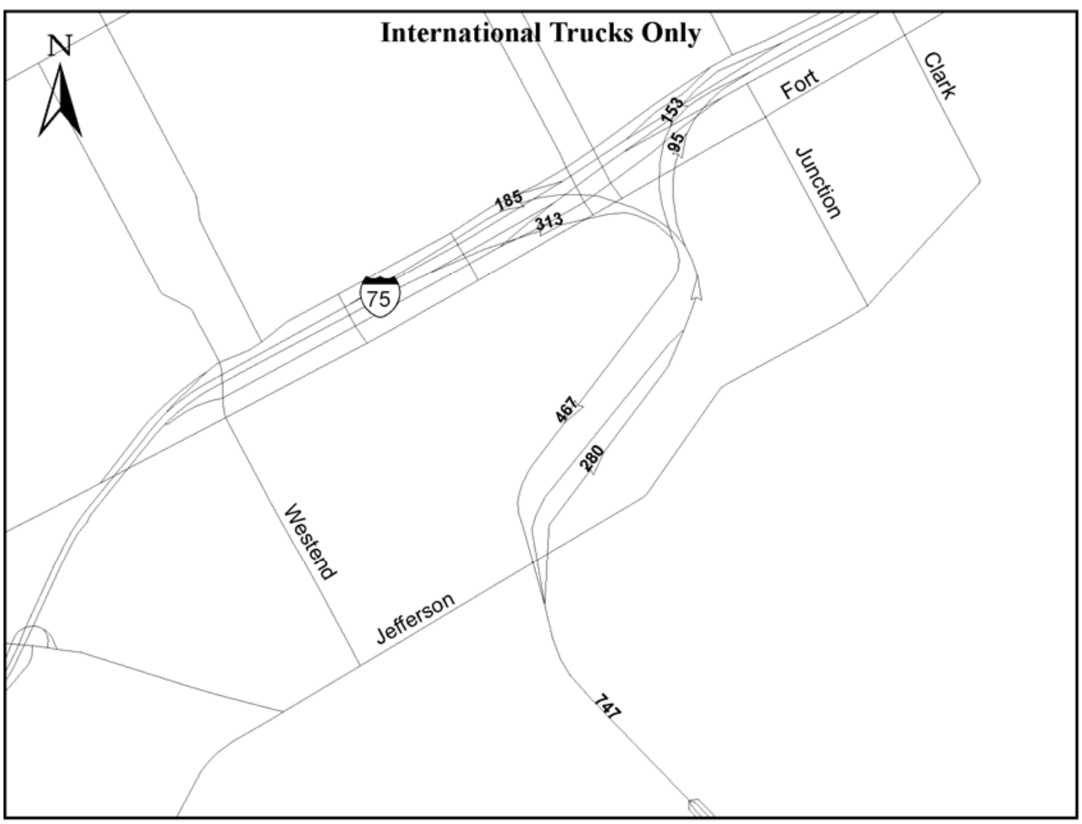




Source: The Corradino Group of Michigan, Inc.

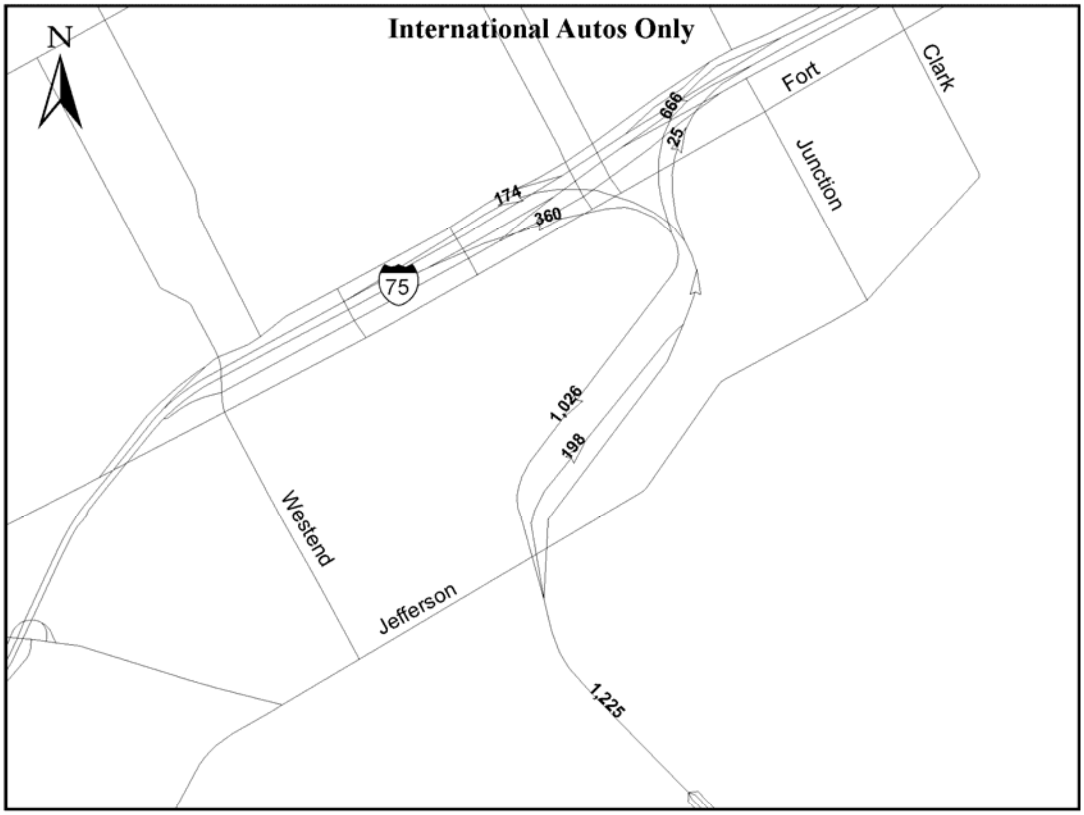
Alternatives #1/2/3/14 and 16
2015 Midday Traffic Volumes

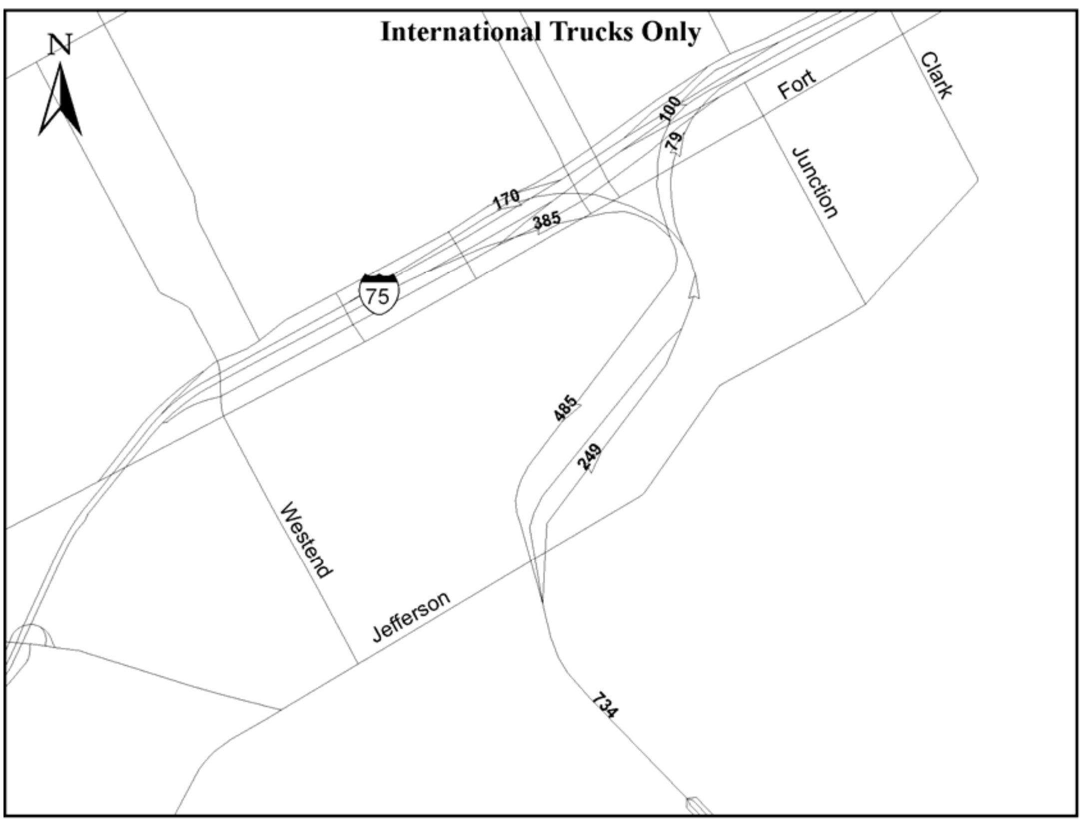




Source: The Corradino Group of Michigan, Inc.

Alternatives #1/2/3/14 and 16
2015 PM Peak Hour Traffic Volumes





Source: The Corradino Group of Michigan, Inc.

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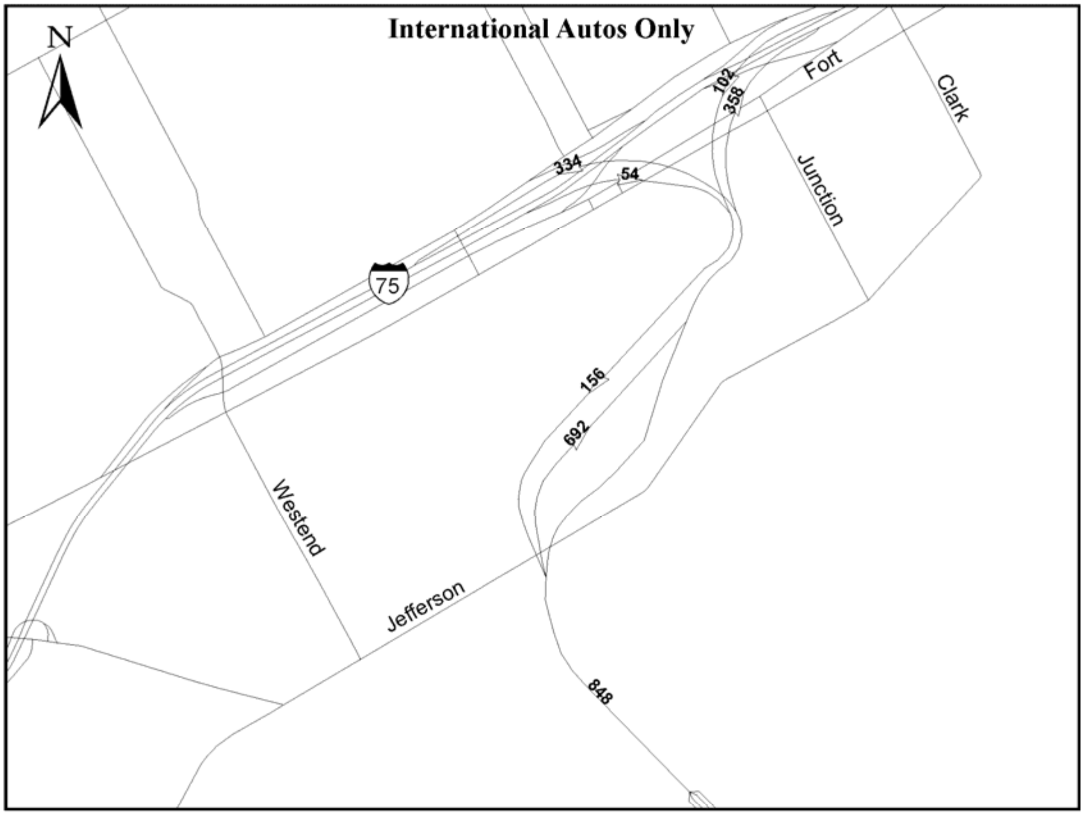
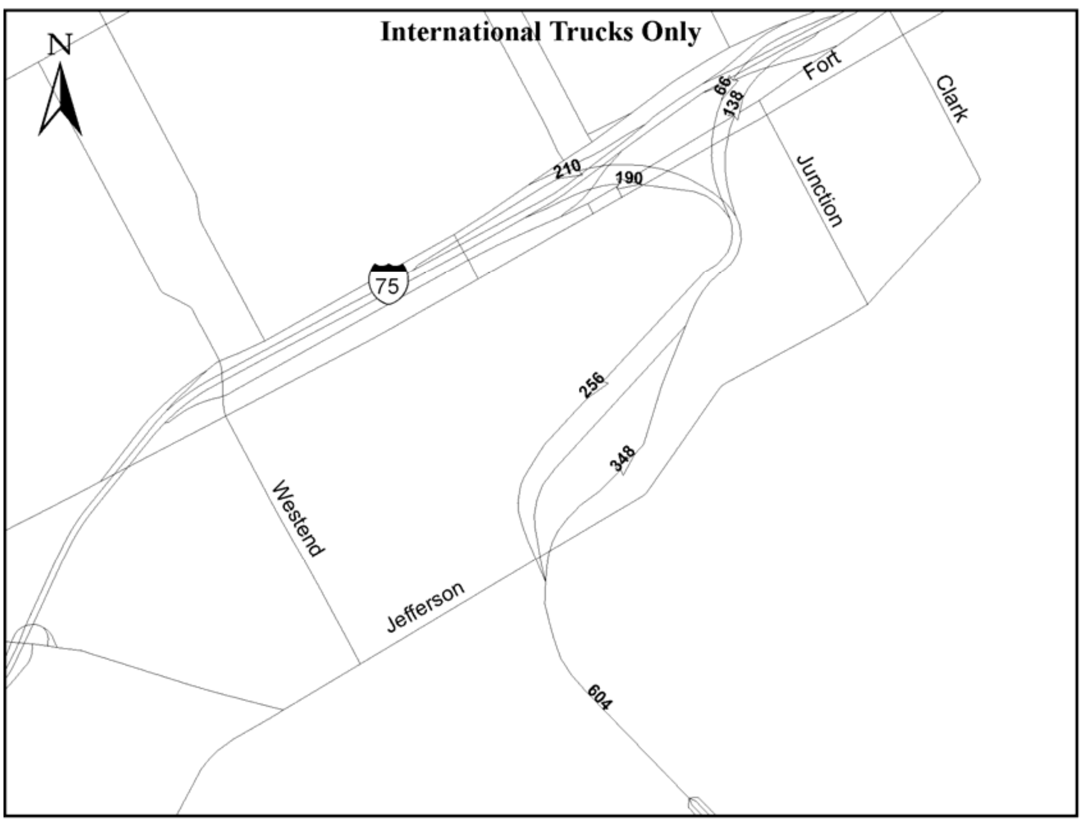
2015 AM Peak Hour Traffic Volumes





Source: The Corradino Group of Michigan, Inc.

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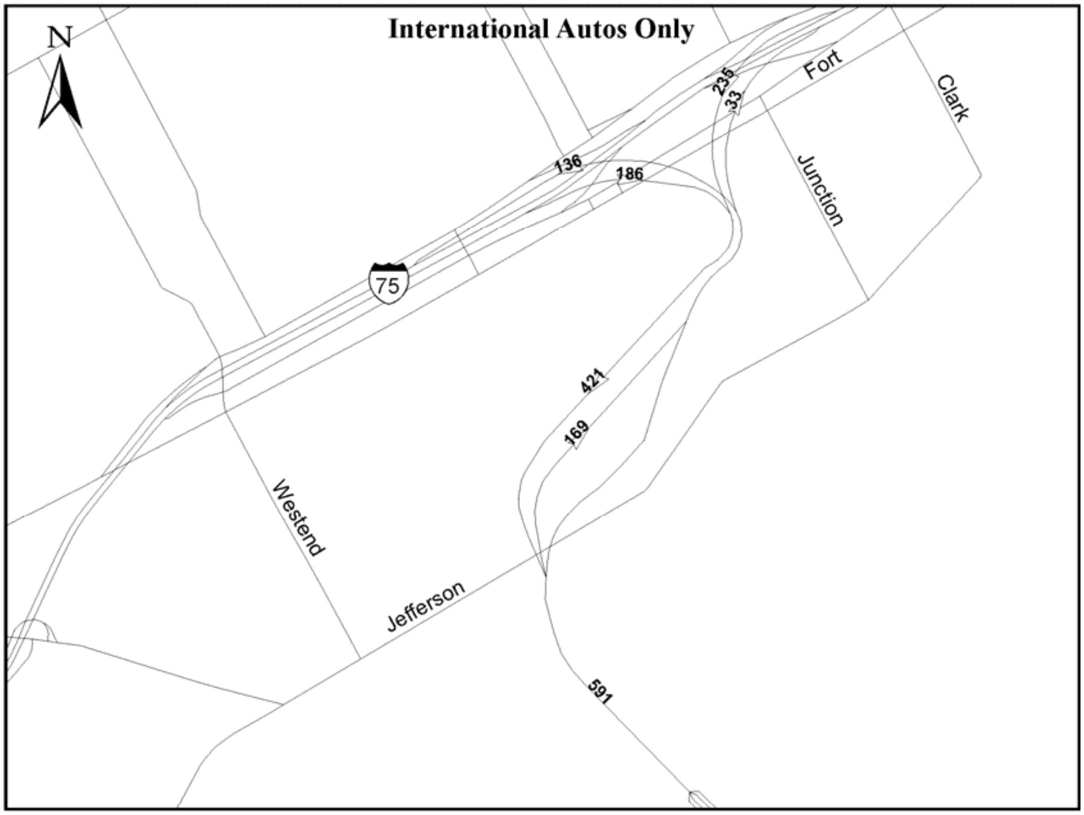

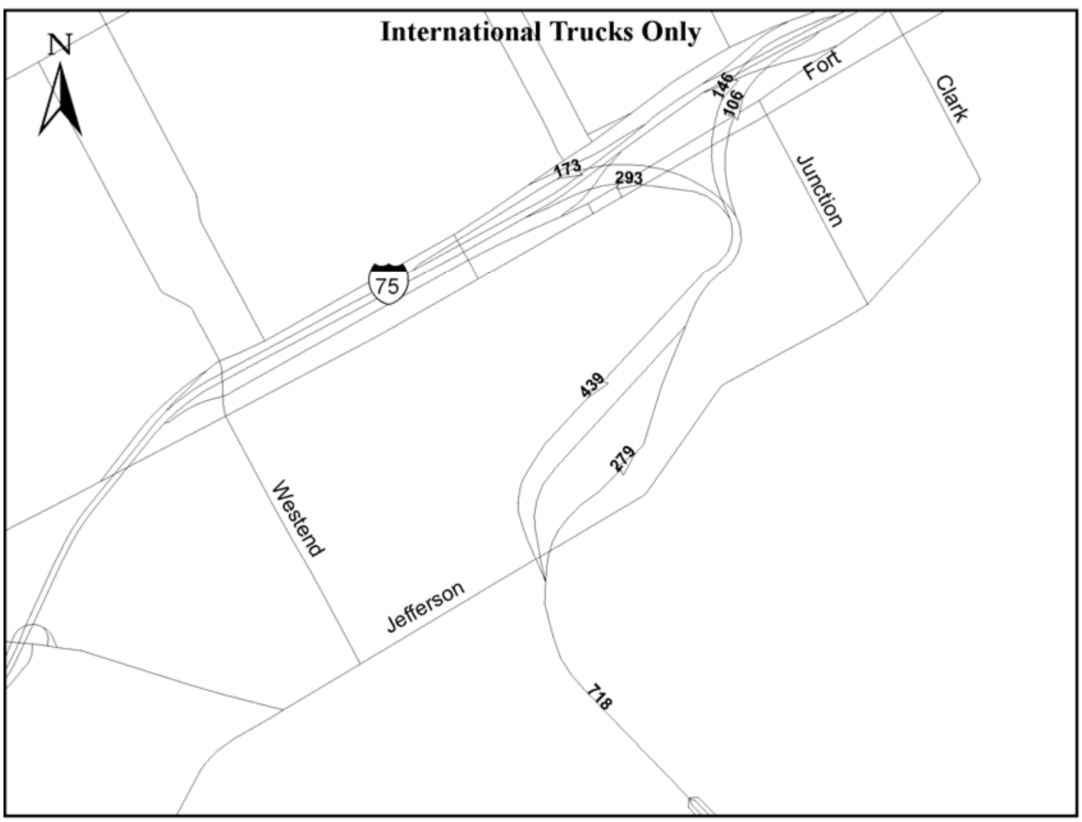

Source: The Corradino Group of Michigan, Inc.

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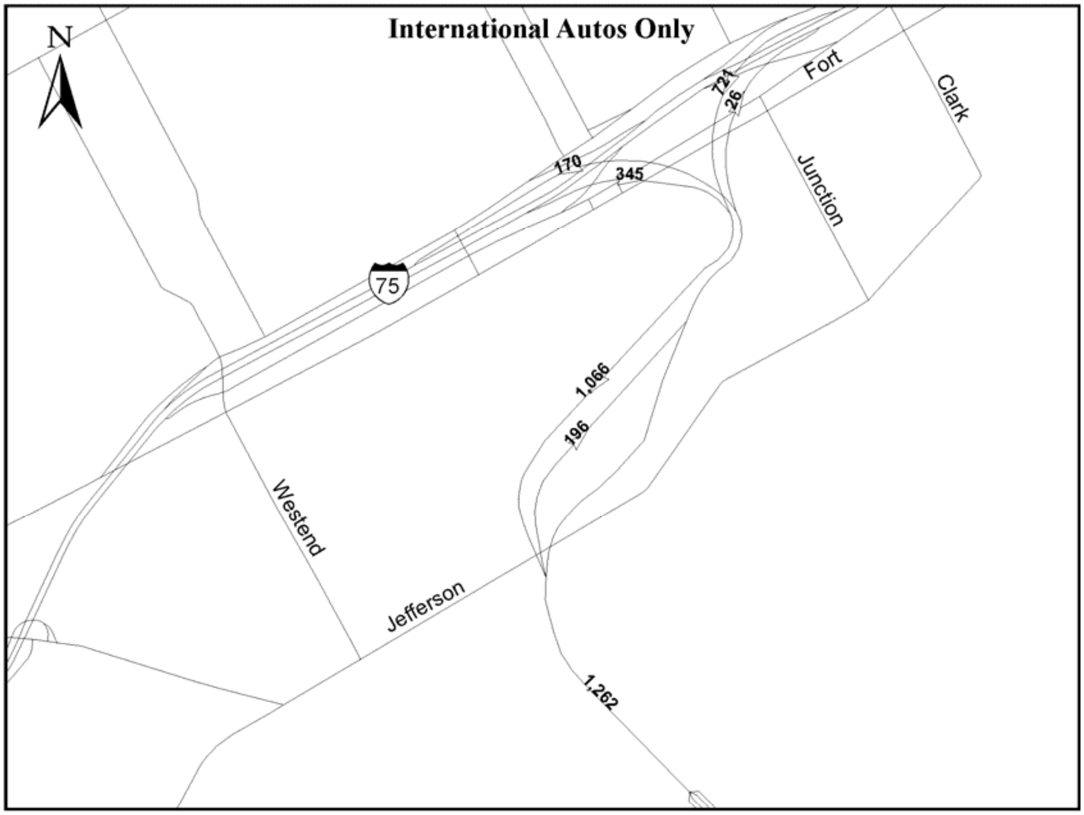
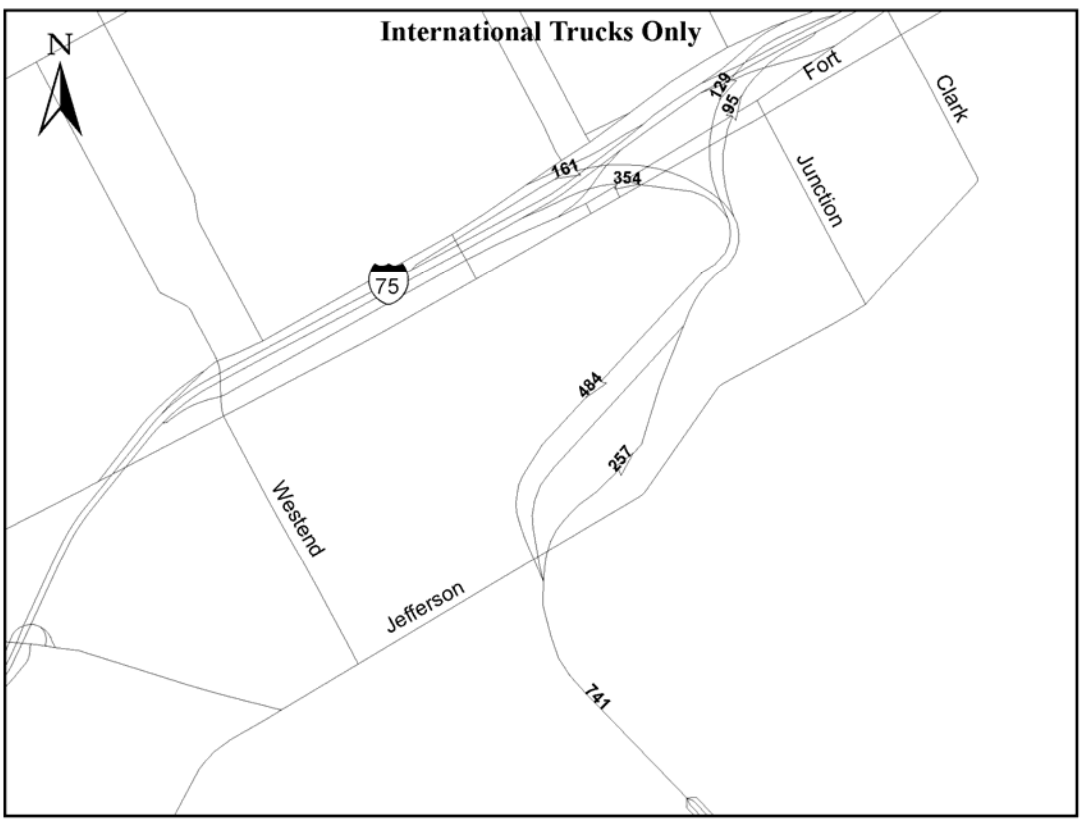
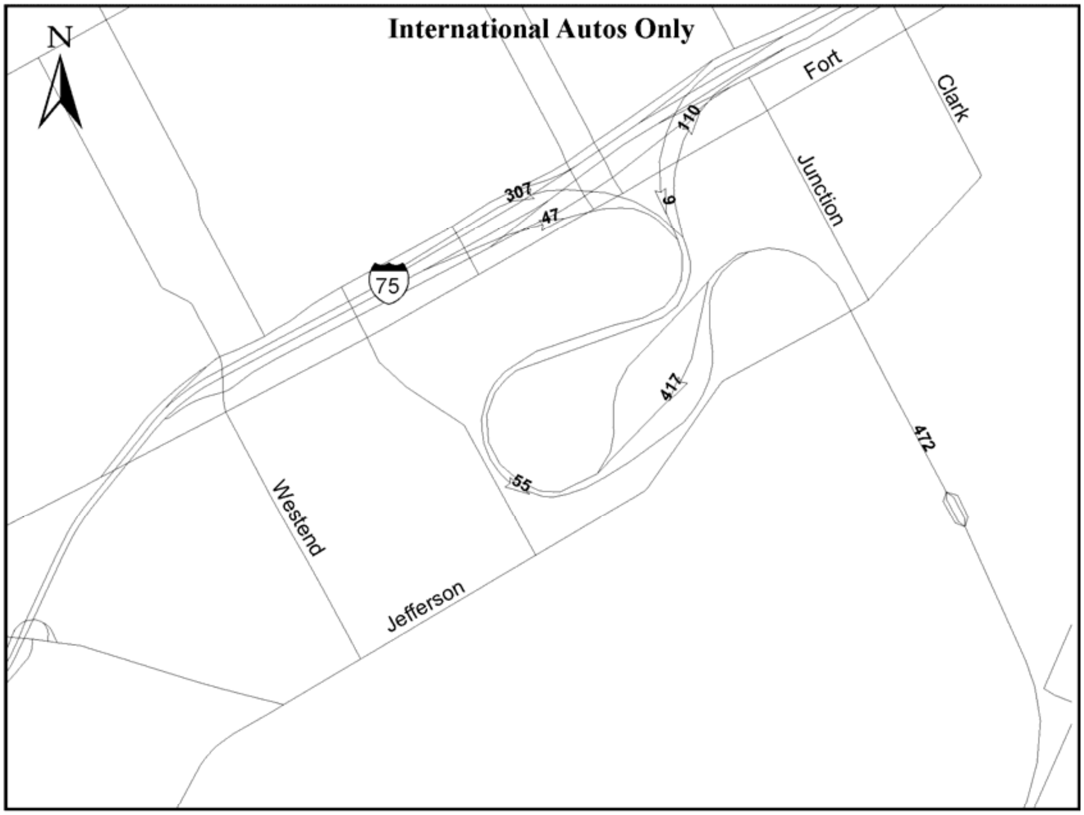
2015 PM Peak Hour Traffic Volumes

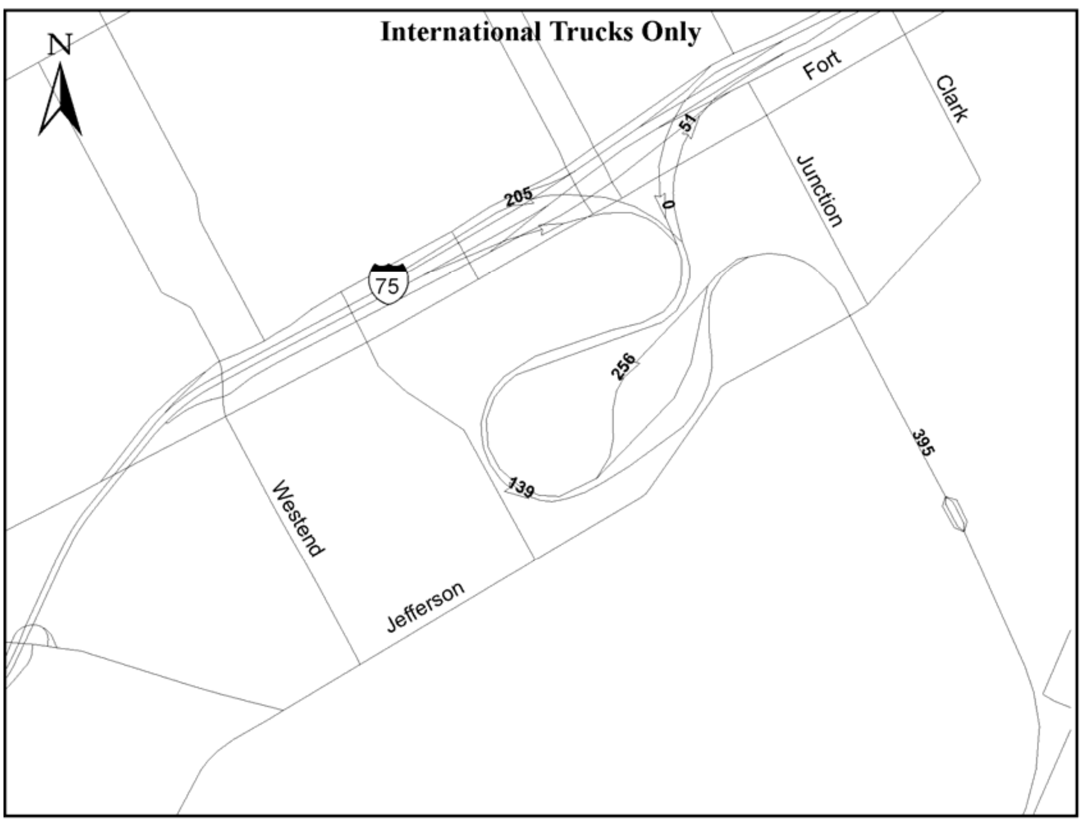




Source: The Corradino Group of Michigan, Inc.

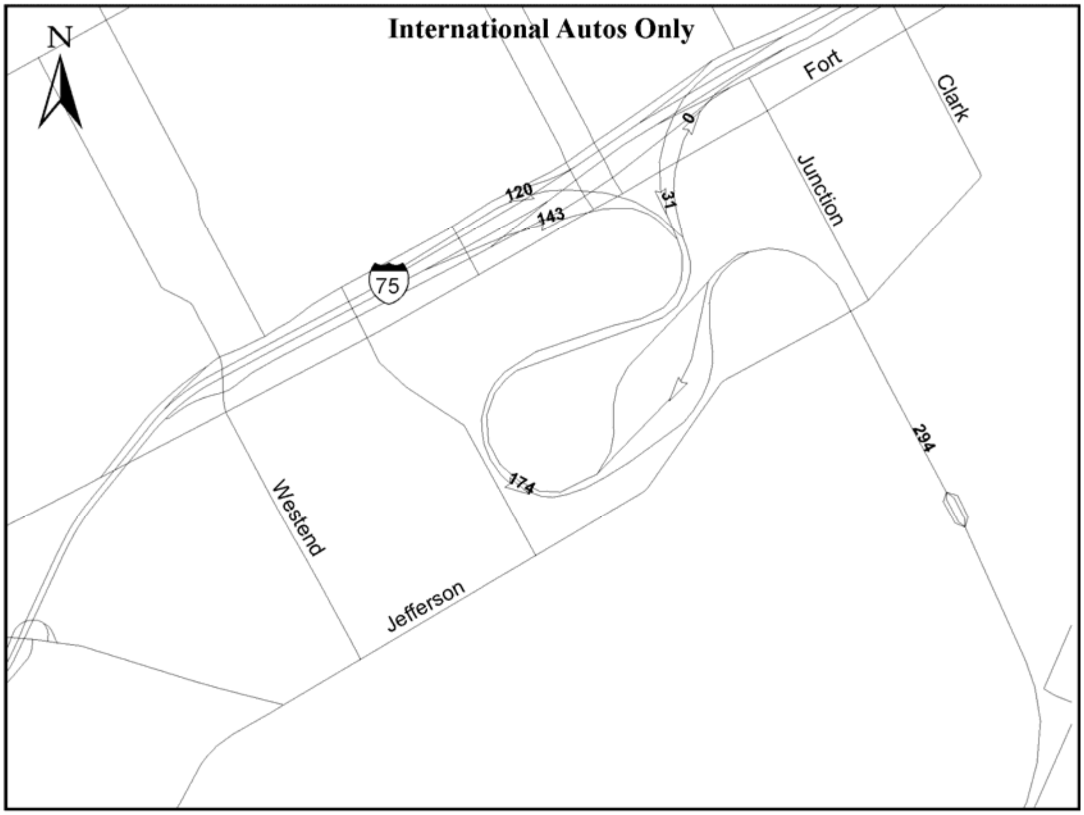
Alternatives #7/9 and 11
2015 AM Peak Hour Traffic Volumes

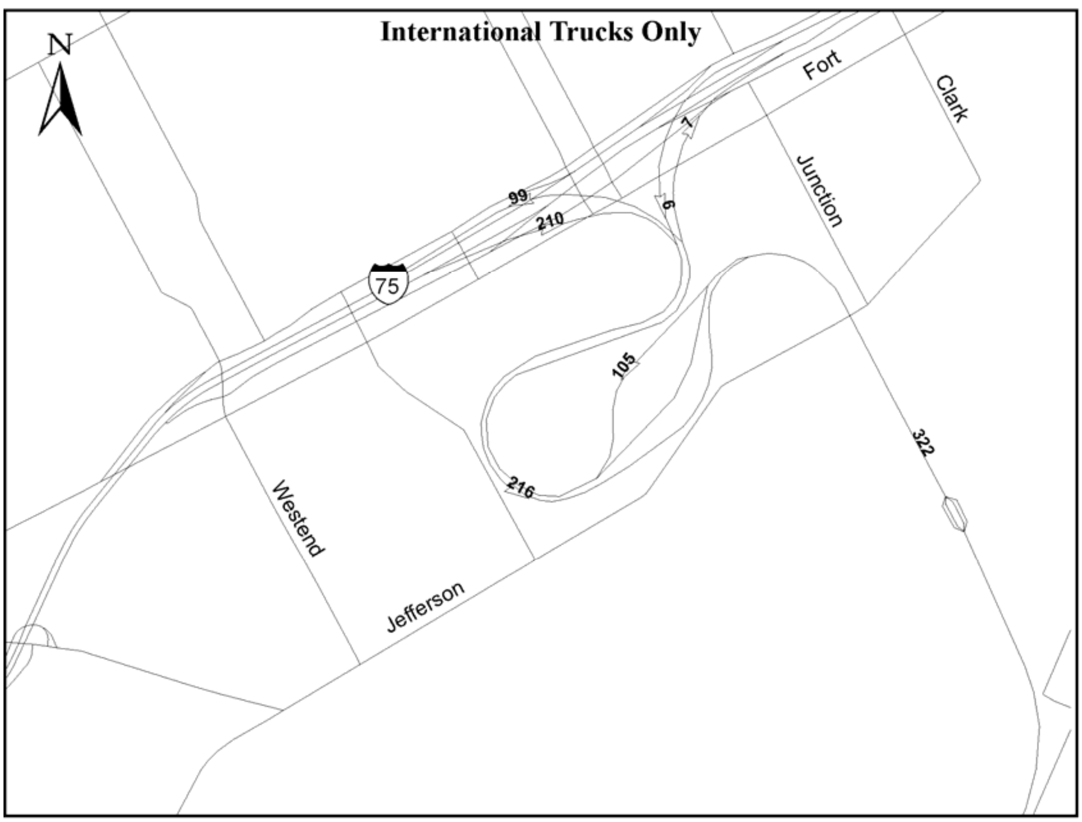




Source: The Corradino Group of Michigan, Inc.

Alternatives #7/9 and 11
2015 Midday Traffic Volumes





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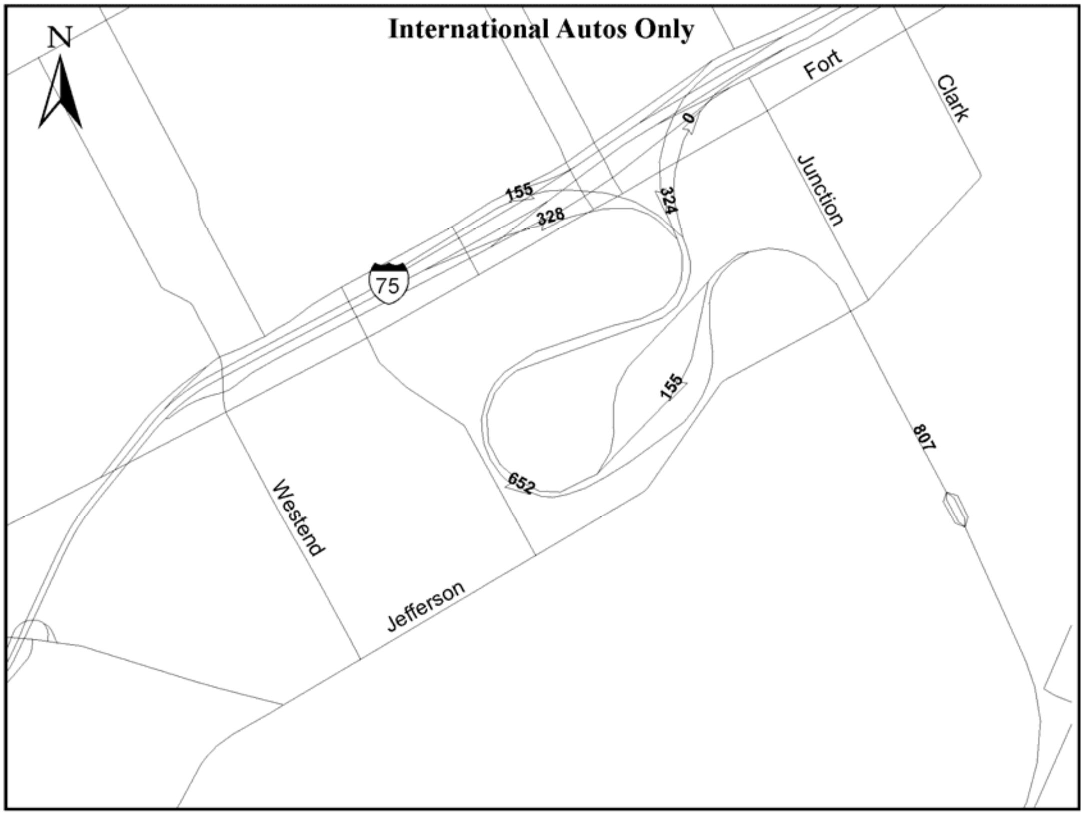
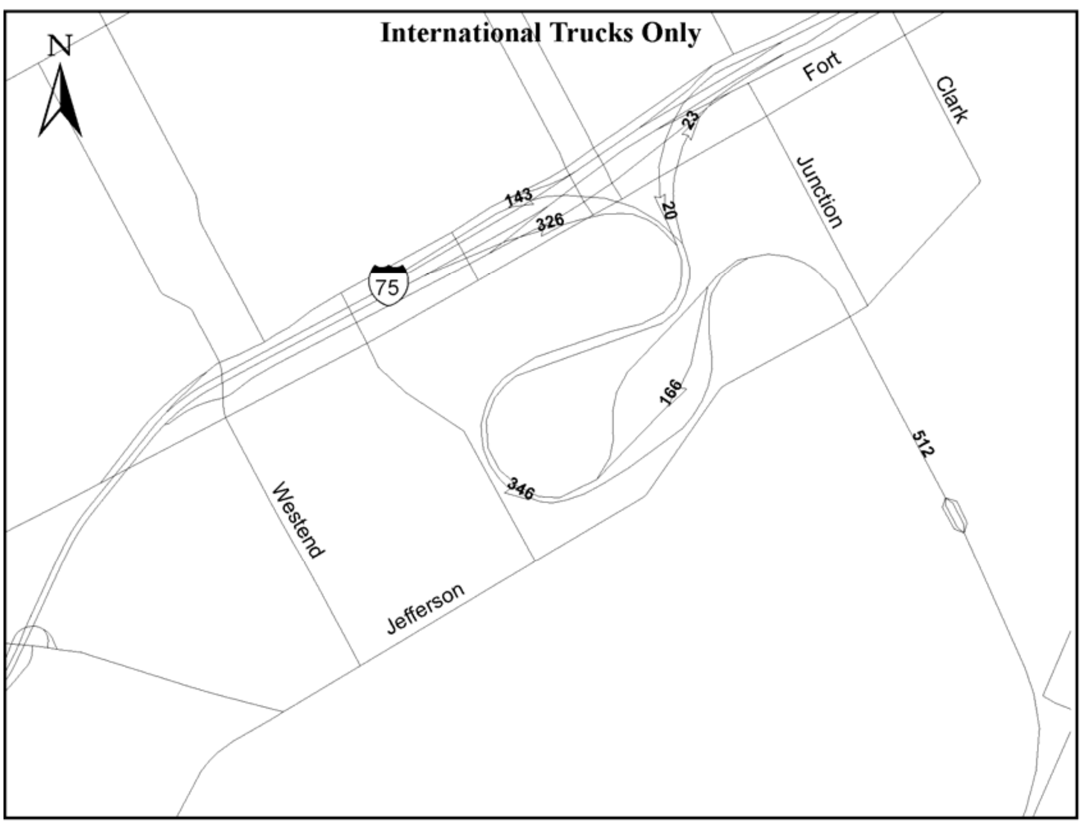
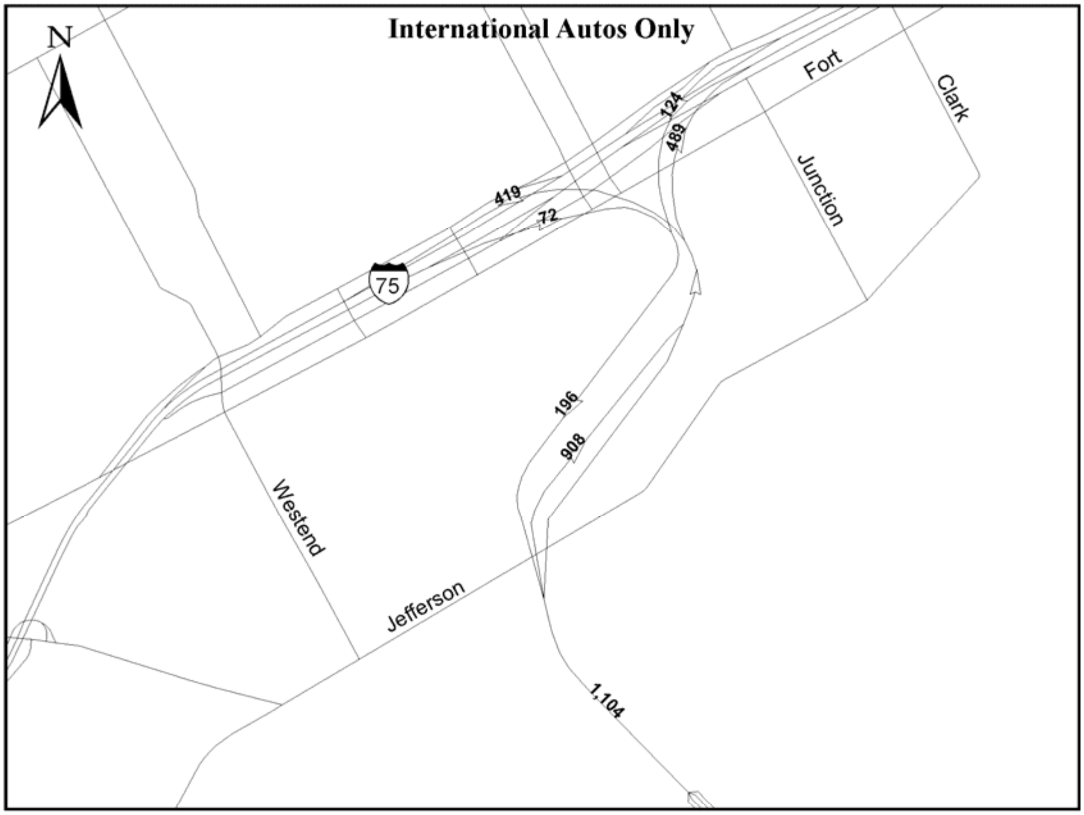
2015 PM Peak Hour Traffic Volumes

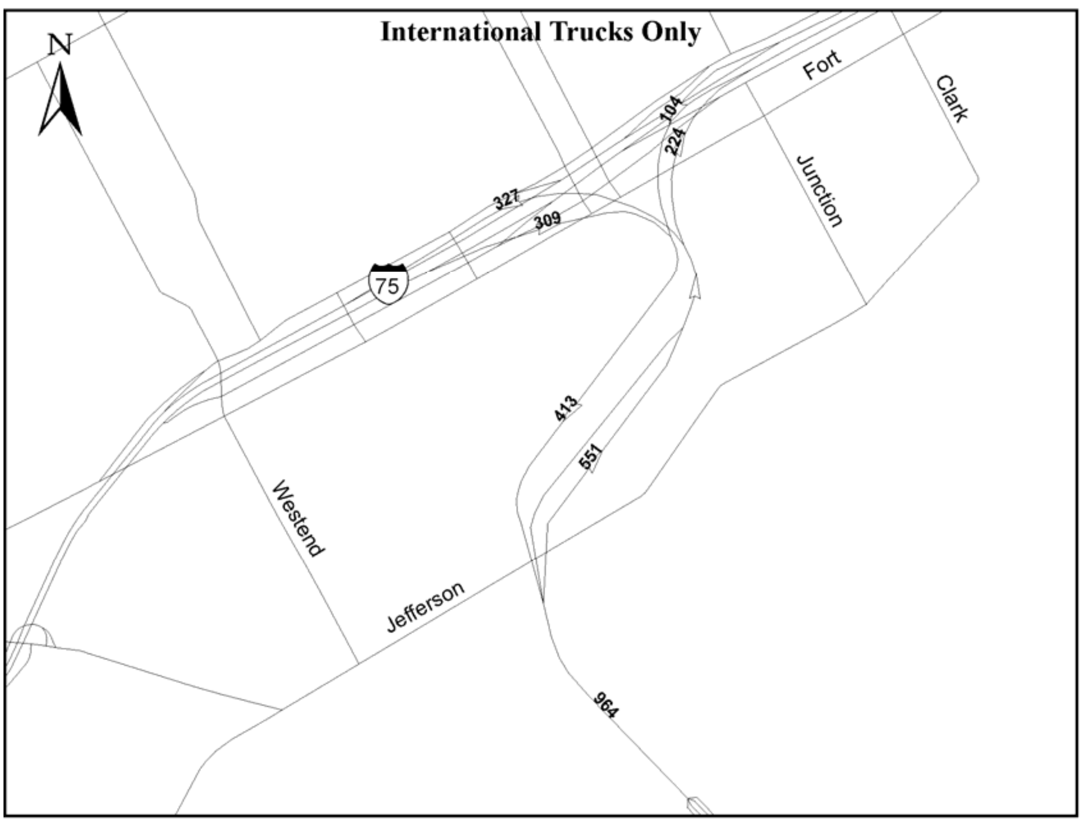




Source: The Corradino Group of Michigan, Inc.

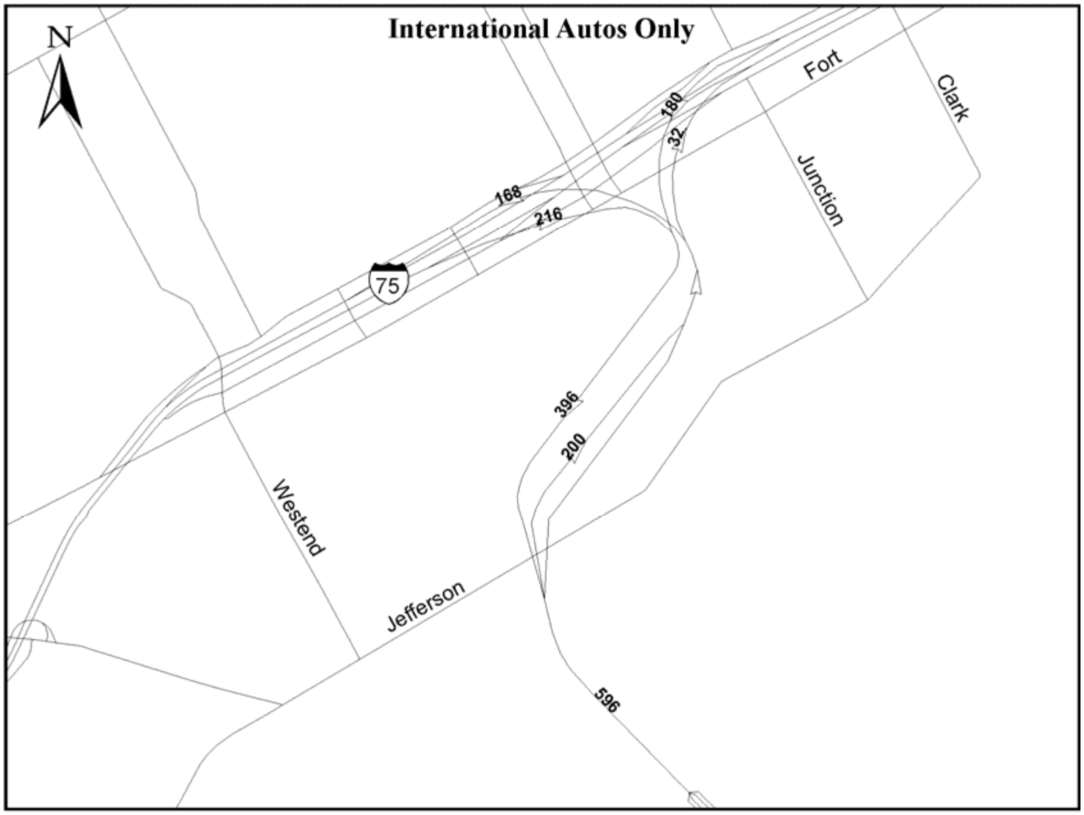
Alternatives #1/2/3/14 and 16
2035 AM Peak Hour Traffic Volumes

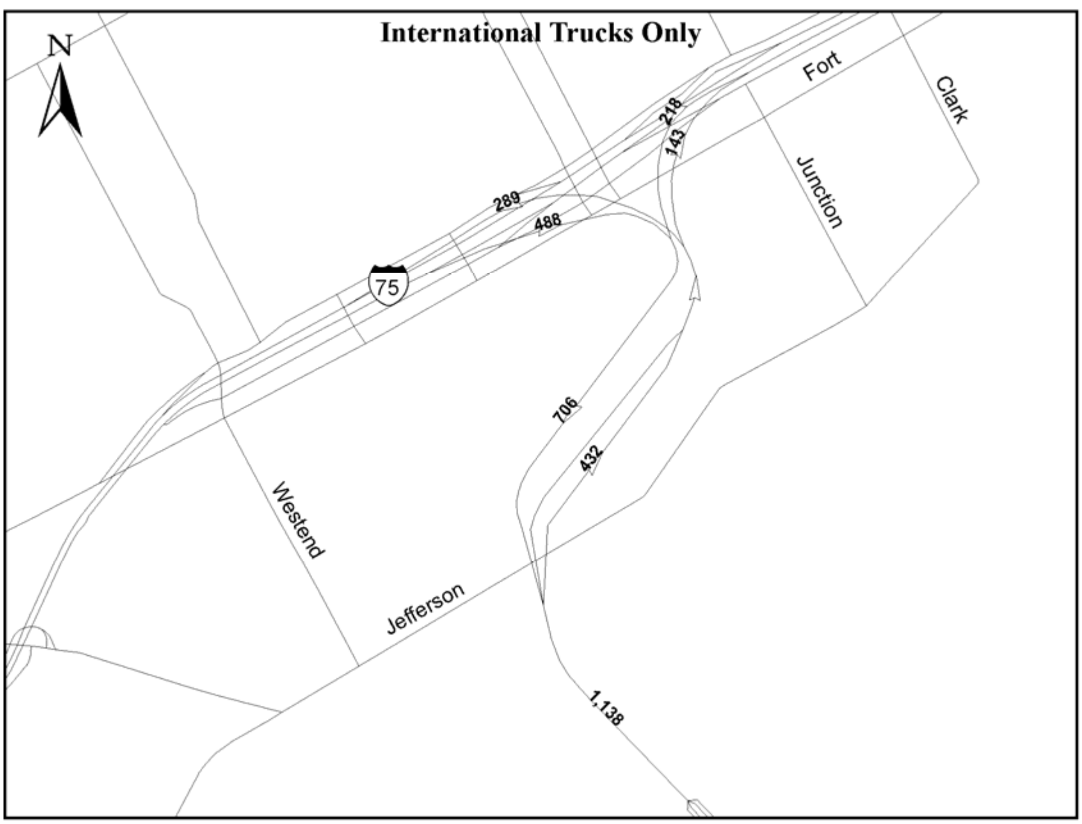




Source: The Corradino Group of Michigan, Inc.

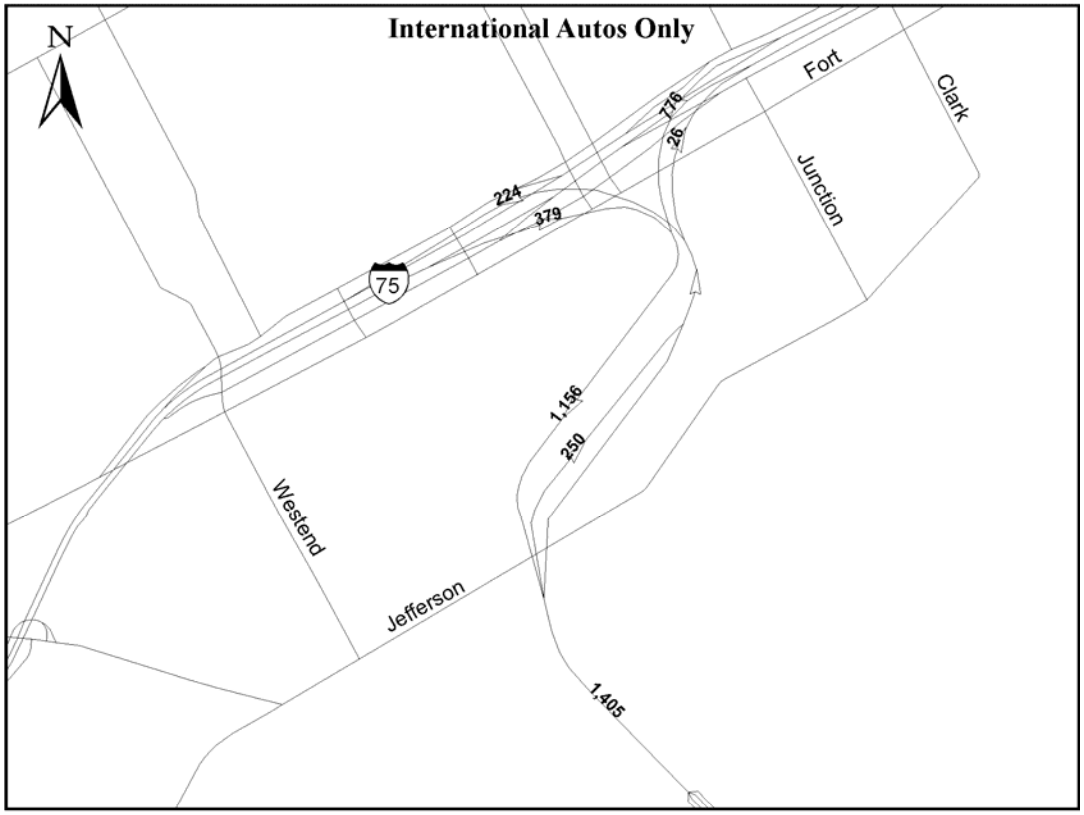
Alternatives #1/2/3/14 and 16
2035 Midday Peak Hour Traffic Volumes

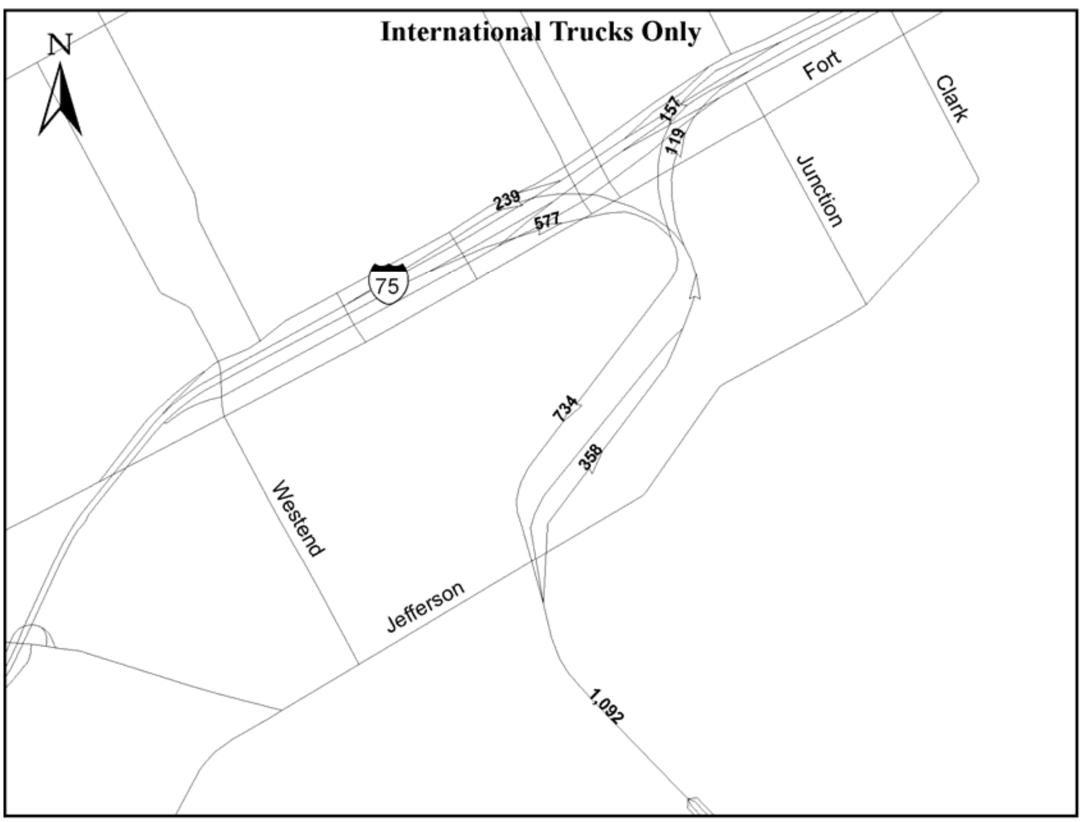




Source: The Corradino Group of Michigan, Inc.

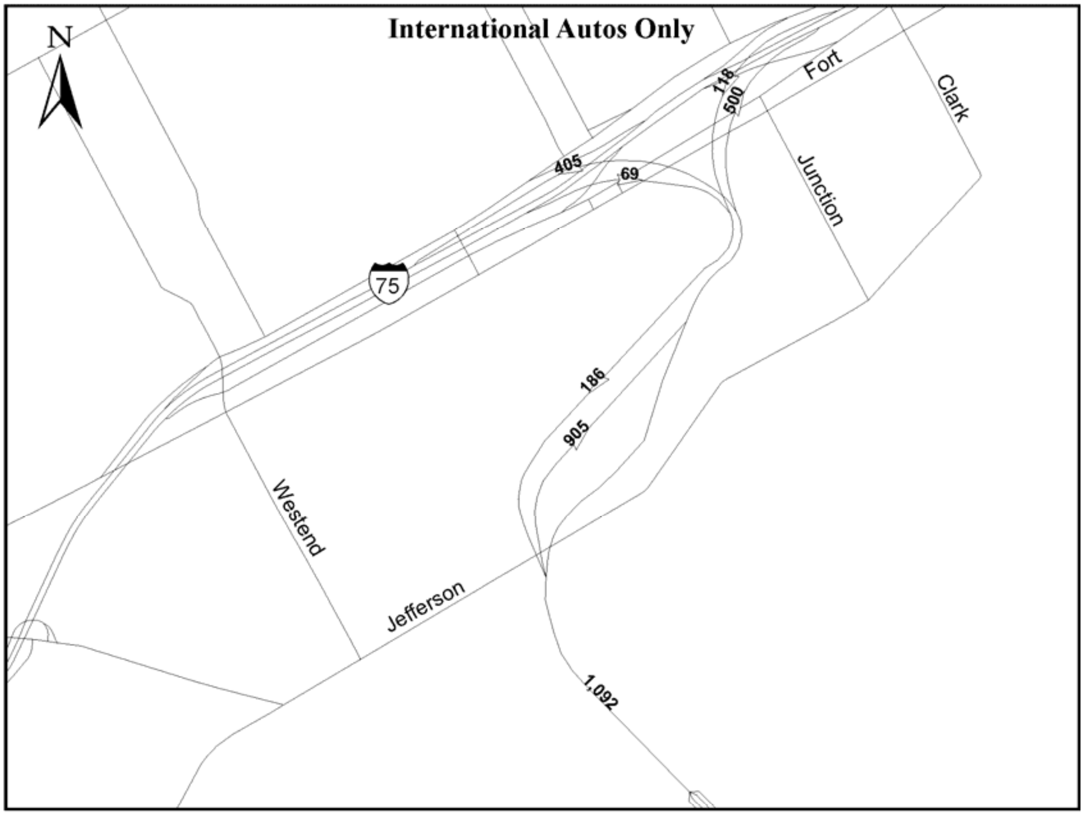
Alternatives #1/2/3/14 and 16
2035 PM Peak Hour Traffic Volumes

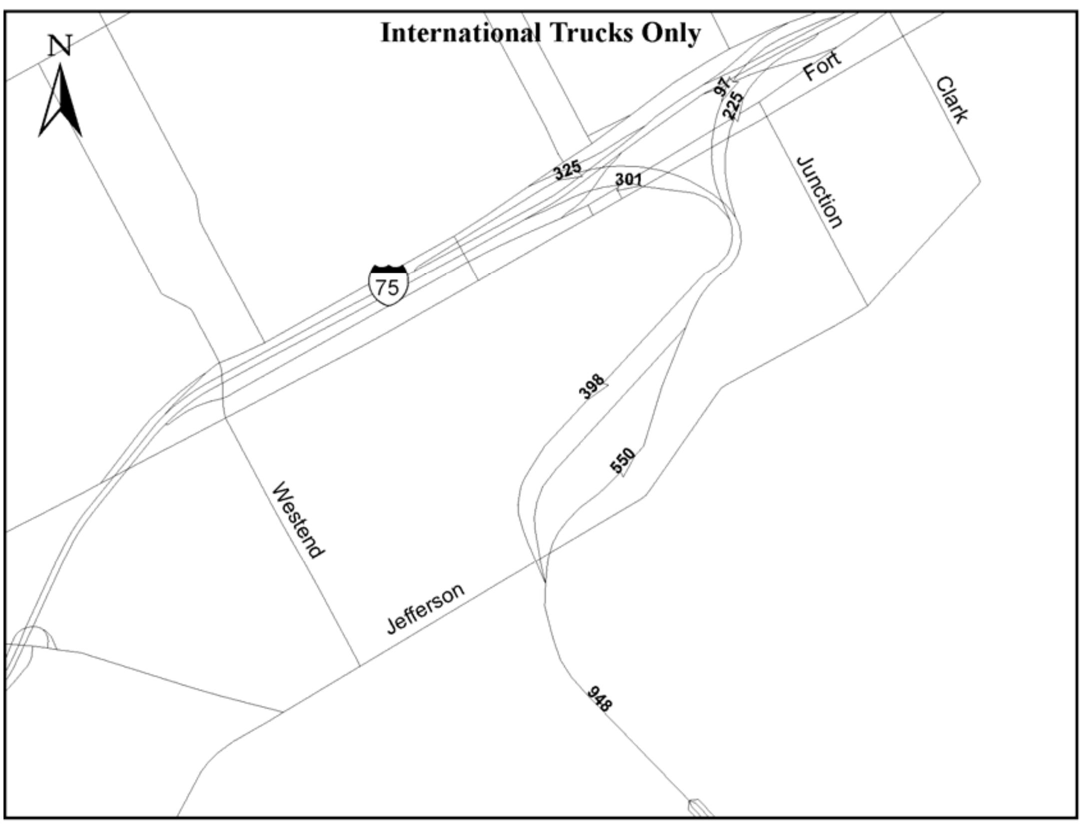




Source: The Corradino Group of Michigan, Inc.

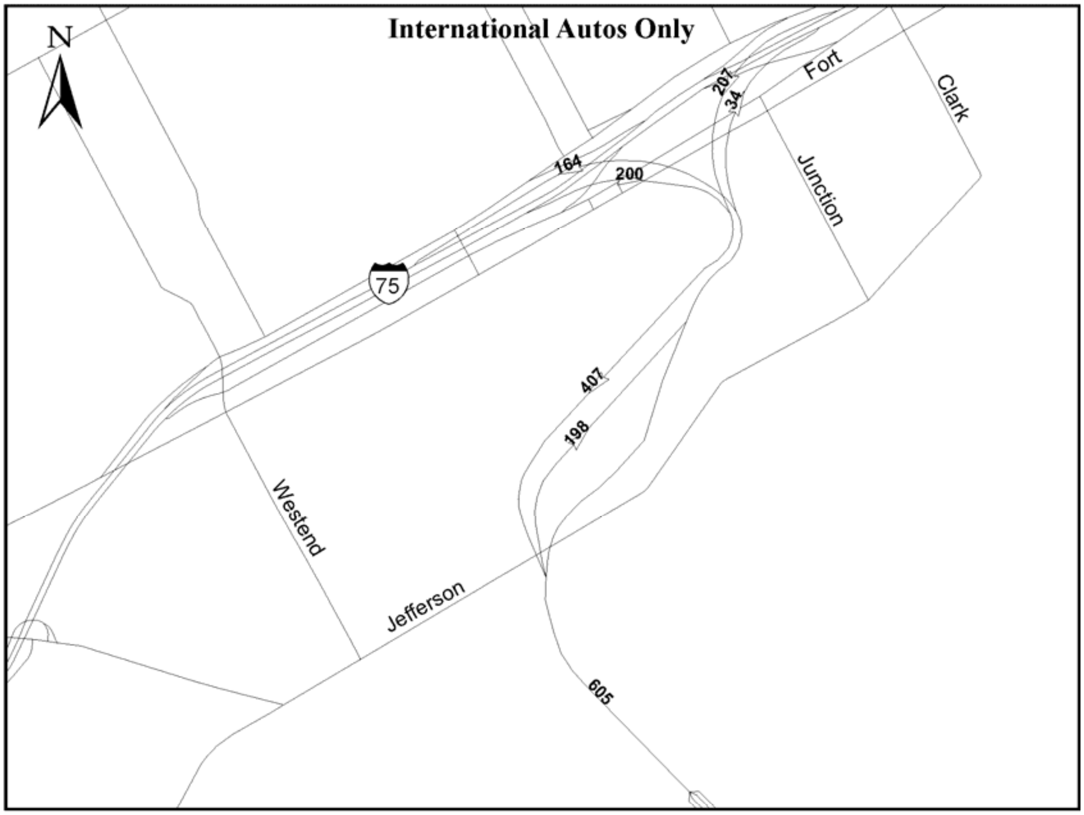
Alternative #5
2035 AM Peak Hour Traffic Volumes

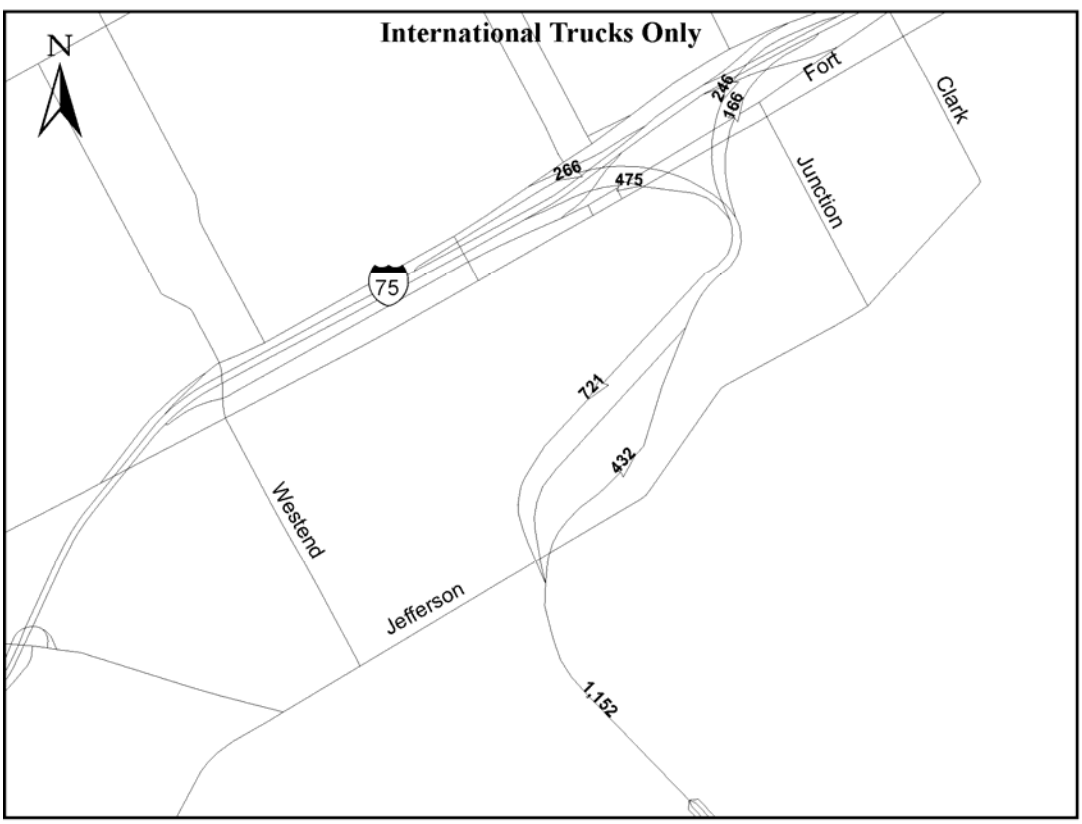




Source: The Corradino Group of Michigan, Inc.

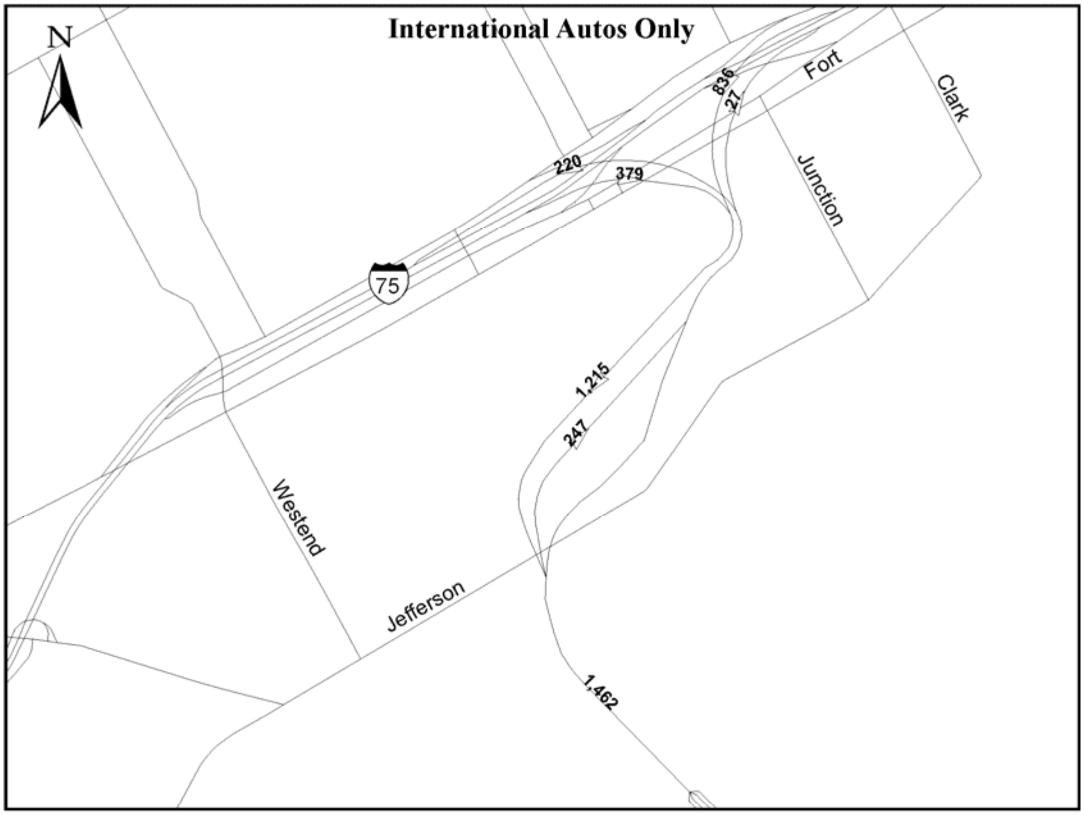
Alternative #5
2035 Midday Traffic Volumes

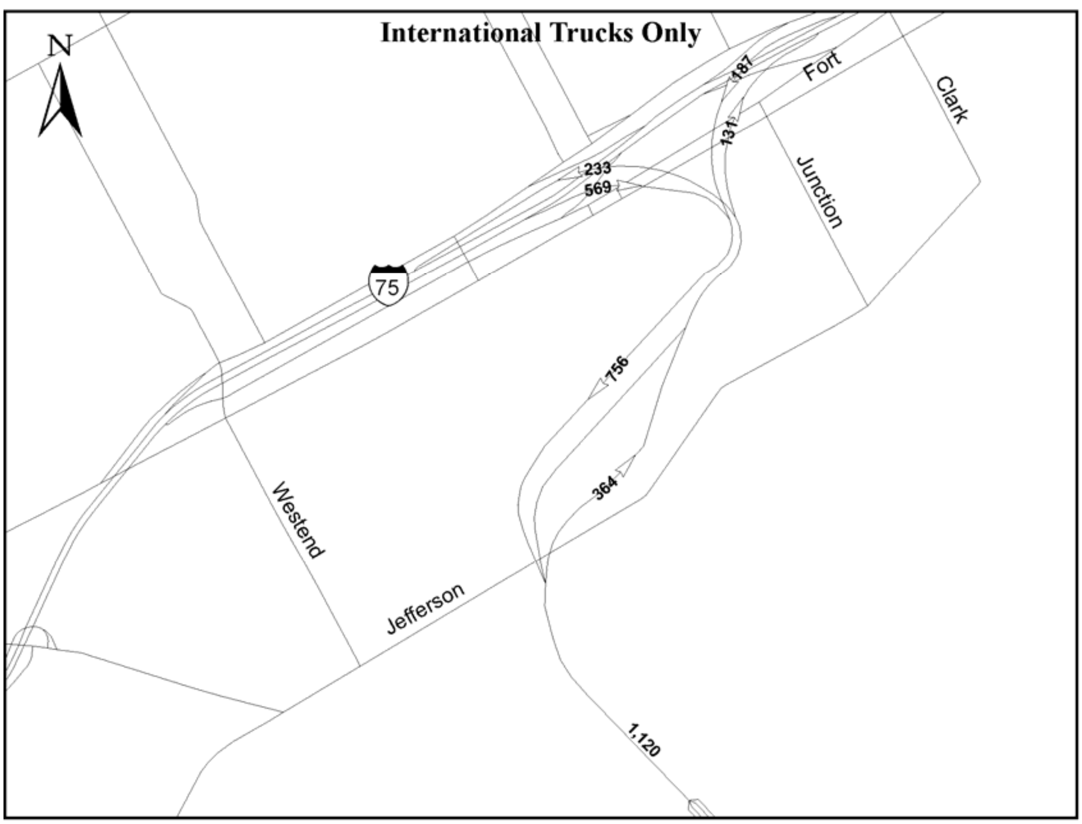




Source: The Corradino Group of Michigan, Inc.

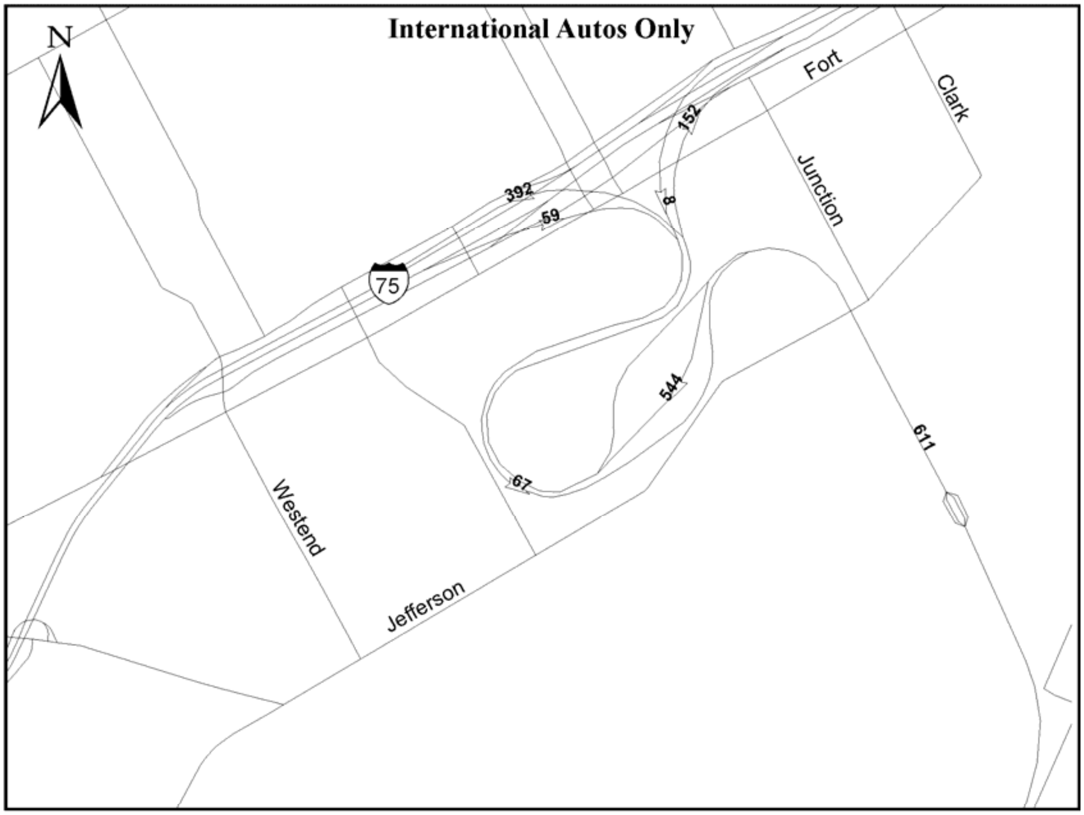
Alternative #5
2035 PM Peak Hour Traffic Volumes

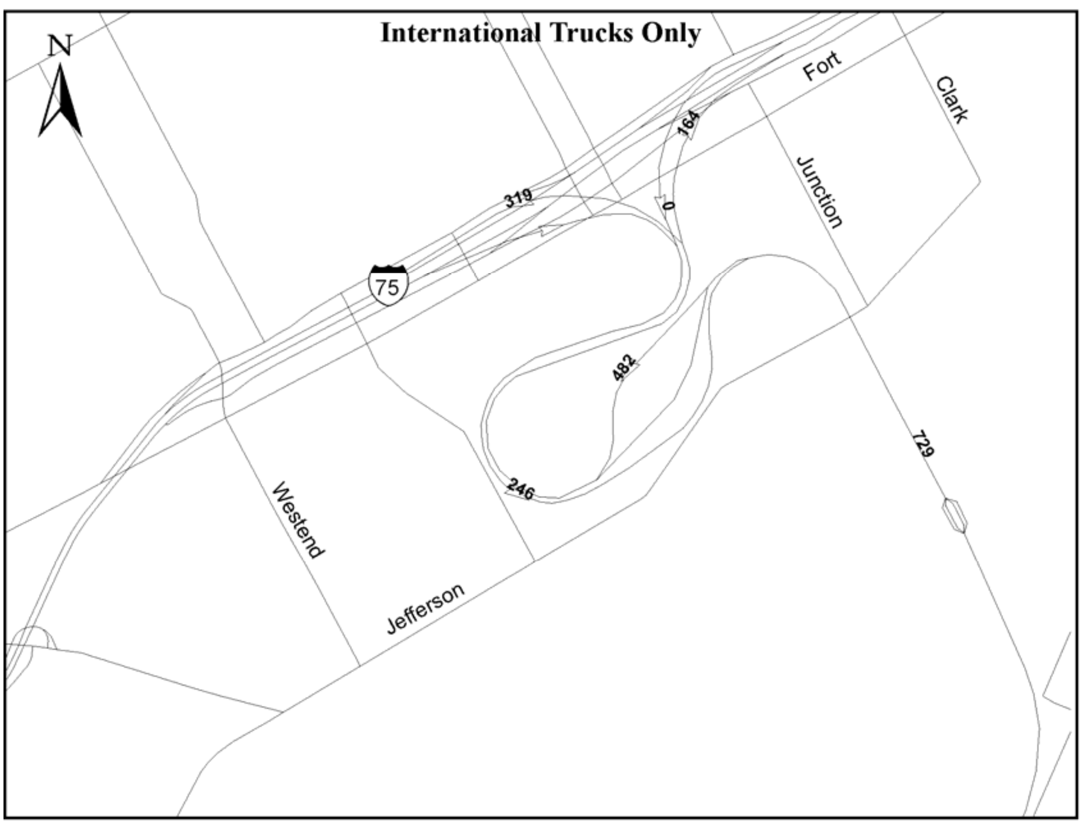




Source: The Corradino Group of Michigan, Inc.

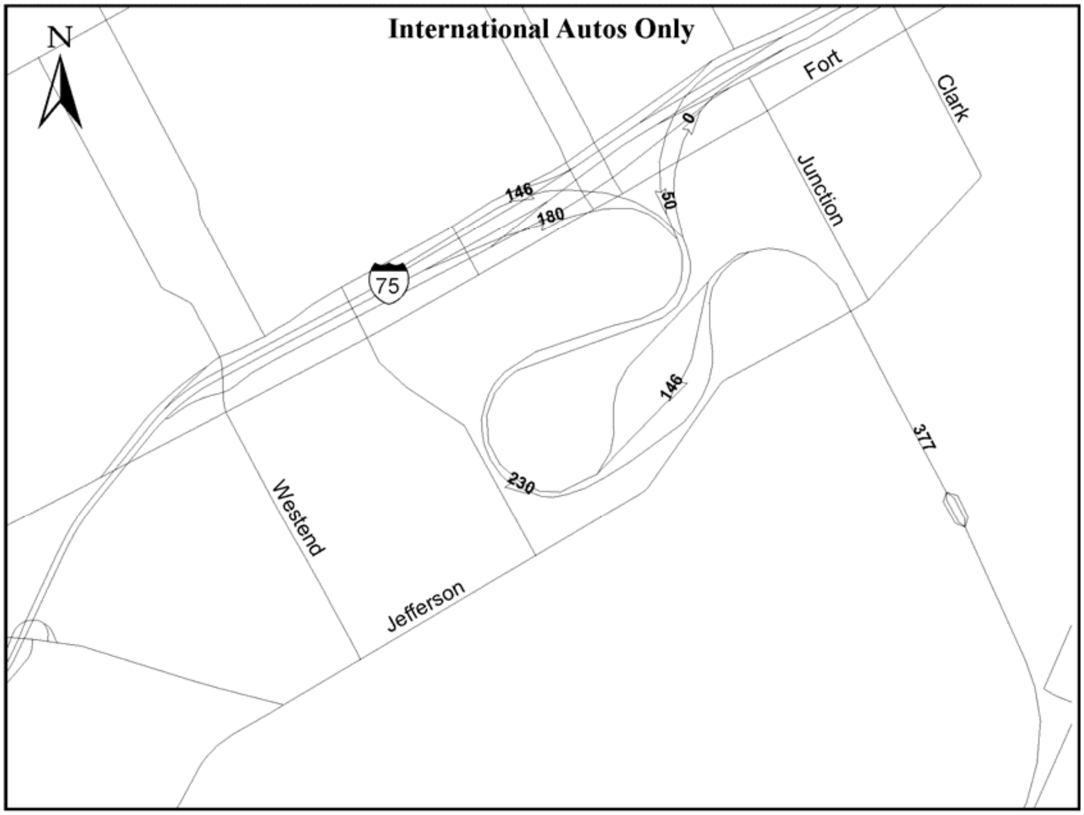
Alternatives #7/9 and 11
2035 AM Peak Hour Traffic Volumes

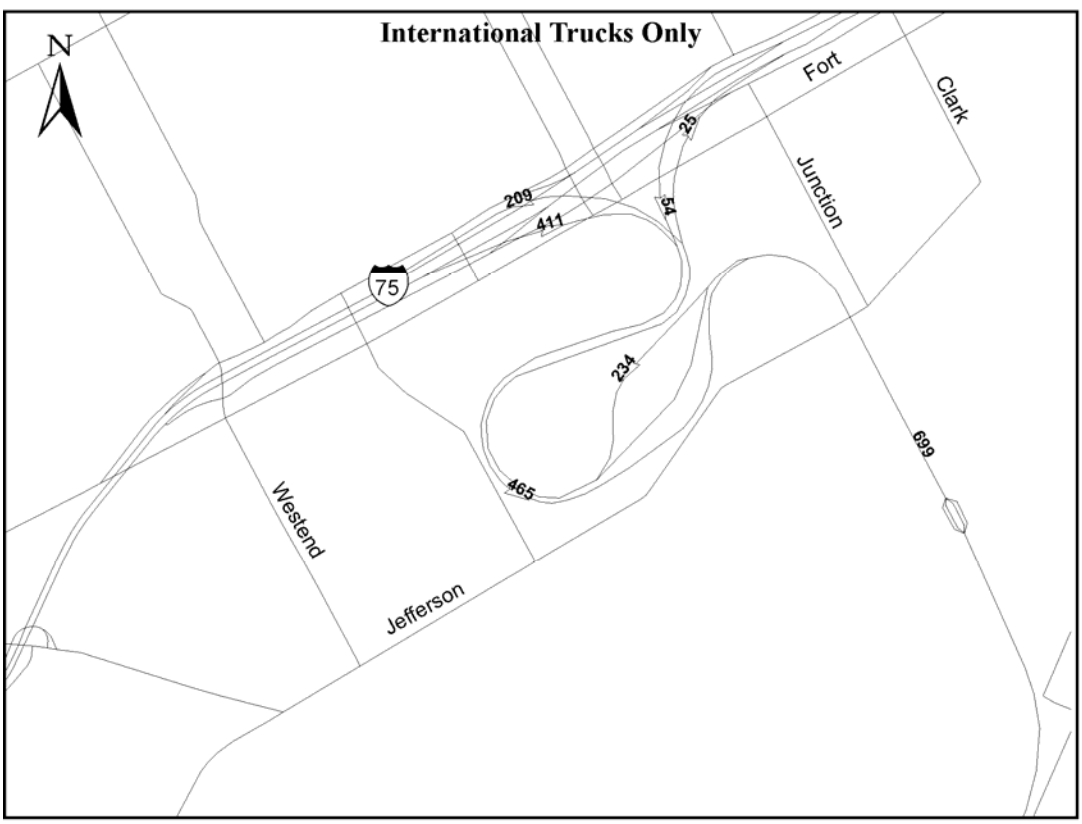




Source: The Corradino Group of Michigan, Inc.

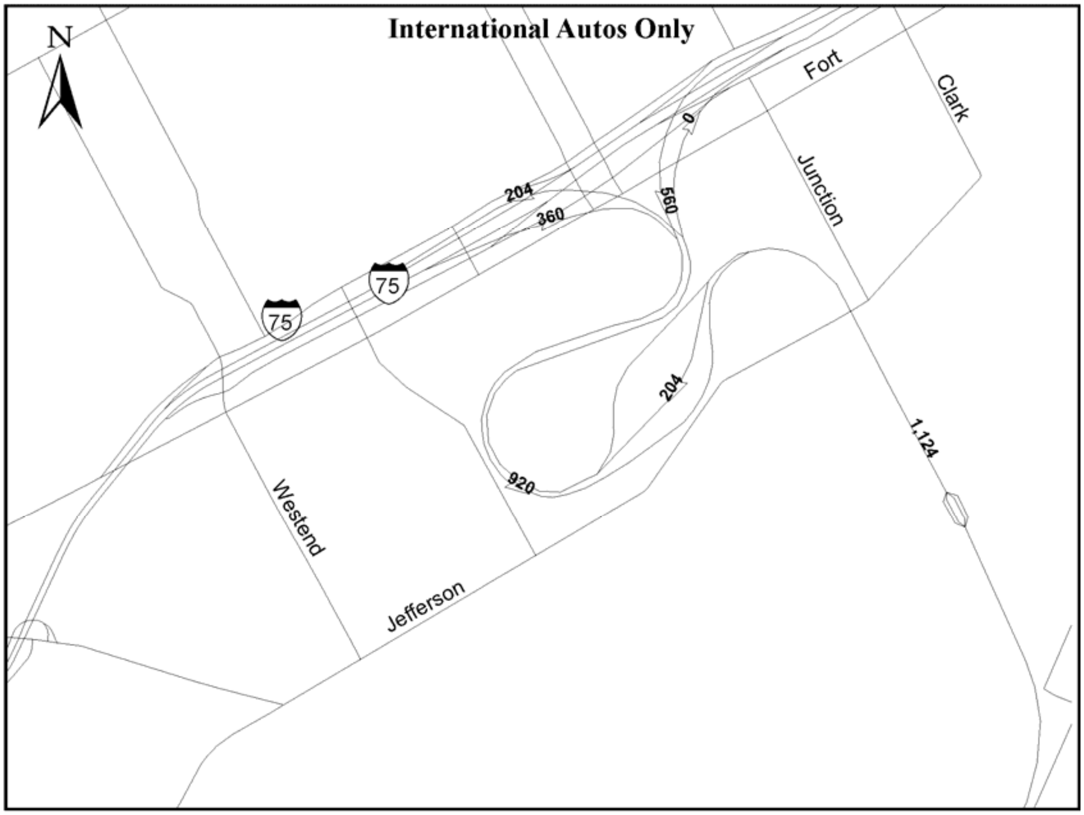
Alternatives #7/9 and 11
2035 Midday Traffic Volumes

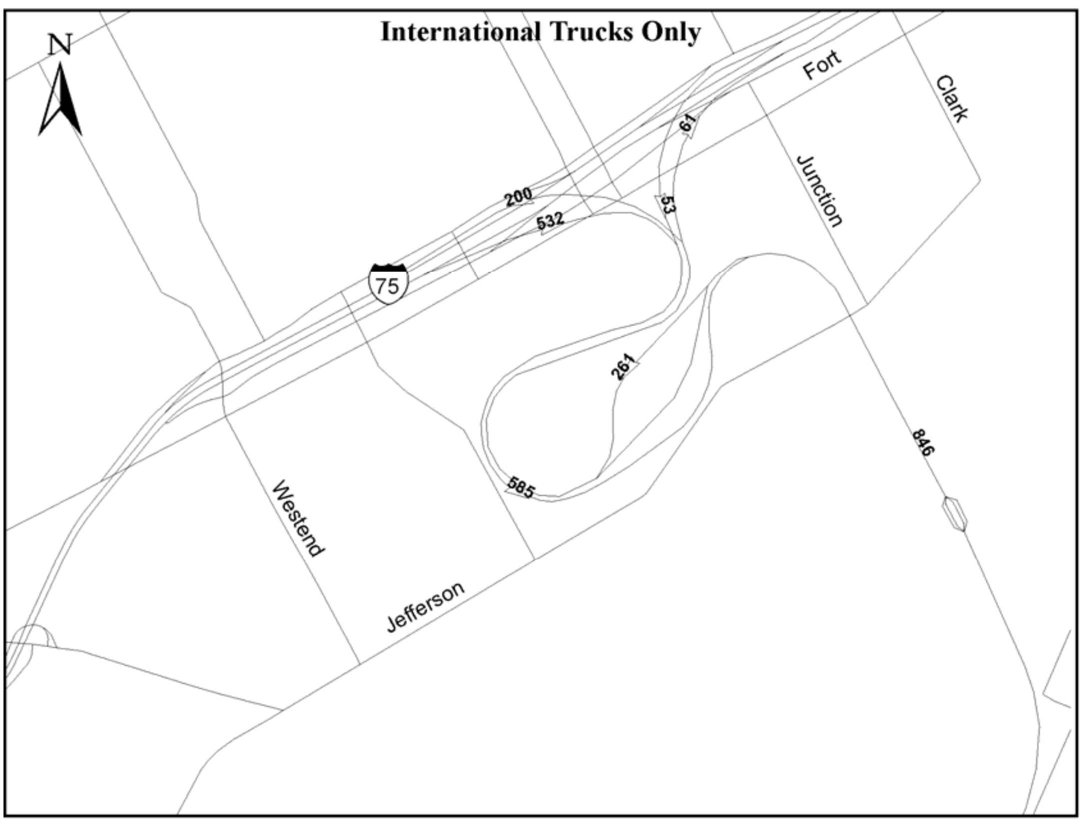




Source: The Corradino Group of Michigan, Inc.

Alternatives #7/9 and 11
2035 PM Peak Hour Traffic Volumes





Source: The Corradino Group of Michigan, Inc.

THESE DATA FOR COMPARISON OF ALTERNATIVES FOR AQ. LESS VMT & VHT = BETTER AQ.

24-HOUR

See next sheets for other times

2004 A0p Area	24 hour	2004				2013				2015				2025				2030				2035			
		Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT	Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT	Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT	Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT	Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT	Intl Car VMT	Intl Car VHT	Intl Truck VMT	Intl Truck VHT
						No Build																			
1	I-75	14,391	245	15,436	263	23,525	401	22,888	389	23,886	408	24,441	417	25,692	442	32,203	554	26,594	460	36,085	623	27,497	477	39,966	692
2	Border Area	188,767	4,493	106,138	2,195	251,916	6,060	148,915	3,081	256,015	6,183	159,323	3,340	276,507	6,799	211,365	4,633	286,753	7,107	237,385	5,280	296,999	7,415	263,406	5,926
3	SEMCOG	1,135,308	26,185	913,479	15,231	1,624,285	35,804	1,241,337	20,738	1,654,886	36,867	1,327,471	22,338	1,807,894	42,182	1,758,145	30,339	1,884,397	44,839	1,973,481	34,339	1,960,901	47,497	2,188,818	38,339
4	US	1,912,621	38,268	3,037,776	48,588	2,550,412	50,231	4,110,374	65,817	2,603,676	51,666	4,407,858	70,777	2,869,996	58,843	5,895,278	95,573	3,003,156	62,432	6,638,988	107,971	3,136,316	66,020	7,382,697	120,370
5	Canada	1,825,015	33,022	2,840,567	47,117	2,387,648	44,611	3,815,724	63,409	2,437,120	45,697	4,076,029	67,945	2,684,482	51,127	5,377,551	90,623	2,808,163	53,841	6,028,312	101,962	2,931,844	56,556	6,679,074	113,301
6	CenCon	800,256	26,344	3,021,560	97,500	907,546	30,180	4,070,670	131,355	927,126	30,833	4,372,172	141,083	1,025,027	34,099	5,879,684	189,727	1,073,978	35,732	6,633,440	214,048	1,122,928	37,365	7,387,196	238,370
7	Total	4,537,892	97,634	8,899,903	193,206	5,845,606	125,022	11,996,768	260,581	5,967,923	128,196	12,856,059	279,805	6,579,506	144,069	17,152,513	375,923	6,885,297	152,006	19,300,740	423,982	7,191,088	159,942	21,448,967	472,041
						Alternatives 1/2/3/14/16																			
						21,560	381	19,270	329	21,775	386	20,478	350	22,849	409	26,522	457	23,386	420	29,544	510	23,923	432	32,566	563
						274,423	6,334	170,998	3,559	278,619	6,453	182,393	3,825	299,599	7,043	239,371	5,152	310,089	7,339	267,860	5,815	320,579	7,634	296,349	6,479
						1,634,179	35,928	1,231,192	20,686	1,664,293	36,970	1,315,674	22,243	1,814,864	42,180	1,738,084	30,029	1,890,150	44,785	1,949,289	33,922	1,965,435	47,389	2,160,493	37,815
						2,548,160	50,185	4,065,071	65,273	2,600,024	51,586	4,356,282	70,123	2,859,348	58,592	5,812,334	94,377	2,989,009	62,095	6,540,360	106,503	3,118,671	65,598	7,268,386	118,630
						2,402,328	43,021	3,857,770	62,930	2,452,786	43,963	4,124,096	67,376	2,705,078	48,677	5,455,723	89,604	2,831,224	51,034	6,121,536	100,719	2,957,369	53,391	6,787,350	111,833
						907,448	30,173	4,070,674	131,355	927,036	30,827	4,372,181	141,084	1,024,974	34,096	5,879,715	189,727	1,073,943	35,730	6,633,482	214,048	1,122,912	37,364	7,387,249	238,370
						5,857,936	123,379	10,546,273	235,090	5,979,846	126,377	11,536,884	256,340	6,589,399	141,365	16,489,934	362,586	6,894,176	148,859	18,966,459	415,709	7,198,952	156,353	21,442,984	468,833
						Alternative 5																			
						23,481	413	21,145	361	23,629	416	22,426	383	24,368	432	28,828	495	24,738	439	32,029	550	25,108	447	35,230	606
						277,810	6,360	172,536	3,591	281,833	6,473	183,866	3,849	301,949	7,038	240,519	5,136	312,008	7,320	268,845	5,779	322,066	7,603	297,171	6,423
						1,637,590	35,934	1,234,541	20,747	1,667,630	36,976	1,319,233	22,302	1,817,829	42,185	1,742,694	30,073	1,892,928	44,789	1,954,424	33,958	1,968,028	47,394	2,166,154	37,843
						2,552,081	50,199	4,070,331	65,361	2,603,856	51,600	4,361,742	70,209	2,862,732	58,604	5,818,798	94,446	2,992,170	62,106	6,547,326	106,565	3,121,608	65,607	7,275,853	118,684
						2,401,999	42,999	3,853,908	62,862	2,452,484	43,941	4,120,424	67,311	2,704,910	48,656	5,453,004	89,556	2,831,122	51,013	6,119,294	100,679	2,957,335	53,370	6,785,584	111,802
						907,441	30,173	4,070,664	131,354	927,030	30,827	4,372,171	141,083	1,024,971	34,096	5,879,709	189,728	1,073,942	35,730	6,633,477	214,050	1,122,913	37,365	7,387,246	238,372
						5,861,522	123,371	11,994,903	259,578	5,983,370	126,368	12,854,337	278,603	6,592,613	141,355	17,151,510	373,730	6,897,234	148,849	19,300,097	421,294	7,201,855	156,342	21,448,683	468,857
						Alternatives 7/9/11																			
						20,077	345	14,867	251	20,404	352	15,990	271	22,037	385	21,605	369	22,854	402	24,412	417	23,670	418	27,220	466
						272,851	6,341	161,426	3,346	277,470	6,467	173,354	3,619	300,563	7,094	232,995	4,982	312,109	7,408	262,816	5,664	323,656	7,722	292,636	6,346
						1,634,367	35,958	1,238,020	20,743	1,664,793	37,005	1,323,025	22,307	1,816,925	42,245	1,748,050	30,130	1,892,991	44,865	1,960,562	34,042	1,969,057	47,485	2,173,074	37,953
						2,551,476	50,259	4,083,012	65,485	2,603,699	51,667	4,375,161	70,351	2,864,812	58,706	5,835,904	94,676	2,995,368	62,225	6,566,275	106,839	3,125,924	65,744	7,296,646	119,002
						2,400,745	43,338	3,846,735	62,996	2,451,245	44,286	4,112,900	67,445	2,703,746	49,027	5,443,726	89,691	2,829,997	51,397	6,109,139	100,814	2,956,248	53,767	6,774,552	111,937
						907,431	30,173	4,070,672	131,355	927,017	30,827	4,372,175	141,083	1,024,951	34,095	5,879,690	189,727	1,073,918	35,730	6,633,448	214,049	1,122,885	37,364	7,387,206	238,370
						5,859,651	123,770	12,000,419	259,836	5,981,961	126,780	12,860,236	278,879	6,593,509	141,827	17,159,320	374,094	6,899,283	149,351	19,308,862	421,702	7,205,058	156,875	21,458,404	469,310

VMT & VHT FOR ALL PERIODS

2004 **AM, Midday, PM, and 24-hour**

These Area Data are Cumulative - USE CUMULATIVE FOR COMPARISON

2004 A0p	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	501	9	479	8
2	Border Area	11,539	285	3,667	78
3	SEMCOG	54,790	1,348	31,992	545
4	US	78,299	1,716	116,162	1,870
5	Canada	70,500	1,392	109,931	1,819
6	CenCon	32,030	1,067	120,884	3,900
7	Total	180,829	4,175	346,977	7,589
2004 A0p	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	656	11	786	13
2	Border Area	7,877	178	5,463	111
3	SEMCOG	52,723	964	46,612	763
4	US	94,550	1,610	151,150	2,400
5	Canada	92,143	1,615	142,751	2,367
6	CenCon	39,568	1,298	151,787	4,898
7	Total	226,261	4,523	445,689	9,665
2004 A0p	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,145	20	852	15
2	Border Area	14,045	359	5,354	117
3	SEMCOG	76,566	2,553	47,096	824
4	US	119,377	3,231	161,738	2,636
5	Canada	110,345	2,091	145,347	2,419
6	CenCon	50,424	1,667	151,569	4,890
7	Total	280,145	6,989	458,654	9,944
2004 A0p	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	14,391	245	15,436	263
2	Border Area	188,767	4,493	106,138	2,195
3	SEMCOG	1,135,308	26,185	913,479	15,231
4	US	1,912,621	38,268	3,037,776	48,588
5	Canada	1,825,015	33,022	2,840,567	47,117
6	CenCon	800,256	26,344	3,021,560	97,500
7	Total	4,537,892	97,634	8,899,903	193,206

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2015 No Build

2015 A0p	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,165	20	760	13
2	Border Area	13,442	335	5,637	118
3	SEMCOG	72,217	1,712	46,128	798
4	US	98,234	2,121	167,986	2,718
5	Canada	78,953	1,665	156,219	2,596
6	CenCon	28,428	968	173,297	5,591
7	Total	205,614	4,754	497,503	10,905
2015 A0p	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,068	18	1,246	21
2	Border Area	10,982	246	8,115	168
3	SEMCOG	78,669	1,445	67,759	1,112
4	US	130,879	2,251	219,301	3,486
5	Canada	127,873	2,291	205,407	3,419
6	CenCon	48,616	1,608	220,503	7,116
7	Total	307,367	6,149	645,211	14,021
2015 A0p	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,742	31	1,342	24
2	Border Area	19,564	528	8,217	180
3	SEMCOG	110,759	3,428	68,663	1,235
4	US	160,974	4,238	235,218	3,881
5	Canada	141,592	2,886	207,878	3,489
6	CenCon	55,067	1,846	217,692	7,023
7	Total	357,633	8,971	660,789	14,393
2015 A0p	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	23,886	408	24,441	417
2	Border Area	256,015	6,183	159,323	3,340
3	SEMCOG	1,654,886	36,867	1,327,471	22,338
4	US	2,603,676	51,666	4,407,858	70,777
5	Canada	2,437,120	45,697	4,076,029	67,945
6	CenCon	927,126	30,833	4,372,172	141,083
7	Total	5,967,923	128,196	12,856,059	279,805

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2035 No Build

2035 A0p	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,387	24	1,241	21
2	Border Area	15,846	420	9,117	197
3	SEMCOG	87,073	2,285	74,678	1,377
4	US	119,063	2,791	277,635	4,584
5	Canada	97,743	2,143	252,227	4,224
6	CenCon	33,829	1,156	284,269	9,171
7	Total	250,635	6,090	814,132	17,979
2035 A0p	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,235	21	2,062	35
2	Border Area	12,722	288	13,426	300
3	SEMCOG	92,850	1,736	112,136	1,876
4	US	155,754	2,706	368,590	5,895
5	Canada	152,409	2,775	337,636	5,715
6	CenCon	58,031	1,920	375,765	12,126
7	Total	366,193	7,401	1,081,990	23,737
2035 A0p	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,953	37	2,115	40
2	Border Area	22,583	648	13,721	323
3	SEMCOG	131,437	4,784	112,950	2,223
4	US	199,774	5,930	392,651	6,745
5	Canada	173,207	3,718	340,139	5,856
6	CenCon	69,969	2,344	363,901	11,740
7	Total	442,951	11,993	1,096,691	24,341
2035 A0p	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	27,497	477	39,966	692
2	Border Area	296,999	7,415	263,406	5,926
3	SEMCOG	1,960,901	47,497	2,188,818	38,339
4	US	3,136,316	66,020	7,382,697	120,370
5	Canada	2,931,844	56,556	6,679,074	113,301
6	CenCon	1,122,928	37,365	7,387,196	238,370
7	Total	7,191,088	159,942	21,448,967	472,041

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2015 Alternative Set #1/2/3/14/16

2015 PA02	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,135	19	647	11
2	Border Area	14,842	347	6,384	136
3	SEMCOG	73,094	1,716	45,810	796
4	US	98,793	2,121	166,068	2,693
5	Canada	79,234	1,546	157,781	2,570
6	CenCon	28,422	967	173,298	5,591
7	Total	133,356	2,918	451,338	10,057
2015 PA02	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	897	15	1,072	18
2	Border Area	11,825	262	9,384	191
3	SEMCOG	78,880	1,451	67,299	1,108
4	US	130,499	2,248	217,206	3,458
5	Canada	128,580	2,248	207,463	3,393
6	CenCon	48,615	1,608	220,504	7,116
7	Total	228,814	4,652	577,875	12,860
2015 PA02	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,795	35	1,023	18
2	Border Area	21,570	538	9,145	209
3	SEMCOG	111,861	3,430	67,493	1,226
4	US	160,928	4,226	230,821	3,829
5	Canada	143,043	2,668	211,809	3,455
6	CenCon	55,049	1,845	217,690	7,023
7	Total	247,159	5,309	592,827	13,081
2015 PA02	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	21,775	386	20,478	350
2	Border Area	278,619	6,453	182,393	3,825
3	SEMCOG	1,664,293	36,970	1,315,674	22,243
4	US	2,600,024	51,586	4,356,282	70,123
5	Canada	2,452,786	43,963	4,124,096	67,376
6	CenCon	927,036	30,827	4,372,181	141,084
7	Total	5,979,846	126,377	11,536,884	256,340

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2035 Alternative Set #1/2/3/14/16

2035 PA02	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,433	25	1,085	19
2	Border Area	17,887	428	10,440	228
3	SEMCOG	88,452	2,282	74,140	1,374
4	US	119,837	2,780	273,688	4,533
5	Canada	98,287	1,923	255,698	4,169
6	CenCon	33,830	1,156	284,275	9,171
7	Total	251,953	5,859	813,660	17,873
2035 PA02	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	931	16	1,684	28
2	Border Area	13,450	303	15,376	324
3	SEMCOG	92,708	1,738	110,750	1,845
4	US	154,579	2,693	363,369	5,810
5	Canada	153,567	2,701	342,528	5,653
6	CenCon	58,030	1,920	375,768	12,126
7	Total	366,176	7,314	1,081,665	23,589
2035 PA02	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	2,026	41	1,650	31
2	Border Area	24,785	646	14,363	356
3	SEMCOG	132,129	4,753	110,915	2,197
4	US	198,661	5,874	384,625	6,636
5	Canada	175,492	3,307	348,140	5,740
6	CenCon	69,967	2,344	363,900	11,740
7	Total	444,119	11,525	1,096,665	24,116
2035 PA02	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	23,923	432	32,566	563
2	Border Area	320,579	7,634	296,349	6,479
3	SEMCOG	1,965,435	47,389	2,160,493	37,815
4	US	3,118,671	65,598	7,268,386	118,630
5	Canada	2,957,369	53,391	6,787,350	111,833
6	CenCon	1,122,912	37,364	7,387,249	238,370
7	Total	7,198,952	156,353	21,442,984	468,833

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2015 Alternative #5

2015 PA05	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,147	19	708	12
2	Border Area	14,910	348	6,434	136
3	SEMCOG	73,173	1,717	45,941	798
4	US	98,890	2,123	166,295	2,696
5	Canada	79,236	1,546	157,673	2,568
6	CenCon	28,422	967	173,298	5,591
7	Total	206,548	4,636	497,265	10,855
2015 PA05	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	994	17	1,167	20
2	Border Area	11,972	263	9,444	193
3	SEMCOG	79,033	1,453	67,474	1,111
4	US	130,676	2,251	217,475	3,463
5	Canada	128,557	2,247	207,246	3,389
6	CenCon	48,615	1,608	220,504	7,116
7	Total	307,848	6,105	645,224	13,968
2015 PA05	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,936	37	1,144	21
2	Border Area	21,854	537	9,273	209
3	SEMCOG	112,146	3,426	67,693	1,227
4	US	161,250	4,221	231,110	3,831
5	Canada	143,041	2,666	211,704	3,453
6	CenCon	55,049	1,845	217,689	7,023
7	Total	359,340	8,733	660,503	14,307
2015 PA05	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	23,629	416	22,426	383
2	Border Area	281,833	6,473	183,866	3,849
3	SEMCOG	1,667,630	36,976	1,319,233	22,302
4	US	2,603,856	51,600	4,361,742	70,209
5	Canada	2,452,484	43,941	4,120,424	67,311
6	CenCon	927,030	30,827	4,372,171	141,083
7	Total	5,983,370	126,368	12,854,337	278,603

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2035 Alternative #5

2035 PA05	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,407	24	1,148	20
2	Border Area	17,909	428	10,506	229
3	SEMCOG	88,484	2,286	74,293	1,378
4	US	119,881	2,784	273,996	4,539
5	Canada	98,324	1,925	255,537	4,167
6	CenCon	33,830	1,156	284,275	9,171
7	Total	252,035	5,865	813,808	17,877
2035 PA05	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,007	17	1,829	31
2	Border Area	13,506	303	15,371	320
3	SEMCOG	92,843	1,738	111,054	1,846
4	US	154,741	2,694	363,787	5,812
5	Canada	153,532	2,700	342,400	5,651
6	CenCon	58,030	1,920	375,768	12,126
7	Total	366,303	7,314	1,081,955	23,590
2035 PA05	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	2,095	41	1,782	33
2	Border Area	24,963	640	14,535	354
3	SEMCOG	132,319	4,750	111,192	2,197
4	US	198,840	5,871	384,845	6,635
5	Canada	175,576	3,304	348,261	5,742
6	CenCon	69,968	2,344	363,899	11,740
7	Total	444,383	11,518	1,097,005	24,117
2035 PA05	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	25,108	447	35,230	606
2	Border Area	322,066	7,603	297,171	6,423
3	SEMCOG	1,968,028	47,394	2,166,154	37,843
4	US	3,121,608	65,607	7,275,853	118,684
5	Canada	2,957,335	53,370	6,785,584	111,802
6	CenCon	1,122,913	37,365	7,387,246	238,372
7	Total	7,201,855	156,342	21,448,683	468,857

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2015 Alternative Set #7/9/11

2015 PA09	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	828	14	461	8
2	Border Area	14,597	349	6,438	136
3	SEMCOG	72,878	1,719	46,118	801
4	US	98,653	2,125	166,857	2,705
5	Canada	79,314	1,572	157,476	2,572
6	CenCon	28,417	967	173,298	5,591
7	Total	206,385	4,664	497,631	10,867
2015 PA09	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	900	15	833	14
2	Border Area	11,733	261	8,694	177
3	SEMCOG	78,912	1,452	67,603	1,110
4	US	130,685	2,251	218,071	3,468
5	Canada	128,449	2,257	206,845	3,397
6	CenCon	48,615	1,608	220,504	7,116
7	Total	307,749	6,116	645,419	13,981
2015 PA09	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,643	29	847	15
2	Border Area	21,752	544	9,154	205
3	SEMCOG	112,028	3,435	68,071	1,232
4	US	161,341	4,234	232,028	3,843
5	Canada	143,033	2,702	211,321	3,456
6	CenCon	55,049	1,845	217,691	7,023
7	Total	359,422	8,781	661,039	14,323
2015 PA09	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	20,404	352	15,990	271
2	Border Area	277,470	6,467	173,354	3,619
3	SEMCOG	1,664,793	37,005	1,323,025	22,307
4	US	2,603,699	51,667	4,375,161	70,351
5	Canada	2,451,245	44,286	4,112,900	67,445
6	CenCon	927,017	30,827	4,372,175	141,083
7	Total	5,981,961	126,780	12,860,236	278,879

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

2035 Alternative Set #7/9/11

2035 PA09	AM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	977	17	869	15
2	Border Area	17,415	430	10,610	230
3	SEMCOG	87,961	2,286	74,696	1,382
4	US	119,447	2,785	275,039	4,552
5	Canada	98,382	1,962	255,252	4,171
6	CenCon	33,823	1,156	284,271	9,171
7	Total	251,653	5,903	814,562	17,893
2035 PA09	MD	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,014	17	1,385	23
2	Border Area	13,543	305	14,887	313
3	SEMCOG	92,829	1,740	111,374	1,852
4	US	154,875	2,698	364,866	5,829
5	Canada	153,430	2,712	341,852	5,660
6	CenCon	58,029	1,920	375,765	12,126
7	Total	366,334	7,330	1,082,483	23,616
2035 PA09	PM	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	1,996	38	1,487	27
2	Border Area	25,584	660	14,947	356
3	SEMCOG	132,988	4,767	111,529	2,200
4	US	199,794	5,891	385,598	6,647
5	Canada	175,598	3,337	347,558	5,742
6	CenCon	69,968	2,344	363,901	11,740
7	Total	445,360	11,572	1,097,057	24,129
2035 PA09	**24 hour**	Intl Car	Intl Car	Intl Truck	Intl Truck
Area		VMT	VHT	VMT	VHT
1	I-75	23,670	418	27,220	466
2	Border Area	323,656	7,722	292,636	6,346
3	SEMCOG	1,969,057	47,485	2,173,074	37,953
4	US	3,125,924	65,744	7,296,646	119,002
5	Canada	2,956,248	53,767	6,774,552	111,937
6	CenCon	1,122,885	37,364	7,387,206	238,370
7	Total	7,205,058	156,875	21,458,404	469,310

Daily Factors		Cars	Trucks
AM Pk Hr - AM Pk Per:		2.677	3.231
MD Pk Hr - MD Pk Per:		6.383	5.671
PM Pk Hr - PM Pk Per:		3.900	3.934
MD Pk Hr - Overnight:		6.704	7.734

Appendix C

Mobile Source Air Toxics Analysis

TRAFFIC VOLUMES FROM TRAVEL DEMAND MODEL - 2015 and 2035

Volumes from Travel Demand Model from which all other cells derive

PA02 = Alternatives 1/2/3/14/16

	2013				2015				2030				2035			
	AM	MD	PM	Daily	AM	MD	PM	Daily	AM	MD	PM	Daily	AM	MD	PM	Daily
I-75 Ramps																
Auto																
Plaza to NB	337	31	25	1338	351	31	25	1375	455	32	26	1647	489	32	26	1738
Plaza to SB	337	137	169	3264	344	140	174	3338	400	161	212	3896	419	168	224	4082
NB to Plaza	57	191	358	3696	58	193	360	3734	69	210	374	4019	72	216	379	4114
SB to Plaza	89	197	655	4917	92	195	666	4948	116	184	749	5178	124	180	776	5254
Auto Total				13215				13395				14740				15188
Truck																
Plaza to NB	121	90	75	1909	130	95	79	2020	201	131	109	2849	224	143	119	3126
Plaza to SB	208	175	163	3695	219	185	170	3898	300	263	222	5424	327	289	239	5933
NB to Plaza	179	296	366	5460	191	313	385	5778	280	444	529	8159	309	488	577	8953
SB to Plaza	58	145	94	2261	62	152	100	2374	94	202	143	3222	104	218	157	3505
Truck Total				13325				14070				19655				21517
TOTAL				26541				27465				34395				36705
Plaza Links to US																
Auto																
Common 1																
Auto 1	674	168	194	4602	695	171	199	4713	855	193	237	5543	908	200	250	5820
Common 2	674	168	194	4602	695	171	199	4713	855	193	237	5543	908	200	250	5820
Truck																
Common 1																
Truck 1	329	265	238	5604	349	280	249	5918	501	394	331	8274	551	432	358	9059
Common 2	329	265	238	5604	349	280	249	5918	501	394	331	8274	551	432	358	9059
Plaza Links to Can																
Auto	145	387	1013	8613	150	388	1026	8682	185	394	1123	9197	196	396	1155	9368
Truck	237	441	460	7721	253	465	485	8152	373	646	672	11381	413	706	734	12458
Bridge to US																
Auto	674	168	194	4602	695	171	199	4713	855	193	237	5543	908	200	250	5820
Truck	329	265	238	5604	349	280	249	5918	501	394	331	8274	551	432	358	9059
Bridge to Canada																
Auto	145	387	1013	8613	150	388	1026	8682	185	394	1123	9197	196	396	1155	9368
Truck	237	441	460	7721	253	465	485	8152	373	646	672	11381	413	706	734	12458

PA05 = Alternative 5

	2013				2015				2030				2035			
	AM	MD	PM		AM	MD	PM	Daily	AM	MD	PM	Daily	AM	MD	PM	Daily
I-75 Ramps																
Auto																
Plaza to NB	344	33	26	1384	358	33	26	1422	465	34	27	1701	500	34	27	1795
Plaza to SB	327	133	165	3173	334	136	170	3246	387	157	208	3797	405	164	220	3980
NB to Plaza	53	185	342	3554	54	186	345	3587	65	197	371	3834	69	200	379	3916
SB to Plaza	100	238	710	5633	102	235	721	5646	114	214	807	5740	118	207	836	5771
Auto Total				13744				13900				15071				15462
Truck																
Plaza to NB	129	100	91	2138	138	106	95	2261	203	151	122	3186	225	166	131	3494
Plaza to SB	199	164	154	3478	210	173	161	3669	296	243	215	5108	325	266	233	5588
NB to Plaza	179	275	333	5086	190	293	354	5419	273	430	515	7912	301	475	569	8744
SB to Plaza	63	136	123	2278	66	146	129	2428	89	221	173	3554	97	246	187	3929
Truck Total				12979				13777				19760				21754
TOTAL				26723				27677				34831				37216
Plaza Links to US																
Auto																
Common 1																
Auto 1	671	166	191	4557	692	169	196	4668	852	191	234	5498	905	198	247	5775
Common 2	671	166	191	4557	692	169	196	4668	852	191	234	5498	905	198	247	5775
Truck																
Common 1																
Truck 1	328	264	245	5616	348	279	256	5931	500	394	337	8294	550	432	364	9081
Common 2	328	264	245	5616	348	279	256	5931	500	394	337	8294	550	432	364	9081
Plaza Links to Can																
Auto	153	422	1051	9187	156	421	1066	9232	179	411	1178	9573	187	407	1215	9687
Truck	242	411	456	7364	256	439	483	7846	363	651	688	11466	398	721	756	12673
Bridge to US																
Auto	671	166	191	4557	692	169	196	4668	852	191	234	5498	905	198	247	5775
Truck	328	264	245	5616	348	279	256	5931	500	394	337	8294	550	432	364	9081
Bridge to Canada																
Auto	153	422	1051	9187	156	421	1066	9232	179	411	1178	9573	187	407	1215	9687
Truck	242	411	456	7364	256	439	483	7846	363	651	688	11466	398	721	756	12673

PA09 = Alternative 7/9/11

	2013				2015				2030				2035			
	AM	MD	PM	Daily	AM	MD	PM	Daily	AM	MD	PM	Daily	AM	MD	PM	Daily
I-75 Ramps																
Auto																
Plaza to NB	106	0	0	265	110	0	0	276	142	0	0	355	152	0	0	381
Plaza to SB	299	117	150	2841	307	120	155	2915	371	140	192	3470	392	146	204	3655
NB to Plaza	46	139	325	2938	47	143	328	2997	56	171	352	3437	59	180	360	3583
SB to Plaza	6	29	300	1434	6	31	324	1541	8	45	501	2346	8	50	560	2614
Auto Total				7479				7729				9607				10233
Truck																
Plaza to NB	40	5	19	271	51	7	23	345	136	21	52	904	164	25	61	1090
Plaza to SB	194	88	137	2359	205	99	143	2567	291	182	186	4131	319	209	200	4652
NB to Plaza	128	190	305	3821	139	210	326	4171	219	361	481	6798	246	411	532	7674
SB to Plaza	0	1	17	79	0	6	20	148	0	42	45	669	0	54	53	842
Truck Total				6529				7232				12502				14258
TOTAL				14008				14961				22109				24492
Plaza Links to US																
Auto																
Common 1																
Auto 1	404	117	150	3107	417	120	155	3191	512	140	192	3825	544	146	204	4036
Common 2	404	117	150	3107	417	120	155	3191	512	140	192	3825	544	146	204	4036
Truck																
Common 1																
Truck 1	233	93	157	2630	256	106	166	2913	426	202	237	5035	483	234	261	5742
Common 2	233	93	157	2630	256	106	166	2913	426	202	237	5035	483	234	261	5742
Plaza Links to Can																
Auto	52	168	625	4372	53	174	652	4538	64	216	853	5783	67	230	920	6197
Truck	128	191	322	3900	139	216	346	4319	219	403	525	7467	246	465	585	8516
Bridge to US																
Auto	404	117	150	3107	417	120	155	3191	512	140	192	3825	544	146	204	4036
Truck	233	93	157	2630	256	106	166	2913	426	202	237	5035	483	234	261	5742
Bridge to Canada																
Auto	52	168	625	4372	53	174	652	4538	64	216	853	5783	67	230	920	6197
Truck	128	191	322	3900	139	216	346	4319	219	403	525	7467	246	465	585	8516

MOBILE6.2 MSAT EMISSION FACTORS 2013										
		LDGV- 2013			**LDGT - 2013**			**"Autos"**	**HDDV-2013**		
Speed	Pollutant	Sum	Win	Avg	Sum	Win	Avg		Sum	Win	Avg
Idle	BENZ [a]	220.40	173.73	197.06	149.43	124.88	137.15	156.58	27.48	27.83	27.65
	BUTA	12.18	13.53	12.85	9.50	10.35	9.93	10.87	15.98	16.18	16.08
	FORM	25.58	28.88	27.23	21.00	23.18	22.09	23.75	204.65	207.28	205.96
	ACET	12.30	13.80	13.05	9.68	13.50	11.59	12.06	75.38	76.35	75.86
	ACRO	1.28	1.85	1.56	1.08	1.50	1.29	1.38	9.15	9.28	9.21
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.216
2.5	BENZ [a]	88.16	69.49	78.83	59.77	49.95	54.86	62.63	10.99	11.13	11.06
	BUTA	4.87	5.41	5.14	3.80	4.14	3.97	4.35	6.39	6.47	6.43
	FORM	10.23	11.55	10.89	8.40	9.27	8.84	9.50	81.86	82.91	82.39
	ACET	4.92	5.52	5.22	3.87	5.40	4.64	4.83	30.15	30.54	30.35
	ACRO	0.51	0.74	0.63	0.43	0.60	0.52	0.55	3.66	3.71	3.69
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
5	BENZ [a]	46.67	41.50	44.09	33.90	30.99	32.45	36.22	9.66	9.78	9.72
	BUTA	3.22	3.75	3.49	2.46	2.81	2.64	2.91	5.61	5.68	5.65
	FORM	7.25	8.01	7.63	5.80	6.29	6.05	6.56	71.93	72.86	72.40
	ACET	3.47	3.83	3.65	2.66	3.66	3.16	3.32	26.49	26.83	26.66
	ACRO	0.34	0.51	0.43	0.28	0.40	0.34	0.37	3.22	3.26	3.24
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
10	BENZ [a]	30.46	28.65	29.56	22.40	21.57	21.99	24.44	7.58	7.68	7.63
	BUTA	2.25	2.70	2.48	1.69	2.00	1.85	2.05	4.41	4.46	4.44
	FORM	5.05	5.78	5.42	3.99	4.49	4.24	4.62	56.47	57.20	56.84
	ACET	2.42	2.76	2.59	1.83	2.61	2.22	2.34	20.80	21.07	20.94
	ACRO	0.23	0.36	0.30	0.19	0.28	0.24	0.25	2.53	2.56	2.55
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
15	BENZ [a]	24.68	23.71	24.20	18.09	17.91	18.00	20.01	6.09	6.16	6.13
	BUTA	1.82	2.25	2.04	1.37	1.66	1.52	1.68	3.54	3.58	3.56
	FORM	4.11	4.81	4.46	3.23	3.73	3.48	3.80	45.32	45.90	45.61
	ACET	1.97	2.30	2.14	1.48	2.18	1.83	1.93	16.69	16.91	16.80
	ACRO	0.19	0.30	0.25	0.15	0.23	0.19	0.21	2.03	2.05	2.04
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086

20	BENZ [a]	21.68	21.24	21.46	15.84	16.08	15.96	17.74	4.99	5.06	5.03
	BUTA	1.61	2.02	1.82	1.21	1.50	1.36	1.50	2.90	2.94	2.92
	FORM	3.63	4.32	3.98	2.86	3.66	3.26	3.49	37.18	37.66	37.42
	ACET	1.74	2.07	1.91	1.31	1.96	1.64	1.72	13.69	13.87	13.78
	ACRO	0.17	0.27	0.22	0.13	0.21	0.17	0.19	1.66	1.69	1.68
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
25	BENZ [a]	19.99	19.76	19.88	14.59	14.98	14.79	16.44	4.19	4.24	4.22
	BUTA	1.49	1.89	1.69	1.11	1.39	1.25	1.39	2.43	2.46	2.45
	FORM	3.35	4.03	3.69	2.63	3.13	2.88	3.14	31.18	31.58	31.38
	ACET	1.61	1.93	1.77	1.21	1.82	1.52	1.60	11.48	11.63	11.56
	ACRO	0.15	0.25	0.20	0.12	0.19	0.16	0.17	1.40	1.41	1.41
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
30	BENZ [a]	19.11	19.02	19.07	13.93	14.41	14.17	15.76	3.59	3.64	3.62
	BUTA	1.43	1.82	1.63	1.06	1.34	1.20	1.34	2.08	2.11	2.10
	FORM	3.22	3.89	3.56	2.52	3.02	2.77	3.02	26.73	27.07	26.90
	ACET	1.54	1.86	1.70	1.16	1.76	1.46	1.54	9.84	9.97	9.91
	ACRO	0.15	0.24	0.20	0.11	0.18	0.15	0.16	1.20	1.21	1.21
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
35	BENZ [a]	18.36	18.38	18.37	13.43	13.99	13.71	15.22	3.15	3.19	3.17
	BUTA	1.38	1.76	1.57	1.03	1.30	1.17	1.30	1.83	1.85	1.84
	FORM	3.11	3.77	3.44	2.43	2.93	2.68	2.93	23.42	23.73	23.58
	ACET	1.49	1.80	1.65	1.12	1.71	1.42	1.49	8.63	8.74	8.69
	ACRO	0.14	0.23	0.19	0.11	0.18	0.15	0.16	1.05	1.06	1.06
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
40	BENZ [a]	18.07	18.16	18.12	13.32	13.92	13.62	15.08	2.82	2.85	2.84
	BUTA	1.37	1.74	1.56	1.02	1.30	1.16	1.29	1.64	1.66	1.65
	FORM	3.08	3.73	3.41	2.43	2.92	2.68	2.91	20.98	21.25	21.12
	ACET	1.47	1.78	1.63	1.11	1.73	1.42	1.49	7.73	7.83	7.78
	ACRO	0.14	0.23	0.19	0.11	0.18	0.15	0.16	0.94	0.95	0.95
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086

45	BENZ [a]	17.80	17.95	17.88	12.19	13.86	13.03	14.60	2.58	2.61	2.60
	BUTA	1.35	1.73	1.54	1.02	1.29	1.16	1.28	1.50	1.52	1.51
	FORM	3.05	3.70	3.38	2.43	2.91	2.67	2.90	19.22	19.46	19.34
	ACET	1.46	1.77	1.62	1.11	1.00	1.06	1.24	7.08	7.17	7.13
	ACRO	0.14	0.23	0.19	0.11	0.18	0.15	0.16	0.86	0.87	0.87
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
50	BENZ [a]	17.55	17.74	17.65	13.13	13.79	13.46	14.82	2.42	2.45	2.44
	BUTA	1.34	1.71	1.53	1.02	1.29	1.16	1.28	1.40	1.42	1.41
	FORM	3.02	3.66	3.34	2.42	2.90	2.66	2.88	17.99	18.22	18.11
	ACET	1.45	1.75	1.60	1.11	1.69	1.40	1.46	6.63	6.71	6.67
	ACRO	0.14	0.22	0.18	0.11	0.18	0.15	0.16	0.81	0.82	0.82
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086
55	BENZ [a]	17.32	17.53	17.43	13.05	13.73	13.39	14.70	2.31	2.34	2.33
	BUTA	1.32	1.69	1.51	1.01	1.28	1.15	1.26	1.34	1.36	1.35
	FORM	3.00	3.63	3.32	2.42	2.93	2.68	2.88	17.21	17.44	17.33
	ACET	1.43	1.73	1.58	1.11	1.69	1.40	1.46	6.34	6.42	6.38
	ACRO	0.14	0.22	0.18	0.11	0.17	0.14	0.15	0.77	0.78	0.78
	DPM [b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0843	0.0885	0.086

Source: MOBILE6.2.03 version, July 26, 2004, updated with new PM2.5 module April 2006.
Note that EFs for air toxics are in units mg/mi. Criteria pollutants EFs are in g/mi.

[a] DPM consists of Ecarbon + Ocarbon + sulfate.

[b] BENZ emission factors include evaporative and exhaust emissions.

<table>
<tr><td colspan="12">MOBILE6.2 MSAT EMISSION FACTORS 2030</td></tr>
<tr><td></td><td></td><td colspan="3">LDGV- 2030</td><td colspan="3">LDGT - 2030</td><td>"Autos"</td><td colspan="3">HDDV-2030</td></tr>
<tr><td>Speed</td><td>Pollutant</td><td>Sum</td><td>Win</td><td>Avg</td><td>Sum</td><td>Win</td><td>Avg</td><td></td><td>Sum</td><td>Win</td><td>Avg</td></tr>
<tr><td rowspan="6">Idle</td><td>BENZ [a]</td><td>130.93</td><td>101.35</td><td>116.14</td><td>110.90</td><td>86.28</td><td>98.59</td><td>103.54</td><td>20.53</td><td>20.53</td><td>20.53</td></tr>
<tr><td>BUTA</td><td>6.98</td><td>7.63</td><td>7.30</td><td>6.93</td><td>7.00</td><td>6.96</td><td>7.06</td><td>11.93</td><td>11.93</td><td>11.93</td></tr>
<tr><td>FORM</td><td>15.08</td><td>16.75</td><td>15.91</td><td>15.63</td><td>16.00</td><td>15.81</td><td>15.84</td><td>152.85</td><td>152.93</td><td>152.89</td></tr>
<tr><td>ACET</td><td>7.20</td><td>7.95</td><td>7.58</td><td>7.13</td><td>9.53</td><td>8.33</td><td>8.11</td><td>56.30</td><td>56.33</td><td>56.31</td></tr>
<tr><td>ACRO</td><td>0.75</td><td>1.08</td><td>0.91</td><td>0.78</td><td>1.03</td><td>0.90</td><td>0.90</td><td>6.85</td><td>6.85</td><td>6.85</td></tr>
<tr><td>DPM</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.036</td></tr>
<tr><td rowspan="6">2.5</td><td>BENZ [a]</td><td>52.37</td><td>40.54</td><td>46.46</td><td>44.36</td><td>34.51</td><td>39.44</td><td>41.42</td><td>8.21</td><td>8.21</td><td>8.21</td></tr>
<tr><td>BUTA</td><td>2.79</td><td>3.05</td><td>2.92</td><td>2.77</td><td>2.80</td><td>2.79</td><td>2.82</td><td>4.77</td><td>4.77</td><td>4.77</td></tr>
<tr><td>FORM</td><td>6.03</td><td>6.70</td><td>6.37</td><td>6.25</td><td>6.40</td><td>6.33</td><td>6.34</td><td>61.14</td><td>61.17</td><td>61.16</td></tr>
<tr><td>ACET</td><td>2.88</td><td>3.18</td><td>3.03</td><td>2.85</td><td>3.81</td><td>3.33</td><td>3.25</td><td>22.52</td><td>22.53</td><td>22.53</td></tr>
<tr><td>ACRO</td><td>0.30</td><td>0.43</td><td>0.37</td><td>0.31</td><td>0.41</td><td>0.36</td><td>0.36</td><td>2.74</td><td>2.74</td><td>2.74</td></tr>
<tr><td>DPM</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.015</td><td>0.014</td><td>0.014</td></tr>
<tr><td rowspan="6">5</td><td>BENZ [a]</td><td>27.48</td><td>24.11</td><td>25.80</td><td>25.10</td><td>21.37</td><td>23.24</td><td>23.96</td><td>7.21</td><td>7.22</td><td>7.22</td></tr>
<tr><td>BUTA</td><td>1.86</td><td>2.14</td><td>2.00</td><td>1.80</td><td>1.91</td><td>1.86</td><td>1.90</td><td>4.19</td><td>4.19</td><td>4.19</td></tr>
<tr><td>FORM</td><td>4.31</td><td>4.70</td><td>4.51</td><td>4.35</td><td>4.37</td><td>4.36</td><td>4.40</td><td>53.73</td><td>53.76</td><td>53.75</td></tr>
<tr><td>ACET</td><td>2.05</td><td>2.23</td><td>2.14</td><td>1.98</td><td>2.60</td><td>2.29</td><td>2.25</td><td>19.79</td><td>19.80</td><td>19.80</td></tr>
<tr><td>ACRO</td><td>0.20</td><td>0.30</td><td>0.25</td><td>0.21</td><td>0.28</td><td>0.25</td><td>0.25</td><td>2.40</td><td>2.41</td><td>2.41</td></tr>
<tr><td>DPM</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.015</td><td>0.014</td><td>0.014</td></tr>
<tr><td rowspan="6">10</td><td>BENZ [a]</td><td>17.81</td><td>16.68</td><td>17.25</td><td>16.54</td><td>14.89</td><td>15.72</td><td>16.15</td><td>5.66</td><td>5.67</td><td>5.67</td></tr>
<tr><td>BUTA</td><td>1.31</td><td>1.55</td><td>1.43</td><td>1.24</td><td>1.39</td><td>1.31</td><td>1.35</td><td>3.29</td><td>3.29</td><td>3.29</td></tr>
<tr><td>FORM</td><td>3.03</td><td>3.42</td><td>3.23</td><td>3.01</td><td>3.14</td><td>3.08</td><td>3.12</td><td>42.18</td><td>42.20</td><td>42.19</td></tr>
<tr><td>ACET</td><td>1.44</td><td>1.62</td><td>1.53</td><td>1.37</td><td>1.87</td><td>1.62</td><td>1.59</td><td>15.53</td><td>15.54</td><td>15.54</td></tr>
<tr><td>ACRO</td><td>0.14</td><td>0.21</td><td>0.18</td><td>0.14</td><td>0.20</td><td>0.17</td><td>0.17</td><td>1.89</td><td>1.89</td><td>1.89</td></tr>
<tr><td>DPM</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.015</td><td>0.014</td><td>0.014</td></tr>
<tr><td rowspan="6">15</td><td>BENZ [a]</td><td>14.33</td><td>13.83</td><td>14.08</td><td>13.31</td><td>12.37</td><td>12.84</td><td>13.19</td><td>4.54</td><td>4.55</td><td>4.55</td></tr>
<tr><td>BUTA</td><td>1.07</td><td>1.30</td><td>1.19</td><td>1.01</td><td>1.14</td><td>1.08</td><td>1.11</td><td>2.64</td><td>2.64</td><td>2.64</td></tr>
<tr><td>FORM</td><td>2.47</td><td>2.86</td><td>2.67</td><td>2.44</td><td>2.61</td><td>2.53</td><td>2.56</td><td>33.85</td><td>33.87</td><td>33.86</td></tr>
<tr><td>ACET</td><td>1.17</td><td>1.35</td><td>1.26</td><td>1.11</td><td>1.56</td><td>1.34</td><td>1.31</td><td>12.47</td><td>12.47</td><td>12.47</td></tr>
<tr><td>ACRO</td><td>0.11</td><td>0.18</td><td>0.15</td><td>0.11</td><td>0.16</td><td>0.14</td><td>0.14</td><td>1.51</td><td>1.52</td><td>1.52</td></tr>
<tr><td>DPM</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.015</td><td>0.014</td><td>0.014</td></tr>
</table>

20	BENZ [a]	12.48	12.41	12.45	11.59	11.10	11.35	11.66	3.73	3.73	3.73
	BUTA	0.95	1.17	1.06	0.89	1.02	0.96	0.98	2.17	2.17	2.17
	FORM	2.19	2.58	2.39	2.16	2.35	2.26	2.29	27.77	27.78	27.78
	ACET	1.04	1.22	1.13	0.98	1.40	1.19	1.17	10.23	10.23	10.23
	ACRO	0.10	0.16	0.13	0.10	0.19	0.15	0.14	1.24	1.24	1.24
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
25	BENZ [a]	11.46	11.55	11.51	12.91	10.35	11.63	11.59	3.13	3.13	3.13
	BUTA	0.87	1.10	0.99	0.82	0.96	0.89	0.92	1.82	1.82	1.82
	FORM	2.02	2.41	2.22	1.99	2.20	2.10	2.13	23.29	23.30	23.30
	ACET	0.96	1.14	1.05	0.91	1.31	1.11	1.09	8.58	8.58	8.58
	ACRO	0.09	0.15	0.12	0.09	0.13	0.11	0.11	1.04	1.04	1.04
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
30	BENZ [a]	10.90	11.12	11.01	10.15	9.95	10.05	10.32	2.68	2.68	2.68
	BUTA	0.84	1.06	0.95	0.79	0.92	0.86	0.88	1.56	1.56	1.56
	FORM	1.94	2.33	2.14	1.91	2.21	2.06	2.08	19.96	19.97	19.97
	ACET	0.92	1.10	1.01	0.87	1.26	1.07	1.05	7.35	7.36	7.36
	ACRO	0.09	0.14	0.12	0.09	0.13	0.11	0.11	0.89	0.89	0.89
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
35	BENZ [a]	10.47	10.79	10.63	9.80	9.70	9.75	10.00	2.35	2.35	2.35
	BUTA	0.81	1.03	0.92	0.76	0.90	0.83	0.86	1.36	1.37	1.37
	FORM	1.88	2.27	2.08	1.85	2.07	1.96	1.99	17.50	17.50	17.50
	ACET	0.89	1.07	0.98	0.84	1.23	1.04	1.02	6.44	6.45	6.45
	ACRO	0.08	0.14	0.11	0.08	0.12	0.10	0.10	0.78	0.78	0.78
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
40	BENZ [a]	10.32	10.71	10.52	9.76	9.71	9.74	9.96	2.10	2.11	2.11
	BUTA	0.81	1.02	0.92	0.77	0.90	0.84	0.86	1.22	1.22	1.22
	FORM	1.87	2.26	2.07	1.86	2.07	1.97	1.99	15.67	15.68	15.68
	ACET	0.89	1.07	0.98	0.84	1.23	1.04	1.02	5.77	5.78	5.78
	ACRO	0.08	0.14	0.11	0.08	0.12	0.10	0.10	0.70	0.70	0.70
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014

45	BENZ [a]	10.18	10.64	10.41	9.73	9.73	9.73	9.92	1.93	1.93	1.93
	BUTA	0.80	1.02	0.91	0.77	0.90	0.84	0.86	1.12	1.12	1.12
	FORM	1.86	2.25	2.06	1.86	2.08	1.97	1.99	14.35	14.36	14.36
	ACET	0.88	1.06	0.97	0.85	1.24	1.05	1.02	5.29	5.29	5.29
	ACRO	0.08	0.14	0.11	0.08	0.12	0.10	0.10	0.64	0.64	0.64
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
50	BENZ [a]	10.05	10.57	10.31	9.70	9.74	9.72	9.89	1.80	1.81	1.81
	BUTA	0.80	1.01	0.91	0.77	0.90	0.84	0.85	1.05	1.05	1.05
	FORM	1.85	2.24	2.05	1.87	2.09	1.98	2.00	13.44	13.44	13.44
	ACET	0.88	1.06	0.97	0.85	1.24	1.05	1.02	4.95	4.95	4.95
	ACRO	0.08	0.14	0.11	0.08	0.12	0.10	0.10	0.60	0.60	0.60
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014
55	BENZ [a]	9.95	10.49	10.22	9.69	9.75	9.72	9.86	1.73	1.73	1.73
	BUTA	0.79	1.01	0.90	0.77	0.91	0.84	0.86	1.00	1.00	1.00
	FORM	1.84	2.23	2.04	1.88	2.09	1.99	2.00	12.86	12.86	12.86
	ACET	0.88	1.05	0.97	0.85	1.25	1.05	1.03	4.74	4.74	4.74
	ACRO	0.08	0.13	0.11	0.08	0.12	0.10	0.10	0.58	0.58	0.58
	DPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.015	0.014	0.014

Source: MOBILE6.2.03 version, July 26, 2004, updated with new PM2.5 module April 2006.
Note that EFs for air toxics are in units mg/mi. Criteria pollutants EFs are in g/mi.

[a] DPM consists of Ecarbon + Ocarbon + sulfate.

[b] BENZ emission factors include evaporative and exhaust emissions.

2013 AM, MD, PM, and Daily VMT Estimates For MSATs on Ramps/Plazas/Bridges

Alternatives 1/2/3/14/16

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	337	31	25	1338	0.46	155	14	11	616
Plaza to SB	337	137	169	3264	0.84	283	115	142	2742
NB to Plaza	57	191	358	3696	0.57	32	109	204	2107
SB to Plaza	89	197	655	4917	0.57	51	112	373	2803
Auto Total	819	555	1207	13215		521	350	731	8267
Truck									
Plaza to NB	121	90	75	1909	0.46	55	41	35	878
Plaza to SB	208	175	163	3695	0.84	175	147	137	3104
NB to Plaza	179	296	366	5460	0.57	102	168	209	3112
SB to Plaza	58	145	94	2261	0.57	33	83	54	1289
Truck Total	566	706	698	13325		365	439	434	8383
TOTAL	1385	1261	1905	26541		886	790	1165	16650
Plaza Links to US									
Auto									
Common 1	0	0	0	0	0.00	0	0	0	0
Auto 1	674	168	194	4602	0.72	485	121	140	3314
Common 2	674	168	194	4602	0.19	128	32	37	874
Auto Total						613	153	176	4188
Truck									
Common 1	0	0	0	0	0.00	0	0	0	0
Truck 1	329	265	238	5604	0.70	230	185	167	3923
Common 2	329	265	238	5604	0.19	62	50	45	1065
Truck Total						293	236	212	4988
TOTAL						906	389	388	9176
Plaza Links to C									
Auto	145	387	1013	8613	0.93	135	360	942	8010
Truck	237	441	460	7721	0.93	220	410	428	7181
TOTAL						356	770	1370	15191
Bridge to US									
Auto	674	168	194	4602	0.54	364	91	105	2485
Truck	329	265	238	5604	0.54	178	143	129	3026
TOTAL						541	234	233	5511
Bridge to Canada									
Auto	145	387	1013	8613	0.54	79	209	547	4651
Truck	237	441	460	7721	0.54	128	238	248	4170
TOTAL						206	447	796	8821
					Auto				27601
					Truck				27747
					Total				55,349

Alternative 5

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	344	33	26	1384	0.49	168	16	13	678
Plaza to SB	327	133	165	3173	0.8	262	107	132	2538
NB to Plaza	53	185	342	3554	0.49	26	90	167	1741
SB to Plaza	100	238	710	5633	0.59	59	140	419	3324
Auto Total	824	589	1242	13744		515	353	731	8281
Truck									
Plaza to NB	129	100	91	2138	0.49	63	49	45	1048
Plaza to SB	199	164	154	3478	0.8	159	131	123	2782
NB to Plaza	179	275	333	5086	0.49	88	135	163	2492
SB to Plaza	63	136	123	2278	0.59	37	80	73	1344
Truck Total	570	675	701	12979		347	395	403	7666
TOTAL	1393	1263	1943	26723		862	748	1134	15947
Plaza Links to US									
Auto									
Common 1	0	0	0	0	0.00	0	0	0	0
Auto 1	671	166	191	4557	0.69	463	115	132	3144
Common 2	671	166	191	4557	0.28	188	47	53	1276
Auto Total						651	161	185	4421
Truck									
Common 1	0	0	0	0	0.00	0	0	0	0
Truck 1	328	264	245	5616	0.66	216	174	162	3706
Common 2	328	264	245	5616	0.28	92	74	69	1572
Truck Total						308	248	230	5279
TOTAL						959	409	416	9699
Plaza Links to C									
Auto	153	422	1051	9187	0.99	151	418	1041	9095
Truck	242	411	456	7364	0.99	239	407	451	7290
TOTAL						391	825	1492	16385
Bridge to US									
Auto	671	166	191	4557	0.59	396	98	113	2689
Truck	328	264	245	5616	0.59	193	156	145	3313
TOTAL						589	254	257	6002
Bridge to Canada									
Auto	153	422	1051	9187	0.59	90	249	620	5420
Truck	242	411	456	7364	0.59	143	242	269	4345
TOTAL						233	492	889	9765
					Auto				29906
					Truck				27892
					Total				57,798

Alternatives 7/9/11

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	106	0	0	265	0.53	56	0	0	141
Plaza to SB	299	117	150	2841	0.78	233	92	117	2216
NB to Plaza	46	139	325	2938	0.6	27	84	195	1763
SB to Plaza	6	29	300	1434	0.41	2	12	123	588
Auto Total	456	286	775	7479		319	187	435	4708
Truck									
Plaza to NB	40	5	19	271	0.53	21	3	10	143
Plaza to SB	194	88	137	2359	0.78	151	69	107	1840
NB to Plaza	128	190	305	3821	0.6	77	114	183	2293
SB to Plaza	0	1	17	79	0.41	0	0	7	32
Truck Total	362	284	479	6529		249	186	307	4308
TOTAL	818	570	1254	14008		568	373	742	9016
Plaza Links to US									
Auto									
Common 1	404	117	150	3107	0.11	44	13	17	342
Auto 1	404	117	150	3107	0.5	202	59	75	1553
Common 2	404	117	150	3107	1.02	412	120	153	3169
Auto Total						659	191	245	5064
Truck									
Common 1	233	93	157	2630	0.11	26	10	17	289
Truck 1	233	93	157	2630	0.51	119	48	80	1341
Common 2	233	93	157	2630	1.02	238	95	160	2682
Truck Total						383	153	257	4312
TOTAL						1042	344	501	9376
Plaza Links to C									
Auto	52	168	625	4372	1.68	87	283	1050	7345
Truck	128	191	322	3900	1.68	216	321	541	6552
TOTAL						302	604	1591	13897
Bridge to US									
Auto	404	117	150	3107	0.74	299	87	111	2299
Truck	233	93	157	2630	0.74	173	69	116	1946
TOTAL						472	156	227	4245
Bridge to Canada									
Auto	52	168	625	4372	0.74	38	125	463	3235
Truck	128	191	322	3900	0.74	95	141	238	2886
TOTAL						133	266	701	6121
					Auto				22651
					Truck				20004
					Total				42,655

2030 AM, MD, PM, and Daily VMT Estimates For MSATs on Ramps/Plazas/Bridges

Alternatives 1/2/3/14/16

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	455	32	26	1647	0.46	209	15	12	758
Plaza to SB	400	161	212	3896	0.84	336	135	178	3273
NB to Plaza	69	210	374	4019	0.57	39	120	213	2291
SB to Plaza	116	184	749	5178	0.57	66	105	427	2951
Auto Total	1039	587	1360	14740		650	374	829	9272
Truck									
Plaza to NB	201	131	109	2849	0.46	92	60	50	1311
Plaza to SB	300	263	222	5424	0.84	252	221	186	4557
NB to Plaza	280	444	529	8159	0.57	159	253	302	4651
SB to Plaza	94	202	143	3222	0.57	53	115	81	1837
Truck Total	874	1040	1003	19655		557	649	619	12355
TOTAL	1913	1627	2363	34395		1207	1024	1449	21627
Plaza Links to US									
Auto									
Common 1	0	0	0	0	0.00	0	0	0	0
Auto 1	855	193	237	5543	0.72	615	139	171	3991
Common 2	855	193	237	5543	0.19	162	37	45	1053
Auto Total						778	175	216	5044
Truck									
Common 1	0	0	0	0	0.00	0	0	0	0
Truck 1	501	394	331	8274	0.70	350	276	232	5792
Common 2	501	394	331	8274	0.19	95	75	63	1572
Truck Total						445	351	294	7364
TOTAL						1223	526	510	12408
Plaza Links to C									
Auto	185	394	1123	9197	0.93	172	366	1044	8553
Truck	373	646	672	11381	0.93	347	601	625	10585
TOTAL						518	967	1669	19138
Bridge to US									
Auto	855	193	237	5543	0.54	462	104	128	2993
Truck	501	394	331	8274	0.54	270	213	179	4468
TOTAL						732	317	307	7461
Bridge to Canada									
Auto	185	394	1123	9197	0.54	100	213	606	4966
Truck	373	646	672	11381	0.54	201	349	363	6146
TOTAL						301	561	969	11112
					Auto				30829
					Truck				40917
					Total				71,746

Alternative 5

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	465	34	27	1701	0.49	228	17	13	834
Plaza to SB	387	157	208	3797	0.8	310	126	166	3037
NB to Plaza	65	197	371	3834	0.49	32	96	182	1879
SB to Plaza	114	214	807	5740	0.59	67	126	476	3386
Auto Total	1031	601	1412	15071		637	365	837	9136
Truck									
Plaza to NB	203	151	122	3186	0.49	100	74	60	1561
Plaza to SB	296	243	215	5108	0.8	237	194	172	4086
NB to Plaza	273	430	515	7912	0.49	134	210	252	3877
SB to Plaza	89	221	173	3554	0.59	53	130	102	2097
Truck Total	862	1044	1025	19760		523	609	586	11621
TOTAL	1893	1646	2437	34831		1160	974	1423	20757
Plaza Links to US									
Auto									
Common 1	0	0	0	0	0.00	0	0	0	0
Auto 1	852	191	234	5498	0.69	588	132	162	3794
Common 2	852	191	234	5498	0.28	238	53	66	1539
Auto Total						826	185	227	5333
Truck									
Common 1	0	0	0	0	0.00	0	0	0	0
Truck 1	500	394	337	8294	0.66	330	260	222	5474
Common 2	500	394	337	8294	0.28	140	110	94	2322
Truck Total						470	370	317	7796
TOTAL						1296	555	544	13129
Plaza Links to C									
Auto	179	411	1178	9573	0.99	177	406	1166	9478
Truck	363	651	688	11466	0.99	359	644	681	11352
TOTAL						536	1050	1847	20829
Bridge to US									
Auto	852	191	234	5498	0.59	503	113	138	3244
Truck	500	394	337	8294	0.59	295	232	199	4893
TOTAL						797	345	337	8137
Bridge to Canada									
Auto	179	411	1178	9573	0.59	106	242	695	5648
Truck	363	651	688	11466	0.59	214	384	406	6765
TOTAL						320	626	1101	12414
					Auto				32839
					Truck				42428
					Total				75,266

Alternatives 7/9/11

	AM	MD	PM	Daily Vol	Link Length	AM VMT	MD VMT	PM VMT	Daily VMT
I-75 Ramps									
Auto									
Plaza to NB	142	0	0	355	0.53	75	0	0	188
Plaza to SB	371	140	192	3470	0.78	289	109	150	2706
NB to Plaza	56	171	352	3437	0.6	34	102	211	2062
SB to Plaza	8	45	501	2346	0.41	3	19	205	962
Auto Total	576	356	1045	9607		401	230	566	5918
Truck									
Plaza to NB	136	21	52	904	0.53	72	11	27	479
Plaza to SB	291	182	186	4131	0.78	227	142	145	3222
NB to Plaza	219	361	481	6798	0.6	132	216	288	4079
SB to Plaza	0	42	45	669	0.41	0	17	18	274
Truck Total	646	605	763	12502		430	386	479	8054
TOTAL	1221	960	1807	22109		831	616	1045	13973
Plaza Links to US									
Auto									
Common 1	0	0	0	0	0.11	0	0	0	0
Auto 1	512	140	192	3825	0.5	256	70	96	1912
Common 2	512	140	192	3825	1.02	522	142	196	3901
Auto Total						779	212	291	5814
Truck									
Common 1	0	0	0	0	0.11	0	0	0	0
Truck 1	426	202	237	5035	0.51	217	103	121	2568
Common 2	426	202	237	5035	1.02	435	206	242	5136
Truck Total						652	309	363	7703
TOTAL						1431	521	654	13517
Plaza Links to C									
Auto	64	216	853	5783	1.68	107	363	1433	9715
Truck	219	403	525	7467	1.68	368	677	882	12545
TOTAL						475	1040	2315	22259
Bridge to US									
Auto	512	140	192	3825	0.74	379	103	142	2830
Truck	426	202	237	5035	0.74	315	149	176	3726
TOTAL						694	253	317	6556
Bridge to Canada									
Auto	64	216	853	5783	0.74	47	160	631	4279
Truck	219	403	525	7467	0.74	162	298	389	5526
TOTAL						209	458	1020	9805
					Auto				28556
					Truck				37554
					Total				66,110

AM Peak Hour MSAT Alternative Comparison

Year of Peak Emissions - 2013

(grams of emissions)

AM Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2013
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11
I-75 Ramps			
Auto VMT			
Benzene	8	8	5
Acrolein	1	1	0
Formaldehyde	2	1	1
1,3-butadiene	1	1	0
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	1	1	1
Acrolein	1	1	0
Formaldehyde	8	8	5
1,3-butadiene	3	3	2
Acetaldehyde	0	0	0
Diesel exhaust	32	30	22
Plaza to US			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	21	22	18
Acrolein	2	2	1
Formaldehyde	4	4	3
1,3-butadiene	2	2	2
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	3	3	3
Acrolein	2	2	2
Formaldehyde	21	24	24
1,3-butadiene	8	9	9
Acetaldehyde	1	1	1
Diesel exhaust	30	38	41
Plaza to Canada			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	3	3	2
Acrolein	0	0	0
Formaldehyde	1	1	0
1,3-butadiene	0	0	0
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	1	1	1
Acrolein	1	1	1
Formaldehyde	10	11	9
1,3-butadiene	4	4	3
Acetaldehyde	0	0	0
Diesel exhaust	22	23	20
Bridge			
Auto VMT			
Benzene	7	7	5
Acrolein	1	1	0
Formaldehyde	1	1	1
1,3-butadiene	1	1	1
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	1	1	1
Acrolein	1	1	0
Formaldehyde	7	8	6
1,3-butadiene	3	3	2
Acetaldehyde	0	0	0
Diesel exhaust	26	29	23

		Alt 1/2/3/14/16								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	521	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		172	349	0	0	14.70	15.08	0.00	0.00	8
Acrolein		172	349	0	0	1.26	1.29	0.00	0.00	1
Formaldehyde		172	349	0	0	2.88	2.91	0.00	0.00	2
1,3-butadiene		172	349	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde		172	349	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		172	349	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	365	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		121	245	0	0	2.44	3.17	0.00	0.00	1
Acrolein		121	245	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde		121	245	0	0	18.11	23.58	0.00	0.00	8
1,3-butadiene		121	245	0	0	6.67	8.69	0.00	0.00	3
Acetaldehyde		121	245	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		121	245	0	0	0.09	0.09	0.00	0.00	32
Plaza to US										
Auto traffic	674									
Truck traffic	329									
Auto VMT	613	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		429	61	123	5	15.22	17.74	36.22	156.58	21
Acrolein		429	61	123	5	1.30	1.50	2.91	10.87	2
Formaldehyde		429	61	123	5	2.93	3.49	6.56	23.75	4
1,3-butadiene		429	61	123	5	1.49	1.72	3.32	12.06	2
Acetaldehyde		429	61	123	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		429	61	123	5	0.00	0.00	0.00	0.00	0
Truck VMT	293	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		97	29	88	10	3.62	5.03	9.72	27.65	3
Acrolein		97	29	88	10	2.10	2.92	5.65	16.08	2
Formaldehyde		97	29	88	10	26.90	37.42	72.40	205.96	21
1,3-butadiene		97	29	88	10	9.91	13.78	26.66	75.86	8
Acetaldehyde		97	29	88	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		97	29	88	10	0.09	0.09	0.09	0.22	30
Plaza to Canada										
Auto traffic	145									
Truck traffic	237									
Auto VMT	135	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		108	27	0	2	15.22	21.99	0.00	137.15	3
Acrolein		108	27	0	2	1.30	1.85	0.00	9.93	0
Formaldehyde		108	27	0	2	2.93	4.24	0.00	22.09	1
1,3-butadiene		108	27	0	2	1.49	2.22	0.00	11.59	0
Acetaldehyde		108	27	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		108	27	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	220	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		176	44	0	3	3.62	9.72	0.00	27.65	1
Acrolein		176	44	0	3	2.10	5.65	0.00	16.08	1
Formaldehyde		176	44	0	3	26.90	72.40	0.00	205.96	10
1,3-butadiene		176	44	0	3	9.91	26.66	0.00	75.86	4
Acetaldehyde		176	44	0	3	1.21	3.24	0.00	9.21	0
Diesel exhaust		176	44	0	3	0.09	0.09	0.00	0.22	22
Bridge										
Auto VMT	442	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		442	0	0	0	15.22	0.00	0.00	0.00	7
Acrolein		442	0	0	0	1.30	0.00	0.00	0.00	1
Formaldehyde		442	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene		442	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		442	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		442	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	306	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		306	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		306	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde		306	0	0	0	23.58	0.00	0.00	0.00	7
1,3-butadiene		306	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde		306	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		306	0	0	0	0.09	0.00	0.00	0.00	26

		Alt 5								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	515	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		170	345	0	0	14.70	15.08	0.00	0.00	8
Acrolein		170	345	0	0	1.26	1.29	0.00	0.00	1
Formaldehyde		170	345	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene		170	345	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde		170	345	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		170	345	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	347	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		114	232	0	0	2.44	3.17	0.00	0.00	1
Acrolein		114	232	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde		114	232	0	0	18.11	23.58	0.00	0.00	8
1,3-butadiene		114	232	0	0	6.67	8.69	0.00	0.00	3
Acetaldehyde		114	232	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		114	232	0	0	0.09	0.09	0.00	0.00	30
Plaza to US										
Auto traffic	671									
Truck traffic	328									
Auto VMT	651	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		455	65	130	5	15.22	17.74	36.22	156.58	22
Acrolein		455	65	130	5	1.30	1.50	2.91	10.87	2
Formaldehyde		455	65	130	5	2.93	3.49	6.56	23.75	4
1,3-butadiene		455	65	130	5	1.49	1.72	3.32	12.06	2
Acetaldehyde		455	65	130	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		455	65	130	5	0.00	0.00	0.00	0.00	0
Truck VMT	308	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		185	31	92	10	3.62	5.03	9.72	27.65	3
Acrolein		185	31	92	10	2.10	2.92	5.65	16.08	2
Formaldehyde		185	31	92	10	26.90	37.42	72.40	205.96	24
1,3-butadiene		185	31	92	10	9.91	13.78	26.66	75.86	9
Acetaldehyde		185	31	92	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		185	31	92	10	0.09	0.09	0.09	0.22	38
Plaza to Canada										
Auto traffic	153									
Truck traffic	242									
Auto VMT	151	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		121	30	0	2	15.22	21.99	0.00	137.15	3
Acrolein		121	30	0	2	1.30	1.85	0.00	9.93	0
Formaldehyde		121	30	0	2	2.93	4.24	0.00	22.09	1
1,3-butadiene		121	30	0	2	1.49	2.22	0.00	11.59	0
Acetaldehyde		121	30	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		121	30	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	239	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		192	48	0	3	3.62	9.72	0.00	27.65	1
Acrolein		192	48	0	3	2.10	5.65	0.00	16.08	1
Formaldehyde		192	48	0	3	26.90	72.40	0.00	205.96	11
1,3-butadiene		192	48	0	3	9.91	26.66	0.00	75.86	4
Acetaldehyde		192	48	0	3	1.21	3.24	0.00	9.21	0
Diesel exhaust		192	48	0	3	0.09	0.09	0.00	0.22	23
Bridge										
Auto VMT	486	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		486	0	0	0	15.22	0.00	0.00	0.00	7
Acrolein		486	0	0	0	1.30	0.00	0.00	0.00	1
Formaldehyde		486	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene		486	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		486	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		486	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	336	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		336	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		336	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde		336	0	0	0	23.58	0.00	0.00	0.00	8
1,3-butadiene		336	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde		336	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		336	0	0	0	0.09	0.00	0.00	0.00	29

		Alt 7/9/11								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	319	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		105	214	0	0	14.70	15.08	0.00	0.00	5
Acrolein		105	214	0	0	1.26	1.29	0.00	0.00	0
Formaldehyde		105	214	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene		105	214	0	0	1.46	1.49	0.00	0.00	0
Acetaldehyde		105	214	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		105	214	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	249	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		82	167	0	0	2.44	3.17	0.00	0.00	1
Acrolein		82	167	0	0	1.41	1.84	0.00	0.00	0
Formaldehyde		82	167	0	0	18.11	23.58	0.00	0.00	5
1,3-butadiene		82	167	0	0	6.67	8.69	0.00	0.00	2
Acetaldehyde		82	167	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		82	167	0	0	0.09	0.09	0.00	0.00	22
Plaza to US										
Auto traffic	404									
Truck traffic	233									
Auto VMT	659	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		461	66	132	5	15.22	17.74	36.22	156.58	18
Acrolein		461	66	132	5	1.30	1.50	2.91	10.87	1
Formaldehyde		461	66	132	5	2.93	3.49	6.56	23.75	3
1,3-butadiene		461	66	132	5	1.49	1.72	3.32	12.06	2
Acetaldehyde		461	66	132	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		461	66	132	5	0.00	0.00	0.00	0.00	0
Truck VMT	383	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		230	38	115	10	3.62	5.03	9.72	27.65	3
Acrolein		230	38	115	10	2.10	2.92	5.65	16.08	2
Formaldehyde		230	38	115	10	26.90	37.42	72.40	205.96	24
1,3-butadiene		230	38	115	10	9.91	13.78	26.66	75.86	9
Acetaldehyde		230	38	115	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		230	38	115	10	0.09	0.09	0.09	0.22	41
Plaza to Canada										
Auto traffic	52									
Truck traffic	128									
Auto VMT	87	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		69	17	0	2	15.22	21.99	0.00	137.15	2
Acrolein		69	17	0	2	1.30	1.85	0.00	9.93	0
Formaldehyde		69	17	0	2	2.93	4.24	0.00	22.09	0
1,3-butadiene		69	17	0	2	1.49	2.22	0.00	11.59	0
Acetaldehyde		69	17	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		69	17	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	216	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		172	43	0	3	3.62	9.72	0.00	27.65	1
Acrolein		172	43	0	3	2.10	5.65	0.00	16.08	1
Formaldehyde		172	43	0	3	26.90	72.40	0.00	205.96	9
1,3-butadiene		172	43	0	3	9.91	26.66	0.00	75.86	3
Acetaldehyde		172	43	0	3	1.21	3.24	0.00	9.21	0
Diesel exhaust		172	43	0	3	0.09	0.09	0.00	0.22	20
Bridge										
Auto VMT	337	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		337	0	0	0	15.22	0.00	0.00	0.00	5
Acrolein		337	0	0	0	1.30	0.00	0.00	0.00	0
Formaldehyde		337	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene		337	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		337	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		337	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	268	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		268	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		268	0	0	0	1.84	0.00	0.00	0.00	0
Formaldehyde		268	0	0	0	23.58	0.00	0.00	0.00	6
1,3-butadiene		268	0	0	0	8.69	0.00	0.00	0.00	2
Acetaldehyde		268	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		268	0	0	0	0.09	0.00	0.00	0.00	23

MD Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2013
(grams of emissions)

MD Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2013
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11	Alt 1/2/3/14/16									
					VMT				Emission Factors @ x mph				
I-75 Ramps				Base VMT									
Auto VMT				350	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene	5	5	3		116	235	0	0	14.70	15.08	0.00	0.00	5
Acrolein	0	0	0		116	235	0	0	1.26	1.29	0.00	0.00	0
Formaldehyde	1	1	1		116	235	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene	1	1	0		116	235	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde	0	0	0		116	235	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust	0	0	0		116	235	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				439	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene	1	1	1		145	294	0	0	2.44	3.17	0.00	0.00	1
Acrolein	1	1	0		145	294	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde	10	9	4		145	294	0	0	18.11	23.58	0.00	0.00	10
1,3-butadiene	4	3	1		145	294	0	0	6.67	8.69	0.00	0.00	4
Acetaldehyde	0	0	0		145	294	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust	38	34	16		145	294	0	0	0.09	0.09	0.00	0.00	38
Plaza to US													
Auto traffic				168									
Truck traffic				265									
Auto VMT				153	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene	5	5	5		107	15	31	5	15.22	17.74	36.22	156.58	5
Acrolein	0	0	0		107	15	31	5	1.30	1.50	2.91	10.87	0
Formaldehyde	1	1	1		107	15	31	5	2.93	3.49	6.56	23.75	1
1,3-butadiene	0	0	0		107	15	31	5	1.49	1.72	3.32	12.06	0
Acetaldehyde	0	0	0		107	15	31	5	0.16	0.19	0.37	1.38	0
Diesel exhaust	0	0	0		107	15	31	5	0.00	0.00	0.00	0.00	0
Truck VMT				236	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene	2	3	1		78	24	71	10	3.62	5.03	9.72	27.65	2
Acrolein	1	2	1		78	24	71	10	2.10	2.92	5.65	16.08	1
Formaldehyde	17	19	10		78	24	71	10	26.90	37.42	72.40	205.96	17
1,3-butadiene	6	7	4		78	24	71	10	9.91	13.78	26.66	75.86	6
Acetaldehyde	1	1	0		78	24	71	10	1.21	1.68	3.24	9.21	1
Diesel exhaust	24	31	17		78	24	71	10	0.09	0.09	0.09	0.22	24
Plaza to Canada													
Auto traffic				387									
Truck traffic				441									
Auto VMT				360	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene	8	9	5		288	72	0	2	15.22	21.99	0.00	137.15	8
Acrolein	1	1	0		288	72	0	2	1.30	1.85	0.00	9.93	1
Formaldehyde	1	2	1		288	72	0	2	2.93	4.24	0.00	22.09	1
1,3-butadiene	1	1	1		288	72	0	2	1.49	2.22	0.00	11.59	1
Acetaldehyde	0	0	0		288	72	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust	0	0	0		288	72	0	2	0.00	0.00	0.00	0.00	0
Truck VMT				410	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene	3	3	2		328	82	0	3	3.62	9.72	0.00	27.65	3
Acrolein	2	1	1		328	82	0	3	2.10	5.65	0.00	16.08	2
Formaldehyde	19	19	14		328	82	0	3	26.90	72.40	0.00	205.96	19
1,3-butadiene	7	7	5		328	82	0	3	9.91	26.66	0.00	75.86	7
Acetaldehyde	1	1	1		328	82	0	3	1.21	3.24	0.00	9.21	1
Diesel exhaust	40	40	30		328	82	0	3	0.09	0.09	0.00	0.22	40
Bridge													
Auto VMT				300	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	5	5	3		300	0	0	0	15.22	0.00	0.00	0.00	5
Acrolein	0	0	0		300	0	0	0	1.30	0.00	0.00	0.00	0
Formaldehyde	1	1	1		300	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene	0	1	0		300	0	0	0	1.49	0.00	0.00	0.00	0
Acetaldehyde	0	0	0		300	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust	0	0	0		300	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				381	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	1	1	1		381	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein	1	1	0		381	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde	9	9	5		381	0	0	0	23.58	0.00	0.00	0.00	9
1,3-butadiene	3	3	2		381	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde	0	0	0		381	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust	33	34	18		381	0	0	0	0.09	0.00	0.00	0.00	33

	Alt 5									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	353	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		117	237	0	0	14.70	15.08	0.00	0.00	5
Acrolein		117	237	0	0	1.26	1.29	0.00	0.00	0
Formaldehyde		117	237	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene		117	237	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde		117	237	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		117	237	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	395	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		130	265	0	0	2.44	3.17	0.00	0.00	1
Acrolein		130	265	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde		130	265	0	0	18.11	23.58	0.00	0.00	9
1,3-butadiene		130	265	0	0	6.67	8.69	0.00	0.00	3
Acetaldehyde		130	265	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		130	265	0	0	0.09	0.09	0.00	0.00	34
Plaza to US										
Auto traffic	166									
Truck traffic	264									
Auto VMT	161	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		113	16	32	5	15.22	17.74	36.22	156.58	5
Acrolein		113	16	32	5	1.30	1.50	2.91	10.87	0
Formaldehyde		113	16	32	5	2.93	3.49	6.56	23.75	1
1,3-butadiene		113	16	32	5	1.49	1.72	3.32	12.06	0
Acetaldehyde		113	16	32	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		113	16	32	5	0.00	0.00	0.00	0.00	0
Truck VMT	248	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		149	25	74	10	3.62	5.03	9.72	27.65	3
Acrolein		149	25	74	10	2.10	2.92	5.65	16.08	2
Formaldehyde		149	25	74	10	26.90	37.42	72.40	205.96	19
1,3-butadiene		149	25	74	10	9.91	13.78	26.66	75.86	7
Acetaldehyde		149	25	74	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		149	25	74	10	0.09	0.09	0.09	0.22	31
Plaza to Canada										
Auto traffic	422									
Truck traffic	411									
Auto VMT	418	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		335	84	0	2	15.22	21.99	0.00	137.15	9
Acrolein		335	84	0	2	1.30	1.85	0.00	9.93	1
Formaldehyde		335	84	0	2	2.93	4.24	0.00	22.09	2
1,3-butadiene		335	84	0	2	1.49	2.22	0.00	11.59	1
Acetaldehyde		335	84	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		335	84	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	407	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		325	81	0	3	3.62	9.72	0	27.65	3
Acrolein		325	81	0	3	2.10	5.65	0	16.08	1
Formaldehyde		325	81	0	3	26.90	72.40	0	205.96	19
1,3-butadiene		325	81	0	3	9.91	26.66	0	75.86	7
Acetaldehyde		325	81	0	3	1.21	3.24	0	9.21	1
Diesel exhaust		325	81	0	3	0.09	0.09	0	0.22	40
Bridge										
Auto VMT	347	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		347	0	0	0	15.22	0.00	0.00	0.00	5
Acrolein		347	0	0	0	1.30	0.00	0.00	0.00	0
Formaldehyde		347	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene		347	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		347	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		347	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	398	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		398	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		398	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde		398	0	0	0	23.58	0.00	0.00	0.00	9
1,3-butadiene		398	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde		398	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		398	0	0	0	0.09	0.00	0.00	0.00	34

	Alt 7/9/11									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	187	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		62	125	0	0	14.70	15.08	0.00	0.00	3
Acrolein		62	125	0	0	1.26	1.29	0.00	0.00	0
Formaldehyde		62	125	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene		62	125	0	0	1.46	1.49	0.00	0.00	0
Acetaldehyde		62	125	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		62	125	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	186	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		61	125	0	0	2.44	3.17	0.00	0.00	1
Acrolein		61	125	0	0	1.41	1.84	0.00	0.00	0
Formaldehyde		61	125	0	0	18.11	23.58	0.00	0.00	4
1,3-butadiene		61	125	0	0	6.67	8.69	0.00	0.00	1
Acetaldehyde		61	125	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		61	125	0	0	0.09	0.09	0.00	0.00	16
Plaza to US										
Auto traffic	117									
Truck traffic	93									
Auto VMT	191	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		134	19	38	5	15.22	17.74	36.22	156.58	5
Acrolein		134	19	38	5	1.30	1.50	2.91	10.87	0
Formaldehyde		134	19	38	5	2.93	3.49	6.56	23.75	1
1,3-butadiene		134	19	38	5	1.49	1.72	3.32	12.06	0
Acetaldehyde		134	19	38	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		134	19	38	5	0.00	0.00	0.00	0.00	0
Truck VMT	153	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		92	15	46	10	3.62	5.03	9.72	27.65	1
Acrolein		92	15	46	10	2.10	2.92	5.65	16.08	1
Formaldehyde		92	15	46	10	26.90	37.42	72.40	205.96	10
1,3-butadiene		92	15	46	10	9.91	13.78	26.66	75.86	4
Acetaldehyde		92	15	46	10	1.21	1.68	3.24	9.21	0
Diesel exhaust		92	15	46	10	0.09	0.09	0.09	0.22	17
Plaza to Canada										
Auto traffic	168									
Truck traffic	191									
Auto VMT	283	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		226	57	0	2	15.22	21.99	0.00	137.15	5
Acrolein		226	57	0	2	1.30	1.85	0.00	9.93	0
Formaldehyde		226	57	0	2	2.93	4.24	0.00	22.09	1
1,3-butadiene		226	57	0	2	1.49	2.22	0.00	11.59	1
Acetaldehyde		226	57	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		226	57	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	321	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		257	64	0	3	3.62	9.72	0	27.65	2
Acrolein		257	64	0	3	2.10	5.65	0	16.08	1
Formaldehyde		257	64	0	3	26.90	72.40	0	205.96	14
1,3-butadiene		257	64	0	3	9.91	26.66	0	75.86	5
Acetaldehyde		257	64	0	3	1.21	3.24	0	9.21	1
Diesel exhaust		257	64	0	3	0.09	0.09	0	0.22	30
Bridge										
Auto VMT	211	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		211	0	0	0	15.22	0.00	0.00	0.00	3
Acrolein		211	0	0	0	1.30	0.00	0.00	0.00	0
Formaldehyde		211	0	0	0	2.93	0.00	0.00	0.00	1
1,3-butadiene		211	0	0	0	1.49	0.00	0.00	0.00	0
Acetaldehyde		211	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		211	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	210	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		210	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		210	0	0	0	1.84	0.00	0.00	0.00	0
Formaldehyde		210	0	0	0	23.58	0.00	0.00	0.00	5
1,3-butadiene		210	0	0	0	8.69	0.00	0.00	0.00	2
Acetaldehyde		210	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		210	0	0	0	0.09	0.00	0.00	0.00	18

PM Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2013
(grams of emissions)

PM Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2013
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11	Alt 1/2/3/14/16									
					VMT				Emission Factors @ x mph				
I-75 Ramps				Base VMT									
Auto VMT				731	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene	11	11	7		241	490	0	0	14.70	15.08	0.00	0.00	11
Acrolein	1	1	1		241	490	0	0	1.26	1.29	0.00	0.00	1
Formaldehyde	2	2	1		241	490	0	0	2.88	2.91	0.00	0.00	2
1,3-butadiene	1	1	1		241	490	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde	0	0	0		241	490	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust	0	0	0		241	490	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				434	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene	1	1	1		143	291	0	0	2.44	3.17	0.00	0.00	1
Acrolein	1	1	1		143	291	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde	9	9	7		143	291	0	0	18.11	23.58	0.00	0.00	9
1,3-butadiene	3	3	2		143	291	0	0	6.67	8.69	0.00	0.00	3
Acetaldehyde	0	0	0		143	291	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust	37	35	27		143	291	0	0	0.09	0.09	0.00	0.00	37
Plaza to US													
Auto traffic				194									
Truck traffic				238									
Auto VMT				176	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene	6	6	7		124	18	35	5	15.22	17.74	36.22	156.58	6
Acrolein	0	0	1		124	18	35	5	1.30	1.50	2.91	10.87	0
Formaldehyde	1	1	1		124	18	35	5	2.93	3.49	6.56	23.75	1
1,3-butadiene	1	1	1		124	18	35	5	1.49	1.72	3.32	12.06	1
Acetaldehyde	0	0	0		124	18	35	5	0.16	0.19	0.37	1.38	0
Diesel exhaust	0	0	0		124	18	35	5	0.00	0.00	0.00	0.00	0
Truck VMT				212	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene	2	2	2		70	21	64	10	3.62	5.03	9.72	27.65	2
Acrolein	1	1	1		70	21	64	10	2.10	2.92	5.65	16.08	1
Formaldehyde	15	18	16		70	21	64	10	26.90	37.42	72.40	205.96	15
1,3-butadiene	6	7	6		70	21	64	10	9.91	13.78	26.66	75.86	6
Acetaldehyde	1	1	1		70	21	64	10	1.21	1.68	3.24	9.21	1
Diesel exhaust	22	29	28		70	21	64	10	0.09	0.09	0.09	0.22	22
Plaza to Canada													
Auto traffic				1,013									
Truck traffic				460									
Auto VMT				942	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene	20	22	20		754	188	0	2	15.22	21.99	0.00	137.15	20
Acrolein	2	2	2		754	188	0	2	1.30	1.85	0.00	9.93	2
Formaldehyde	4	4	4		754	188	0	2	2.93	4.24	0.00	22.09	4
1,3-butadiene	2	2	2		754	188	0	2	1.49	2.22	0.00	11.59	2
Acetaldehyde	0	0	0		754	188	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust	0	0	0		754	188	0	2	0.00	0.00	0.00	0.00	0
Truck VMT				428	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene	3	3	3		342	86	0	3	3.62	9.72	0.00	27.65	3
Acrolein	2	2	2		342	86	0	3	2.10	5.65	0.00	16.08	2
Formaldehyde	20	21	23		342	86	0	3	26.90	72.40	0.00	205.96	20
1,3-butadiene	7	8	8		342	86	0	3	9.91	26.66	0.00	75.86	7
Acetaldehyde	1	1	1		342	86	0	3	1.21	3.24	0.00	9.21	1
Diesel exhaust	42	44	50		342	86	0	3	0.09	0.09	0.00	0.22	42
Bridge													
Auto VMT				652	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	10	11	9		652	0	0	0	15.22	0.00	0.00	0.00	10
Acrolein	1	1	1		652	0	0	0	1.30	0.00	0.00	0.00	1
Formaldehyde	2	2	2		652	0	0	0	2.93	0.00	0.00	0.00	2
1,3-butadiene	1	1	1		652	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde	0	0	0		652	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust	0	0	0		652	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				377	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	1	1	1		377	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein	1	1	1		377	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde	9	10	8		377	0	0	0	23.58	0.00	0.00	0.00	9
1,3-butadiene	3	4	3		377	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde	0	0	0		377	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust	33	36	31		377	0	0	0	0.09	0.00	0.00	0.00	33

	Alt 5									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	731	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		241	490	0	0	14.70	15.08	0.00	0.00	11
Acrolein		241	490	0	0	1.26	1.29	0.00	0.00	1
Formaldehyde		241	490	0	0	2.88	2.91	0.00	0.00	2
1,3-butadiene		241	490	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde		241	490	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		241	490	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	403	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		133	270	0	0	2.44	3.17	0.00	0.00	1
Acrolein		133	270	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde		133	270	0	0	18.11	23.58	0.00	0.00	9
1,3-butadiene		133	270	0	0	6.67	8.69	0.00	0.00	3
Acetaldehyde		133	270	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		133	270	0	0	0.09	0.09	0.00	0.00	35
Plaza to US										
Auto traffic	191									
Truck traffic	245									
Auto VMT	185	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		130	19	37	5	15.22	17.74	36.22	156.58	6
Acrolein		130	19	37	5	1.30	1.50	2.91	10.87	0
Formaldehyde		130	19	37	5	2.93	3.49	6.56	23.75	1
1,3-butadiene		130	19	37	5	1.49	1.72	3.32	12.06	1
Acetaldehyde		130	19	37	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		130	19	37	5	0.00	0.00	0.00	0.00	0
Truck VMT	230	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		138	23	69	10	3.62	5.03	9.72	27.65	2
Acrolein		138	23	69	10	2.10	2.92	5.65	16.08	1
Formaldehyde		138	23	69	10	26.90	37.42	72.40	205.96	18
1,3-butadiene		138	23	69	10	9.91	13.78	26.66	75.86	7
Acetaldehyde		138	23	69	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		138	23	69	10	0.09	0.09	0.09	0.22	29
Plaza to Canada										
Auto traffic	1,051									
Truck traffic	456									
Auto VMT	1,041	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		832	208	0	2	15.22	21.99	0.00	137.15	22
Acrolein		832	208	0	2	1.30	1.85	0.00	9.93	2
Formaldehyde		832	208	0	2	2.93	4.24	0.00	22.09	4
1,3-butadiene		832	208	0	2	1.49	2.22	0.00	11.59	2
Acetaldehyde		832	208	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		832	208	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	451	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		361	90	0	3	3.62	9.72	0	27.65	3
Acrolein		361	90	0	3	2.10	5.65	0	16.08	2
Formaldehyde		361	90	0	3	26.90	72.40	0	205.96	21
1,3-butadiene		361	90	0	3	9.91	26.66	0	75.86	8
Acetaldehyde		361	90	0	3	1.21	3.24	0	9.21	1
Diesel exhaust		361	90	0	3	0.09	0.09	0	0.22	44
Bridge										
Auto VMT	733	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		733	0	0	0	15.22	0.00	0.00	0.00	11
Acrolein		733	0	0	0	1.30	0.00	0.00	0.00	1
Formaldehyde		733	0	0	0	2.93	0.00	0.00	0.00	2
1,3-butadiene		733	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		733	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		733	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	414	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		414	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		414	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde		414	0	0	0	23.58	0.00	0.00	0.00	10
1,3-butadiene		414	0	0	0	8.69	0.00	0.00	0.00	4
Acetaldehyde		414	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		414	0	0	0	0.09	0.00	0.00	0.00	36

	Alt 7/9/11									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	435	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		144	292	0	0	14.70	15.08	0.00	0.00	7
Acrolein		144	292	0	0	1.26	1.29	0.00	0.00	1
Formaldehyde		144	292	0	0	2.88	2.91	0.00	0.00	1
1,3-butadiene		144	292	0	0	1.46	1.49	0.00	0.00	1
Acetaldehyde		144	292	0	0	0.15	0.16	0.00	0.00	0
Diesel exhaust		144	292	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	307	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		101	206	0	0	2.44	3.17	0.00	0.00	1
Acrolein		101	206	0	0	1.41	1.84	0.00	0.00	1
Formaldehyde		101	206	0	0	18.11	23.58	0.00	0.00	7
1,3-butadiene		101	206	0	0	6.67	8.69	0.00	0.00	2
Acetaldehyde		101	206	0	0	0.82	1.06	0.00	0.00	0
Diesel exhaust		101	206	0	0	0.09	0.09	0.00	0.00	27
Plaza to US										
Auto traffic	150									
Truck traffic	157									
Auto VMT	245	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		171	24	49	5	15.22	17.74	36.22	156.58	7
Acrolein		171	24	49	5	1.30	1.50	2.91	10.87	1
Formaldehyde		171	24	49	5	2.93	3.49	6.56	23.75	1
1,3-butadiene		171	24	49	5	1.49	1.72	3.32	12.06	1
Acetaldehyde		171	24	49	5	0.16	0.19	0.37	1.38	0
Diesel exhaust		171	24	49	5	0.00	0.00	0.00	0.00	0
Truck VMT	257	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		154	26	77	10	3.62	5.03	9.72	27.65	2
Acrolein		154	26	77	10	2.10	2.92	5.65	16.08	1
Formaldehyde		154	26	77	10	26.90	37.42	72.40	205.96	16
1,3-butadiene		154	26	77	10	9.91	13.78	26.66	75.86	6
Acetaldehyde		154	26	77	10	1.21	1.68	3.24	9.21	1
Diesel exhaust		154	26	77	10	0.09	0.09	0.09	0.22	28
Plaza to Canada										
Auto traffic	625									
Truck traffic	322									
Auto VMT	1,050	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		840	210	0	2	15.22	21.99	0.00	137.15	20
Acrolein		840	210	0	2	1.30	1.85	0.00	9.93	2
Formaldehyde		840	210	0	2	2.93	4.24	0.00	22.09	4
1,3-butadiene		840	210	0	2	1.49	2.22	0.00	11.59	2
Acetaldehyde		840	210	0	2	0.16	0.24	0.00	1.29	0
Diesel exhaust		840	210	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	541	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		433	108	0	3	3.62	9.72	0	27.65	3
Acrolein		433	108	0	3	2.10	5.65	0	16.08	2
Formaldehyde		433	108	0	3	26.90	72.40	0	205.96	23
1,3-butadiene		433	108	0	3	9.91	26.66	0	75.86	8
Acetaldehyde		433	108	0	3	1.21	3.24	0	9.21	1
Diesel exhaust		433	108	0	3	0.09	0.09	0	0.22	50
Bridge										
Auto VMT	574	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		574	0	0	0	15.22	0.00	0.00	0.00	9
Acrolein		574	0	0	0	1.30	0.00	0.00	0.00	1
Formaldehyde		574	0	0	0	2.93	0.00	0.00	0.00	2
1,3-butadiene		574	0	0	0	1.49	0.00	0.00	0.00	1
Acetaldehyde		574	0	0	0	0.16	0.00	0.00	0.00	0
Diesel exhaust		574	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	354	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		354	0	0	0	3.17	0.00	0.00	0.00	1
Acrolein		354	0	0	0	1.84	0.00	0.00	0.00	1
Formaldehyde		354	0	0	0	23.58	0.00	0.00	0.00	8
1,3-butadiene		354	0	0	0	8.69	0.00	0.00	0.00	3
Acetaldehyde		354	0	0	0	1.06	0.00	0.00	0.00	0
Diesel exhaust		354	0	0	0	0.09	0.00	0.00	0.00	31

Daily MSAT Alternative Comparison

Year of Peak Emissions - 2013

(grams of emissions)

Daily MSAT Alternative Comparison

Year of Peak Emissions - 2013

(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11
I-75 Ramps			
Auto VMT			
Benzene	124	124	70
Acrolein	11	11	6
Formaldehyde	24	24	14
1,3-butadiene	12	12	7
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	25	22	13
Acrolein	14	13	7
Formaldehyde	182	167	94
1,3-butadiene	67	61	35
Acetaldehyde	8	7	4
Diesel exhaust	724	662	372
Plaza to US			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	142	146	140
Acrolein	11	11	11
Formaldehyde	25	25	25
1,3-butadiene	12	13	13
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	49	55	36
Acrolein	28	32	21
Formaldehyde	364	412	270
1,3-butadiene	134	152	99
Acetaldehyde	16	18	12
Diesel exhaust	516	658	467
Plaza to Canada			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	172	193	142
Acrolein	14	16	12
Formaldehyde	32	36	27
1,3-butadiene	16	18	14
Acetaldehyde	2	2	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	45	45	37
Acrolein	26	26	22
Formaldehyde	338	338	276
1,3-butadiene	124	125	102
Acetaldehyde	15	15	12
Diesel exhaust	704	709	608
Bridge			
Auto VMT			
Benzene	109	123	84
Acrolein	9	11	7
Formaldehyde	21	24	16
1,3-butadiene	11	12	8
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	23	24	15
Acrolein	13	14	9
Formaldehyde	170	181	114
1,3-butadiene	62	67	42
Acetaldehyde	8	8	5
Diesel exhaust	622	662	417

		Alt 1/2/3/14/16								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	8,267	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		2,728	5,539	0	0	14.70	15.08	0.00	0.00	124
Acrolein		2,728	5,539	0	0	1.26	1.29	0.00	0.00	11
Formaldehyde		2,728	5,539	0	0	2.88	2.91	0.00	0.00	24
1,3-butadiene		2,728	5,539	0	0	1.46	1.49	0.00	0.00	12
Acetaldehyde		2,728	5,539	0	0	0.15	0.16	0.00	0.00	1
Diesel exhaust		2,728	5,539	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	8,383	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		2,766	5,617	0	0	2.44	3.17	0.00	0.00	25
Acrolein		2,766	5,617	0	0	1.41	1.84	0.00	0.00	14
Formaldehyde		2,766	5,617	0	0	18.11	23.58	0.00	0.00	182
1,3-butadiene		2,766	5,617	0	0	6.67	8.69	0.00	0.00	67
Acetaldehyde		2,766	5,617	0	0	0.82	1.06	0.00	0.00	8
Diesel exhaust		2,766	5,617	0	0	0.09	0.09	0.00	0.00	724
Plaza to US										
Auto traffic	4,602									
Truck traffic	5,604									
Auto VMT	4,188	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		2,932	419	838	5	15.22	17.74	36.22	156.58	142
Acrolein		2,932	419	838	5	1.30	1.50	2.91	10.87	11
Formaldehyde		2,932	419	838	5	2.93	3.49	6.56	23.75	25
1,3-butadiene		2,932	419	838	5	1.49	1.72	3.32	12.06	12
Acetaldehyde		2,932	419	838	5	0.16	0.19	0.37	1.38	1
Diesel exhaust		2,932	419	838	5	0.00	0.00	0.00	0.00	0
Truck VMT	4,988	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		1,646	499	1,496	10	3.62	5.03	9.72	27.65	49
Acrolein		1,646	499	1,496	10	2.10	2.92	5.65	16.08	28
Formaldehyde		1,646	499	1,496	10	26.90	37.42	72.40	205.96	364
1,3-butadiene		1,646	499	1,496	10	9.91	13.78	26.66	75.86	134
Acetaldehyde		1,646	499	1,496	10	1.21	1.68	3.24	9.21	16
Diesel exhaust		1,646	499	1,496	10	0.09	0.09	0.09	0.22	516
Plaza to Canada										
Auto traffic	8,613									
Truck traffic	7,721									
Auto VMT	8,010	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		6,408	1,602	0	2	15.22	21.99	0.00	137.15	172
Acrolein		6,408	1,602	0	2	1.30	1.85	0.00	9.93	14
Formaldehyde		6,408	1,602	0	2	2.93	4.24	0.00	22.09	32
1,3-butadiene		6,408	1,602	0	2	1.49	2.22	0.00	11.59	16
Acetaldehyde		6,408	1,602	0	2	0.16	0.24	0.00	1.29	2
Diesel exhaust		6,408	1,602	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	7,181	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		5,745	1,436	0	3	3.62	9.72	0.00	27.65	45
Acrolein		5,745	1,436	0	3	2.10	5.65	0.00	16.08	26
Formaldehyde		5,745	1,436	0	3	26.90	72.40	0.00	205.96	338
1,3-butadiene		5,745	1,436	0	3	9.91	26.66	0.00	75.86	124
Acetaldehyde		5,745	1,436	0	3	1.21	3.24	0.00	9.21	15
Diesel exhaust		5,745	1,436	0	3	0.09	0.09	0.00	0.22	704
Bridge										
Auto VMT	7,136	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		7,136	0	0	0	15.22	0.00	0.00	0.00	109
Acrolein		7,136	0	0	0	1.30	0.00	0.00	0.00	9
Formaldehyde		7,136	0	0	0	2.93	0.00	0.00	0.00	21
1,3-butadiene		7,136	0	0	0	1.49	0.00	0.00	0.00	11
Acetaldehyde		7,136	0	0	0	0.16	0.00	0.00	0.00	1
Diesel exhaust		7,136	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	7,196	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		7,196	0	0	0	3.17	0.00	0.00	0.00	23
Acrolein		7,196	0	0	0	1.84	0.00	0.00	0.00	13
Formaldehyde		7,196	0	0	0	23.58	0.00	0.00	0.00	170
1,3-butadiene		7,196	0	0	0	8.69	0.00	0.00	0.00	62
Acetaldehyde		7,196	0	0	0	1.06	0.00	0.00	0.00	8
Diesel exhaust		7,196	0	0	0	0.09	0.00	0.00	0.00	622

		Alt 5								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	8,281	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		2,733	5,549	0	0	14.70	15.08	0.00	0.00	124
Acrolein		2,733	5,549	0	0	1.26	1.29	0.00	0.00	11
Formaldehyde		2,733	5,549	0	0	2.88	2.91	0.00	0.00	24
1,3-butadiene		2,733	5,549	0	0	1.46	1.49	0.00	0.00	12
Acetaldehyde		2,733	5,549	0	0	0.15	0.16	0.00	0.00	1
Diesel exhaust		2,733	5,549	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	7,666	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		2,530	5,136	0	0	2.44	3.17	0.00	0.00	22
Acrolein		2,530	5,136	0	0	1.41	1.84	0.00	0.00	13
Formaldehyde		2,530	5,136	0	0	18.11	23.58	0.00	0.00	167
1,3-butadiene		2,530	5,136	0	0	6.67	8.69	0.00	0.00	61
Acetaldehyde		2,530	5,136	0	0	0.82	1.06	0.00	0.00	7
Diesel exhaust		2,530	5,136	0	0	0.09	0.09	0.00	0.00	662
Plaza to US										
Auto traffic	4,557									
Truck traffic	5,616									
Auto VMT	4,421	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		3,094	442	884	5	15.22	17.74	36.22	156.58	146
Acrolein		3,094	442	884	5	1.30	1.50	2.91	10.87	11
Formaldehyde		3,094	442	884	5	2.93	3.49	6.56	23.75	25
1,3-butadiene		3,094	442	884	5	1.49	1.72	3.32	12.06	13
Acetaldehyde		3,094	442	884	5	0.16	0.19	0.37	1.38	1
Diesel exhaust		3,094	442	884	5	0.00	0.00	0.00	0.00	0
Truck VMT	5,279	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		3,167	528	1,584	10	3.62	5.03	9.72	27.65	55
Acrolein		3,167	528	1,584	10	2.10	2.92	5.65	16.08	32
Formaldehyde		3,167	528	1,584	10	26.90	37.42	72.40	205.96	412
1,3-butadiene		3,167	528	1,584	10	9.91	13.78	26.66	75.86	152
Acetaldehyde		3,167	528	1,584	10	1.21	1.68	3.24	9.21	18
Diesel exhaust		3,167	528	1,584	10	0.09	0.09	0.09	0.22	658
Plaza to Canada										
Auto traffic	9,187									
Truck traffic	7,364									
Auto VMT	9,095	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		7,276	1,819	0	2	15.22	21.99	0.00	137.15	193
Acrolein		7,276	1,819	0	2	1.30	1.85	0.00	9.93	16
Formaldehyde		7,276	1,819	0	2	2.93	4.24	0.00	22.09	36
1,3-butadiene		7,276	1,819	0	2	1.49	2.22	0.00	11.59	18
Acetaldehyde		7,276	1,819	0	2	0.16	0.24	0.00	1.29	2
Diesel exhaust		7,276	1,819	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	7,290	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		5,832	1,458	0	3	3.62	9.72	0	27.65	45
Acrolein		5,832	1,458	0	3	2.10	5.65	0	16.08	26
Formaldehyde		5,832	1,458	0	3	26.90	72.40	0	205.96	338
1,3-butadiene		5,832	1,458	0	3	9.91	26.66	0	75.86	125
Acetaldehyde		5,832	1,458	0	3	1.21	3.24	0	9.21	15
Diesel exhaust		5,832	1,458	0	3	0.09	0.09	0	0.22	709
Bridge										
Auto VMT	8,109	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		8,109	0	0	0	15.22	0.00	0.00	0.00	123
Acrolein		8,109	0	0	0	1.30	0.00	0.00	0.00	11
Formaldehyde		8,109	0	0	0	2.93	0.00	0.00	0.00	24
1,3-butadiene		8,109	0	0	0	1.49	0.00	0.00	0.00	12
Acetaldehyde		8,109	0	0	0	0.16	0.00	0.00	0.00	1
Diesel exhaust		8,109	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	7,658	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		7,658	0	0	0	3.17	0.00	0.00	0.00	24
Acrolein		7,658	0	0	0	1.84	0.00	0.00	0.00	14
Formaldehyde		7,658	0	0	0	23.58	0.00	0.00	0.00	181
1,3-butadiene		7,658	0	0	0	8.69	0.00	0.00	0.00	67
Acetaldehyde		7,658	0	0	0	1.06	0.00	0.00	0.00	8
Diesel exhaust		7,658	0	0	0	0.09	0.00	0.00	0.00	662

		Alt 7/9/11								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	4,708	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		1,554	3,154	0	0	14.70	15.08	0.00	0.00	70
Acrolein		1,554	3,154	0	0	1.26	1.29	0.00	0.00	6
Formaldehyde		1,554	3,154	0	0	2.88	2.91	0.00	0.00	14
1,3-butadiene		1,554	3,154	0	0	1.46	1.49	0.00	0.00	7
Acetaldehyde		1,554	3,154	0	0	0.15	0.16	0.00	0.00	1
Diesel exhaust		1,554	3,154	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	4,308	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		1,422	2,887	0	0	2.44	3.17	0.00	0.00	13
Acrolein		1,422	2,887	0	0	1.41	1.84	0.00	0.00	7
Formaldehyde		1,422	2,887	0	0	18.11	23.58	0.00	0.00	94
1,3-butadiene		1,422	2,887	0	0	6.67	8.69	0.00	0.00	35
Acetaldehyde		1,422	2,887	0	0	0.82	1.06	0.00	0.00	4
Diesel exhaust		1,422	2,887	0	0	0.09	0.09	0.00	0.00	372
Plaza to US										
Auto traffic	3,107									
Truck traffic	2,630									
Auto VMT	5,064	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		3,545	506	1,013	5	15.22	17.74	36.22	156.58	140
Acrolein		3,545	506	1,013	5	1.30	1.50	2.91	10.87	11
Formaldehyde		3,545	506	1,013	5	2.93	3.49	6.56	23.75	25
1,3-butadiene		3,545	506	1,013	5	1.49	1.72	3.32	12.06	13
Acetaldehyde		3,545	506	1,013	5	0.16	0.19	0.37	1.38	1
Diesel exhaust		3,545	506	1,013	5	0.00	0.00	0.00	0.00	0
Truck VMT	4,312	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		2,587	431	1,294	10	3.62	5.03	9.72	27.65	36
Acrolein		2,587	431	1,294	10	2.10	2.92	5.65	16.08	21
Formaldehyde		2,587	431	1,294	10	26.90	37.42	72.40	205.96	270
1,3-butadiene		2,587	431	1,294	10	9.91	13.78	26.66	75.86	99
Acetaldehyde		2,587	431	1,294	10	1.21	1.68	3.24	9.21	12
Diesel exhaust		2,587	431	1,294	10	0.09	0.09	0.09	0.22	467
Plaza to Canada										
Auto traffic	4,372									
Truck traffic	3,900									
Auto VMT	7,345	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		5,876	1,469	0	2	15.22	21.99	0.00	137.15	142
Acrolein		5,876	1,469	0	2	1.30	1.85	0.00	9.93	12
Formaldehyde		5,876	1,469	0	2	2.93	4.24	0.00	22.09	27
1,3-butadiene		5,876	1,469	0	2	1.49	2.22	0.00	11.59	14
Acetaldehyde		5,876	1,469	0	2	0.16	0.24	0.00	1.29	1
Diesel exhaust		5,876	1,469	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	6,552	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		5,241	1,310	0	3	3.62	9.72	0	27.65	37
Acrolein		5,241	1,310	0	3	2.10	5.65	0	16.08	22
Formaldehyde		5,241	1,310	0	3	26.90	72.40	0	205.96	276
1,3-butadiene		5,241	1,310	0	3	9.91	26.66	0	75.86	102
Acetaldehyde		5,241	1,310	0	3	1.21	3.24	0	9.21	12
Diesel exhaust		5,241	1,310	0	3	0.09	0.09	0	0.22	608
Bridge										
Auto VMT	5,534	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		5,534	0	0	0	15.22	0.00	0.00	0.00	84
Acrolein		5,534	0	0	0	1.30	0.00	0.00	0.00	7
Formaldehyde		5,534	0	0	0	2.93	0.00	0.00	0.00	16
1,3-butadiene		5,534	0	0	0	1.49	0.00	0.00	0.00	8
Acetaldehyde		5,534	0	0	0	0.16	0.00	0.00	0.00	1
Diesel exhaust		5,534	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	4,832	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		4,832	0	0	0	3.17	0.00	0.00	0.00	15
Acrolein		4,832	0	0	0	1.84	0.00	0.00	0.00	9
Formaldehyde		4,832	0	0	0	23.58	0.00	0.00	0.00	114
1,3-butadiene		4,832	0	0	0	8.69	0.00	0.00	0.00	42
Acetaldehyde		4,832	0	0	0	1.06	0.00	0.00	0.00	5
Diesel exhaust		4,832	0	0	0	0.09	0.00	0.00	0.00	417

AM Peak Hour MSAT Alternative Comparison

Year of Peak Emissions - 2030

(grams of emissions)

AM Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2030
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11
I-75 Ramps			
Auto VMT			
Benzene	6	6	4
Acrolein	1	1	0
Formaldehyde	1	1	1
1,3-butadiene	1	1	0
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	1	1	1
Acrolein	1	1	1
Formaldehyde	9	8	7
1,3-butadiene	3	3	3
Acetaldehyde	0	0	0
Diesel exhaust	8	8	6
Plaza to US			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	17	18	15
Acrolein	1	1	1
Formaldehyde	3	3	3
1,3-butadiene	2	2	1
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	3	4	4
Acrolein	2	2	2
Formaldehyde	24	27	31
1,3-butadiene	9	10	11
Acetaldehyde	1	1	1
Diesel exhaust	8	10	12
Plaza to Canada			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	3	3	1
Acrolein	0	0	0
Formaldehyde	0	0	0
1,3-butadiene	0	0	0
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	2	2	2
Acrolein	1	1	1
Formaldehyde	12	12	12
1,3-butadiene	4	5	4
Acetaldehyde	1	1	1
Diesel exhaust	6	6	6
Bridge			
Auto VMT			
Benzene	6	6	4
Acrolein	0	1	0
Formaldehyde	1	1	1
1,3-butadiene	1	1	0
Acetaldehyde	0	0	0
Diesel exhaust	0	0	0
Truck VMT			
Benzene	1	1	1
Acrolein	1	1	1
Formaldehyde	8	9	8
1,3-butadiene	3	3	3
Acetaldehyde	0	0	0
Diesel exhaust	7	7	7

	Alt 1/2/3/14/16									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	650	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		215	436	0	0	9.86	9.96	0.00	0.00	6
Acrolein		215	436	0	0	0.86	0.86	0.00	0.00	1
Formaldehyde		215	436	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene		215	436	0	0	1.03	1.02	0.00	0.00	1
Acetaldehyde		215	436	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		215	436	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	557	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		184	373	0	0	1.81	2.35	0.00	0.00	1
Acrolein		184	373	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		184	373	0	0	13.44	17.50	0.00	0.00	9
1,3-butadiene		184	373	0	0	4.95	6.45	0.00	0.00	3
Acetaldehyde		184	373	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		184	373	0	0	0.01	0.01	0.00	0.00	8
Plaza to US										
Auto traffic	855									
Truck traffic	501									
Auto VMT	778	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		544	78	156	5	10.00	11.66	23.96	103.54	17
Acrolein		544	78	156	5	0.86	0.98	1.90	7.06	1
Formaldehyde		544	78	156	5	1.99	2.29	4.40	15.84	3
1,3-butadiene		544	78	156	5	1.02	1.17	2.25	8.11	2
Acetaldehyde		544	78	156	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		544	78	156	5	0.00	0.00	0.00	0.00	0
Truck VMT	445	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		147	45	134	10	2.68	3.73	7.22	20.53	3
Acrolein		147	45	134	10	1.56	2.17	4.19	11.93	2
Formaldehyde		147	45	134	10	19.97	27.78	53.75	152.89	24
1,3-butadiene		147	45	134	10	7.36	10.23	19.80	56.31	9
Acetaldehyde		147	45	134	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		147	45	134	10	0.01	0.01	0.01	0.04	8
Plaza to Canada										
Auto traffic	185									
Truck traffic	373									
Auto VMT	172	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		137	34	0	2	10.00	16.15	0.00	103.54	3
Acrolein		137	34	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde		137	34	0	2	1.99	3.12	0.00	15.84	0
1,3-butadiene		137	34	0	2	1.02	1.59	0.00	8.11	0
Acetaldehyde		137	34	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		137	34	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	347	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		278	69	0	3	2.68	7.22	0.00	20.53	2
Acrolein		278	69	0	3	1.56	4.19	0.00	11.93	1
Formaldehyde		278	69	0	3	19.97	53.75	0.00	152.89	12
1,3-butadiene		278	69	0	3	7.36	19.80	0.00	56.31	4
Acetaldehyde		278	69	0	3	0.89	2.41	0.00	6.85	1
Diesel exhaust		278	69	0	3	0.01	0.01	0.00	0.04	6
Bridge										
Auto VMT	561	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		561	0	0	0	10.00	0.00	0.00	0.00	6
Acrolein		561	0	0	0	0.86	0.00	0.00	0.00	0
Formaldehyde		561	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene		561	0	0	0	1.02	0.00	0.00	0.00	1
Acetaldehyde		561	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		561	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	472	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		472	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		472	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		472	0	0	0	17.50	0.00	0.00	0.00	8
1,3-butadiene		472	0	0	0	6.45	0.00	0.00	0.00	3
Acetaldehyde		472	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		472	0	0	0	0.01	0.00	0.00	0.00	7

	Alt 5									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	637	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		210	427	0	0	9.86	9.96	0.00	0.00	6
Acrolein		210	427	0	0	0.86	0.86	0.00	0.00	1
Formaldehyde		210	427	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene		210	427	0	0	1.03	1.02	0.00	0.00	1
Acetaldehyde		210	427	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		210	427	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	523	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		173	351	0	0	1.81	2.35	0.00	0.00	1
Acrolein		173	351	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		173	351	0	0	13.44	17.50	0.00	0.00	8
1,3-butadiene		173	351	0	0	4.95	6.45	0.00	0.00	3
Acetaldehyde		173	351	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		173	351	0	0	0.01	0.01	0.00	0.00	8
Plaza to US										
Auto traffic	852									
Truck traffic	500									
Auto VMT	826	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		578	83	165	5	10.00	11.66	23.96	103.54	18
Acrolein		578	83	165	5	0.86	0.98	1.90	7.06	1
Formaldehyde		578	83	165	5	1.99	2.29	4.40	15.84	3
1,3-butadiene		578	83	165	5	1.02	1.17	2.25	8.11	2
Acetaldehyde		578	83	165	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		578	83	165	5	0.00	0.00	0.00	0.00	0
Truck VMT	470	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		282	47	141	10	2.68	3.73	7.22	20.53	4
Acrolein		282	47	141	10	1.56	2.17	4.19	11.93	2
Formaldehyde		282	47	141	10	19.97	27.78	53.75	152.89	27
1,3-butadiene		282	47	141	10	7.36	10.23	19.80	56.31	10
Acetaldehyde		282	47	141	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		282	47	141	10	0.01	0.01	0.01	0.04	10
Plaza to Canada										
Auto traffic	179									
Truck traffic	363									
Auto VMT	177	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		142	35	0	2	10.00	16.15	0.00	103.54	3
Acrolein		142	35	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde		142	35	0	2	1.99	3.12	0.00	15.84	0
1,3-butadiene		142	35	0	2	1.02	1.59	0.00	8.11	0
Acetaldehyde		142	35	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		142	35	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	359	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		287	72	0	3	2.68	7.22	0	20.53	2
Acrolein		287	72	0	3	1.56	4.19	0	11.93	1
Formaldehyde		287	72	0	3	19.97	53.75	0	152.89	12
1,3-butadiene		287	72	0	3	7.36	19.80	0	56.31	5
Acetaldehyde		287	72	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		287	72	0	3	0.01	0.01	0	0.04	6
Bridge										
Auto VMT	608	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		608	0	0	0	10.00	0.00	0.00	0.00	6
Acrolein		608	0	0	0	0.86	0.00	0.00	0.00	1
Formaldehyde		608	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene		608	0	0	0	1.02	0.00	0.00	0.00	1
Acetaldehyde		608	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		608	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	509	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		509	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		509	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		509	0	0	0	17.50	0.00	0.00	0.00	9
1,3-butadiene		509	0	0	0	6.45	0.00	0.00	0.00	3
Acetaldehyde		509	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		509	0	0	0	0.01	0.00	0.00	0.00	7

	Alt 7/9/11									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	401	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		132	269	0	0	9.86	9.96	0.00	0.00	4
Acrolein		132	269	0	0	0.86	0.86	0.00	0.00	0
Formaldehyde		132	269	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene		132	269	0	0	1.03	1.02	0.00	0.00	0
Acetaldehyde		132	269	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		132	269	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	430	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		142	288	0	0	1.81	2.35	0.00	0.00	1
Acrolein		142	288	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		142	288	0	0	13.44	17.50	0.00	0.00	7
1,3-butadiene		142	288	0	0	4.95	6.45	0.00	0.00	3
Acetaldehyde		142	288	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		142	288	0	0	0.01	0.01	0.00	0.00	6
Plaza to US										
Auto traffic	512									
Truck traffic	426									
Auto VMT	779	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		545	78	156	5	10.00	11.66	23.96	103.54	15
Acrolein		545	78	156	5	0.86	0.98	1.90	7.06	1
Formaldehyde		545	78	156	5	1.99	2.29	4.40	15.84	3
1,3-butadiene		545	78	156	5	1.02	1.17	2.25	8.11	1
Acetaldehyde		545	78	156	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		545	78	156	5	0.00	0.00	0.00	0.00	0
Truck VMT	652	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		391	65	196	10	2.68	3.73	7.22	20.53	4
Acrolein		391	65	196	10	1.56	2.17	4.19	11.93	2
Formaldehyde		391	65	196	10	19.97	27.78	53.75	152.89	31
1,3-butadiene		391	65	196	10	7.36	10.23	19.80	56.31	11
Acetaldehyde		391	65	196	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		391	65	196	10	0.01	0.01	0.01	0.04	12
Plaza to Canada										
Auto traffic	64									
Truck traffic	219									
Auto VMT	107	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		85	21	0	2	10.00	16.15	0.00	103.54	1
Acrolein		85	21	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde		85	21	0	2	1.99	3.12	0.00	15.84	0
1,3-butadiene		85	21	0	2	1.02	1.59	0.00	8.11	0
Acetaldehyde		85	21	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		85	21	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	368	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		295	74	0	3	2.68	7.22	0	20.53	2
Acrolein		295	74	0	3	1.56	4.19	0	11.93	1
Formaldehyde		295	74	0	3	19.97	53.75	0	152.89	12
1,3-butadiene		295	74	0	3	7.36	19.80	0	56.31	4
Acetaldehyde		295	74	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		295	74	0	3	0.01	0.01	0	0.04	6
Bridge										
Auto VMT	426	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		426	0	0	0	10.00	0.00	0.00	0.00	4
Acrolein		426	0	0	0	0.86	0.00	0.00	0.00	0
Formaldehyde		426	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene		426	0	0	0	1.02	0.00	0.00	0.00	0
Acetaldehyde		426	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		426	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	478	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		478	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		478	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		478	0	0	0	17.50	0.00	0.00	0.00	8
1,3-butadiene		478	0	0	0	6.45	0.00	0.00	0.00	3
Acetaldehyde		478	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		478	0	0	0	0.01	0.00	0.00	0.00	7

MD Peak Hour MSAT Alternative Comparison

Year of Peak Emissions - 2030

(grams of emissions)

MD Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2030
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11	Alt 1/2/3/14/16									
					VMT				Emission Factors @ x mph				
I-75 Ramps				Base VMT									
Auto VMT				374	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene	4	4	2		124	251	0	0	9.86	9.96	0.00	0.00	4
Acrolein	0	0	0		124	251	0	0	0.86	0.86	0.00	0.00	0
Formaldehyde	1	1	0		124	251	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene	0	0	0		124	251	0	0	1.03	1.02	0.00	0.00	0
Acetaldehyde	0	0	0		124	251	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust	0	0	0		124	251	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				649	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene	1	1	1		214	435	0	0	1.81	2.35	0.00	0.00	1
Acrolein	1	1	0		214	435	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde	10	10	6		214	435	0	0	13.44	17.50	0.00	0.00	10
1,3-butadiene	4	4	2		214	435	0	0	4.95	6.45	0.00	0.00	4
Acetaldehyde	0	0	0		214	435	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust	9	9	6		214	435	0	0	0.01	0.01	0.00	0.00	9
Plaza to US													
Auto traffic				193									
Truck traffic				394									
Auto VMT				175	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene	4	4	4		123	18	35	5	10.00	11.66	23.96	103.54	4
Acrolein	0	0	0		123	18	35	5	0.86	0.98	1.90	7.06	0
Formaldehyde	1	1	1		123	18	35	5	1.99	2.29	4.40	15.84	1
1,3-butadiene	0	0	0		123	18	35	5	1.02	1.17	2.25	8.11	0
Acetaldehyde	0	0	0		123	18	35	5	0.10	0.14	0.25	0.90	0
Diesel exhaust	0	0	0		123	18	35	5	0.00	0.00	0.00	0.00	0
Truck VMT				351	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene	3	3	2		116	35	105	10	2.68	3.73	7.22	20.53	3
Acrolein	1	2	1		116	35	105	10	1.56	2.17	4.19	11.93	1
Formaldehyde	19	21	15		116	35	105	10	19.97	27.78	53.75	152.89	19
1,3-butadiene	7	8	5		116	35	105	10	7.36	10.23	19.80	56.31	7
Acetaldehyde	1	1	1		116	35	105	10	0.89	1.24	2.41	6.85	1
Diesel exhaust	6	8	6		116	35	105	10	0.01	0.01	0.01	0.04	6
Plaza to Canada													
Auto traffic				394									
Truck traffic				646									
Auto VMT				366	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene	5	6	5		293	73	0	2	10.00	16.15	0.00	103.54	5
Acrolein	0	0	0		293	73	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde	1	1	1		293	73	0	2	1.99	3.12	0.00	15.84	1
1,3-butadiene	1	1	0		293	73	0	2	1.02	1.59	0.00	8.11	1
Acetaldehyde	0	0	0		293	73	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust	0	0	0		293	73	0	2	0.00	0.00	0.00	0.00	0
Truck VMT				601	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene	3	3	3		480	120	0	3	2.68	7.22	0.00	20.53	3
Acrolein	2	2	2		480	120	0	3	1.56	4.19	0.00	11.93	2
Formaldehyde	21	22	21		480	120	0	3	19.97	53.75	0.00	152.89	21
1,3-butadiene	8	8	8		480	120	0	3	7.36	19.80	0.00	56.31	8
Acetaldehyde	1	1	1		480	120	0	3	0.89	2.41	0.00	6.85	1
Diesel exhaust	10	10	10		480	120	0	3	0.01	0.01	0.00	0.04	10
Bridge													
Auto VMT				317	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	3	4	3		317	0	0	0	10.00	0.00	0.00	0.00	3
Acrolein	0	0	0		317	0	0	0	0.86	0.00	0.00	0.00	0
Formaldehyde	1	1	1		317	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene	0	0	0		317	0	0	0	1.02	0.00	0.00	0.00	0
Acetaldehyde	0	0	0		317	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust	0	0	0		317	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				561	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	1	1	1		561	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein	1	1	1		561	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde	10	11	8		561	0	0	0	17.50	0.00	0.00	0.00	10
1,3-butadiene	4	4	3		561	0	0	0	6.45	0.00	0.00	0.00	4
Acetaldehyde	0	0	0		561	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust	8	9	6		561	0	0	0	0.01	0.00	0.00	0.00	8

	Alt 5									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	365	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		120	244	0	0	9.86	9.96	0.00	0.00	4
Acrolein		120	244	0	0	0.86	0.86	0.00	0.00	0
Formaldehyde		120	244	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene		120	244	0	0	1.03	1.02	0.00	0.00	0
Acetaldehyde		120	244	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		120	244	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	609	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		201	408	0	0	1.81	2.35	0.00	0.00	1
Acrolein		201	408	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		201	408	0	0	13.44	17.50	0.00	0.00	10
1,3-butadiene		201	408	0	0	4.95	6.45	0.00	0.00	4
Acetaldehyde		201	408	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		201	408	0	0	0.01	0.01	0.00	0.00	9
Plaza to US										
Auto traffic	191									
Truck traffic	394									
Auto VMT	185	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		130	19	37	5	10.00	11.66	23.96	103.54	4
Acrolein		130	19	37	5	0.86	0.98	1.90	7.06	0
Formaldehyde		130	19	37	5	1.99	2.29	4.40	15.84	1
1,3-butadiene		130	19	37	5	1.02	1.17	2.25	8.11	0
Acetaldehyde		130	19	37	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		130	19	37	5	0.00	0.00	0.00	0.00	0
Truck VMT	370	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		222	37	111	10	2.68	3.73	7.22	20.53	3
Acrolein		222	37	111	10	1.56	2.17	4.19	11.93	2
Formaldehyde		222	37	111	10	19.97	27.78	53.75	152.89	21
1,3-butadiene		222	37	111	10	7.36	10.23	19.80	56.31	8
Acetaldehyde		222	37	111	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		222	37	111	10	0.01	0.01	0.01	0.04	8
Plaza to Canada										
Auto traffic	411									
Truck traffic	651									
Auto VMT	406	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		325	81	0	2	10.00	16.15	0.00	103.54	6
Acrolein		325	81	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde		325	81	0	2	1.99	3.12	0.00	15.84	1
1,3-butadiene		325	81	0	2	1.02	1.59	0.00	8.11	1
Acetaldehyde		325	81	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		325	81	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	644	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		515	129	0	3	2.68	7.22	0	20.53	3
Acrolein		515	129	0	3	1.56	4.19	0	11.93	2
Formaldehyde		515	129	0	3	19.97	53.75	0	152.89	22
1,3-butadiene		515	129	0	3	7.36	19.80	0	56.31	8
Acetaldehyde		515	129	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		515	129	0	3	0.01	0.01	0	0.04	10
Bridge										
Auto VMT	355	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		355	0	0	0	10.00	0.00	0.00	0.00	4
Acrolein		355	0	0	0	0.86	0.00	0.00	0.00	0
Formaldehyde		355	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene		355	0	0	0	1.02	0.00	0.00	0.00	0
Acetaldehyde		355	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		355	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	616	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		616	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		616	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		616	0	0	0	17.50	0.00	0.00	0.00	11
1,3-butadiene		616	0	0	0	6.45	0.00	0.00	0.00	4
Acetaldehyde		616	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		616	0	0	0	0.01	0.00	0.00	0.00	9

	Alt 7/9/11									
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	230	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		76	154	0	0	9.86	9.96	0.00	0.00	2
Acrolein		76	154	0	0	0.86	0.86	0.00	0.00	0
Formaldehyde		76	154	0	0	2.00	1.99	0.00	0.00	0
1,3-butadiene		76	154	0	0	1.03	1.02	0.00	0.00	0
Acetaldehyde		76	154	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		76	154	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	386	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		127	259	0	0	1.81	2.35	0.00	0.00	1
Acrolein		127	259	0	0	1.05	1.37	0.00	0.00	0
Formaldehyde		127	259	0	0	13.44	17.50	0.00	0.00	6
1,3-butadiene		127	259	0	0	4.95	6.45	0.00	0.00	2
Acetaldehyde		127	259	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		127	259	0	0	0.01	0.01	0.00	0.00	6
Plaza to US										
Auto traffic	140									
Truck traffic	202									
Auto VMT	212	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		148	21	42	5	10.00	11.66	23.96	103.54	4
Acrolein		148	21	42	5	0.86	0.98	1.90	7.06	0
Formaldehyde		148	21	42	5	1.99	2.29	4.40	15.84	1
1,3-butadiene		148	21	42	5	1.02	1.17	2.25	8.11	0
Acetaldehyde		148	21	42	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		148	21	42	5	0.00	0.00	0.00	0.00	0
Truck VMT	309	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		185	31	93	10	2.68	3.73	7.22	20.53	2
Acrolein		185	31	93	10	1.56	2.17	4.19	11.93	1
Formaldehyde		185	31	93	10	19.97	27.78	53.75	152.89	15
1,3-butadiene		185	31	93	10	7.36	10.23	19.80	56.31	5
Acetaldehyde		185	31	93	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		185	31	93	10	0.01	0.01	0.01	0.04	6
Plaza to Canada										
Auto traffic	216									
Truck traffic	403									
Auto VMT	363	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		290	73	0	2	10.00	16.15	0.00	103.54	5
Acrolein		290	73	0	2	0.86	1.35	0.00	7.06	0
Formaldehyde		290	73	0	2	1.99	3.12	0.00	15.84	1
1,3-butadiene		290	73	0	2	1.02	1.59	0.00	8.11	0
Acetaldehyde		290	73	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		290	73	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	677	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		541	135	0	3	2.68	7.22	0	20.53	3
Acrolein		541	135	0	3	1.56	4.19	0	11.93	2
Formaldehyde		541	135	0	3	19.97	53.75	0	152.89	21
1,3-butadiene		541	135	0	3	7.36	19.80	0	56.31	8
Acetaldehyde		541	135	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		541	135	0	3	0.01	0.01	0	0.04	10
Bridge										
Auto VMT	263	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		263	0	0	0	10.00	0.00	0.00	0.00	3
Acrolein		263	0	0	0	0.86	0.00	0.00	0.00	0
Formaldehyde		263	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene		263	0	0	0	1.02	0.00	0.00	0.00	0
Acetaldehyde		263	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		263	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	448	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		448	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		448	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		448	0	0	0	17.50	0.00	0.00	0.00	8
1,3-butadiene		448	0	0	0	6.45	0.00	0.00	0.00	3
Acetaldehyde		448	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		448	0	0	0	0.01	0.00	0.00	0.00	6

PM Peak Hour MSAT Alternative Comparison

Year of Peak Emissions - 2030

(grams of emissions)

PM Peak Hour MSAT Alternative Comparison
Year of Peak Emissions - 2030
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11		Alt 1/2/3/14/16								
					VMT				Emission Factors @ x mph				
I-75 Ramps				Base VMT									
Auto VMT				829	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene	8	8	6		274	556	0	0	9.86	9.96	0.00	0.00	8
Acrolein	1	1	0		274	556	0	0	0.86	0.86	0.00	0.00	1
Formaldehyde	2	2	1		274	556	0	0	2.00	1.99	0.00	0.00	2
1,3-butadiene	1	1	1		274	556	0	0	1.03	1.02	0.00	0.00	1
Acetaldehyde	0	0	0		274	556	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust	0	0	0		274	556	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				619	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene	1	1	1		204	415	0	0	1.81	2.35	0.00	0.00	1
Acrolein	1	1	1		204	415	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde	10	9	8		204	415	0	0	13.44	17.50	0.00	0.00	10
1,3-butadiene	4	3	3		204	415	0	0	4.95	6.45	0.00	0.00	4
Acetaldehyde	0	0	0		204	415	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust	9	8	7		204	415	0	0	0.01	0.01	0.00	0.00	9
Plaza to US													
Auto traffic				237									
Truck traffic				331									
Auto VMT				216	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene	5	5	5		151	22	43	5	10.00	11.66	23.96	103.54	5
Acrolein	0	0	0		151	22	43	5	0.86	0.98	1.90	7.06	0
Formaldehyde	1	1	1		151	22	43	5	1.99	2.29	4.40	15.84	1
1,3-butadiene	0	0	1		151	22	43	5	1.02	1.17	2.25	8.11	0
Acetaldehyde	0	0	0		151	22	43	5	0.10	0.14	0.25	0.90	0
Diesel exhaust	0	0	0		151	22	43	5	0.00	0.00	0.00	0.00	0
Truck VMT				294	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene	2	2	2		97	29	88	10	2.68	3.73	7.22	20.53	2
Acrolein	1	1	1		97	29	88	10	1.56	2.17	4.19	11.93	1
Formaldehyde	16	18	17		97	29	88	10	19.97	27.78	53.75	152.89	16
1,3-butadiene	6	7	6		97	29	88	10	7.36	10.23	19.80	56.31	6
Acetaldehyde	1	1	1		97	29	88	10	0.89	1.24	2.41	6.85	1
Diesel exhaust	5	7	7		97	29	88	10	0.01	0.01	0.01	0.04	5
Plaza to Canada													
Auto traffic				1,123									
Truck traffic				672									
Auto VMT				1,044	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene	16	17	19		835	209	0	2	10.00	16.15	0.00	103.54	16
Acrolein	1	1	2		835	209	0	2	0.86	1.35	0.00	7.06	1
Formaldehyde	3	3	4		835	209	0	2	1.99	3.12	0.00	15.84	3
1,3-butadiene	1	2	2		835	209	0	2	1.02	1.59	0.00	8.11	1
Acetaldehyde	0	0	0		835	209	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust	0	0	0		835	209	0	2	0.00	0.00	0.00	0.00	0
Truck VMT				625	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene	3	3	4		500	125	0	3	2.68	7.22	0.00	20.53	3
Acrolein	2	2	2		500	125	0	3	1.56	4.19	0.00	11.93	2
Formaldehyde	22	23	28		500	125	0	3	19.97	53.75	0.00	152.89	22
1,3-butadiene	8	9	10		500	125	0	3	7.36	19.80	0.00	56.31	8
Acetaldehyde	1	1	1		500	125	0	3	0.89	2.41	0.00	6.85	1
Diesel exhaust	10	11	14		500	125	0	3	0.01	0.01	0.00	0.04	10
Bridge													
Auto VMT				734	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	7	8	8		734	0	0	0	10.00	0.00	0.00	0.00	7
Acrolein	1	1	1		734	0	0	0	0.86	0.00	0.00	0.00	1
Formaldehyde	1	2	2		734	0	0	0	1.99	0.00	0.00	0.00	1
1,3-butadiene	1	1	1		734	0	0	0	1.02	0.00	0.00	0.00	1
Acetaldehyde	0	0	0		734	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust	0	0	0		734	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT				541	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene	1	1	1		541	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein	1	1	1		541	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde	9	11	10		541	0	0	0	17.50	0.00	0.00	0.00	9
1,3-butadiene	3	4	4		541	0	0	0	6.45	0.00	0.00	0.00	3
Acetaldehyde	0	0	0		541	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust	8	9	8		541	0	0	0	0.01	0.00	0.00	0.00	8

		Alt 5								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	837	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		276	561	0	0	9.86	9.96	0.00	0.00	8
Acrolein		276	561	0	0	0.86	0.86	0.00	0.00	1
Formaldehyde		276	561	0	0	2.00	1.99	0.00	0.00	2
1,3-butadiene		276	561	0	0	1.03	1.02	0.00	0.00	1
Acetaldehyde		276	561	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		276	561	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	586	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		193	393	0	0	1.81	2.35	0.00	0.00	1
Acrolein		193	393	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		193	393	0	0	13.44	17.50	0.00	0.00	9
1,3-butadiene		193	393	0	0	4.95	6.45	0.00	0.00	3
Acetaldehyde		193	393	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		193	393	0	0	0.01	0.01	0.00	0.00	8
Plaza to US										
Auto traffic	234									
Truck traffic	337									
Auto VMT	227	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		159	23	45	5	10.00	11.66	23.96	103.54	5
Acrolein		159	23	45	5	0.86	0.98	1.90	7.06	0
Formaldehyde		159	23	45	5	1.99	2.29	4.40	15.84	1
1,3-butadiene		159	23	45	5	1.02	1.17	2.25	8.11	0
Acetaldehyde		159	23	45	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		159	23	45	5	0.00	0.00	0.00	0.00	0
Truck VMT	317	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		190	32	95	10	2.68	3.73	7.22	20.53	2
Acrolein		190	32	95	10	1.56	2.17	4.19	11.93	1
Formaldehyde		190	32	95	10	19.97	27.78	53.75	152.89	18
1,3-butadiene		190	32	95	10	7.36	10.23	19.80	56.31	7
Acetaldehyde		190	32	95	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		190	32	95	10	0.01	0.01	0.01	0.04	7
Plaza to Canada										
Auto traffic	1,178									
Truck traffic	688									
Auto VMT	1,166	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		933	233	0	2	10.00	16.15	0.00	103.54	17
Acrolein		933	233	0	2	0.86	1.35	0.00	7.06	1
Formaldehyde		933	233	0	2	1.99	3.12	0.00	15.84	3
1,3-butadiene		933	233	0	2	1.02	1.59	0.00	8.11	2
Acetaldehyde		933	233	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		933	233	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	681	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		545	136	0	3	2.68	7.22	0	20.53	3
Acrolein		545	136	0	3	1.56	4.19	0	11.93	2
Formaldehyde		545	136	0	3	19.97	53.75	0	152.89	23
1,3-butadiene		545	136	0	3	7.36	19.80	0	56.31	9
Acetaldehyde		545	136	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		545	136	0	3	0.01	0.01	0	0.04	11
Bridge										
Auto VMT	833	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		833	0	0	0	10.00	0.00	0.00	0.00	8
Acrolein		833	0	0	0	0.86	0.00	0.00	0.00	1
Formaldehyde		833	0	0	0	1.99	0.00	0.00	0.00	2
1,3-butadiene		833	0	0	0	1.02	0.00	0.00	0.00	1
Acetaldehyde		833	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		833	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	605	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		605	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		605	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		605	0	0	0	17.50	0.00	0.00	0.00	11
1,3-butadiene		605	0	0	0	6.45	0.00	0.00	0.00	4
Acetaldehyde		605	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		605	0	0	0	0.01	0.00	0.00	0.00	9

		Alt 7/9/11								
		VMT				Emission Factors @ x mph				
I-75 Ramps	Base VMT									
Auto VMT	566	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		187	379	0	0	9.86	9.96	0.00	0.00	6
Acrolein		187	379	0	0	0.86	0.86	0.00	0.00	0
Formaldehyde		187	379	0	0	2.00	1.99	0.00	0.00	1
1,3-butadiene		187	379	0	0	1.03	1.02	0.00	0.00	1
Acetaldehyde		187	379	0	0	0.10	0.10	0.00	0.00	0
Diesel exhaust		187	379	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	479	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		158	321	0	0	1.81	2.35	0.00	0.00	1
Acrolein		158	321	0	0	1.05	1.37	0.00	0.00	1
Formaldehyde		158	321	0	0	13.44	17.50	0.00	0.00	8
1,3-butadiene		158	321	0	0	4.95	6.45	0.00	0.00	3
Acetaldehyde		158	321	0	0	0.60	0.78	0.00	0.00	0
Diesel exhaust		158	321	0	0	0.01	0.01	0.00	0.00	7
Plaza to US										
Auto traffic	192									
Truck traffic	237									
Auto VMT	291	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		204	29	58	5	10.00	11.66	23.96	103.54	5
Acrolein		204	29	58	5	0.86	0.98	1.90	7.06	0
Formaldehyde		204	29	58	5	1.99	2.29	4.40	15.84	1
1,3-butadiene		204	29	58	5	1.02	1.17	2.25	8.11	1
Acetaldehyde		204	29	58	5	0.10	0.14	0.25	0.90	0
Diesel exhaust		204	29	58	5	0.00	0.00	0.00	0.00	0
Truck VMT	363	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		218	36	109	10	2.68	3.73	7.22	20.53	2
Acrolein		218	36	109	10	1.56	2.17	4.19	11.93	1
Formaldehyde		218	36	109	10	19.97	27.78	53.75	152.89	17
1,3-butadiene		218	36	109	10	7.36	10.23	19.80	56.31	6
Acetaldehyde		218	36	109	10	0.89	1.24	2.41	6.85	1
Diesel exhaust		218	36	109	10	0.01	0.01	0.01	0.04	7
Plaza to Canada										
Auto traffic	853									
Truck traffic	525									
Auto VMT	1,433	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		1,146	287	0	2	10.00	16.15	0.00	103.54	19
Acrolein		1,146	287	0	2	0.86	1.35	0.00	7.06	2
Formaldehyde		1,146	287	0	2	1.99	3.12	0.00	15.84	4
1,3-butadiene		1,146	287	0	2	1.02	1.59	0.00	8.11	2
Acetaldehyde		1,146	287	0	2	0.10	0.17	0.00	0.90	0
Diesel exhaust		1,146	287	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	882	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		706	176	0	3	2.68	7.22	0	20.53	4
Acrolein		706	176	0	3	1.56	4.19	0	11.93	2
Formaldehyde		706	176	0	3	19.97	53.75	0	152.89	28
1,3-butadiene		706	176	0	3	7.36	19.80	0	56.31	10
Acetaldehyde		706	176	0	3	0.89	2.41	0	6.85	1
Diesel exhaust		706	176	0	3	0.01	0.01	0	0.04	14
Bridge										
Auto VMT	773	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		773	0	0	0	10.00	0.00	0.00	0.00	8
Acrolein		773	0	0	0	0.86	0.00	0.00	0.00	1
Formaldehyde		773	0	0	0	1.99	0.00	0.00	0.00	2
1,3-butadiene		773	0	0	0	1.02	0.00	0.00	0.00	1
Acetaldehyde		773	0	0	0	0.10	0.00	0.00	0.00	0
Diesel exhaust		773	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	564	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		564	0	0	0	2.35	0.00	0.00	0.00	1
Acrolein		564	0	0	0	1.37	0.00	0.00	0.00	1
Formaldehyde		564	0	0	0	17.50	0.00	0.00	0.00	10
1,3-butadiene		564	0	0	0	6.45	0.00	0.00	0.00	4
Acetaldehyde		564	0	0	0	0.78	0.00	0.00	0.00	0
Diesel exhaust		564	0	0	0	0.01	0.00	0.00	0.00	8

Daily MSAT Alternative Comparison

Year of Regional Transportation Plan - 2030

(grams of emissions)

Daily MSAT Alternative Comparison
Year of Regional Transportation Plan - 2030
(grams of emissions)

	Alt 1/2/3/14/16	Alt 5	Alt 7/9/11
I-75 Ramps			
Auto VMT			
Benzene	92	91	59
Acrolein	8	8	5
Formaldehyde	18	18	12
1,3-butadiene	9	9	6
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	27	25	17
Acrolein	16	15	10
Formaldehyde	200	188	130
1,3-butadiene	74	69	48
Acetaldehyde	9	8	6
Diesel exhaust	177	167	116
Plaza to US			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	113	117	108
Acrolein	9	9	9
Formaldehyde	20	21	20
1,3-butadiene	10	11	10
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	54	61	49
Acrolein	31	35	29
Formaldehyde	399	452	366
1,3-butadiene	147	167	135
Acetaldehyde	18	20	16
Diesel exhaust	127	161	141
Plaza to Canada			
Auto traffic			
Truck traffic			
Auto VMT			
Benzene	128	139	129
Acrolein	10	11	11
Formaldehyde	24	26	25
1,3-butadiene	12	13	13
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	50	52	53
Acrolein	29	31	31
Formaldehyde	370	391	392
1,3-butadiene	136	144	145
Acetaldehyde	17	17	18
Diesel exhaust	172	183	193
Bridge			
Auto VMT			
Benzene	80	89	71
Acrolein	7	8	6
Formaldehyde	16	18	14
1,3-butadiene	8	9	7
Acetaldehyde	1	1	1
Diesel exhaust	0	0	0
Truck VMT			
Benzene	25	27	22
Acrolein	14	16	13
Formaldehyde	186	204	162
1,3-butadiene	68	75	60
Acetaldehyde	8	9	7
Diesel exhaust	152	167	133

		Alt 1/2/3/14/16								
		VMT				**Emission Factors @ x mph**				
I-75 Ramps	Base VMT									
Auto VMT	9,272	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		3,060	6,212	0	0	9.86	9.96	0.00	0.00	92
Acrolein		3,060	6,212	0	0	0.86	0.86	0.00	0.00	8
Formaldehyde		3,060	6,212	0	0	2.00	1.99	0.00	0.00	18
1,3-butadiene		3,060	6,212	0	0	1.03	1.02	0.00	0.00	9
Acetaldehyde		3,060	6,212	0	0	0.10	0.10	0.00	0.00	1
Diesel exhaust		3,060	6,212	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	12,355	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		4,077	8,278	0	0	1.81	2.35	0.00	0.00	27
Acrolein		4,077	8,278	0	0	1.05	1.37	0.00	0.00	16
Formaldehyde		4,077	8,278	0	0	13.44	17.50	0.00	0.00	200
1,3-butadiene		4,077	8,278	0	0	4.95	6.45	0.00	0.00	74
Acetaldehyde		4,077	8,278	0	0	0.60	0.78	0.00	0.00	9
Diesel exhaust		4,077	8,278	0	0	0.01	0.01	0.00	0.00	177
Plaza to US										
Auto traffic	5,543									
Truck traffic	8,274									
Auto VMT	5,044	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		3,531	504	1009	5	10.00	11.66	23.96	103.54	113
Acrolein		3,531	504	1009	5	0.86	0.98	1.90	7.06	9
Formaldehyde		3,531	504	1009	5	1.99	2.29	4.40	15.84	20
1,3-butadiene		3,531	504	1009	5	1.02	1.17	2.25	8.11	10
Acetaldehyde		3,531	504	1009	5	0.10	0.14	0.25	0.90	1
Diesel exhaust		3,531	504	1009	5	0.00	0.00	0.00	0.00	0
Truck VMT	7,364	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		2,430	736	2,209	10	2.68	3.73	7.22	20.53	54
Acrolein		2,430	736	2,209	10	1.56	2.17	4.19	11.93	31
Formaldehyde		2,430	736	2,209	10	19.97	27.78	53.75	152.89	399
1,3-butadiene		2,430	736	2,209	10	7.36	10.23	19.80	56.31	147
Acetaldehyde		2,430	736	2,209	10	0.89	1.24	2.41	6.85	18
Diesel exhaust		2,430	736	2,209	10	0.01	0.01	0.01	0.04	127
Plaza to Canada										
Auto traffic	9,197									
Truck traffic	11,381									
Auto VMT	8,553	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		6,842	1,711	0	2	10.00	16.15	0.00	103.54	128
Acrolein		6,842	1,711	0	2	0.86	1.35	0.00	7.06	10
Formaldehyde		6,842	1,711	0	2	1.99	3.12	0.00	15.84	24
1,3-butadiene		6,842	1,711	0	2	1.02	1.59	0.00	8.11	12
Acetaldehyde		6,842	1,711	0	2	0.10	0.17	0.00	0.90	1
Diesel exhaust		6,842	1,711	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	10,585	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		8,468	2,117	0	3	2.68	7.22	0.00	20.53	50
Acrolein		8,468	2,117	0	3	1.56	4.19	0.00	11.93	29
Formaldehyde		8,468	2,117	0	3	19.97	53.75	0.00	152.89	370
1,3-butadiene		8,468	2,117	0	3	7.36	19.80	0.00	56.31	136
Acetaldehyde		8,468	2,117	0	3	0.89	2.41	0.00	6.85	17
Diesel exhaust		8,468	2,117	0	3	0.01	0.01	0.00	0.04	172
Bridge										
Auto VMT	7,959	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		7,959	0	0	0	10.00	0.00	0.00	0.00	80
Acrolein		7,959	0	0	0	0.86	0.00	0.00	0.00	7
Formaldehyde		7,959	0	0	0	1.99	0.00	0.00	0.00	16
1,3-butadiene		7,959	0	0	0	1.02	0.00	0.00	0.00	8
Acetaldehyde		7,959	0	0	0	0.10	0.00	0.00	0.00	1
Diesel exhaust		7,959	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	10,614	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		10,614	0	0	0	2.35	0.00	0.00	0.00	25
Acrolein		10,614	0	0	0	1.37	0.00	0.00	0.00	14
Formaldehyde		10,614	0	0	0	17.50	0.00	0.00	0.00	186
1,3-butadiene		10,614	0	0	0	6.45	0.00	0.00	0.00	68
Acetaldehyde		10,614	0	0	0	0.78	0.00	0.00	0.00	8
Diesel exhaust		10,614	0	0	0	0.01	0.00	0.00	0.00	152

		Alt 5								
		VMT				**Emission Factors @ x mph**				
I-75 Ramps	Base VMT									
Auto VMT	9,136	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		3,015	6,121	0	0	9.86	9.96	0.00	0.00	91
Acrolein		3,015	6,121	0	0	0.86	0.86	0.00	0.00	8
Formaldehyde		3,015	6,121	0	0	2.00	1.99	0.00	0.00	18
1,3-butadiene		3,015	6,121	0	0	1.03	1.02	0.00	0.00	9
Acetaldehyde		3,015	6,121	0	0	0.10	0.10	0.00	0.00	1
Diesel exhaust		3,015	6,121	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	11,621	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		3,835	7,786	0	0	1.81	2.35	0.00	0.00	25
Acrolein		3,835	7,786	0	0	1.05	1.37	0.00	0.00	15
Formaldehyde		3,835	7,786	0	0	13.44	17.50	0.00	0.00	188
1,3-butadiene		3,835	7,786	0	0	4.95	6.45	0.00	0.00	69
Acetaldehyde		3,835	7,786	0	0	0.60	0.78	0.00	0.00	8
Diesel exhaust		3,835	7,786	0	0	0.01	0.01	0.00	0.00	167
Plaza to US										
Auto traffic	5,498									
Truck traffic	8,294									
Auto VMT	5,333	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		3,733	533	1,067	5	10.00	11.66	23.96	103.54	117
Acrolein		3,733	533	1,067	5	0.86	0.98	1.90	7.06	9
Formaldehyde		3,733	533	1,067	5	1.99	2.29	4.40	15.84	21
1,3-butadiene		3,733	533	1,067	5	1.02	1.17	2.25	8.11	11
Acetaldehyde		3,733	533	1,067	5	0.10	0.14	0.25	0.90	1
Diesel exhaust		3,733	533	1,067	5	0.00	0.00	0.00	0.00	0
Truck VMT	7,796	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		4,678	780	2,339	10	2.68	3.73	7.22	20.53	61
Acrolein		4,678	780	2,339	10	1.56	2.17	4.19	11.93	35
Formaldehyde		4,678	780	2,339	10	19.97	27.78	53.75	152.89	452
1,3-butadiene		4,678	780	2,339	10	7.36	10.23	19.80	56.31	167
Acetaldehyde		4,678	780	2,339	10	0.89	1.24	2.41	6.85	20
Diesel exhaust		4,678	780	2,339	10	0.01	0.01	0.01	0.04	161
Plaza to Canada										
Auto traffic	9,573									
Truck traffic	11,466									
Auto VMT	9,478	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		7,582	1,896	0	2	10.00	16.15	0.00	103.54	139
Acrolein		7,582	1,896	0	2	0.86	1.35	0.00	7.06	11
Formaldehyde		7,582	1,896	0	2	1.99	3.12	0.00	15.84	26
1,3-butadiene		7,582	1,896	0	2	1.02	1.59	0.00	8.11	13
Acetaldehyde		7,582	1,896	0	2	0.10	0.17	0.00	0.90	1
Diesel exhaust		7,582	1,896	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	11,352	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		9,081	2,270	0	3	2.68	7.22	0	20.53	52
Acrolein		9,081	2,270	0	3	1.56	4.19	0	11.93	31
Formaldehyde		9,081	2,270	0	3	19.97	53.75	0	152.89	391
1,3-butadiene		9,081	2,270	0	3	7.36	19.80	0	56.31	144
Acetaldehyde		9,081	2,270	0	3	0.89	2.41	0	6.85	17
Diesel exhaust		9,081	2,270	0	3	0.01	0.01	0	0.04	183
Bridge										
Auto VMT	8,892	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		8,892	0	0	0	10.00	0.00	0.00	0.00	89
Acrolein		8,892	0	0	0	0.86	0.00	0.00	0.00	8
Formaldehyde		8,892	0	0	0	1.99	0.00	0.00	0.00	18
1,3-butadiene		8,892	0	0	0	1.02	0.00	0.00	0.00	9
Acetaldehyde		8,892	0	0	0	0.10	0.00	0.00	0.00	1
Diesel exhaust		8,892	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	11,658	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		11,658	0	0	0	2.35	0.00	0.00	0.00	27
Acrolein		11,658	0	0	0	1.37	0.00	0.00	0.00	16
Formaldehyde		11,658	0	0	0	17.50	0.00	0.00	0.00	204
1,3-butadiene		11,658	0	0	0	6.45	0.00	0.00	0.00	75
Acetaldehyde		11,658	0	0	0	0.78	0.00	0.00	0.00	9
Diesel exhaust		11,658	0	0	0	0.01	0.00	0.00	0.00	167

		Alt 7/9/11								
		VMT				**Emission Factors @ x mph**				
I-75 Ramps	Base VMT									
Auto VMT	5,918	33%@ 55	67 %@ 40	NA	Idle 0 min	55	40	NA	Idle - NA	Sum
Benzene		1,953	3,965	0	0	9.86	9.96	0.00	0.00	59
Acrolein		1,953	3,965	0	0	0.86	0.86	0.00	0.00	5
Formaldehyde		1,953	3,965	0	0	2.00	1.99	0.00	0.00	12
1,3-butadiene		1,953	3,965	0	0	1.03	1.02	0.00	0.00	6
Acetaldehyde		1,953	3,965	0	0	0.10	0.10	0.00	0.00	1
Diesel exhaust		1,953	3,965	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	8,054	33%@ 50	67 %@ 35	NA	NA	50	35	NA	Idle - NA	Sum
Benzene		2,658	5,396	0	0	1.81	2.35	0.00	0.00	17
Acrolein		2,658	5,396	0	0	1.05	1.37	0.00	0.00	10
Formaldehyde		2,658	5,396	0	0	13.44	17.50	0.00	0.00	130
1,3-butadiene		2,658	5,396	0	0	4.95	6.45	0.00	0.00	48
Acetaldehyde		2,658	5,396	0	0	0.60	0.78	0.00	0.00	6
Diesel exhaust		2,658	5,396	0	0	0.01	0.01	0.00	0.00	116
Plaza to US										
Auto traffic	3,825									
Truck traffic	5,035									
Auto VMT	5,814	70 %@ 35	10%@ 20	20%@ 5	Idle 5 min	35	20	5	Idle	Sum
Benzene		4,069	581	1,163	5	10.00	11.66	23.96	103.54	108
Acrolein		4,069	581	1,163	5	0.86	0.98	1.90	7.06	9
Formaldehyde		4,069	581	1,163	5	1.99	2.29	4.40	15.84	20
1,3-butadiene		4,069	581	1,163	5	1.02	1.17	2.25	8.11	10
Acetaldehyde		4,069	581	1,163	5	0.10	0.14	0.25	0.90	1
Diesel exhaust		4,069	581	1,163	5	0.00	0.00	0.00	0.00	0
Truck VMT	7,703	60 %@ 30	10%@ 20	30%@ 5	Idle 10 min	30	20	5	Idle	Sum
Benzene		4,622	770	2,311	10	2.68	3.73	7.22	20.53	49
Acrolein		4,622	770	2,311	10	1.56	2.17	4.19	11.93	29
Formaldehyde		4,622	770	2,311	10	19.97	27.78	53.75	152.89	366
1,3-butadiene		4,622	770	2,311	10	7.36	10.23	19.80	56.31	135
Acetaldehyde		4,622	770	2,311	10	0.89	1.24	2.41	6.85	16
Diesel exhaust		4,622	770	2,311	10	0.01	0.01	0.01	0.04	141
Plaza to Canada										
Auto traffic	5,783									
Truck traffic	7,467									
Auto VMT	9,715	80 %@ 35	20%@ 10	NA	Idle 2 min	35	10	NA	Idle	Sum
Benzene		7,772	1,943	0	2	10.00	16.15	0.00	103.54	129
Acrolein		7,772	1,943	0	2	0.86	1.35	0.00	7.06	11
Formaldehyde		7,772	1,943	0	2	1.99	3.12	0.00	15.84	25
1,3-butadiene		7,772	1,943	0	2	1.02	1.59	0.00	8.11	13
Acetaldehyde		7,772	1,943	0	2	0.10	0.17	0.00	0.90	1
Diesel exhaust		7,772	1,943	0	2	0.00	0.00	0.00	0.00	0
Truck VMT	12,545	80 %@ 30	20%@ 5	NA	Idle 3 min	30	5	NA	Idle	Sum
Benzene		10,036	2,509	0	3	2.68	7.22	0	20.53	53
Acrolein		10,036	2,509	0	3	1.56	4.19	0	11.93	31
Formaldehyde		10,036	2,509	0	3	19.97	53.75	0	152.89	392
1,3-butadiene		10,036	2,509	0	3	7.36	19.80	0	56.31	145
Acetaldehyde		10,036	2,509	0	3	0.89	2.41	0	6.85	18
Diesel exhaust		10,036	2,509	0	3	0.01	0.01	0	0.04	193
Bridge										
Auto VMT	7,109	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		7,109	0	0	0	10.00	0.00	0.00	0.00	71
Acrolein		7,109	0	0	0	0.86	0.00	0.00	0.00	6
Formaldehyde		7,109	0	0	0	1.99	0.00	0.00	0.00	14
1,3-butadiene		7,109	0	0	0	1.02	0.00	0.00	0.00	7
Acetaldehyde		7,109	0	0	0	0.10	0.00	0.00	0.00	1
Diesel exhaust		7,109	0	0	0	0.00	0.00	0.00	0.00	0
Truck VMT	9,251	100%@35	NA	NA	NA	35	NA	NA	NA	Sum
Benzene		9,251	0	0	0	2.35	0.00	0.00	0.00	22
Acrolein		9,251	0	0	0	1.37	0.00	0.00	0.00	13
Formaldehyde		9,251	0	0	0	17.50	0.00	0.00	0.00	162
1,3-butadiene		9,251	0	0	0	6.45	0.00	0.00	0.00	60
Acetaldehyde		9,251	0	0	0	0.78	0.00	0.00	0.00	7
Diesel exhaust		9,251	0	0	0	0.01	0.00	0.00	0.00	133

Appendix D

General Conformity
$PM_{2.5}$ and PM_{10} Construction
de minimus Analysis

Construction $PM_{2.5}$ and PM_{10} for Hot-spot Project-Level Conformity and Comparison to *de minimus* Value

Site Development Construction PM

ROW acquisition is 150 acres.

With a two-year construction period, a peak construction year might be expected to be in the neighborhood of 100+ acres = clearance and site preparation

Assume a site of

width	length	acres
1300	5000	149

The site is essentially flat.

Assume worst case in a year is earthmover cutting from one side of site and depositing on other side of site.

If an earthmover cuts 2' over a 50' run & deposits it 2500' downstream, 2500'/50' is 50 loaded trips per swath for 2' cut.

but trips are 2-way so VMT must double.

	2500	50	=	50	1	2	=	100	trips of 2500' in one swath
Width/10' per swath = # of swaths	1300	/	10	=				130	swaths
								6155	VMT for earthmover
Grader & misc. work = 10 passes over		5000feet and		130	swaths				
	10	5000	130					1231	VMT grader/misc. other
								7386	total VMT

Method - PM_{10} AP-42 adjusted EF *

*AP-42 EF from Table 11.9-1 for grading (see separate worksheet in this file) is

$0.051(S)^2$

with an adjustment factor for PM_{10} of 0.6 and $PM_{2.5}$ of 0.031

Then for PM_{10} at a speed of 10 mph $0.051 \times (10)^2 =$			5.1	lbs/VMT	x	0.6	=	3.06	lbs/VMT
		EF		VMT	lbs/yr				
Site Development	$PM_{10} =$	3.06	lbs/VMT	7386	22602			11.30	**Annual Tons PM_{10}**
Then for $PM_{2.5}$ at a speed of 10 mph $0.051 \times (10)^2 =$			5.1	lbs/VMT	x	0.031	=	0.16	lbs/VMT
Site Development	$PM_{2.5} =$	0.16	lbs/VMT	7386	1168			0.58	**Annual Tons $PM_{2.5}$**

Using scaling factor from Table 11.9.1 of AP-42 of $0.031PM_{2.5}$

vs. 0.6 for PM_{10} then for $PM_{2.5}$,

Table 11.9-1 (English Units). EMISSION FACTOR EQUATIONS FOR UNCONTROLLED OPEN DUST SOURCES AT WESTERN SURFACE COAL MINES[a]

Operation	Material	Emissions By Particle Size Range (Aerodynamic Diameter)[b,c]				Units	EMISSION FACTOR RATING
		Emission Factor Equations		Scaling Factors			
		TSP ≤30 µm	≤15 µm	≤10 µm[d]	≤2.5 µm/TSP[e]		
Blasting[f]	Coal or overburden	$0.000014(A)^{1.5}$	ND	0.52[e]	0.03	lb/blast	C_DD
Truck loading	Coal	$\frac{1.16}{(M)^{1.2}}$	$\frac{0.119}{(M)^{0.9}}$	0.75	0.019	lb/ton	BBCC
Bulldozing	Coal	$\frac{78.4\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{18.6\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.022	lb/hr	CCDD
	Overburden	$\frac{5.7\ (s)^{1.2}}{(M)^{1.3}}$	$\frac{1.0\ (s)^{1.5}}{(M)^{1.4}}$	0.75	0.105	lb/hr	BCDD
Dragline	Overburden	$\frac{0.0021\ (d)^{1.1}}{(M)^{0.3}}$	$\frac{0.0021\ (d)^{0.7}}{(M)^{0.3}}$	0.75	0.017	lb/yd^3	BCDD
Vehicle traffic[g]							
Grading		$0.040\ (S)^{2.5}$	$0.051\ (S)^{2.0}$	0.60	0.031	lb/VMT	CCDD
Active storage pile[h] (wind erosion and maintenance)	Coal	0.72 u	ND	ND	ND	$\frac{lb}{(acre)(hr)}$	C[i]___

[a] Reference 1, except as noted. VMT = vehicle miles traveled. ND = no data. Quality ratings coded where "Q, X, Y, Z" are ratings for ≤30 µm, ≤15 µm, ≤10 µm, and ≤2.5 µm, respectively. See also note below.

[b] Particulate matter less than or equal to 30 µm in aerodynamic diameter is sometimes termed "suspendable particulate" and is often used as a surrogate for TSP (total suspended particulate). TSP denotes what is measured by a standard high volume sampler (see Section 13.2).

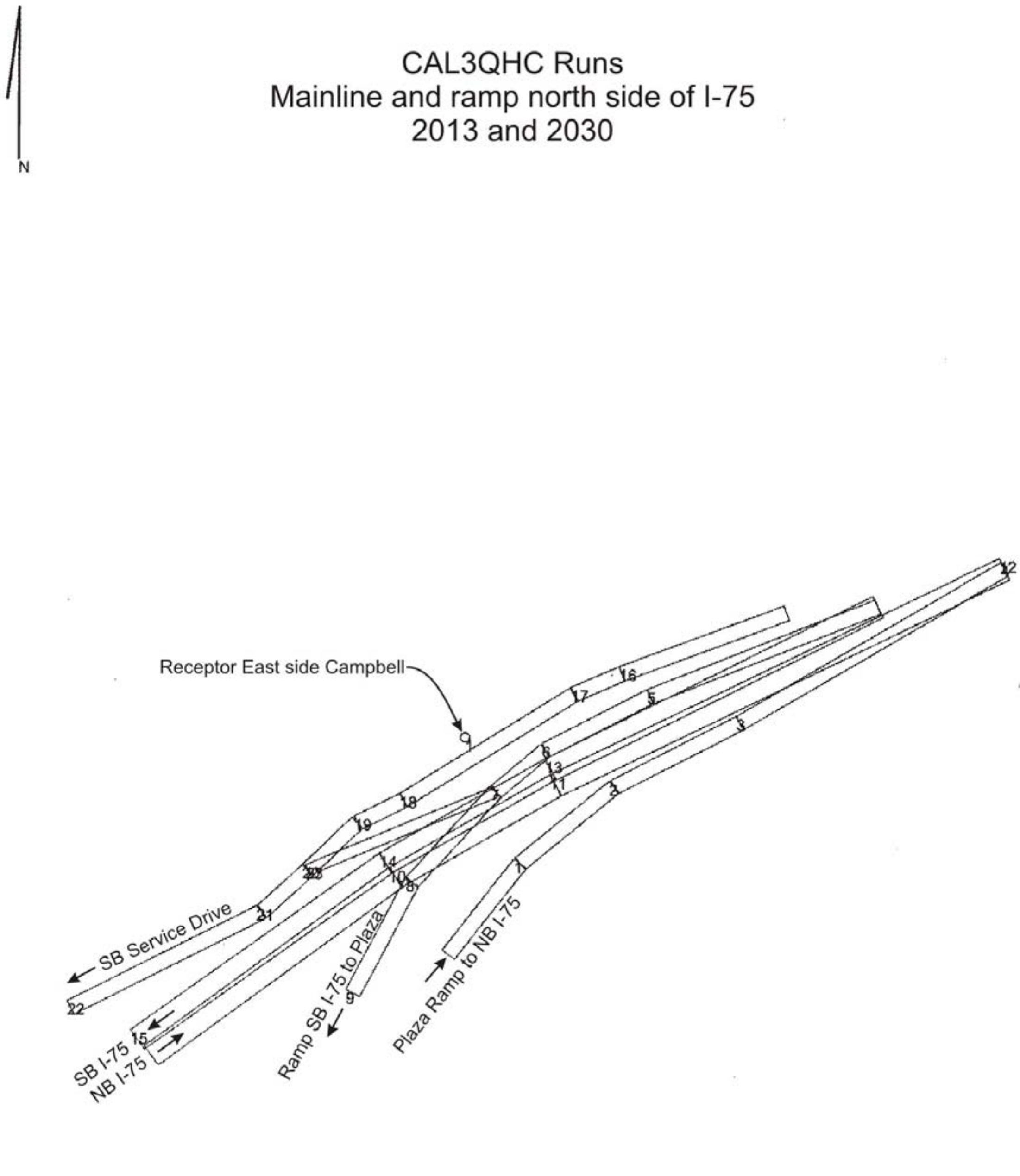
[c] Symbols for equations:

- A = horizontal area (ft^2), with blasting depth ≤ 70 ft. Not for vertical face of a bench.
- M = material moisture content (%)
- s = material silt content (%)
- u = wind speed (mph)
- d = drop height (ft)
- W = mean vehicle weight (tons)
- S = mean vehicle speed (mph)
- w = mean number of wheels

Appendix E

CAL3QHC Input Parameters and CAL3QHC Model Runs for CO Hot-spot Analysis

CAL3QHC Runs
Mainline and ramp north side of I-75
2013 and 2030



CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: DRIC Pract Alt 1 I-75 Road 2013 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 14: 4:49

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 11. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
1. 1	1130.0	320.0	1330.0	580.0	328.	38.	BR	88.	12.2	.0	44.0
2. 2	1330.0	580.0	1595.0	800.0	344.	50.	BR	88.	12.2	.0	44.0
3. 3	1595.0	800.0	1950.0	985.0	400.	62.	BR	88.	12.2	.0	44.0
4. 4	1950.0	985.0	2700.0	1430.0	872.	59.	BR	88.	12.2	.0	44.0
5. 5	2340.0	1320.0	1695.0	1060.0	695.	248.	BR	748.	12.2	.0	44.0
6. 6	1695.0	1060.0	1400.0	905.0	333.	242.	BR	748.	12.2	.0	44.0
7. 7	1400.0	905.0	1260.0	785.0	184.	229.	BR	748.	12.2	.0	44.0
8. 8	1260.0	785.0	1025.0	525.0	350.	222.	BR	748.	12.2	.0	44.0
9. 9	1025.0	525.0	860.0	210.0	356.	208.	BR	748.	12.2	.0	44.0
10. 10	290.0	30.0	980.0	540.0	858.	54.	D	3000.	12.2	.0	68.0
11. 11	980.0	540.0	1430.0	805.0	522.	60.	D	3000.	12.2	.0	68.0
12. 12	1430.0	805.0	2700.0	1430.0	1415.	64.	D	3000.	12.2	.0	68.0
13. 13	2340.0	1320.0	1415.0	850.0	1038.	243.	D	4652.	11.8	.0	68.0
14. 14	1415.0	850.0	950.0	580.0	538.	240.	D	4652.	11.8	.0	68.0
15. 15	950.0	580.0	250.0	75.0	863.	234.	D	4652.	11.8	.0	68.0
16. 16	2080.0	1300.0	1615.0	1125.0	497.	249.	AG	540.	11.8	.0	44.0
17. 17	1615.0	1125.0	1480.0	1065.0	148.	246.	AG	540.	11.8	.0	44.0
18. 18	1480.0	1065.0	1000.0	760.0	569.	238.	AG	540.	11.8	.0	44.0
19. 19	1000.0	760.0	870.0	695.0	145.	243.	AG	540.	11.8	.0	44.0
20. 20	870.0	695.0	730.0	560.0	194.	226.	AG	540.	11.8	.0	44.0
21. 21	730.0	560.0	600.0	440.0	177.	227.	AG	1340.	11.8	.0	44.0
22. 22	600.0	440.0	60.0	165.0	606.	243.	AG	1340.	11.8	.0	44.0
23. 23	1260.0	785.0	730.0	560.0	576.	247.	FL	800.	12.2	.0	32.0

JOB: DRIC Pract Alt 1 I-75 Road 2013 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 14: 4:49

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. Receptor 1	*	1173.0	940.0	6.0	*

```
JOB: DRIC Pract Alt 1 I-75 Road 2013                RUN: DRIC PA 1

 MODEL RESULTS
 -------------

 REMARKS : In search of the angle corresponding to
           the maximum concentration, only the first
           angle, of the angles with same maximum
           concentrations, is indicated as maximum.

WIND ANGLE RANGE:  20.-370.

WIND   * CONCENTRATION
ANGLE  *      (PPM)
(DEGR) * REC1
------*------
  20.  *    .0
  30.  *    .0
  40.  *    .0
  50.  *    .0
  60.  *    .1
  70.  *    .9
  80.  *   1.5
  90.  *   1.4
 100.  *   1.4
 110.  *   1.2
 120.  *   1.1
 130.  *   1.1
 140.  *   1.1
 150.  *   1.0
 160.  *   1.2
 170.  *   1.2
 180.  *   1.2
 190.  *   1.2
 200.  *   1.6
 210.  *   1.4
 220.  *   1.4
 230.  *    .8
 240.  *    .2
 250.  *    .0
 260.  *    .0
 270.  *    .0
 280.  *    .0
 290.  *    .0
 300.  *    .0
 310.  *    .0
 320.  *    .0
 330.  *    .0
 340.  *    .0
 350.  *    .0
 360.  *    .0
  10.  *    .0
------*------
MAX    *   1.6
DEGR.  *  200

THE HIGHEST CONCENTRATION OF    1.60 PPM OCCURRED AT RECEPTOR REC1 .
```

JOB: DRIC Pract Alt 1 I-75 Road 2030 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 14:17:25

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 11. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
1. 1	1130.0	320.0	1330.0	580.0	328.	38.	BR	114.	9.9	.0	44.0
2. 2	1330.0	580.0	1595.0	800.0	344.	50.	BR	114.	9.9	.0	44.0
3. 3	1595.0	800.0	1950.0	985.0	400.	62.	BR	114.	9.9	.0	44.0
4. 4	1950.0	985.0	2700.0	1430.0	872.	59.	BR	114.	9.9	.0	44.0
5. 5	2340.0	1320.0	1695.0	1060.0	695.	248.	BR	895.	9.9	.0	44.0
6. 6	1695.0	1060.0	1400.0	905.0	333.	242.	BR	895.	9.9	.0	44.0
7. 7	1400.0	905.0	1260.0	785.0	184.	229.	BR	895.	9.9	.0	44.0
8. 8	1260.0	785.0	1025.0	525.0	350.	222.	BR	895.	9.9	.0	44.0
9. 9	1025.0	525.0	860.0	210.0	356.	208.	BR	895.	9.9	.0	44.0
10. 10	290.0	30.0	980.0	540.0	858.	54.	D	6300.	9.9	.0	68.0
11. 11	980.0	540.0	1430.0	805.0	522.	60.	D	6300.	9.9	.0	68.0
12. 12	1430.0	805.0	2700.0	1430.0	1415.	64.	D	6300.	9.9	.0	68.0
13. 13	2340.0	1320.0	1415.0	850.0	1038.	243.	D	11505.	9.6	.0	68.0
14. 14	1415.0	850.0	950.0	580.0	538.	240.	D	11505.	9.6	.0	68.0
15. 15	950.0	580.0	250.0	75.0	863.	234.	D	11505.	9.6	.0	68.0
16. 16	2080.0	1300.0	1615.0	1125.0	497.	249.	AG	540.	9.6	.0	44.0
17. 17	1615.0	1125.0	1480.0	1065.0	148.	246.	AG	540.	9.6	.0	44.0
18. 18	1480.0	1065.0	1000.0	760.0	569.	238.	AG	540.	9.6	.0	44.0
19. 19	1000.0	760.0	870.0	695.0	145.	243.	AG	540.	9.6	.0	44.0
20. 20	870.0	695.0	730.0	560.0	194.	226.	AG	540.	9.6	.0	44.0
21. 21	730.0	560.0	600.0	440.0	177.	227.	AG	1340.	9.6	.0	44.0
22. 22	600.0	440.0	60.0	165.0	606.	243.	AG	1340.	9.6	.0	44.0
23. 23	1260.0	785.0	730.0	560.0	576.	247.	FL	800.	10.0	.0	32.0

JOB: DRIC Pract Alt 1 I-75 Road 2030　　RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 14:17:25

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Receptor 1	1173.0	940.0	6.0

JOB: DRIC Pract Alt 1 I-75 Road 2030 RUN: DRIC PA 1

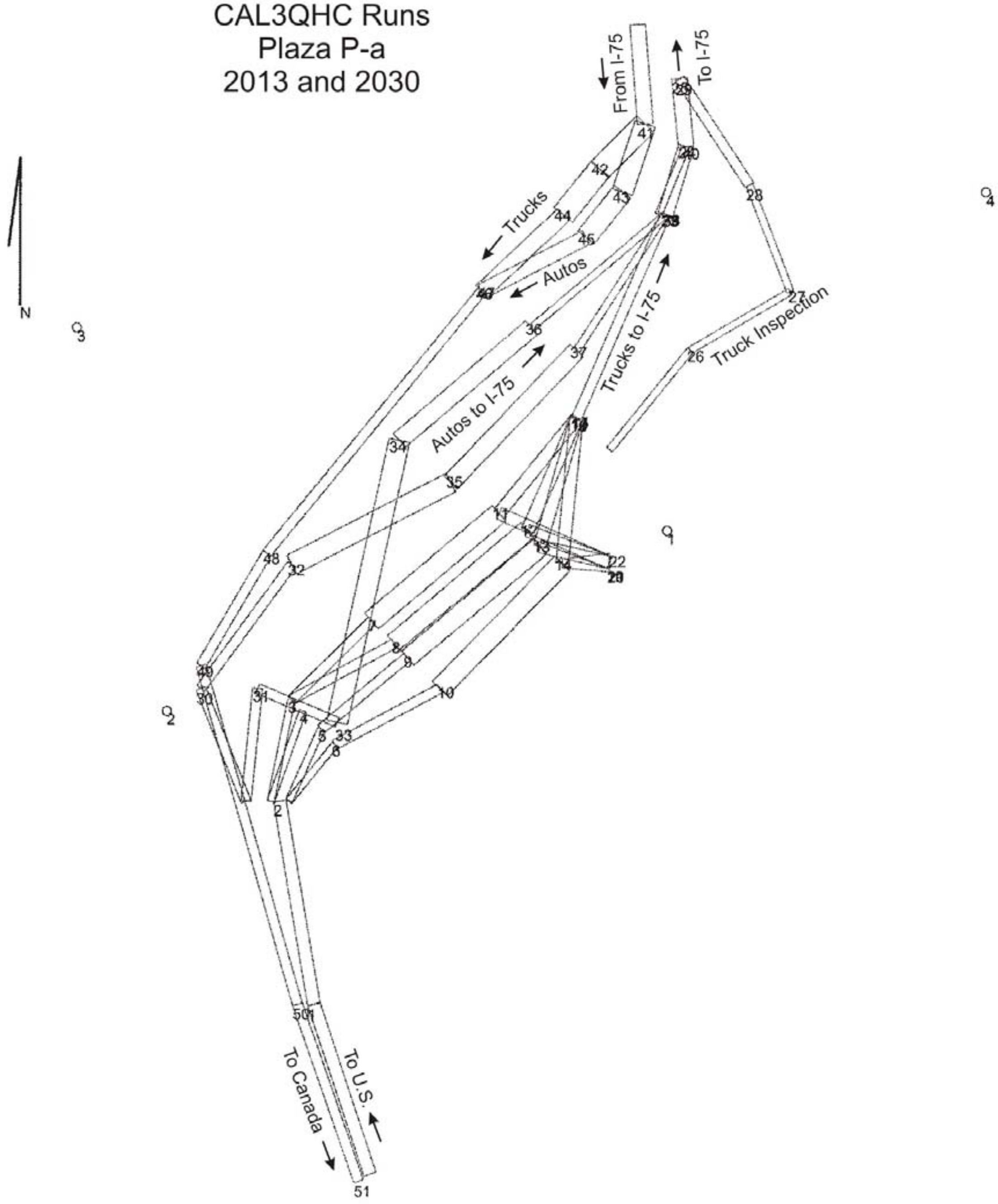
MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 20.-370.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1
20.	.0
30.	.0
40.	.0
50.	.0
60.	.1
70.	1.4
80.	2.5
90.	2.4
100.	2.4
110.	2.0
120.	2.0
130.	1.9
140.	1.9
150.	1.8
160.	2.0
170.	2.0
180.	2.1
190.	2.1
200.	2.5
210.	2.5
220.	2.4
230.	1.1
240.	.1
250.	.0
260.	.0
270.	.0
280.	.0
290.	.0
300.	.0
310.	.0
320.	.0
330.	.0
340.	.0
350.	.0
360.	.0
10.	.0
MAX	2.5
DEGR.	80

THE HIGHEST CONCENTRATION OF 2.50 PPM OCCURRED AT RECEPTOR REC1 .


CAL3QHC Runs
Plaza P-a
2013 and 2030
From I-75
To I-75
Trucks
Autos
Autos to I-75
Trucks to I-75
Truck Inspection
N
To Canada
To U.S.

JOB: DRIC Pract Alt 1 Plaza 2013 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:46:13

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 11. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
1. 0	200.0	-1650.0	-48.0	-900.0	790.	342.	BR	435.	13.6	.0	56.0
2. 1	-48.0	-900.0	-200.0	.0	913.	350.	AG	435.	11.6	.0	56.0
3. 2	-240.0	.0	-150.0	450.0	459.	11.	AG	60.	1.3	.0	32.0
4. 3	-240.0	.0	-100.0	400.0	424.	19.	AG	60.	1.3	.0	32.0
5. 4	-160.0	.0	-20.0	320.0	349.	24.	AG	60.	1.3	.0	32.0
6. 5	-160.0	.0	40.0	250.0	320.	39.	AG	60.	1.3	.0	32.0
7. 6	-150.0	450.0	200.0	800.0	495.	45.	AG	60.	2.5	.0	44.0
8. 7	-150.0	450.0	300.0	700.0	515.	61.	AG	60.	2.5	.0	44.0
9. 8	-20.0	320.0	356.0	640.0	494.	50.	AG	60.	2.5	.0	44.0
10. 9	40.0	250.0	500.0	500.0	524.	61.	AG	60.	2.5	.0	44.0
11. 10	200.0	800.0	759.0	1278.0	736.	49.	AG	60.	2.5	.0	92.0
12. 11	300.0	700.0	885.0	1202.0	771.	49.	AG	60.	2.5	.0	92.0
13. 12	356.0	640.0	940.0	1132.0	764.	50.	AG	60.	2.5	.0	92.0
14. 13	500.0	500.0	1038.0	1056.0	774.	44.	AG	60.	2.5	.0	92.0
15. 18	759.0	1278.0	1100.0	1700.0	543.	39.	AG	55.	8.3	.0	56.0
16. 19	885.0	1202.0	1100.0	1700.0	542.	23.	AG	55.	8.3	.0	56.0
17. 20	940.0	1132.0	1100.0	1700.0	590.	16.	AG	55.	8.3	.0	56.0
18. 21	1038.0	1056.0	1100.0	1700.0	647.	5.	AG	55.	8.3	.0	56.0
19. 22	759.0	1278.0	1246.0	1060.0	534.	114.	AG	5.	2.5	.0	56.0
20. 23	885.0	1202.0	1246.0	1060.0	388.	111.	AG	5.	2.5	.0	56.0
21. 24	940.0	1132.0	1246.0	1060.0	314.	103.	AG	5.	2.5	.0	56.0
22. 25	1038.0	1056.0	1246.0	1060.0	208.	89.	AG	5.	2.5	.0	56.0
23. 26	1100.0	1700.0	1490.0	2600.0	981.	23.	AG	241.	1.3	.0	44.0
24. 27	1490.0	2600.0	1580.0	2900.0	313.	17.	AG	435.	11.8	.0	68.0
25. 28	1580.0	2900.0	1550.0	3200.0	301.	354.	AG	435.	11.8	.0	68.0
26. 29	1246.0	1560.0	1600.0	2000.0	565.	39.	AG	20.	2.5	.0	32.0
27. 30	1600.0	2000.0	2040.0	2260.0	511.	59.	AG	20.	2.5	.0	32.0
28. 31	2040.0	2260.0	1860.0	2730.0	503.	339.	AG	20.	2.5	.0	32.0
29. 32	1860.0	2730.0	1550.0	3200.0	563.	327.	AG	20.	1.3	.0	44.0
30. 33	-350.0	.0	-550.0	500.0	539.	338.	AG	100.	6.5	.0	44.0
31. 34	-350.0	.0	-300.0	500.0	502.	6.	AG	100.	6.5	.0	44.0
32. 35	-550.0	500.0	-150.0	1050.0	680.	36.	AG	100.	9.7	.0	44.0
33. 36	-300.0	500.0	50.0	350.0	381.	113.	AG	97.	9.7	.0	44.0
34. 37	50.0	350.0	320.0	1600.0	1279.	12.	AG	97.	56.2	.0	92.0
35. 38	-150.0	1050.0	546.0	1414.0	785.	62.	AG	97.	56.2	.0	92.0
36. 39	320.0	1600.0	900.0	2100.0	766.	49.	AG	97.	9.7	.0	80.0
37. 40	546.0	1414.0	1100.0	2000.0	806.	43.	AG	97.	9.7	.0	80.0
38. 41	900.0	2100.0	1490.0	2600.0	773.	50.	AG	97.	6.5	.0	32.0
39. 42	1100.0	2000.0	1490.0	2600.0	716.	33.	AG	97.	6.5	.0	32.0
40. 43	1460.0	2600.0	1580.0	2900.0	323.	22.	AG	97.	6.5	.0	32.0
41. 44	1365.0	3440.0	1400.0	3000.0	441.	175.	AG	1464.	12.2	.0	68.0
42. 45	1400.0	3000.0	1200.0	2800.0	283.	225.	AG	1464.	14.6	.0	****
43. 46	1400.0	3000.0	1300.0	2700.0	316.	198.	AG	1464.	14.6	.0	92.0
44. 47	1200.0	2800.0	1040.0	2600.0	256.	219.	AG	1464.	70.6	.0	****

JOB: DRIC Pract Alt 1 Plaza 2013 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:46:13

LINK VARIABLES

LINK DESCRIPTION	*	X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
45. 48	*	1300.0	2700.0	1140.0	2500.0	*	256.	219.	AG	1464.	70.6	.0	92.0
46. 49	*	1040.0	2600.0	680.0	2260.0	*	495.	227.	AG	1464.	12.2	.0	74.0
47. 50	*	1140.0	2500.0	680.0	2260.0	*	519.	242.	AG	1464.	12.2	.0	68.0
48. 51	*	680.0	2260.0	-260.0	1100.0	*	1493.	219.	AG	1464.	11.6	.0	44.0
49. 52	*	-260.0	1100.0	-550.0	600.0	*	578.	210.	AG	1464.	11.6	.0	44.0
50. 53	*	-550.0	600.0	-120.0	-900.0	*	1560.	164.	AG	1464.	11.6	.0	44.0
51. 54	*	-120.0	-900.0	150.0	-1680.0	*	825.	161.	BR	1464.	13.6	.0	44.0

0 PAGE

JOB: DRIC Pract Alt 1 Plaza 2013 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:46:13

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. Rec 1 (Ft Wayne)	*	1500.0	1200.0	6.0	*
2. Rec 2 (Post)	*	-700.0	400.0	6.0	*
3. Rec 3 (SWHS)	*	-1100.0	2100.0	6.0	*
4. Rec 4 (East)	*	2900.0	2700.0	6.0	*

JOB: DRIC Pract Alt 1 Plaza 2013 RUN: DRIC PA 1

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	.0	.0	.0	.0
10.	.0	.0	.0	.0
20.	.0	.1	.0	.0
30.	.0	.6	.0	.0
40.	.0	.8	.0	.0
50.	.0	.2	.0	.0
60.	.0	.2	.0	.0
70.	.0	.2	.1	.0
80.	.0	.2	.2	.0
90.	.0	.2	.1	.0
100.	.0	.2	.1	.0
110.	.0	.2	.1	.0
120.	.0	.2	.1	.0
130.	.0	.2	.1	.0
140.	.0	.3	.0	.0
150.	.0	.4	.1	.0
160.	.0	.2	.1	.0
170.	.0	.0	.0	.0
180.	.0	.0	.0	.0
190.	.0	.0	.0	.0
200.	.0	.0	.0	.0
210.	.0	.0	.0	.0
220.	.0	.0	.0	.0
230.	.0	.0	.0	.0
240.	.0	.0	.0	.0
250.	.0	.0	.0	.1
260.	.0	.0	.0	.2
270.	.1	.0	.0	.4
280.	.1	.0	.0	.0
290.	.1	.0	.0	.1
300.	.1	.0	.0	.0
310.	.1	.0	.0	.0
320.	.0	.0	.0	.0
330.	.2	.0	.0	.0
340.	.3	.0	.0	.0
350.	.4	.0	.0	.0
360.	.0	.0	.0	.0
MAX	.4	.8	.2	.4
DEGR.	350	40	80	270

THE HIGHEST CONCENTRATION OF .80 PPM OCCURRED AT RECEPTOR REC2 .

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE

JOB: DRIC Pract Alt 1 Plaza 2030 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:56:50

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 11. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
1. 0	200.0	-1650.0	-48.0	-900.0	790.	342.	BR	572.	9.6	.0	56.0
2. 1	-48.0	-900.0	-200.0	.0	913.	350.	AG	572.	9.6	.0	56.0
3. 2	-240.0	.0	-150.0	450.0	459.	11.	AG	84.	.3	.0	32.0
4. 3	-240.0	.0	-100.0	400.0	424.	19.	AG	84.	.3	.0	32.0
5. 4	-160.0	.0	-20.0	320.0	349.	24.	AG	84.	.3	.0	32.0
6. 5	-160.0	.0	40.0	250.0	320.	39.	AG	84.	.3	.0	32.0
7. 6	-150.0	450.0	200.0	800.0	495.	45.	AG	84.	.6	.0	44.0
8. 7	-150.0	450.0	300.0	700.0	515.	61.	AG	84.	.6	.0	44.0
9. 8	-20.0	320.0	356.0	640.0	494.	50.	AG	84.	.6	.0	44.0
10. 9	40.0	250.0	500.0	500.0	524.	61.	AG	84.	.6	.0	44.0
11. 10	200.0	800.0	759.0	1278.0	736.	49.	AG	84.	.6	.0	92.0
12. 11	300.0	700.0	885.0	1202.0	771.	49.	AG	84.	.6	.0	92.0
13. 12	356.0	640.0	940.0	1132.0	764.	50.	AG	84.	.6	.0	92.0
14. 13	500.0	500.0	1038.0	1056.0	774.	44.	AG	84.	.6	.0	92.0
15. 18	759.0	1278.0	1100.0	1700.0	543.	39.	AG	79.	2.1	.0	56.0
16. 19	885.0	1202.0	1100.0	1700.0	542.	23.	AG	79.	2.1	.0	56.0
17. 20	940.0	1132.0	1100.0	1700.0	590.	16.	AG	79.	2.1	.0	56.0
18. 21	1038.0	1056.0	1100.0	1700.0	647.	5.	AG	79.	2.1	.0	56.0
19. 22	759.0	1278.0	1246.0	1060.0	534.	114.	AG	5.	1.1	.0	56.0
20. 23	885.0	1202.0	1246.0	1060.0	388.	111.	AG	5.	1.1	.0	56.0
21. 24	940.0	1132.0	1246.0	1060.0	314.	103.	AG	5.	1.1	.0	56.0
22. 25	1038.0	1056.0	1246.0	1060.0	208.	89.	AG	5.	1.1	.0	56.0
23. 26	1100.0	1700.0	1490.0	2600.0	981.	23.	AG	334.	.3	.0	44.0
24. 27	1490.0	2600.0	1580.0	2900.0	313.	17.	AG	572.	2.1	.0	68.0
25. 28	1580.0	2900.0	1550.0	3200.0	301.	354.	AG	572.	2.1	.0	68.0
26. 29	1246.0	1560.0	1600.0	2000.0	565.	39.	AG	20.	.6	.0	32.0
27. 30	1600.0	2000.0	2040.0	2260.0	511.	59.	AG	20.	.6	.0	32.0
28. 31	2040.0	2260.0	1860.0	2730.0	503.	339.	AG	20.	.6	.0	32.0
29. 32	1860.0	2730.0	1550.0	3200.0	563.	327.	AG	20.	.6	.0	44.0
30. 33	-350.0	.0	-550.0	500.0	539.	338.	AG	119.	4.9	.0	44.0
31. 34	-350.0	.0	-300.0	500.0	502.	6.	AG	119.	4.9	.0	44.0
32. 35	-550.0	500.0	-150.0	1050.0	680.	36.	AG	119.	7.4	.0	44.0
33. 36	-300.0	500.0	50.0	350.0	381.	113.	AG	119.	7.4	.0	44.0
34. 37	50.0	350.0	320.0	1600.0	1279.	12.	AG	119.	56.2	.0	92.0
35. 38	-150.0	1050.0	546.0	1414.0	785.	62.	AG	119.	56.2	.0	92.0
36. 39	320.0	1600.0	900.0	2100.0	766.	49.	AG	119.	7.4	.0	80.0
37. 40	546.0	1414.0	1100.0	2000.0	806.	43.	AG	119.	7.4	.0	80.0
38. 41	900.0	2100.0	1490.0	2600.0	773.	50.	AG	119.	4.9	.0	32.0
39. 42	1100.0	2000.0	1490.0	2600.0	716.	33.	AG	119.	4.9	.0	32.0
40. 43	1460.0	2600.0	1580.0	2900.0	323.	22.	AG	119.	4.9	.0	32.0
41. 44	1365.0	3440.0	1400.0	3000.0	441.	175.	AG	1805.	10.2	.0	68.0
42. 45	1400.0	3000.0	1200.0	2800.0	283.	225.	AG	1805.	12.0	.0	****
43. 46	1400.0	3000.0	1300.0	2700.0	316.	198.	AG	1805.	12.0	.0	92.0
44. 47	1200.0	2800.0	1040.0	2600.0	256.	219.	AG	1805.	49.0	.0	****

JOB: DRIC Pract Alt 1 Plaza 2030 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:56:50

LINK VARIABLES

LINK DESCRIPTION	*	X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)
45. 48	*	1300.0	2700.0	1140.0	2500.0	*	256.	219.	AG	1805.	49.0	.0	92.0
46. 49	*	1040.0	2600.0	680.0	2260.0	*	495.	227.	AG	1805.	10.2	.0	74.0
47. 50	*	1140.0	2500.0	680.0	2260.0	*	519.	242.	AG	1805.	10.2	.0	68.0
48. 51	*	680.0	2260.0	-260.0	1100.0	*	1493.	219.	AG	1805.	9.6	.0	44.0
49. 52	*	-260.0	1100.0	-550.0	600.0	*	578.	210.	AG	1805.	9.6	.0	44.0
50. 53	*	-550.0	600.0	-120.0	-900.0	*	1560.	164.	AG	1805.	9.6	.0	44.0
51. 54	*	-120.0	-900.0	150.0	-1680.0	*	825.	161.	BR	1805.	9.6	.0	44.0

JOB: DRIC Pract Alt 1 Plaza 2030 RUN: DRIC PA 1

DATE : 7/26/ 7
TIME : 11:56:50

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	*	X	Y	Z	*
1. Rec 1 (Ft. Wayne)	*	1500.0	1200.0	6.0	*
2. Rec 2 (Post)	*	-700.0	400.0	6.0	*
3. Rec 3 (SWHS)	*	-1100.0	2100.0	6.0	*
4. Rec 4 (East)	*	2900.0	2700.0	6.0	*

JOB: DRIC Pract Alt 1 Plaza 2030 RUN: DRIC PA 1

MODEL RESULTS

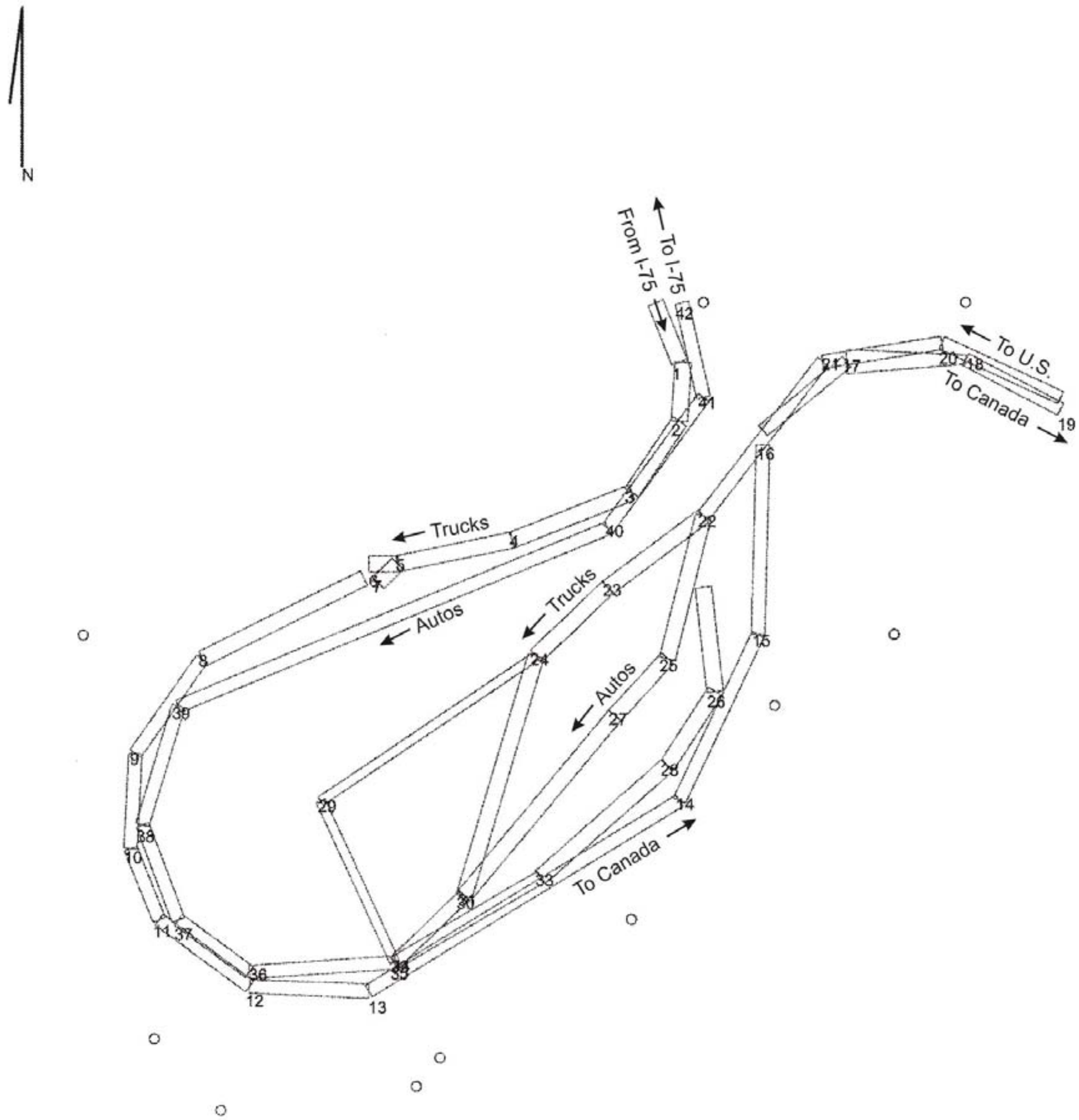
REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	*	.0	.0	.0	.0
10.	*	.0	.0	.0	.0
20.	*	.0	.1	.0	.0
30.	*	.0	.6	.0	.0
40.	*	.0	.8	.0	.0
50.	*	.0	.3	.0	.0
60.	*	.0	.2	.0	.0
70.	*	.0	.2	.1	.0
80.	*	.0	.2	.4	.0
90.	*	.0	.2	.1	.0
100.	*	.0	.2	.1	.0
110.	*	.0	.2	.1	.0
120.	*	.0	.2	.1	.0
130.	*	.0	.2	.1	.0
140.	*	.0	.3	.0	.0
150.	*	.0	.3	.1	.0
160.	*	.0	.2	.1	.0
170.	*	.0	.0	.0	.0
180.	*	.0	.0	.0	.0
190.	*	.0	.0	.0	.0
200.	*	.0	.0	.0	.0
210.	*	.0	.0	.0	.0
220.	*	.0	.0	.0	.0
230.	*	.0	.0	.0	.0
240.	*	.0	.0	.0	.0
250.	*	.0	.0	.0	.1
260.	*	.0	.0	.0	.2
270.	*	.1	.0	.0	.3
280.	*	.1	.0	.0	.0
290.	*	.1	.0	.0	.1
300.	*	.1	.0	.0	.0
310.	*	.1	.0	.0	.0
320.	*	.0	.0	.0	.0
330.	*	.2	.0	.0	.0
340.	*	.3	.0	.0	.0
350.	*	.4	.0	.0	.0
360.	*	.0	.0	.0	.0
MAX	*	.4	.8	.4	.3
DEGR.	*	350	40	80	270

THE HIGHEST CONCENTRATION OF .80 PPM OCCURRED AT RECEPTOR REC2 .

CAL3QHC Runs
Plaza P-c
2013 and 2030



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CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1

JOB: DRIC                                          RUN: ALT 7 2013

DATE :  7/26/ 7
TIME : 13: 9:41

  The MODE flag has been set to C for calculating CO averages.

 SITE & METEOROLOGICAL VARIABLES
 -------------------------------
 VS =   0.0 CM/S      VD =   0.0 CM/S       Z0 = 175. CM
  U =  1.0 M/S        CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  0.0 PPM

 LINK VARIABLES
 --------------
  LINK DESCRIPTION     *         LINK COORDINATES (FT)          *   LENGTH  BRG TYPE  VPH    EF      H    W     V/C
QUEUE
                       *   X1        Y1        X2        Y2     *    (FT)  (DEG)          (G/MI)  (FT) (FT)
(VEH)
---------------------------*-----------------------------------------
*-------------------------------------------------------------
  1. Cars & Trucks to Can*  1700.0    3000.0    1815.0    2750.0 *    275.   155. AG    954.  11.6    0.0 68.0
  2. Cars & Trucks to Can*  1815.0    2750.0    1800.0    2500.0 *    250.   183. AG    954.  11.6    0.0 68.0
  3. Cars & Trucks to Can*  1800.0    2500.0    1600.0    2200.0 *    361.   214. AG    954.  11.6    0.0 68.0
  4. Cars & Trucks approa*  1600.0    2200.0    1100.0    2000.0 *    539.   248. AG    954.  11.8    0.0 68.0
  5. Cars & Trucks approa*  1100.0    2000.0     620.0    1900.0 *    490.   258. AG    954.  12.2    0.0 68.0
  6. Cars & Trucks at Tol*   620.0    1900.0     500.0    1900.0 *    120.   270. AG    477.  84.0    0.0 ****
  7. Cars & Trucks at tol*   620.0    1900.0     540.0    1820.0 *    113.   225. AG    477.  84.0    0.0 ****
  8. Cars & Trucks leavin*   480.0    1840.0    -200.0    1500.0 *    760.   243. AG    954.  12.2    0.0 ****
  9. Cars & Trucks, 35mph*  -200.0    1500.0    -480.0    1100.0 *    488.   215. AG    954.  11.6    0.0 56.0
 10. 10 cars & trucks, 35*  -480.0    1100.0    -500.0     700.0 *    400.   183. AG    954.  11.6    0.0 56.0
 11. 11 cars & trucks, 35*  -500.0     700.0    -380.0     400.0 *    323.   158. AG    954.  11.6    0.0 56.0
 12. 12 cars & trucks, 35*  -380.0     400.0       0.0     120.0 *    472.   126. AG    954.  11.6    0.0 56.0
 13. 13                  *     0.0     120.0     500.0     100.0 *    500.    92. AG    970.  11.6    0.0 56.0
 14. 14                  *   500.0     100.0    1800.0     900.0 *   1526.    58. AG    970.  11.6    0.0 56.0
 15. 15                  *  1800.0     900.0    2130.0    1600.0 *    774.    25. AG    970.  11.6    0.0 56.0
 16. 16                  *  2130.0    1600.0    2150.0    2400.0 *    800.     1. AG    970.  11.6    0.0 56.0
 17. 17                  *  2150.0    2460.0    2500.0    2750.0 *    455.    50. AG    970.  11.6    0.0 56.0
 18. 18                  *  2500.0    2750.0    3000.0    2760.0 *    500.    89. AG    970.  11.6    0.0 56.0
 19. 19                  *  3000.0    2760.0    3400.0    2550.0 *    452.   118. AG    970.  11.6    0.0 56.0
 20. 20 cars/trucks to US*  3400.0    2600.0    2900.0    2830.0 *    550.   295. AG    312.  11.6    0.0 56.0
 21. 21                  *  2900.0    2830.0    2400.0    2750.0 *    506.   261. AG    312.  11.6    0.0 56.0
 22. 22                  *  2400.0    2750.0    1900.0    2100.0 *    820.   218. AG    312.  11.6    0.0 56.0
 23. 23 trucks appr custo*  1900.0    2100.0    1500.0    1800.0 *    500.   233. AG    162.   2.5    0.0 ****
 24. 24 trucks at customs*  1500.0    1800.0    1200.0    1510.0 *    417.   226. AG    162.   8.8    0.0 ****
 25.  25 cars appr custom*  1900.0    2100.0    1750.0    1500.0 *    618.   194. AG    150.   7.0    0.0 68.0
 26. 26 cars appr custom,*  1900.0    1800.0    1950.0    1360.0 *    443.   174. AG    150.   7.0    0.0 68.0
 27. 27 cars at customs  *  1750.0    1500.0    1530.0    1260.0 *    326.   223. AG     75.  56.2    0.0 ****
 28. 28 cars at customs  *  1950.0    1360.0    1750.0    1050.0 *    369.   213. AG     75.  56.2    0.0 ****
 29. 29 trucks to vac, 10*  1200.0    1510.0     300.0     900.0 *   1087.   236. AG     81.   2.5    0.0 40.0
 30. 30 trucks bypass vac*  1200.0    1510.0     900.0     500.0 *   1054.   197. AG     81.   2.5    0.0 ****
 31. 31 cars depart custo*  1530.0    1260.0     900.0     500.0 *    987.   220. AG     75.   7.0    0.0 ****
 32. 32 cars/trucks, 20mp*   900.0     500.0     610.0     220.0 *    403.   226. AG    156.  12.2    0.0 56.0
 33. 33 cars from customs*  1750.0    1050.0    1220.0     580.0 *    708.   228. AG     75.   7.0    0.0 68.0
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34. 34 cars from customs*   1220.0     580.0     610.0     220.0 *    708.   239. AG     75.   7.0    0.0 56.0
35. 35 trucks from vac a*    300.0     900.0     610.0     220.0 *    747.   155. AG    167.   1.3    0.0 40.0
36. 36 cars\trucks, 20mp*    610.0     220.0       0.0     180.0 *    611.   266. AG    312.  12.2    0.0 56.0
37. 37                  *      0.0     180.0    -300.0     400.0 *    372.   306. AG    312.  12.2    0.0 56.0
38. 38                  *   -300.0     400.0    -450.0     800.0 *    427.   339. AG    312.  12.2    0.0 56.0
39. 39                  *   -450.0     800.0    -300.0    1300.0 *    522.    17. AG    312.  12.2    0.0 56.0
40. 40 35mph            *   -300.0    1300.0    1500.0    2050.0 *   1950.    67. AG    312.  11.6    0.0 56.0
41. 41                  *   1500.0    2050.0    1900.0    2600.0 *    680.    36. AG    312.  11.6    0.0 56.0
42. 42                  *   1900.0    2600.0    1810.0    3000.0 *    410.   347. AG    312.  11.6    0.0 56.0
43. Brigdge             *   4180.0    1100.0    3400.0    2600.0 *   1691.   333. BR    312.  11.6    6.0 56.0
44. Bridge              *   4115.0    1100.0    3400.0    2550.0 *   1617.   334. BR    970.  11.6    6.0 56.0
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JOB: DRIC

RUN: ALT 7 2013

DATE : 7/26/ 7
TIME : 13: 9:41

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec 1 (Ft. Wayne)	1900.0	700.0	6.0
2. Rec 2 (Post)	-400.0	-100.0	6.0
3. Rec 3 (SWHS)	-700.0	1600.0	6.0
4. Rec 4 (East)	3800.0	2700.0	6.0

JOB: DRIC

RUN: ALT 7 2013

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.1	0.0	0.0	0.0
10.	0.1	0.0	0.0	0.0
20.	0.1	0.1	0.0	0.0
30.	0.0	0.1	0.0	0.0
40.	0.0	0.1	0.0	0.0
50.	0.0	0.1	0.0	0.0
60.	0.0	0.0	0.0	0.0
70.	0.0	0.2	0.0	0.0
80.	0.0	0.0	0.1	0.0
90.	0.0	0.0	0.1	0.0
100.	0.0	0.0	0.1	0.0
110.	0.0	0.0	0.0	0.0
120.	0.0	0.0	0.1	0.0
130.	0.0	0.0	0.1	0.0
140.	0.0	0.0	0.1	0.0
150.	0.0	0.0	0.0	0.0
160.	0.0	0.0	0.0	0.0
170.	0.0	0.0	0.0	0.0
180.	0.0	0.0	0.0	0.1
190.	0.0	0.0	0.0	0.1
200.	0.0	0.0	0.0	0.1
210.	0.0	0.0	0.0	0.1
220.	0.0	0.0	0.0	0.1
230.	0.0	0.0	0.0	0.1
240.	0.0	0.0	0.0	0.0
250.	0.1	0.0	0.0	0.0
260.	0.1	0.0	0.0	0.1
270.	0.1	0.0	0.0	0.1
280.	0.1	0.0	0.0	0.0
290.	0.1	0.0	0.0	0.0
300.	0.1	0.0	0.0	0.0
310.	0.1	0.0	0.0	0.0
320.	0.1	0.0	0.0	0.0
330.	0.1	0.0	0.0	0.0
340.	0.1	0.0	0.0	0.0
350.	0.1	0.0	0.0	0.0
360.	0.1	0.0	0.0	0.0
MAX	0.1	0.2	0.1	0.1
DEGR.	0	70	80	180

THE HIGHEST CONCENTRATION OF 0.20 PPM OCCURRED AT RECEPTOR REC2 .

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: DRIC

RUN: ALT 7 2030

DATE : 7/26/ 7
TIME : 13:44: 0

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

```
VS =   0.0 CM/S       VD =   0.0 CM/S        Z0 = 175. CM
 U =  1.0 M/S         CLAS =   4  (D)      ATIM =  60. MINUTES      MIXH =  1000. M    AMB =  0.0 PPM
```

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Cars & Trucks to Can*	1700.0	3000.0	1815.0	2750.0 *	275.	155.	AG	1380.	9.6	0.0	68.0		
2. Cars & Trucks to Can*	1815.0	2750.0	1800.0	2500.0 *	250.	183.	AG	1380.	9.6	0.0	68.0		
3. Cars & Trucks to Can*	1800.0	2500.0	1600.0	2200.0 *	361.	214.	AG	1380.	9.6	0.0	68.0		
4. Cars & Trucks approa*	1600.0	2200.0	1100.0	2000.0 *	539.	248.	AG	1380.	9.8	0.0	68.0		
5. Cars & Trucks approa*	1100.0	2000.0	620.0	1900.0 *	490.	258.	AG	1380.	12.0	0.0	68.0		
6. Cars & Trucks at Tol*	620.0	1900.0	500.0	1900.0 *	120.	270.	AG	690.	49.0	0.0	****		
7. Cars & Trucks at tol*	620.0	1900.0	540.0	1820.0 *	113.	225.	AG	690.	49.0	0.0	****		
8. Cars & Trucks leavin*	480.0	1840.0	-200.0	1500.0 *	760.	243.	AG	1380.	10.2	0.0	****		
9. Cars & Trucks, 35mph*	-200.0	1500.0	-480.0	1100.0 *	488.	215.	AG	1380.	9.6	0.0	56.0		
10. 10 cars & trucks, 35*	-480.0	1100.0	-500.0	700.0 *	400.	183.	AG	1380.	9.6	0.0	56.0		
11. 11 cars & trucks, 35*	-500.0	700.0	-380.0	400.0 *	323.	158.	AG	1380.	9.6	0.0	56.0		
12. 12 cars & trucks, 35*	-380.0	400.0	0.0	120.0 *	472.	126.	AG	1380.	9.6	0.0	56.0		
13. 13 *	0.0	120.0	500.0	100.0 *	500.	92.	AG	1380.	9.6	0.0	56.0		
14. 14 *	500.0	100.0	1800.0	900.0 *	1526.	58.	AG	1380.	9.6	0.0	56.0		
15. 15 *	1800.0	900.0	2130.0	1600.0 *	774.	25.	AG	1380.	9.6	0.0	56.0		
16. 16 *	2130.0	1600.0	2150.0	2400.0 *	800.	1.	AG	1380.	9.6	0.0	56.0		
17. 17 *	2150.0	2460.0	2500.0	2750.0 *	455.	50.	AG	1380.	9.6	0.0	56.0		
18. 18 *	2500.0	2750.0	3000.0	2760.0 *	500.	89.	AG	1380.	9.6	0.0	56.0		
19. 19 *	3000.0	2760.0	3400.0	2550.0 *	452.	118.	AG	1380.	9.6	0.0	56.0		
20. 20 cars/trucks to US*	3400.0	2600.0	2900.0	2830.0 *	550.	295.	AG	431.	9.6	0.0	56.0		
21. 21 *	2900.0	2830.0	2400.0	2750.0 *	506.	261.	AG	431.	9.6	0.0	56.0		
22. 22 *	2400.0	2750.0	1900.0	2100.0 *	820.	218.	AG	431.	9.6	0.0	56.0		
23. 23 trucks appr custo*	1900.0	2100.0	1500.0	1800.0 *	500.	233.	AG	239.	0.6	0.0	****		
24. 24 trucks at customs*	1500.0	1800.0	1200.0	1510.0 *	417.	226.	AG	239.	2.1	0.0	****		
25. 25 cars appr custom*	1900.0	2100.0	1750.0	1500.0 *	618.	194.	AG	192.	7.4	0.0	68.0		
26. 26 cars appr custom,*	1900.0	1800.0	1950.0	1360.0 *	443.	174.	AG	192.	7.4	0.0	68.0		
27. 27 cars at customs *	1750.0	1500.0	1530.0	1260.0 *	326.	223.	AG	96.	42.8	0.0	****		
28. 28 cars at customs *	1950.0	1360.0	1750.0	1050.0 *	369.	213.	AG	96.	42.8	0.0	****		
29. 29 trucks to vac, 10*	1200.0	1510.0	300.0	900.0 *	1087.	236.	AG	120.	0.6	0.0	40.0		
30. 30 trucks bypass vac*	1200.0	1510.0	900.0	500.0 *	1054.	197.	AG	120.	0.6	0.0	****		
31. 31 cars depart custo*	1530.0	1260.0	900.0	500.0 *	987.	220.	AG	96.	5.3	0.0	****		
32. 32 cars/trucks, 20mp*	900.0	500.0	610.0	220.0 *	403.	226.	AG	431.	10.2	0.0	56.0		

33.	33 cars from customs	*	1750.0	1050.0	1220.0	580.0	*	708.	228.	AG	96.	5.3	0.0 68.0
34.	34 cars from customs	*	1220.0	580.0	610.0	220.0	*	708.	239.	AG	96.	5.3	0.0 56.0
35.	35 trucks from vac a	*	300.0	900.0	610.0	220.0	*	747.	155.	AG	239.	0.3	0.0 40.0
36.	36 cars\trucks, 20mp	*	610.0	220.0	0.0	180.0	*	611.	266.	AG	431.	10.2	0.0 56.0
37.	37	*	0.0	180.0	-300.0	400.0	*	372.	306.	AG	431.	10.2	0.0 56.0
38.	38	*	-300.0	400.0	-450.0	800.0	*	427.	339.	AG	431.	10.2	0.0 56.0
39.	39	*	-450.0	800.0	-300.0	1300.0	*	522.	17.	AG	431.	10.2	0.0 56.0
40.	40 35mph	*	-300.0	1300.0	1500.0	2050.0	*	1950.	67.	AG	431.	9.6	0.0 56.0
41.	41	*	1500.0	2050.0	1900.0	2600.0	*	680.	36.	AG	431.	9.6	0.0 56.0
42.	42	*	1900.0	2600.0	1810.0	3000.0	*	410.	347.	AG	431.	9.6	0.0 56.0
43.	Bridge	*	4180.0	1100.0	3400.0	2600.0	*	1691.	333.	BR	312.	9.6	6.0 56.0
44.	bridge	*	4115.0	1100.0	3400.0	2550.0	*	1617.	334.	BR	1380.	9.6	6.0 56.0

JOB: DRIC RUN: ALT 7 2030 PAGE 2

DATE : 7/26/ 7
TIME : 13:44: 0

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec 1 (Ft. Wayne)	1900.0	700.0	6.0
2. Rec 2 (Post)	-400.0	-100.0	6.0
3. Rec 3 (SWHS)	-700.0	1600.0	6.0
4. Rec 4 (East)	3800.0	2700.0	6.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.2	0.1	0.0	0.0
10.	0.1	0.1	0.0	0.0
20.	0.1	0.1	0.0	0.0
30.	0.0	0.1	0.0	0.0
40.	0.0	0.1	0.0	0.0
50.	0.0	0.1	0.0	0.0
60.	0.0	0.1	0.0	0.0
70.	0.0	0.2	0.0	0.0
80.	0.0	0.1	0.1	0.0
90.	0.0	0.0	0.1	0.0
100.	0.0	0.0	0.1	0.0
110.	0.0	0.0	0.1	0.0
120.	0.0	0.0	0.1	0.0
130.	0.0	0.0	0.1	0.0
140.	0.0	0.0	0.1	0.0
150.	0.0	0.0	0.0	0.0
160.	0.0	0.0	0.1	0.0
170.	0.0	0.0	0.0	0.1
180.	0.0	0.0	0.0	0.1
190.	0.0	0.0	0.0	0.1
200.	0.0	0.0	0.0	0.1
210.	0.0	0.0	0.0	0.1
220.	0.0	0.0	0.0	0.1
230.	0.0	0.0	0.0	0.1
240.	0.0	0.0	0.0	0.1
250.	0.1	0.0	0.0	0.0
260.	0.1	0.0	0.0	0.1
270.	0.1	0.0	0.0	0.1
280.	0.1	0.0	0.0	0.0
290.	0.1	0.0	0.0	0.0
300.	0.1	0.0	0.0	0.0
310.	0.1	0.0	0.0	0.0
320.	0.1	0.0	0.0	0.0
330.	0.2	0.0	0.0	0.0
340.	0.1	0.0	0.0	0.0
350.	0.1	0.0	0.0	0.0
360.	0.2	0.1	0.0	0.0
MAX	0.2	0.2	0.1	0.1
DEGR.	0	70	80	170

THE HIGHEST CONCENTRATION OF 0.20 PPM OCCURRED AT RECEPTOR REC1 .

Appendix F

Draft Weight of Evidence for the Southeast Michigan $PM_{2.5}$ Attainment Strategy

Prepared by SEMCOG and MDEQ

November 6, 2007

DRAFT
Weight of Evidence for the Southeast Michigan PM2.5 Attainment Strategy
Prepared by SEMCOG and MDEQ

November 6, 2007

I. **Inventory**:

a) Quantification of fine particulate matter (PM2.5) emissions is still evolving. Techniques for measuring these emissions are still being evaluated and debated. Much of the current inventory cannot be measured directly. It must instead be estimated through other methods such as factoring total PM emissions or use of activity levels and emission factors.

b) Our understanding of how much PM2.5 is primary (directly emitted) versus secondary (formed in the atmosphere), and how fast secondary formation takes place is limited. Current analyses based on ambient monitoring data indicate that PM2.5 concentrations result from both primary emissions (e.g., crustal matter, elemental carbon, and much of organic carbon), and secondary formation (e.g., ammonium sulfate, ammonium nitrate, and some of organic carbon).

c) Significant emission reductions are expected from national controls including the Clean Air Interstate Rule (CAIR) and additional motor vehicle reductions (Tier 2, the Diesel Rule and low-sulfur fuel requirements).

- EPA's Mobile6 model predicts that volatile organic compounds (VOC), oxides of nitrogen (NOx) and PM2.5 emissions from on-road mobile sources alone will be reduced by more than 50% between 2002 and 2010 in Southeast Michigan (see Figure 1).

- In addition, national stationary source controls, including CAIR and the NOx SIP call, are expected to reduce point source NOx emissions by 40% and sulfate (SO2) emissions by 15% between 2002 and 2009.

- These reductions already take into account expected economic growth and increases in travel.

- This is compelling evidence that areas in Southeast Michigan that are currently attaining the standard will remain in compliance.

d) While these reductions are already having a significant, positive impact in Southeast Michigan and will continue to do so in future, we cannot assume that they will result in attainment at Dearborn and Southwestern High School (SWHS), the two monitoring sites that are still exceeding the annual standard. Additional reductions in the vicinity of these sites are needed.

e) The area surrounding the two nonattaining monitors in Southeast Michigan contains a complex array of emission sources (see figures 2 & 3). Some of these sources may be significant contributors because their emissions occur closer to ground level and/or because of their proximity to a monitor. However, many of these are area sources that are exempt from MDEQ's emissions inventory reporting requirements so their exact contribution is unknown. In addition, many of these smaller sources have little or no emission controls while larger sources already have controls in place.

f) A number of industrial facilities in the area surrounding the Dearborn, Southwestern High School, and Wyandotte monitors have either closed or scaled back their operations since 2002 (see Table 1). These changes are likely contributing to the more rapid decrease in PM2.5 levels observed at industrial monitoring sites (see item II.s. below).

g) In addition to changes that have already taken place, significant local PM2.5 reductions will be achieved from controls that are currently being phased in at the Severstal and U.S. Steel facilities as well as the Marathon oil refinery. All three of these facilities are less than three miles from the monitors measuring the highest PM2.5 concentrations in the region - Dearborn and Southwestern High School. Based on a recent EPA study[24] as well as permit application data, MDEQ estimates these controls will provide a combined PM2.5 emission reduction of 330 tons per year.

h) There are a significant number of storage piles, unpaved lots, and parcels of barren land in the vicinity of the Dearborn and SWHS monitors. While most emissions from these sources are larger than 2.5 microns, their collective impact is cause for concern. As part of a previous particulate SIP, a number of facilities in the area do have fugitive dust plans. However, many others do not

II. Monitoring:

a) PM2.5 in Southeast Michigan is comprised largely of sulfates, nitrates, and organic carbon (see Figure 4). At the Dearborn monitoring site, there is also a significant "crustal" component, which is largely iron (Figure 5).

b) Southeast Michigan's current nonattainment designation pertains to the annual standard, not the daily standard. Developing a control strategy to address an annual standard is complicated because sources may be significant contributors on certain days or during certain times of the year but not during others. However, recent source apportionment studies show that the source contributions to PM2.5 on an annual average basis are similar to those on high PM2.5 concentration days. This suggests that a strategy designed to reduce annual average PM2.5 concentrations will also be effective in reducing high daily PM2.5 concentrations.

c) The entire Southeast Michigan area has been designated nonattainment. However, the only monitors measuring violations of the standard are located in a small portion of eastern Wayne County (see Figure 6).

d) At the time EPA made its nonattainment designations, the latest three-year average concentrations (2001-2003) showed six of Southeast Michigan's 12 PM2.5 monitors were violating the annual PM2.5 standard, five of these monitors were in eastern Wayne County and the sixth was the Luna Pier monitor in southern Monroe County.

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[24] U.S. Environmental Protection Agency, *Evaluation of PM2.5 Emissions and Controls at Two Michigan Steel Mills and a Coke Oven Battery,* February 7, 2006.

e) The latest three-year average concentrations (2004-2006) show that only two of these monitors are still violating the standard: Dearborn and SWHS (see Table 2).

f) Since 2000, PM2.5 concentrations at all sites in the region have steadily declined. The 3-year average concentration dropped 1.6 $\mu g/m^3$ between 2002 and 2006 (see Table 2). The largest decreases have occurred at the sites with the highest concentrations: Dearborn (2.69 $\mu g/m^3$), SWHS (2.16 $\mu g/m^3$), and Wyandotte (3.04 $\mu g/m^3$).

g) PM2.5 concentrations at monitoring sites in the industrial core of Southeast Michigan's nonattainment area (Dearborn, SWHS & Wyandotte) have been decreasing faster than other sites (see Figure 7). This is likely due to changes in emissions in the industrial area (see Section I.f above).

h) OC concentrations at all three Southeast Michigan sites show a statistically significant downward trend. Dearborn's reduction is the highest: 0.54 $\mu g/m^3$ reduction between 2002 and 2006 (see Table 3).

i) Despite a rise in 2005 PM2.5 concentrations in southeast Michigan and the entire Midwestern United States as a whole, there has been a strong downward trend in Southeast Michigan's PM2.5 concentrations over the last six years (see Figure 8).

j) In fact, every monitor in Southeast Michigan recorded its lowest annual average PM2.5 concentration in 2006 (see Table 4). [will add information on 2007 concentrations as it becomes available]

k) At the time Southeast Michigan was designated nonattainment, monitoring data showed the Luna Pier monitor in Monroe County was violating the annual standard. This monitor is located in the southeastern corner of the county, one mile north of the Ohio border. In its February 2004 PM2.5 nonattainment designation recommendation to EPA, MDEQ argued strongly that Monroe and Wayne counties should be designated as separate nonattainment areas because PM2.5 levels at the Luna Pier monitor tracked far more closely with those in Toledo (see Figure 9).

l) MDEQ and SEMCOG also showed that levels at the site had been decreasing in recent years and trend data indicated the monitor would likely measure attainment by the end of 2004. This was an accurate prediction. Levels at the site have continued to track those in Toledo and monitors in both areas have measured attainment of the standard since 2004. In 2005, EPA redesignated the Toledo area as attainment.

m) In addition, as of 2006, monitors at Allen Park, Linwood and Wyandotte are now measuring attainment.

n) The area where the two remaining violating monitors (Dearborn and SWHS) are located is one with a history of particulate matter problems, associated with local industrial sources. Figure 10 shows the location of these monitors relative to the former PM10 nonattainment area. As the map illustrates, the areas are nearly identical. The primary source of the former PM10 problem was determined to be a few local industrial sources.

Emissions from these sources were reduced and the region came into compliance in 1996[25].

The overlap of the Total Suspended Particulate (TSP) and PM10 nonattainment areas with the PM2.5 nonattainment area, and the successful attainment of those standards after the application of local controls, suggests that the most effective attainment strategy is to focus on local emission reductions from sources in this area.

o) Various analyses of both local and regional monitoring data all indicate that Southeast Michigan's nonattainment problem is caused by a combination of regional transport and local emissions from sources in the vicinity of the violating monitors.

1. All PM2.5 monitors in other parts of the designated Southeast Michigan nonattainment area are meeting the standard and have shown a downward trend since 2000. (see Figure 11)

2. Analysis of monitoring data shows that counties north of Wayne do not contribute to PM2.5 nonattainment at the violating monitors. The analysis shows that the vast majority of the urban excess at these monitors on days when winds are from the northeast, north or northwest, comes from within Wayne County. Little increase is attributable to Oakland and Macomb counties. And in all cases, average concentrations at the violating monitors are well below the standard when winds are from these directions (see figures 12 and 13).

3. Lake Michigan Air Directors Consortium (LADCO) analysis of rural background concentrations versus urban excess in the Midwest shows that the vast majority of PM2.5 measured in our region is coming from outside Southeast Michigan. (see Figure 14).

4. This is true for all components of PM2.5 except organic carbon (OC), which has a higher local contribution. (see Figure 15)

5. Within Southeast Michigan, organic carbon and crustal matter (mostly iron) are significantly higher at Dearborn (1.5-2.0µg/m^3), even though this monitor is less than three miles from several others (see Figure 16).

6. A wind rose for the iron component of PM2.5 at Dearborn points directly to the southwest (see Figure 17). Conversely, the iron wind rose for Allen Park, while measuring much lower levels, points to the northeast. The Allen Park monitor is approximately five miles southwest of Dearborn. Additional wind direction analysis shows that, when winds are from the southwest average crustal concentrations at Dearborn are over 2.5 µg/m^3 higher than those at Allen Park and are sometimes as much as 6 µg/m^3 higher (see Figure 18). This clearly indicates a significant local iron source directly between these two sites (which are approximately five miles apart) and closer to the Dearborn monitor.

   The Severstal steel facility lies in exactly this position (see Figure 19). As part of a consent order and permit with the State, this facility is in the process of installing

[25] These emission reductions probably also helped lower PM2.5 concentrations in the area. However, no long-term PM2.5 monitoring data exist to determine the degree of improvement.

new bag houses on its blast and basic oxygen furnaces, as well as other control equipment. These changes are expected to reduce PM2.5 emissions at this facility by 166 tons per year.

7. The Dearborn wind rose for organic carbon indicates a more even distribution than iron but still shows noticeably higher concentrations when the wind is from the west, southwest or south (see Figure 17). However, the specific sources(s) of this excess have yet to be identified.

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p) The localized nature of Southeast Michigan's nonattainment problem makes broad-based application of control measures throughout the official seven-county nonattainment area an ineffective and unproductive strategy for bringing the region into compliance. All available data show that targeted local organic carbon emission reductions, coupled with the iron reductions resulting from planned steel mill controls, will be the most cost-effective way to bring the region into attainment.

q) Determining the source of local organic carbon emissions is difficult. Results of source apportionment studies conducted to date vary significantly in their results. However, the data do indicate a significant local industrial component at Dearborn that exceeds that seen at Allen Park and other sites in Southeast Michigan. Mobile sources also appear to be significant component, though no more so than they are at other sites in the region that are measuring attainment. More needs to be done to identify the source(s) of organic carbon excess at Dearborn and determine how it can be controlled.

r) Despite this limitation, these studies have provided corroborating information with regard to local source contribution.

1. Positive matrix factorization (PMF) analysis conducted by Sonoma Technologies confirmed that organic carbon is a significant part of the annual average PM2.5 mass (40% - see Figure 20).

2. The analysis also found that 22% of the organic mass (OM) at Dearborn is attributable to local industrial sources compared to 8% at Allen Park. In contrast, 19% of the OM at Allen Park was attributable to Mobile sources compared to 10% at Dearborn (see Figure 21).

3. Chemical mass balance (CMB) analysis of source profiles on high PM2.5 days at Dearborn show very different patterns, indicating a varying mixture of sources is impacting this site on any given day. Plumes from industrial sources as well as emissions from smoking vehicles appear evident in these episodes (see Figure 22). However, the observed contribution from smoking vehicles is not unique to Dearborn. The same patterns are evident at Allen Park and other sites in Southeast Michigan, as well as sites in other parts of the Midwest where this analysis has been done. Thus, this source does not appear to explain the PM2.5 excess being measured at Dearborn.

s) While the exact contribution of mobile sources at Dearborn is not yet known, the site is in close proximity to several rail yards, one of which is immediately upwind of the monitor. There are as many as 40 switch yard locomotives operating within 2.5 miles of the site and most operate 24 hours/day, seven days/week. Some of these rail operations are also in the vicinity of the Southwestern High School monitor.

Over the next two years, virtually all of the switch engines in this area will be retrofitted with anti-idling equipment. These retrofits are being funded through a $1.5 million federal Supplemental Environmental Project. Based on data from a similar project in Chicago[26], this initiative is expected to reduce NOx emissions by 96 tons/year and PM by 2.8 tons/year. In addition, four switch engine locomotives at the CSX rail yard immediately adjacent to the Dearborn monitoring site will be rebuilt with smaller engines over the next two years, resulting in an annual emissions reduction of 66 tons of NOx and 1.8 tons of diesel PM. This project is being funding through the federal Congestion Mitigation Air Quality (CMAQ) program.

t) Unlike ozone, PM2.5 is composed of many different components that can come from a wide variety of sources. Lack of speciated PM2.5 data at the Linwood, Southwestern High School, and Wyandotte monitoring sites makes identification of specific local source contributors in these areas very difficult. One must make assumptions based on their proximity to neighboring monitors that do have detailed data available. However, as has been seen in the data from Allen Park and Dearborn, monitors in relatively close proximity can have significantly different source apportionments, particularly with regard to organic carbon and crustal material.

u) Trend analyses of speciated PM2.5 data indicate the decline in PM2.5 levels at Dearborn is due to reductions in sulfates and organic carbon (see Figure 23).

v) A separate analysis of organic carbon levels by wind direction indicates that the decrease at Dearborn is occurring at a faster rate than at Allen Park. This provides corroborating evidence that local sources are significantly impacting Dearborn (see Table 5).

w) A faster decrease of organic carbon at Dearborn compared to Allen Park is also shown in Figure 24, where the trend line for the difference in organic carbon at Dearborn compared to Allen Park is sloping downward, from an average of 2 $\mu g/m^3$ difference in 2002 to a 1 $\mu g/m^3$ difference in 2007

x) Currently, we are unable to explain the observed decrease in excess organic carbon unique to Dearborn. To the extent that this reduction is permanent, future analysis focused on explaining this urban excess will be more difficult.

y) There is evidence that some fraction of fugitive dust is PM2.5. While we are not sure how large this fraction is, the vast number of storage piles, barren land and unpaved lots in the vicinity of the Dearborn and SWHS monitors suggests that some attention needs to be paid to this source.

z) The difference in PM2.5 is highest from the southwest and west wind directions when nearby monitors are subtracted out of the Dearborn concentration. This would indicate that there is a large local source between the Dearborn and "background" monitors (Allen Park, Luna Pier & Ypsilanti) (see Figure 25).

[26] EPA, Case Study: Chicago Locomotive Idle Reduction Project, March, 2004.

aa) [Information on the Canadian Crusier data analysis will be added, including reference to Table 6, as well as diesel truck and sausage factory impacts visible in Figure 26]

II. **Modeling**:

a) Neither the control strategy nor the attainment demonstration should be based solely on modeling. PM2.5 models are still developing. Initial modeling results showed a very poor correlation with observed monitoring data. And while the most recent modeling has shown improvement, its ability to forecast organic carbon remains problematic (see Figure 27). This is particularly troubling as monitoring data shows organic carbon is a significant portion of locally generated PM2.5 in Southeast Michigan.

b) Despite these limitations, modeling is a useful tool for estimating changes in primary PM2.5 mass concentrations, as well as sulfate and nitrate levels. In addition, modeling is helpful in making qualitative assessments of the relative benefits of some potential control measures.

c) Significant reductions in sulfate and nitrate concentrations can be expected over the next several years due to national control programs that are currently being phased in (e.g., CAIR, Tier 2, and low-sulfur fuel). It is estimated that these controls will result in a 1 – 2 $\mu g/m^3$ reduction in PM2.5 mass concentrations by 2009 (see Table 7).

[Will update this section with results of LADCO's new modeling when it becomes available]

d) It is very hard to accurately model the impact of CAIR beyond 2009 because of changes being made in control installation plans. We know approximately how much reduction will occur but we don't know specifically where those reductions will come from.

e) The fact that the models already account for future economic and travel growth helps assure that areas currently in attainment will remain in attainment.

f) As noted in the inventory section, there will be significant reductions from enforceable controls being phased in at Severstal, and U.S. Steel, and Marathon. Based on the modeling, these reductions will result in a significant decrease in PM2.5 concentrations at Dearborn (over $2 \mu g/m^3$), and to a lesser extent, at Southwestern High School and Wyandotte (see Table 8). These results appear very probable considering the large local contribution of total PM2.5, and in particular the crustal component, that is coming from the direction of Severstal (see figures 17 and 18).

g) When summed together, the benefits of national controls as well as these local reductions will bring the area into or near attainment. To the extent that the model is over predicting benefits, we may need additional emission reductions. To the extent that it is under predicting benefits, Southeast Michigan would be coming into attainment within the next few years.

A list of contingency measures will be prepared in the event that additional reductions are determined to be necessary. In addition, an ambient monitoring strategy will be adopted to provide information to assess the effectiveness of existing/new control programs, to evaluate progress towards attainment, and to help determine which (if any) additional control measures should be considered.

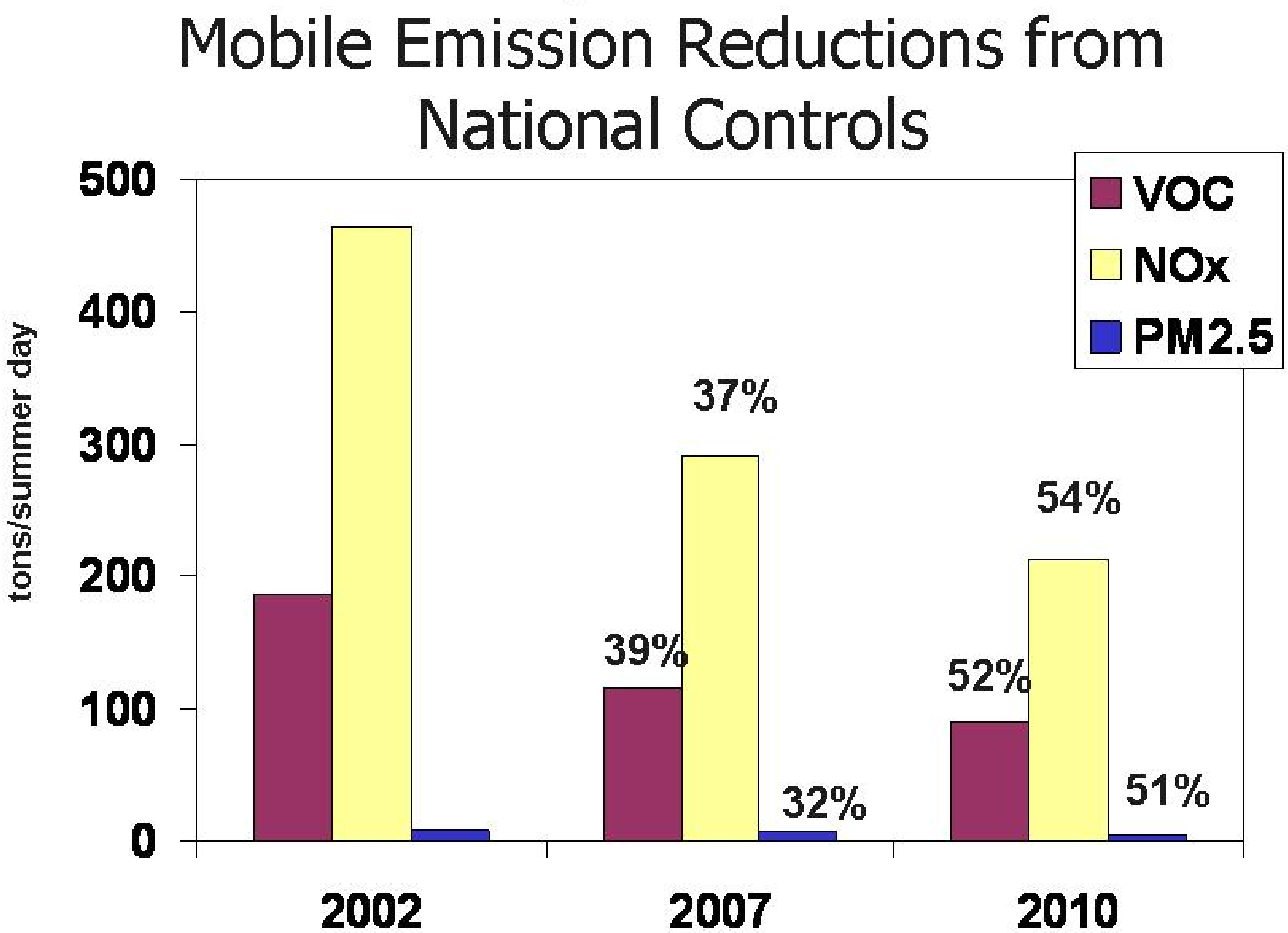
h) While the emission reductions expected from retrofitting diesel switch engine locomotives is much less in magnitude, they are expected to be helpful because of their low level of discharge and proximity to the Dearborn monitor. In fact, modeling predicts the benefit of this control measure will be over 50 times greater at Dearborn than at Southwestern High School or Wyandotte (see Table 9).

DRAFT
Weight of Evidence for the Southeast Michigan PM2.5 Attainment Strategy

Figures & Tables

11/06/07

Figure 1



Percentages indicate reduction from 2002

Source: SEMCOG

Figure 2

Dearborn 3-mile radius map
(Still being developed)

Figure 3

SWHS 3-mile radius map
(Still being developed)

Table 1

Recent Plant Closings

Dearborn & SWHS Monitoring areas

Facility	Last Year Reported	2002 (tons/year)					Current (tons/year)					Difference (tons/year)				
		NOx	SO2	PM25	PM10	VOC	NOx	SO2	PM25	PM10	VOC	NOx	SO2	PM25	PM10	VOC
Carmeuse/ Detroit Lime	2002	555.98	29.14		5.87	0.00						555.98	29.14		5.87	
Daimler Chrystler McGraw Glass	2003	8.25	0.05			5.32						8.25	0.05			5.32
Frito Lay	2003	4.54	0.02		2.13	1.15						4.54	0.02		2.13	1.15
IPMC Acquisition	2003	128.08	0.40			3.71						128.08	0.40			3.71
Gutter Supliers, Inc	2004	0.73	0.00			1.56						0.73	0.00			1.56
Darling International*	2005	19.48	5.25		16.94	12.48	5.54	0.91	0.23	0.51	9.04	13.95	4.34	-0.23	16.43	3.44
Honeywell	2005	39.21	37.60			82.15					0.37	39.21	37.60			81.78
Total												750.74	71.56	-0.23	24.43	96.97

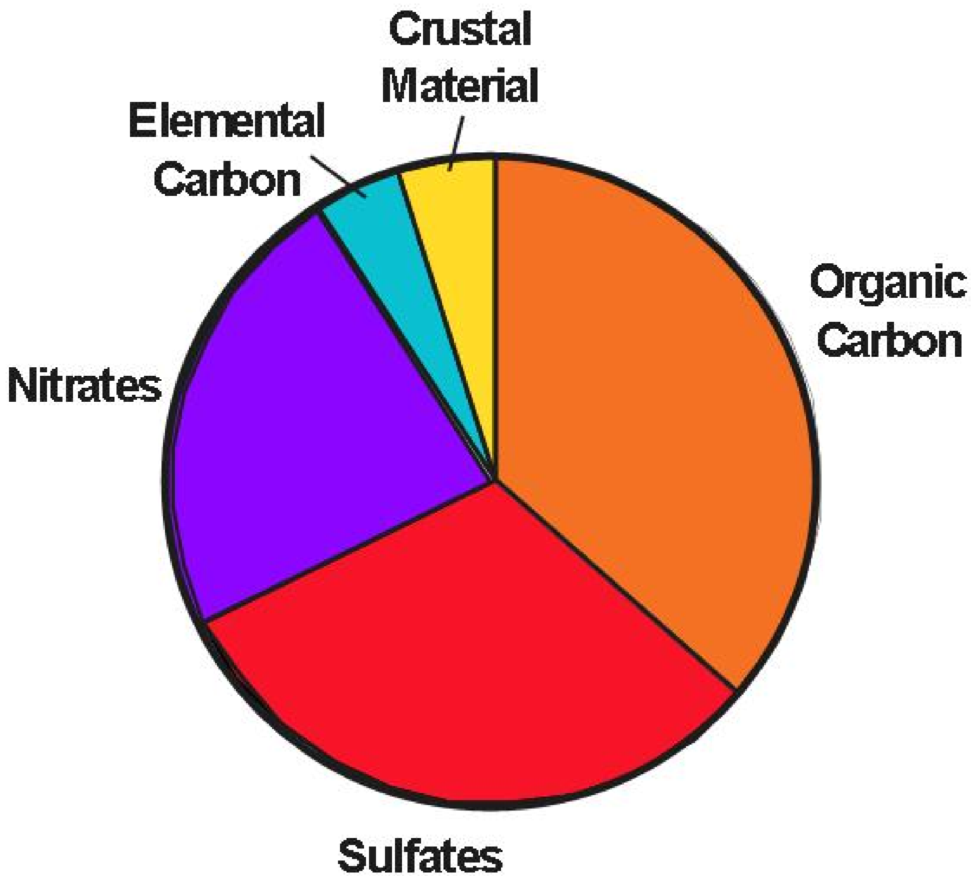
*Partial plant closing

Source: MDEQ

Figure 4

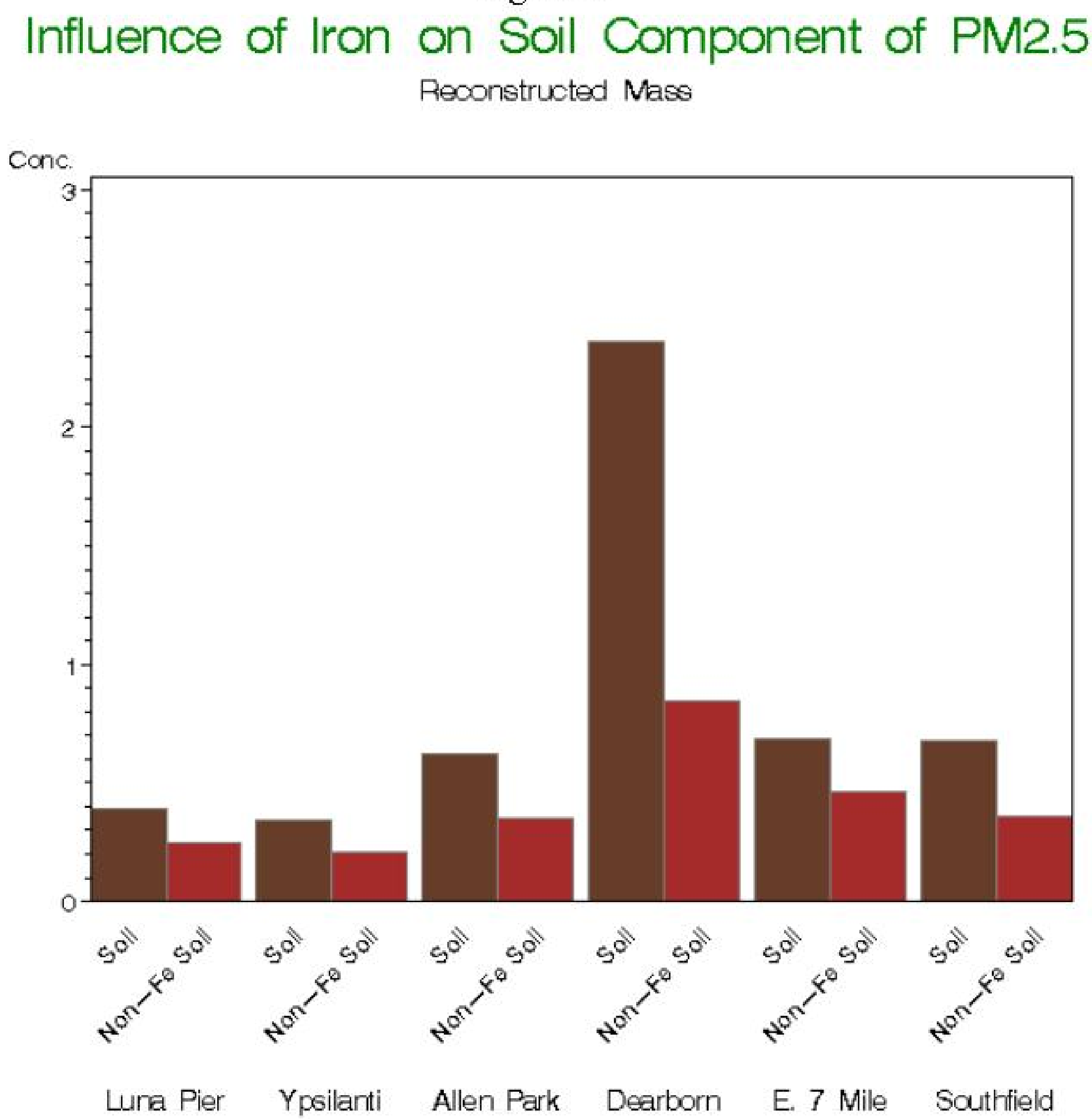
Components of PM2.5

in Southeast Michigan



Source: SEMCOG

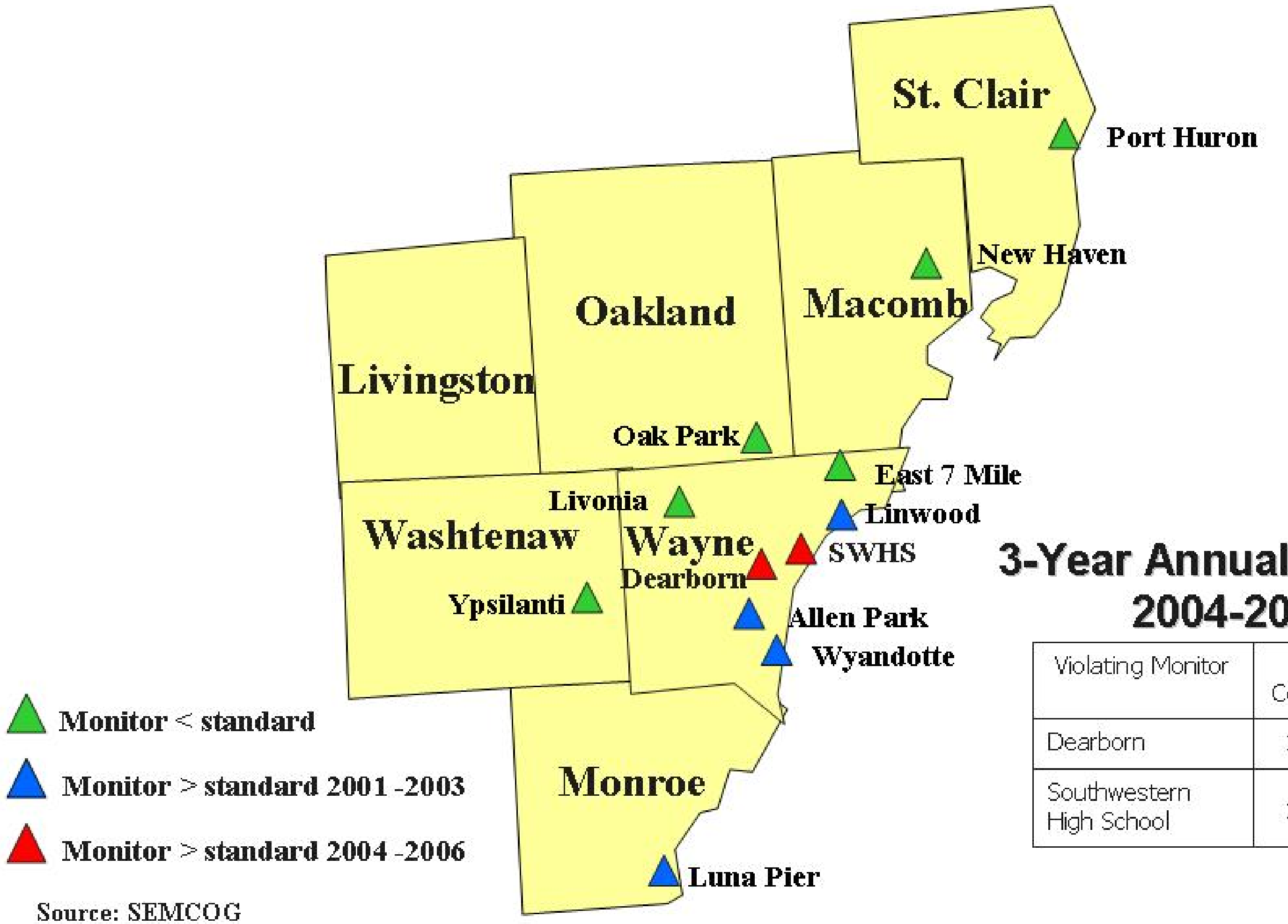
Figure 5



Source: LADCO

Figure 6

PM2.5 Nonattainment Area



Source: SEMCOG

3-Year Annual Average 2004-2006

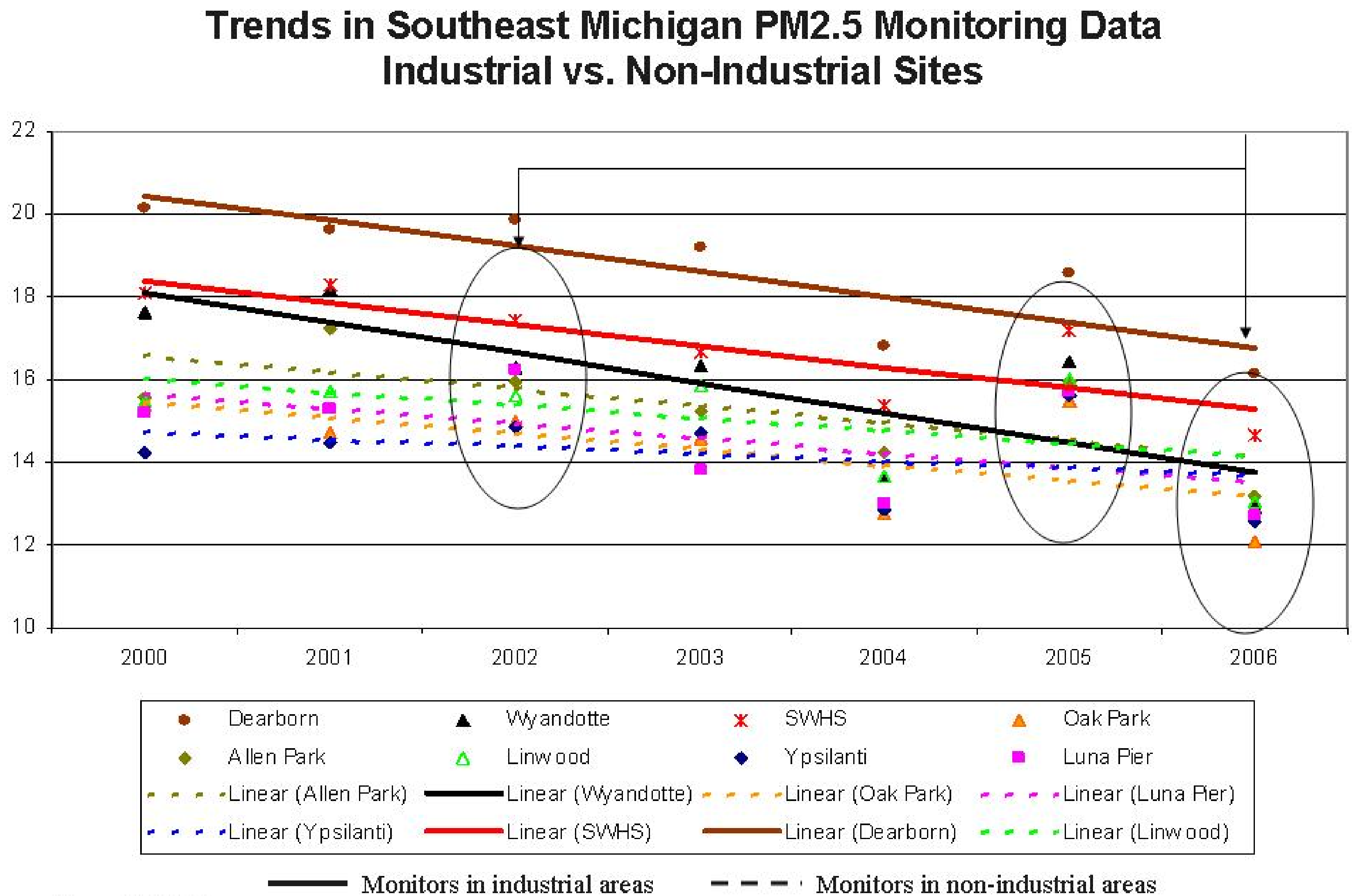
Violating Monitor	PM2.5 Concentration
Dearborn	17.2 µg/m³
Southwestern High School	15.8 µg/m³

Table 2
Change in Southeast Michigan PM2.5 Concentrations

Monitoring Site	3 Yr. Average 2000-2002	3 Yr. Average 2004-2006	Change	Percent Change
Dearborn	**19.9**	**17.2**	2.69	-14%
SW HS	**17.9**	**15.8**	2.16	-12%
Wyandotte	**17.4**	14.3	3.04	-17%
Allen Park	**16.3**	14.5	1.80	-11%
Linwood	**15.6**	14.2	1.36	-9%
Luna Pier	**15.8**	13.8	1.98	-13%
Oak Park	15.0	13.4	1.58	-11%
Ypsilanti	14.5	13.7	0.86	-6%
Livonia	14.5	13.1	1.42	-10%
E 7 Mile	14.9	14.1	0.75	-5%
Port Huron	14.0	13.1	0.97	-7%
New Haven	13.5	12.5	0.92	-7%
Regional Average	15.77	14.15	1.63	-10%

Source: SEMCOG

Figure 7



Source: LADCO

Table 3

PM2.5 Speciation Trends

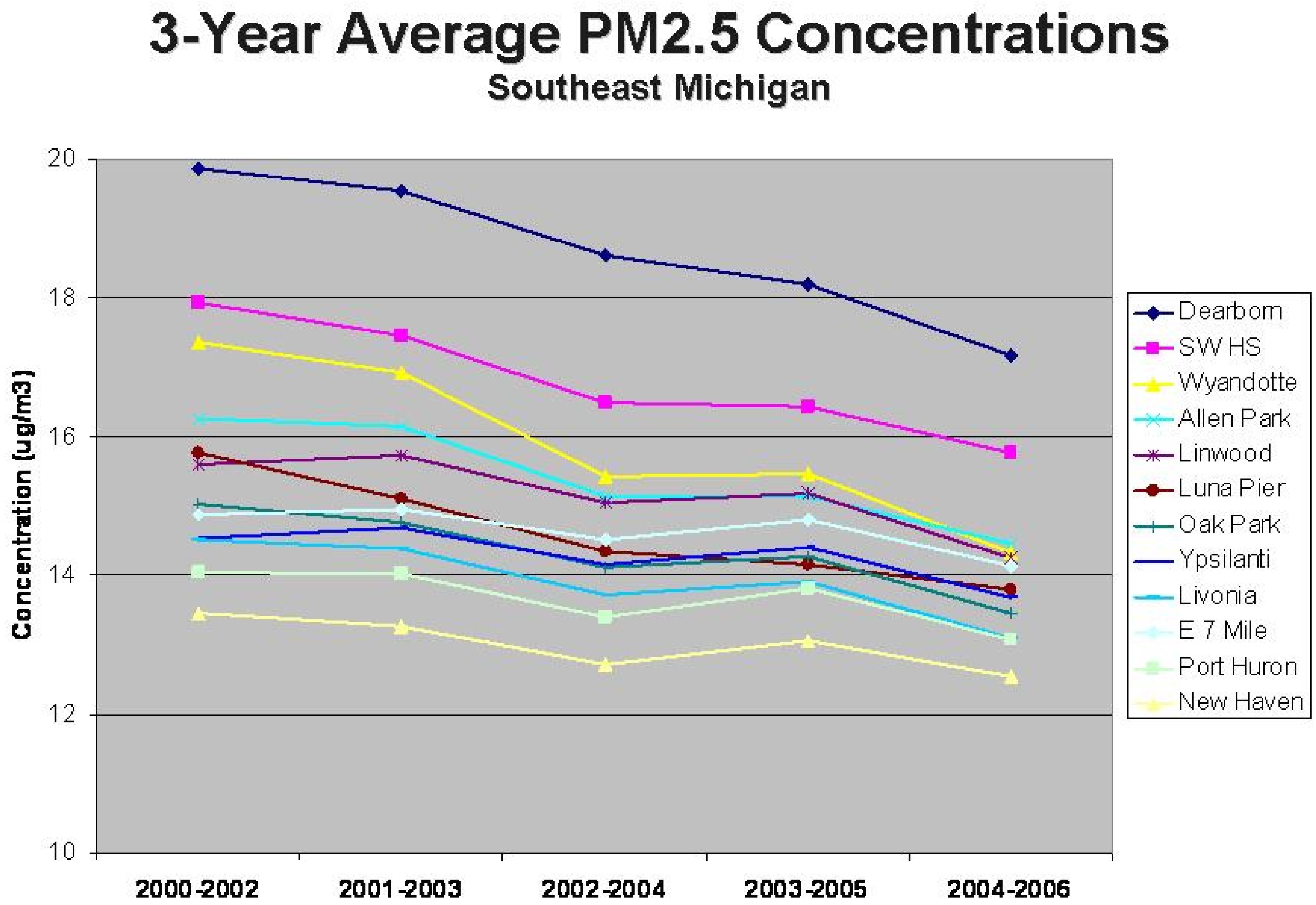
ug/m3/year

Species	Allen Park Jan '01- Dec '06	Dearborn May '02 – Dec '06	Luna Pier May '02 - Dec '06	Houghton Lake Jan '02 – Dec '06	Grand Rapids Jun '02 – Dec '06
Nitrate	**-0.16**	-0.11	-0.19	-0.04	-.07
Sulfate	**-0.17**	-0.19	-0.22	-0.08	-.09
EC	0.01	-0.04	0.007	**-0.02**	-.01
OC	**-0.17**	**-0.54**	**-0.22**	-0.09	**-.30**
Soil	**-0.019**	-0.08	**0.008**	-0.02	**-.036**

Significant trends in bold.

Source: LADCO

Figure 8



Source: SEMCOG

Table 4

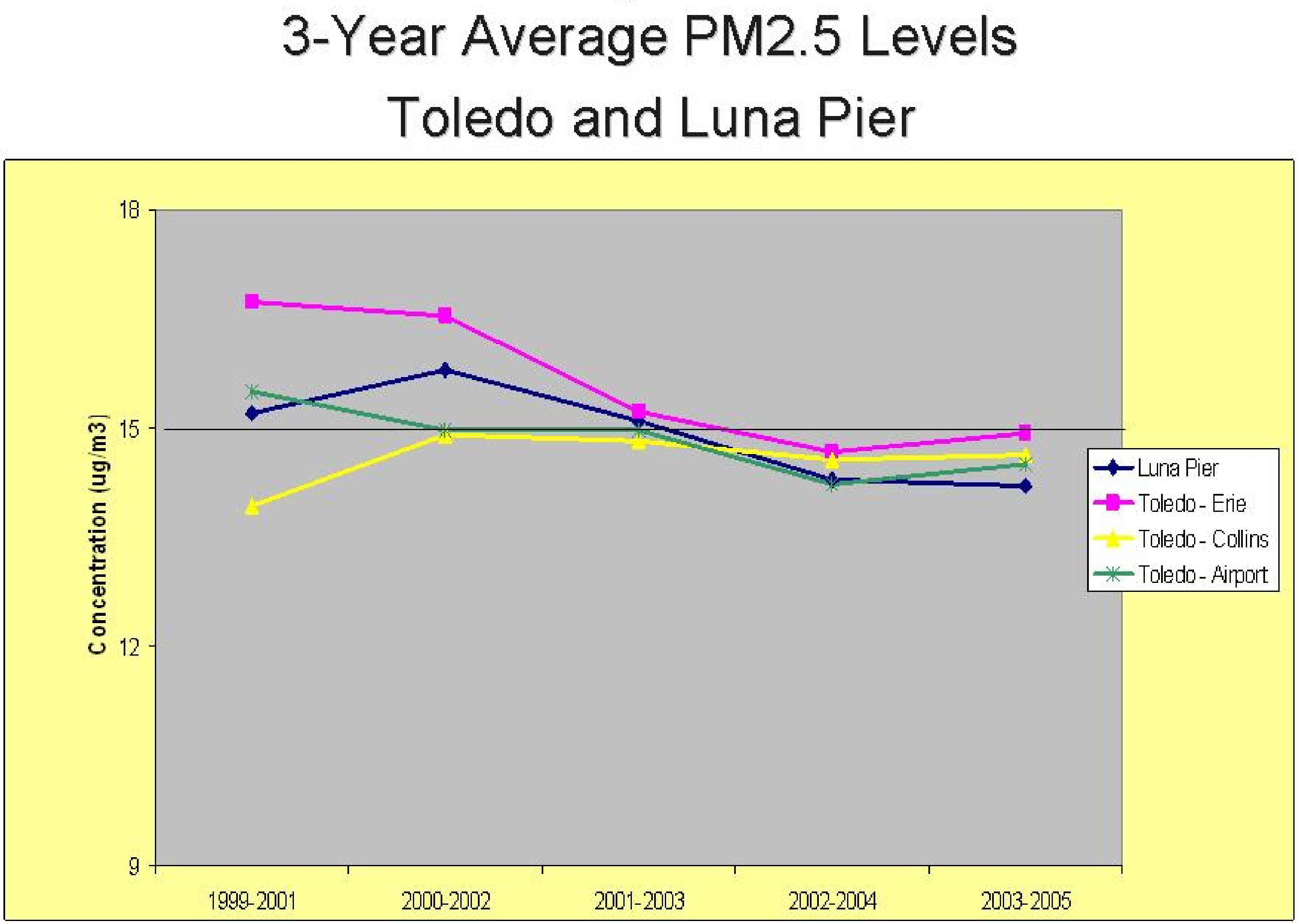
Annual Average PM2.5 Concentrations in Southeast Michigan 2000 - 2006

Monitoring site	Year						
	2000	2001	2002	2003	2004	2005	2006
Dearborn	**20.13**	**19.61**	**19.84**	**19.20**	**16.83**	**18.55**	**16.13**
SW HS	**18.10**	**18.28**	**17.42**	**16.69**	**15.39**	**17.21**	14.68
Wyandotte	**17.63**	**18.20**	**16.28**	**16.32**	13.66	**16.42**	12.92
Allen Park	**15.56**	**17.25**	**15.96**	**15.23**	14.24	**15.94**	13.19
Linwood	**15.49**	**15.72**	**15.60**	**15.85**	13.69	**16.01**	13.04
Luna Pier	**15.19**	**15.30**	**16.26**	13.79	12.98	**15.70**	12.72
Oak Park	**15.39**	14.70	**15.00**	14.58	12.76	**15.47**	12.11
Ypsilanti	14.26	14.49	14.86	14.73	12.87	**15.61**	12.55
Livonia	14.59	14.60	14.37	14.20	12.57	14.93	11.80
E 7 Mile	14.51	14.50	**15.64**	14.71	13.23	**16.48**	12.71
Port Huron	14.35	13.96	13.84	14.25	12.11	**15.09**	12.04
New Haven	13.42	13.60	13.35	12.85	11.96	14.38	11.28

Bold numbers denote values above the annual PM2.5 standard.

Source: MDEQ air monitoring data

Figure 9

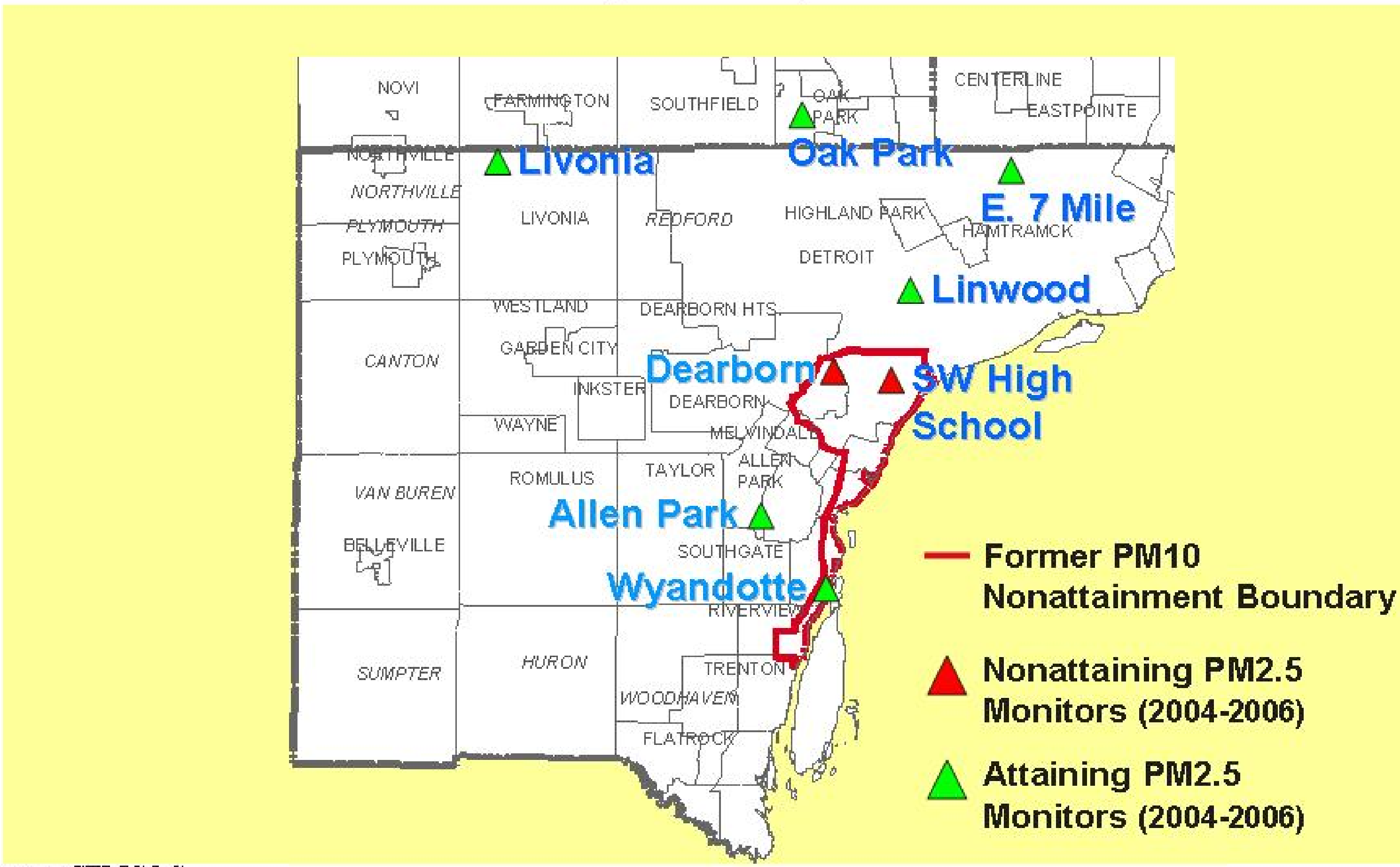


Source: SEMCOG

Figure 10

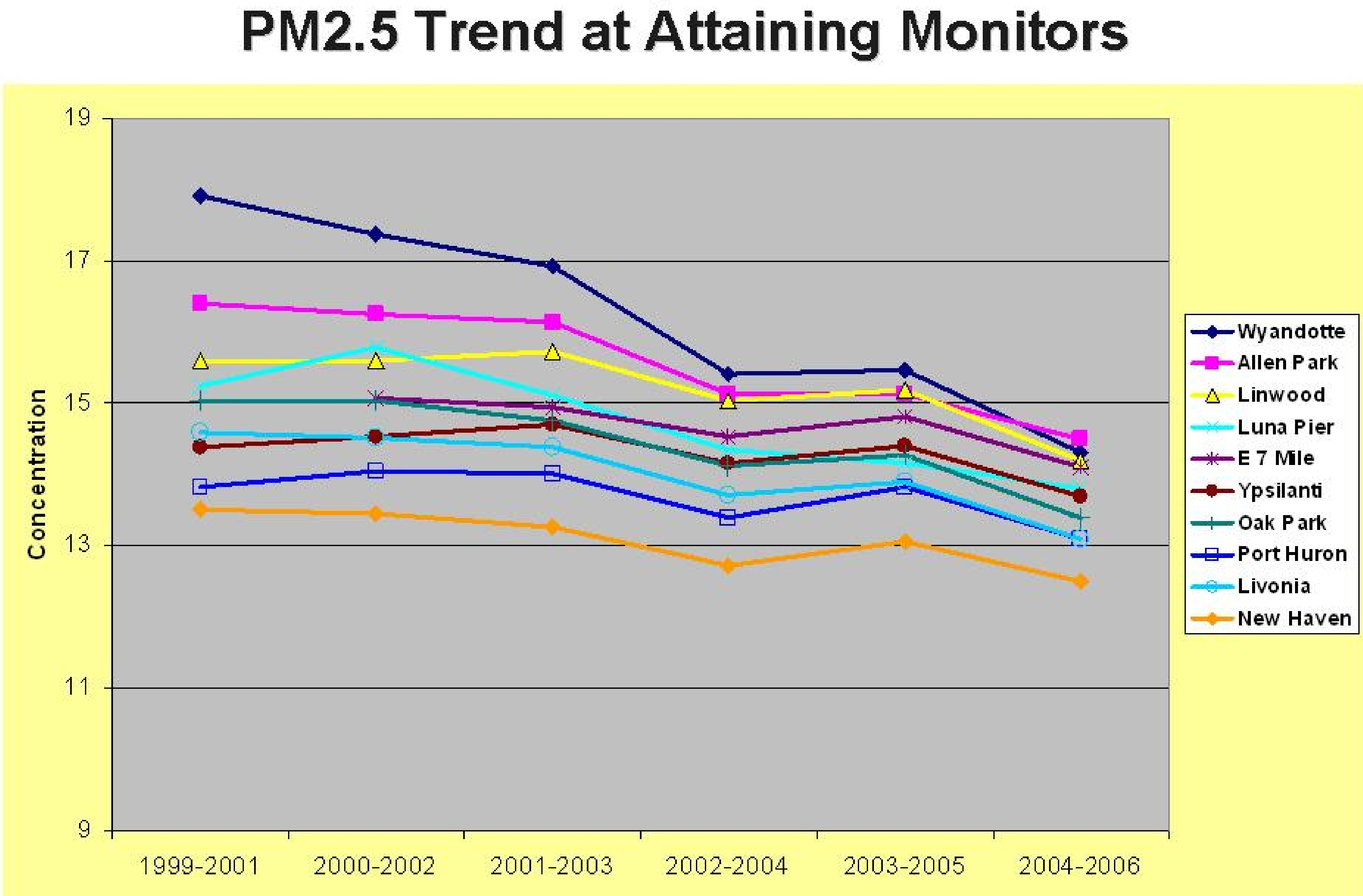
Former PM10 Nonattainment Area with Overlay of PM2.5 Monitors

Wayne County



Source: SEMCOG

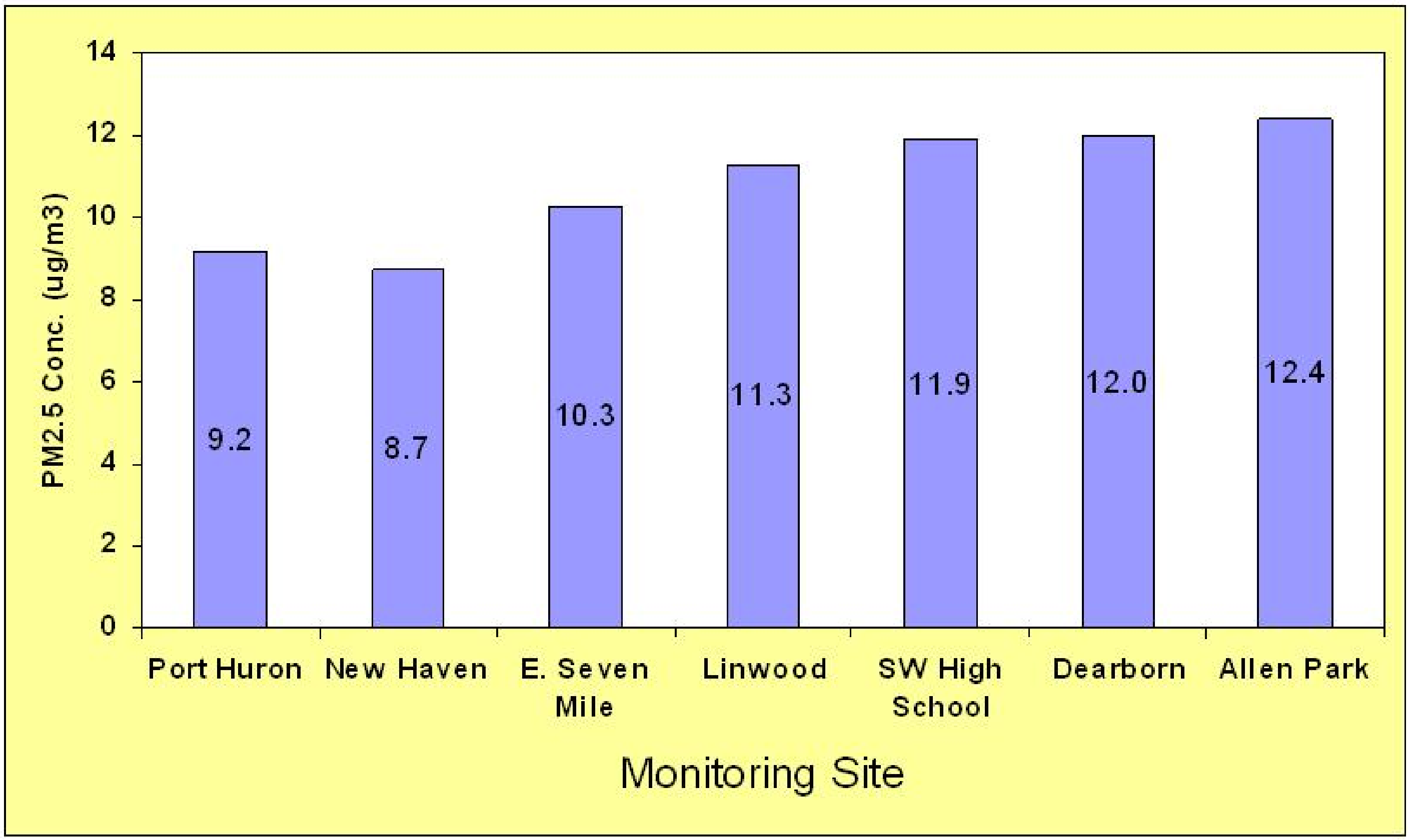
Figure 11



Source: SEMCOG

Figure 12

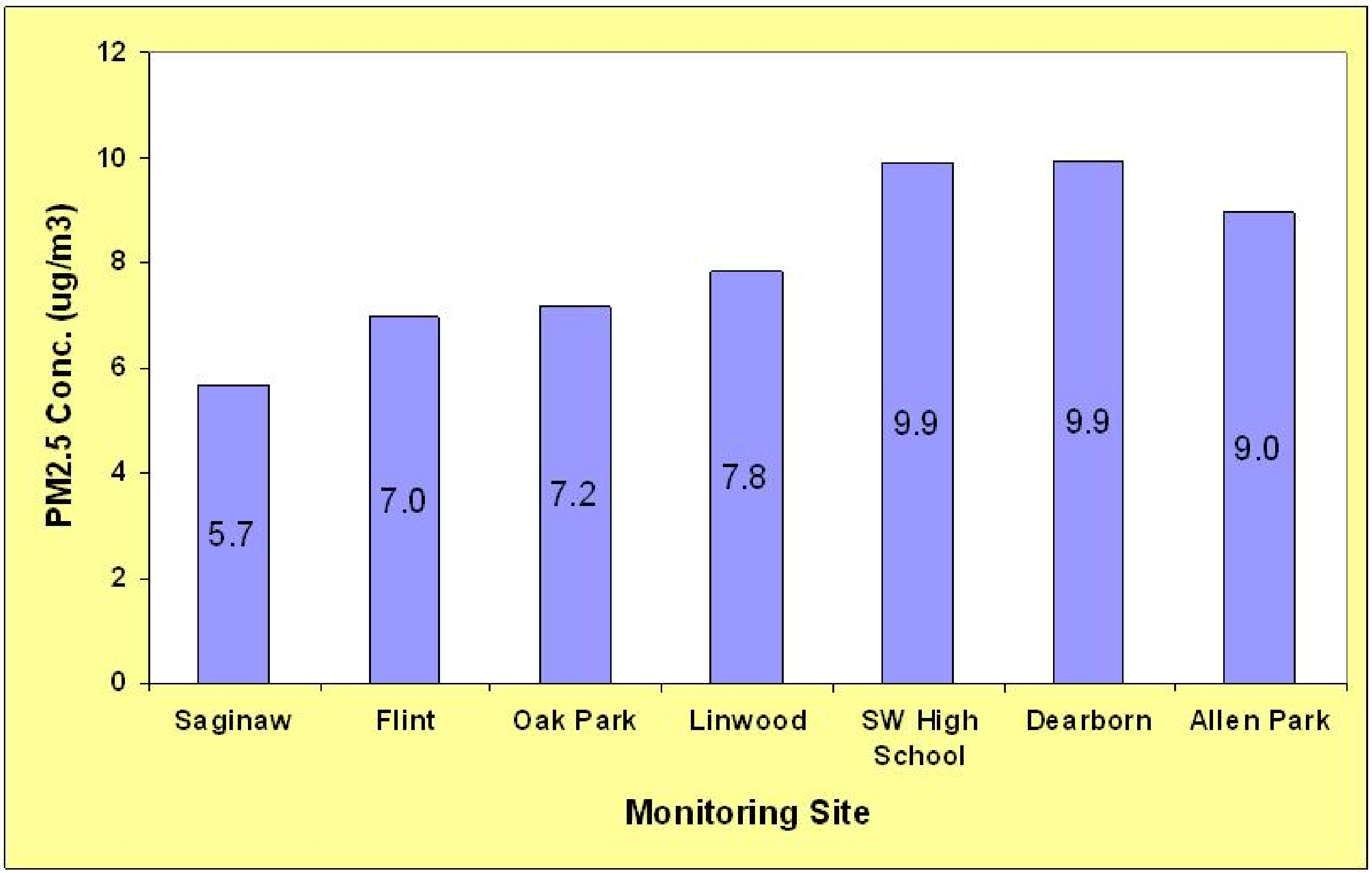
**Average PM2.5 Concentrations
When Winds Are From Northwest
2001 - 2006**



Source: SEMOS

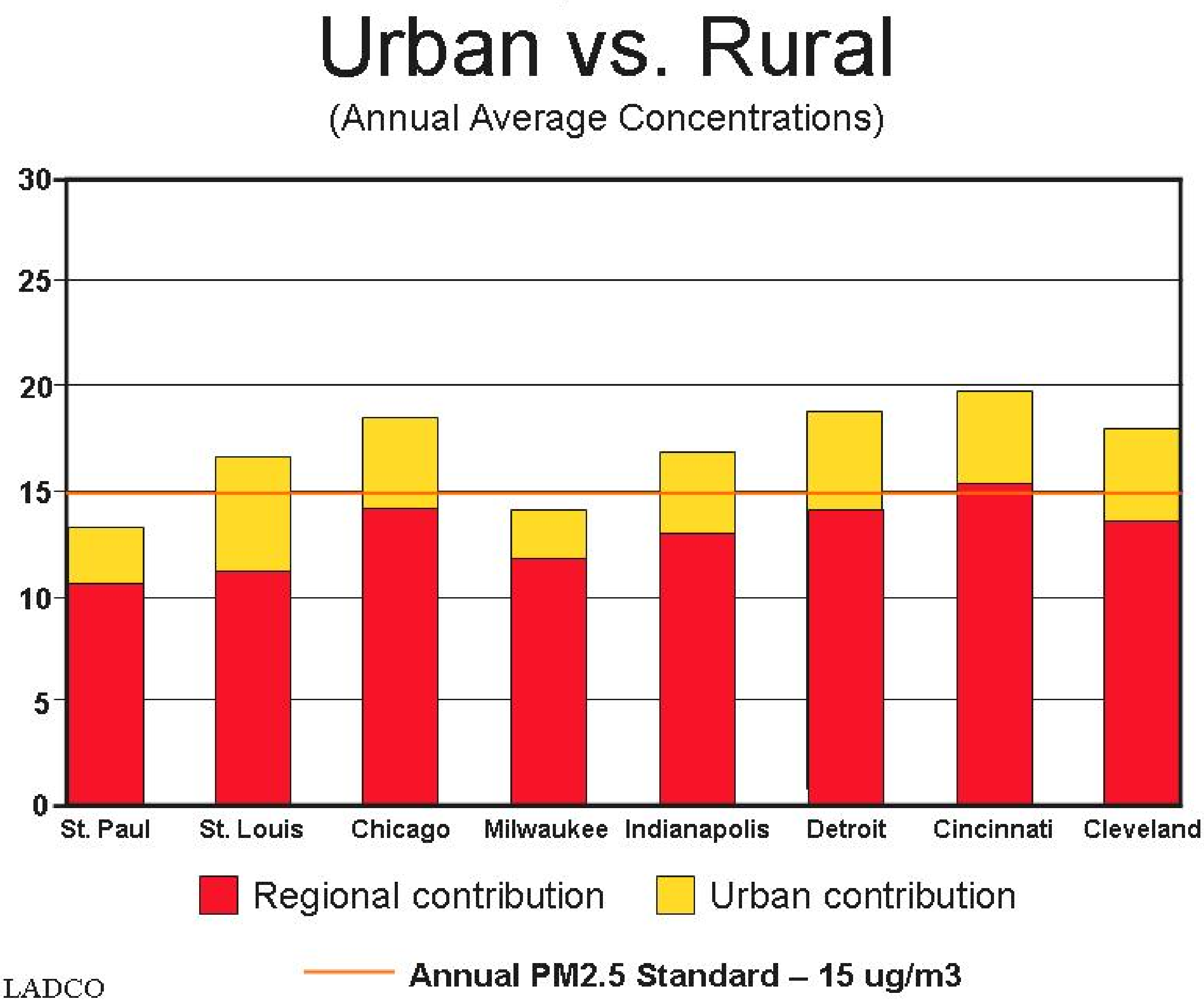
Figure 13

Average PM2.5 Concentrations
When Winds Are From Northwest
2001 - 2006



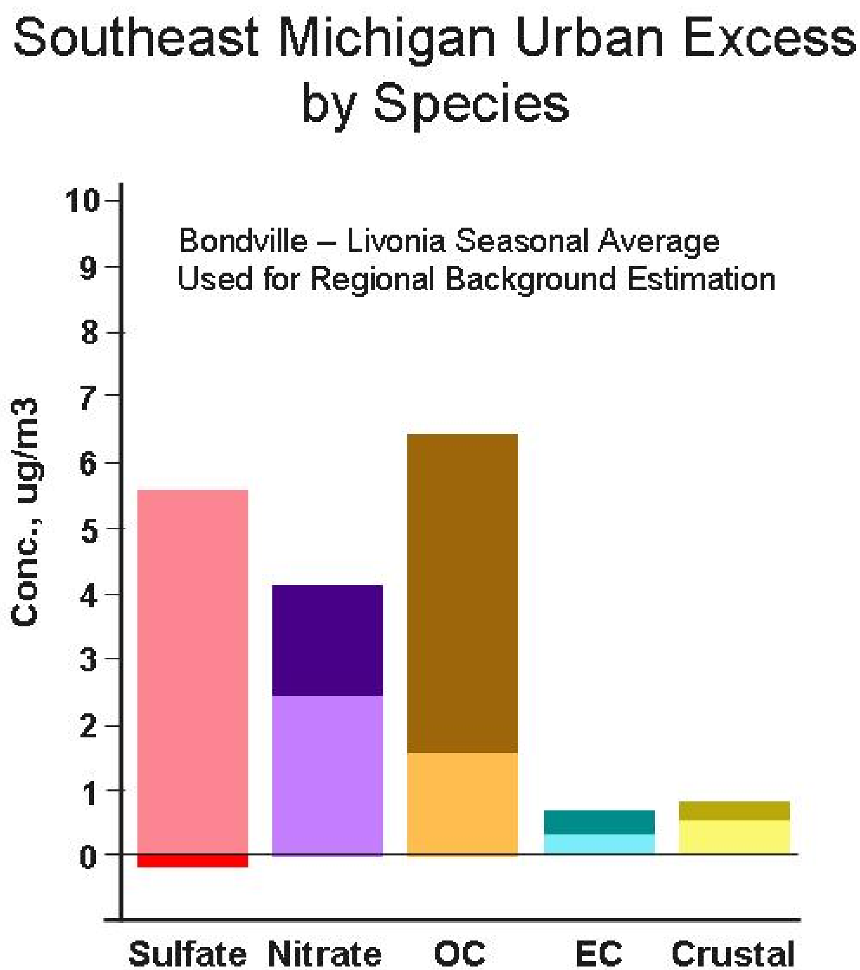
Source: SEMOS

Figure 14



Source: LADCO

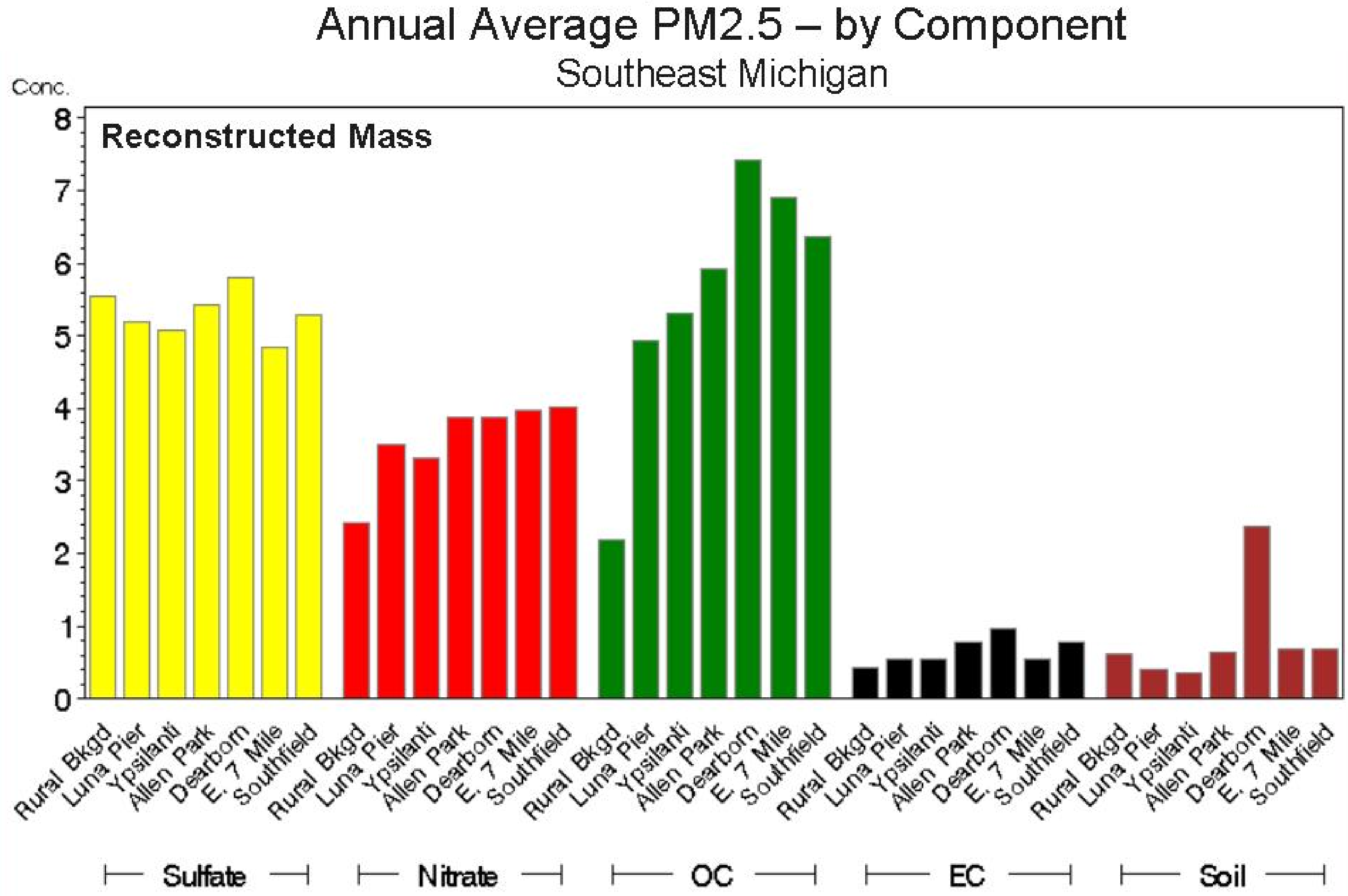
Figure 15



Light color portion of bar is regional background; darker portion is urban excess

Source: LADCO

Figure 16

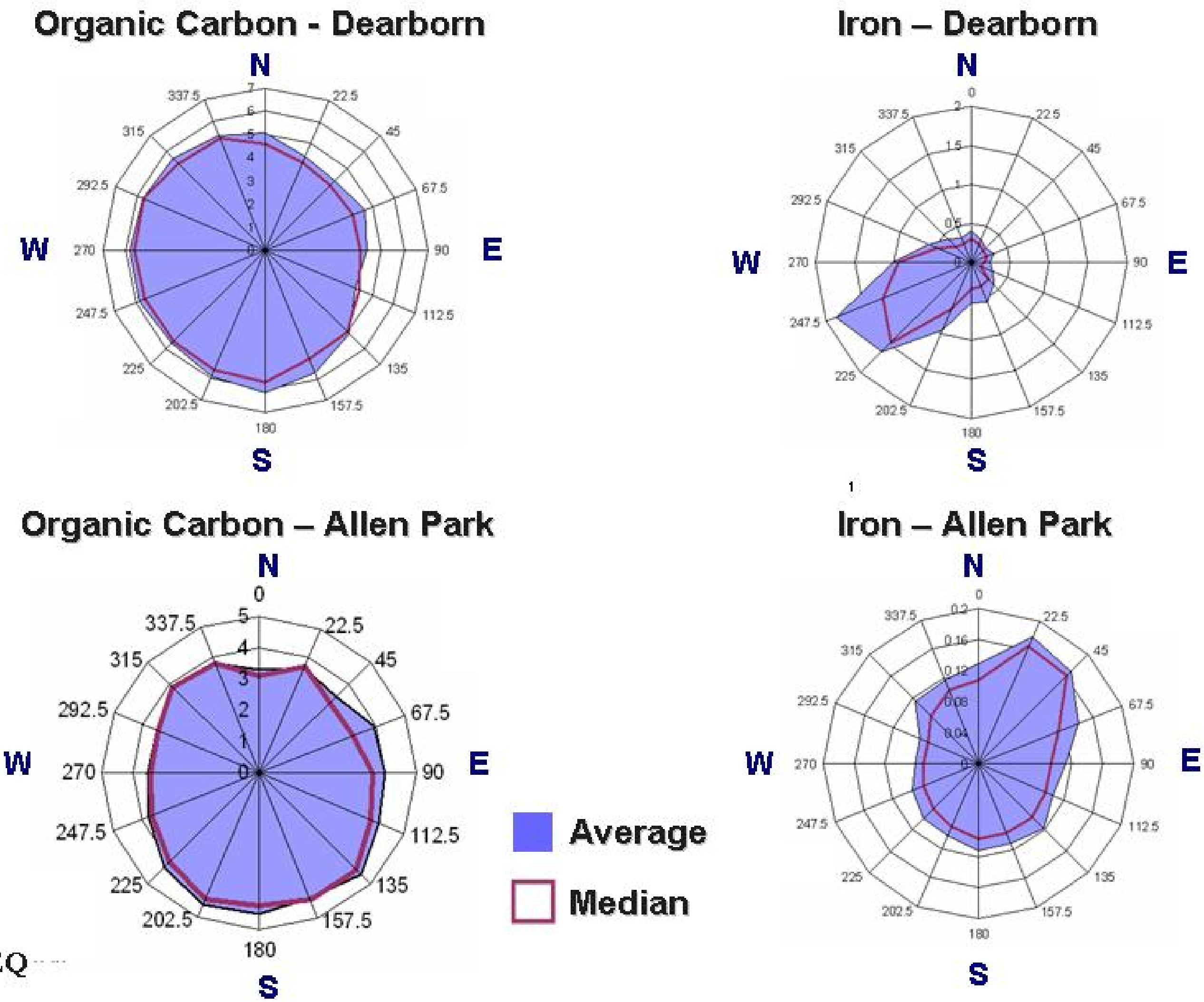


Source: LADCO

Figure 17

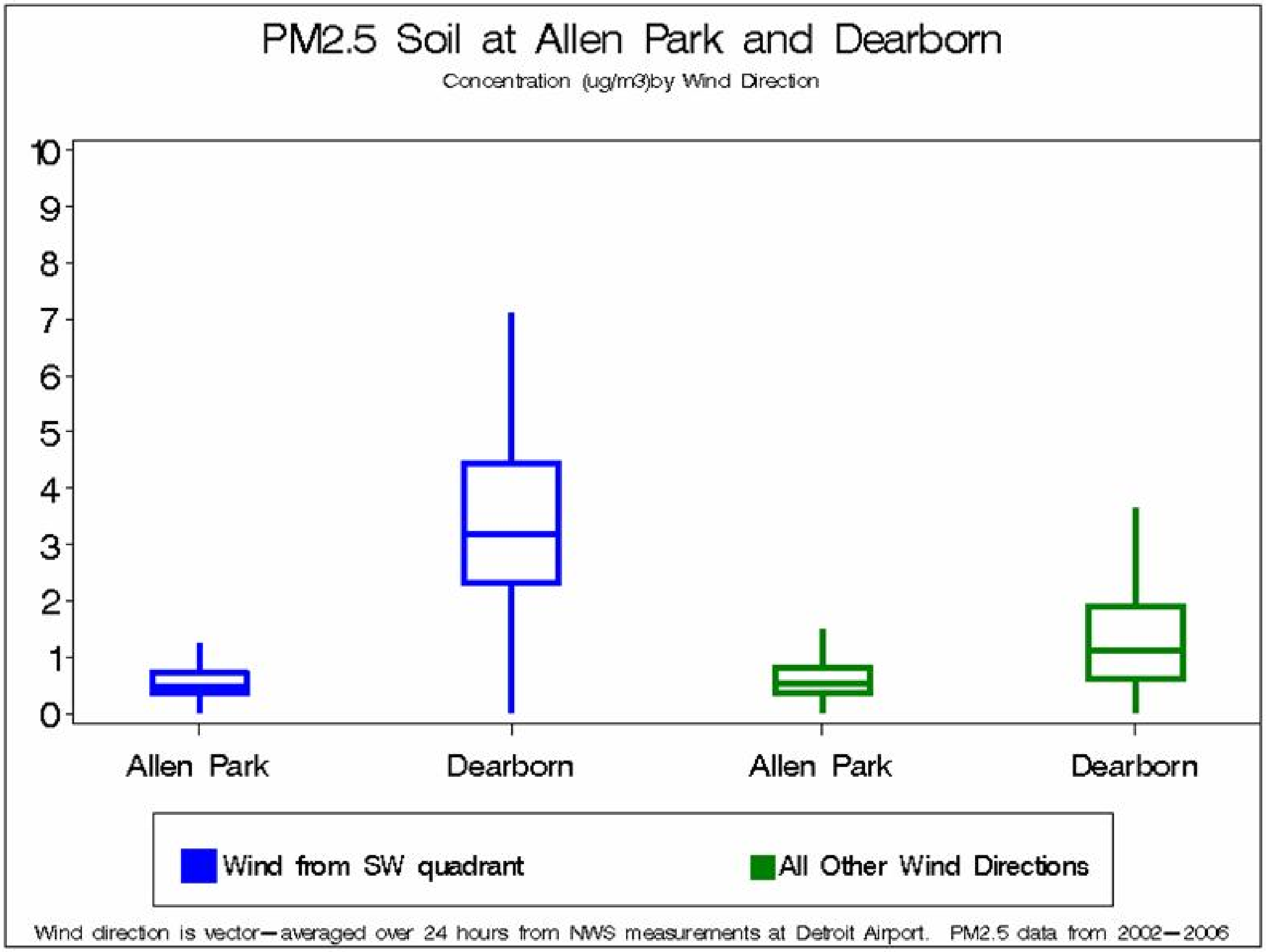
Pollution Roses

2003-2004



Source: MDEQ

Figure 18



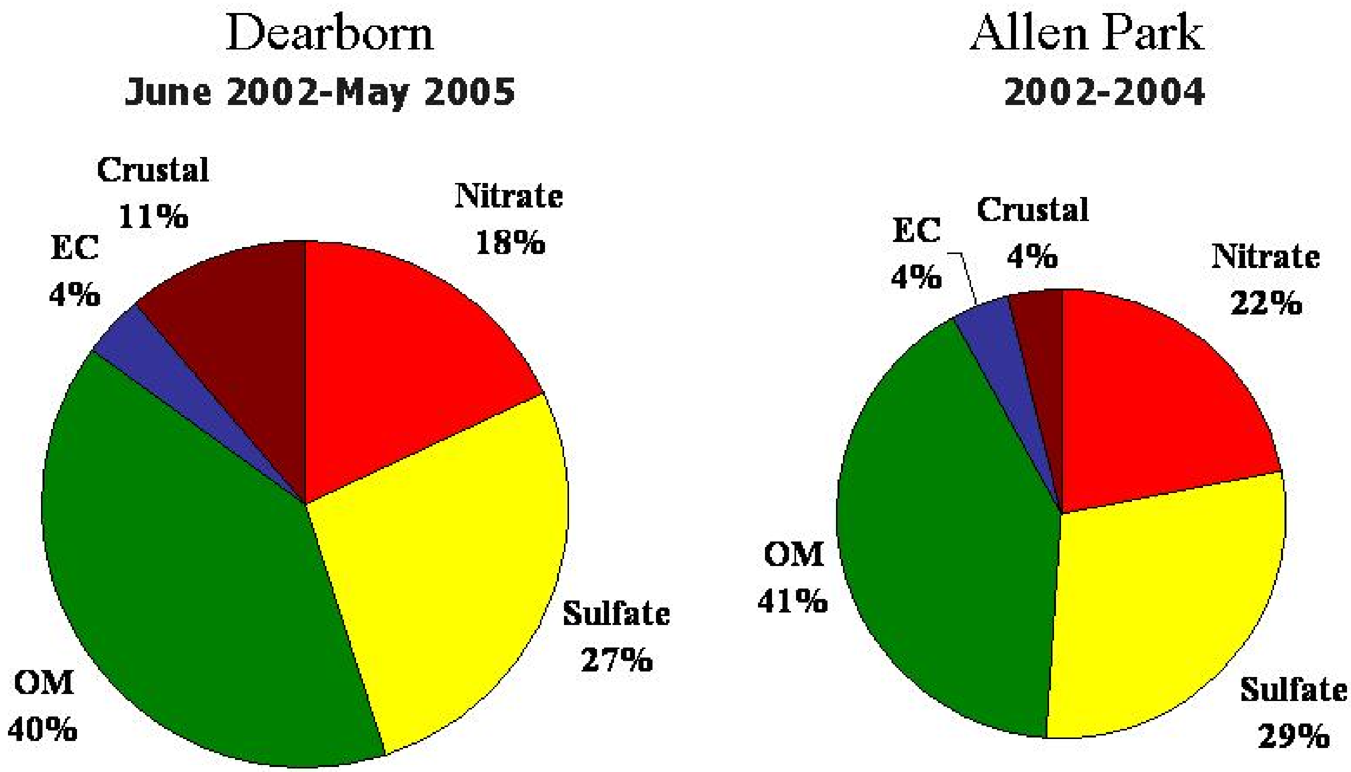
Source: LADCO

Figure 19

Proximity of Severstal to Air Monitors

Figure 20

Average PM2.5 Mass



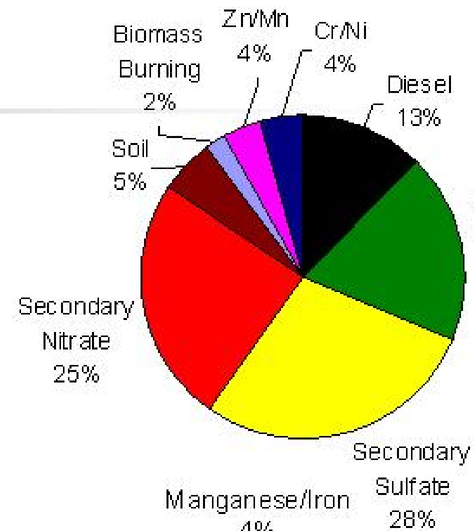
SOURCE: Sonoma Technologies Inc., 2006

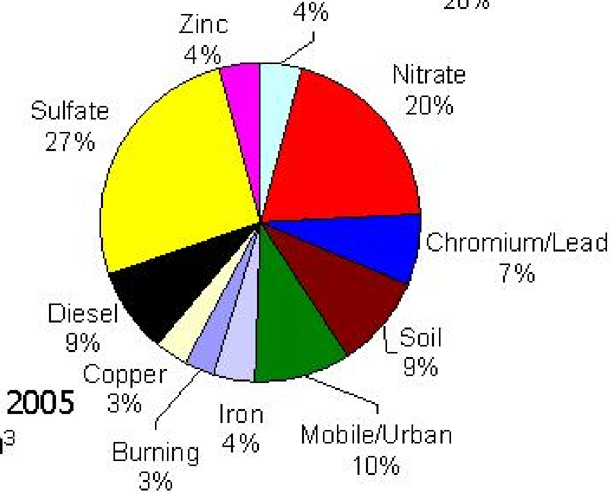
Figure 21

Organic Mass Comparison
Dearborn vs. Allen Park

- Local industrial factors at Dearborn are ~22% of the mass (not including the excess soil) while only ~ 8% at Allen Park
- More of the OM was apportioned with the mobile/urban factor at Allen Park, making this factor larger than at Dearborn
- Sulfate, nitrate and burning factors were similar between sites

Allen Park
2002-2004
Avg=15.9 μg/m³



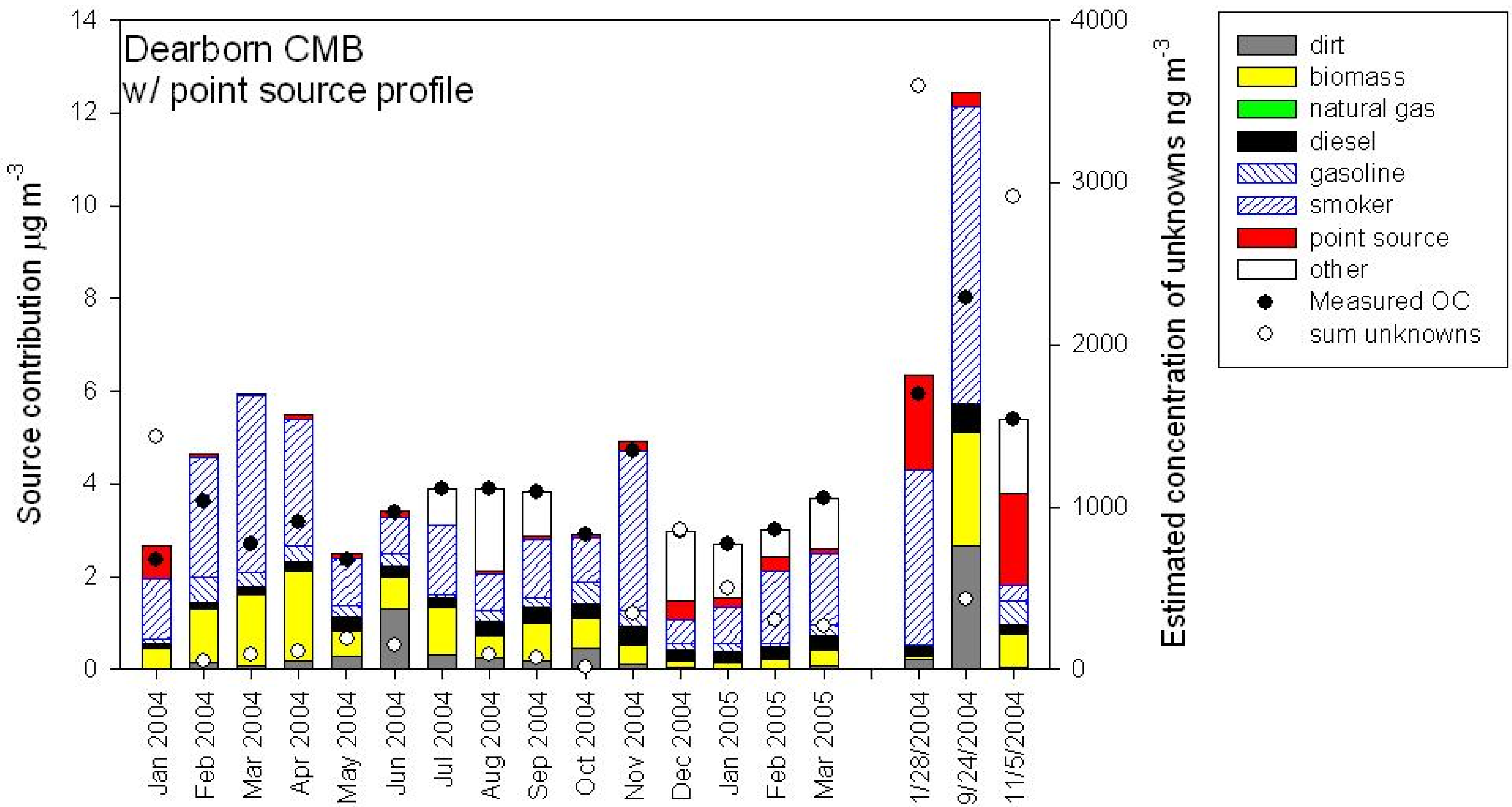


Dearborn
June 2002-May 2005
Avg=19.8 μg/m³

SOURCE: Sonoma Technologies Inc., 2006

Figure 22

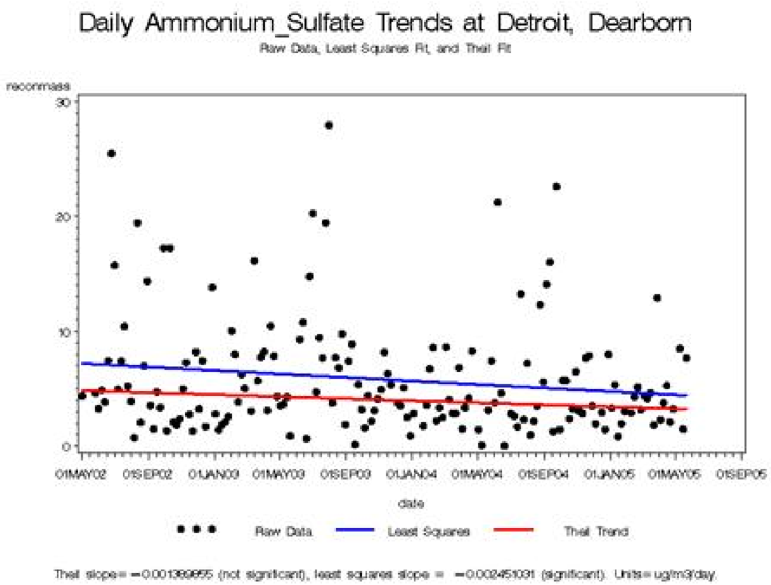
Dearborn CMB Analysis
Source Profile Comparison – Average vs. High PM2.5 Days

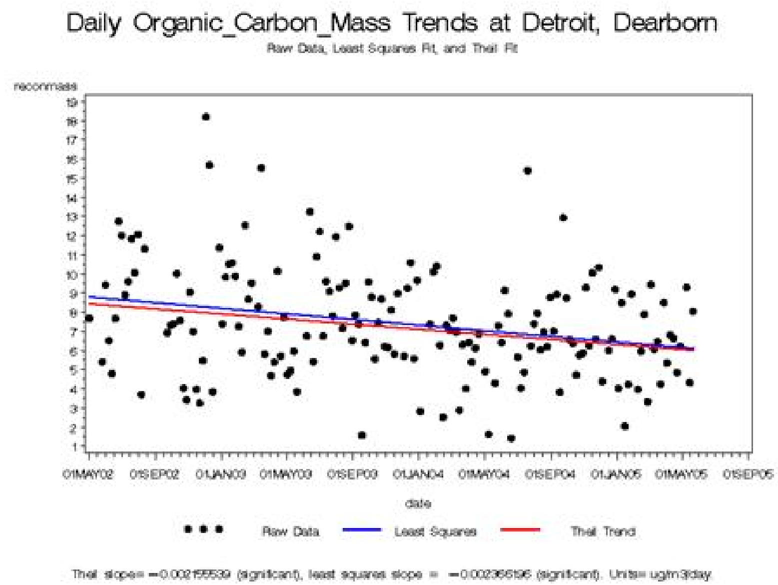


Source: LADCO

Figure 23

Sulfate and Organic Carbon Trend Analysis - Dearborn





Monitoring Site	Trend, ug/m3/year							Speciation monitoring period[a]
	FRM PM2.5 (1999-2005)	Spec. PM2.5	Sulfate	Nitrate	OC	EC	Soil	
Dearborn	**-0.56**	-0.97	-0.51	0.13	**-0.79**	-0.05	-0.19	May 2002-May 2005
Allen Park	**-0.32**	**-0.61**	-0.09	**-0.15**	**-0.17**	0.01	**-0.03**	Dec. 2000-Dec 2005
Luna Pier	-0.32	**-1.55**	**-0.44**	-0.07	**-0.67**	-0.04	**-0.05**	May 2002-May 2005
Ypsilanti	**-0.12**	-0.35	-0.09	0.34	-0.43	-0.01	0.00	June 2003-June 2005

[a]Reduced to whole years for trend analysis
BOLD = statistically significant trend

Source: LADCO

Table 5
Organic Carbon Analysis by Wind Direction
Dearborn vs. Allen Park
2003-2006

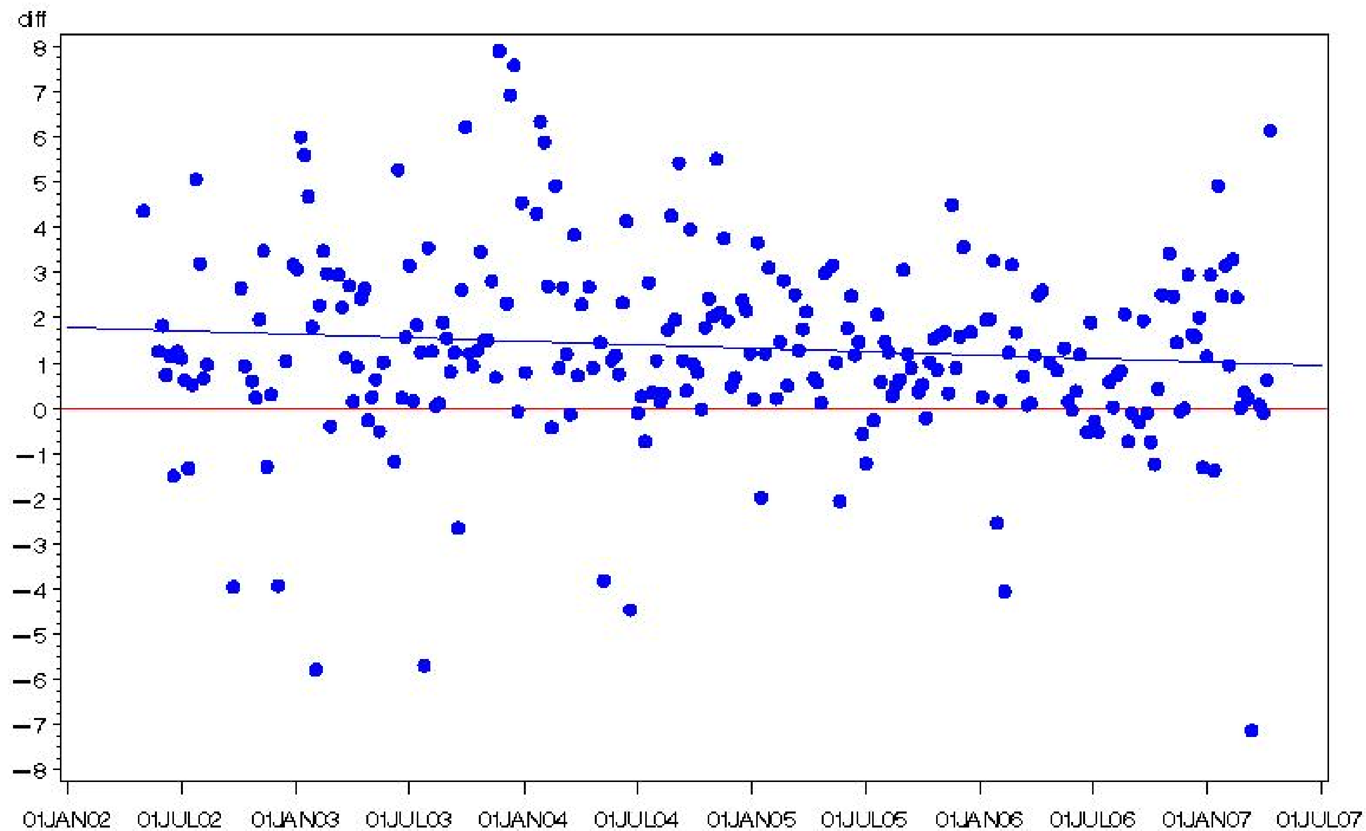
Measurement	Northeast Winds			East Winds			Southeast Winds		
	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference
2003 Average	3.91	3.47	0.44	4.88	5.00	-0.12	6.69	4.91	1.79
2004 Average	2.96	2.75	0.21	4.05	3.10	0.96	5.56	4.52	1.04
2005 Average	3.14	2.69	0.45	4.60	3.96	0.64	5.58	5.11	0.47
2006 Average	3.70	3.67	0.03	3.33	2.66	0.67	5.41	4.75	0.66
4-yr Average	3.42	3.12	0.30	4.45	3.95	0.50	5.84	4.87	0.97
Median	3.39	2.86		4.38	3.56		5.75	4.33	
Std. Deviation	0.87	1.04	0.59	1.78	1.80	1.54	2.13	2.19	1.52

Measurement	Northwest Winds			West Winds			Southwest Winds		
	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference	Dearborn	Allen Park	Difference
2003 Average	5.55	4.57	0.98	6.47	3.58	2.89	5.99	4.84	1.15
2004 Average	4.10	3.34	0.76	5.21	3.29	1.92	5.59	4.15	1.44
2005 Average	2.45	2.41	0.04	4.89	3.46	1.43	5.67	4.41	1.26
2006 Average	3.27	2.90	0.36	4.49	3.56	0.92	5.34	5.07	0.27
4-Yr Average	3.62	3.15	0.47	5.18	3.47	1.71	5.70	4.58	1.12
Median	3.65	3.03		4.82	3.21		5.68	4.49	
Std. Deviation	1.30	1.14	0.79	1.42	1.35	1.43	1.61	1.73	1.50

Source: SEMOS

Figure 24

Dearborn—Allen Park Difference in Organic Carbon Mass



Regression Equation:
diff = 8.205233 − 0.000418*date

Figure 25

Average Difference in Concentrations Between Dearborn and Selected "Background" Monitors

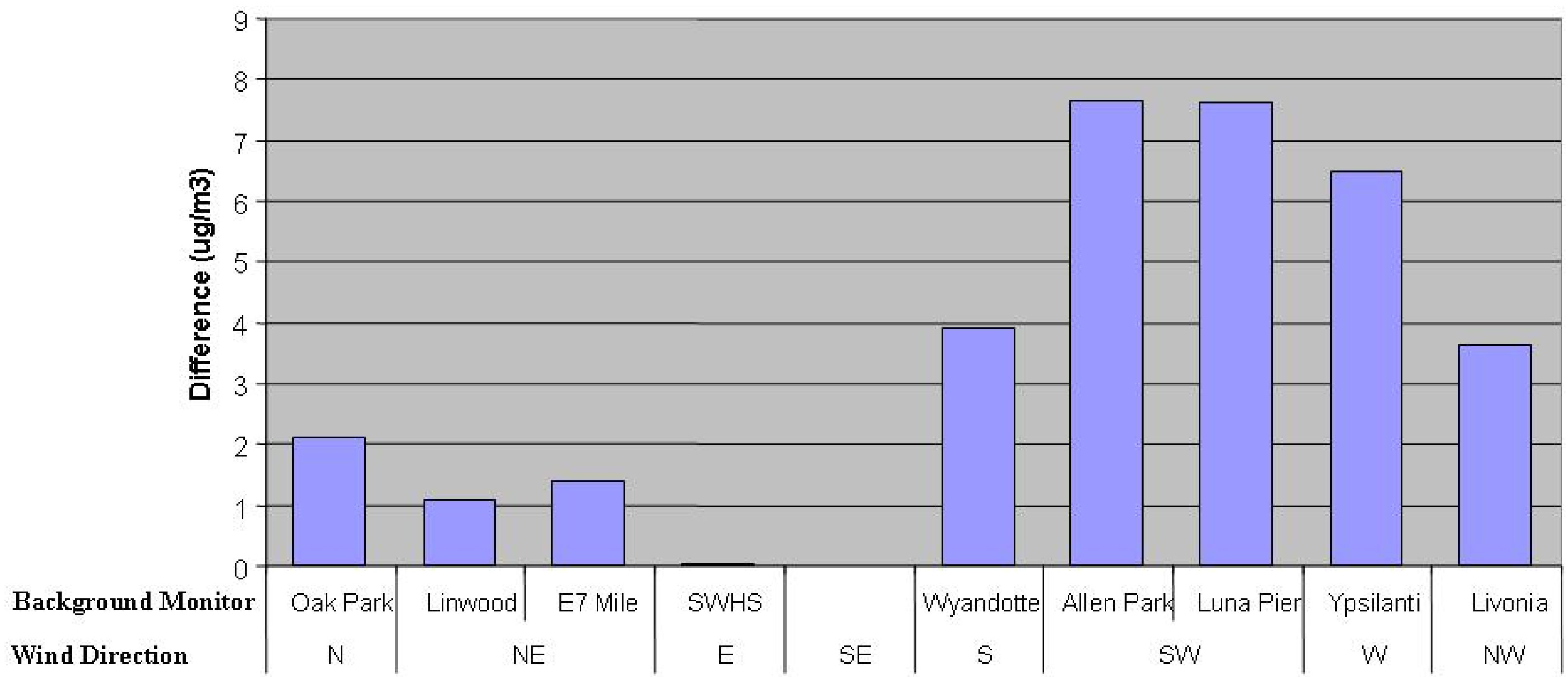


Table 6

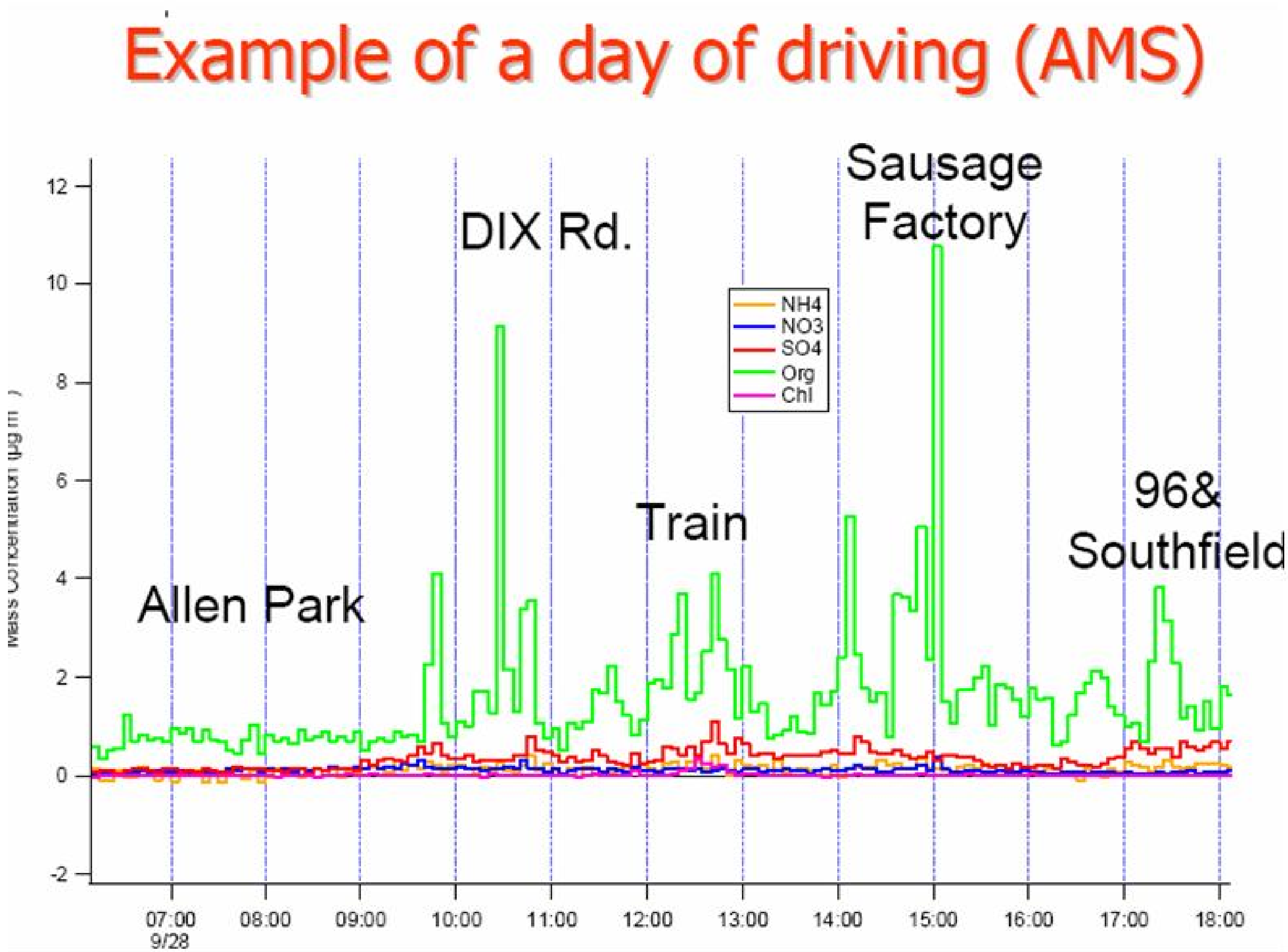
Observed Increase in Pollutant Concentrations Between Locations Immediately Upwind & Downwind of Zug Island

Fall 2006

Pol.	Conc.	Unit
NO	28.3	ppb
NOy	45.2	ppb
CO	82.7	ppb
SO2	96.7	ppb
CO2	61.2	ppb
PM2.5	15.8	ug/m3
pSO4	7.8	ug/m3
pOM	0.8	ug/m3
BC	4.9	1/Mm

Source: "Preliminary Results from the Deployment of an Advanced Mobile Laboratory in Detroit", Jeff Brook, Environment Canada, May 7, 2007.

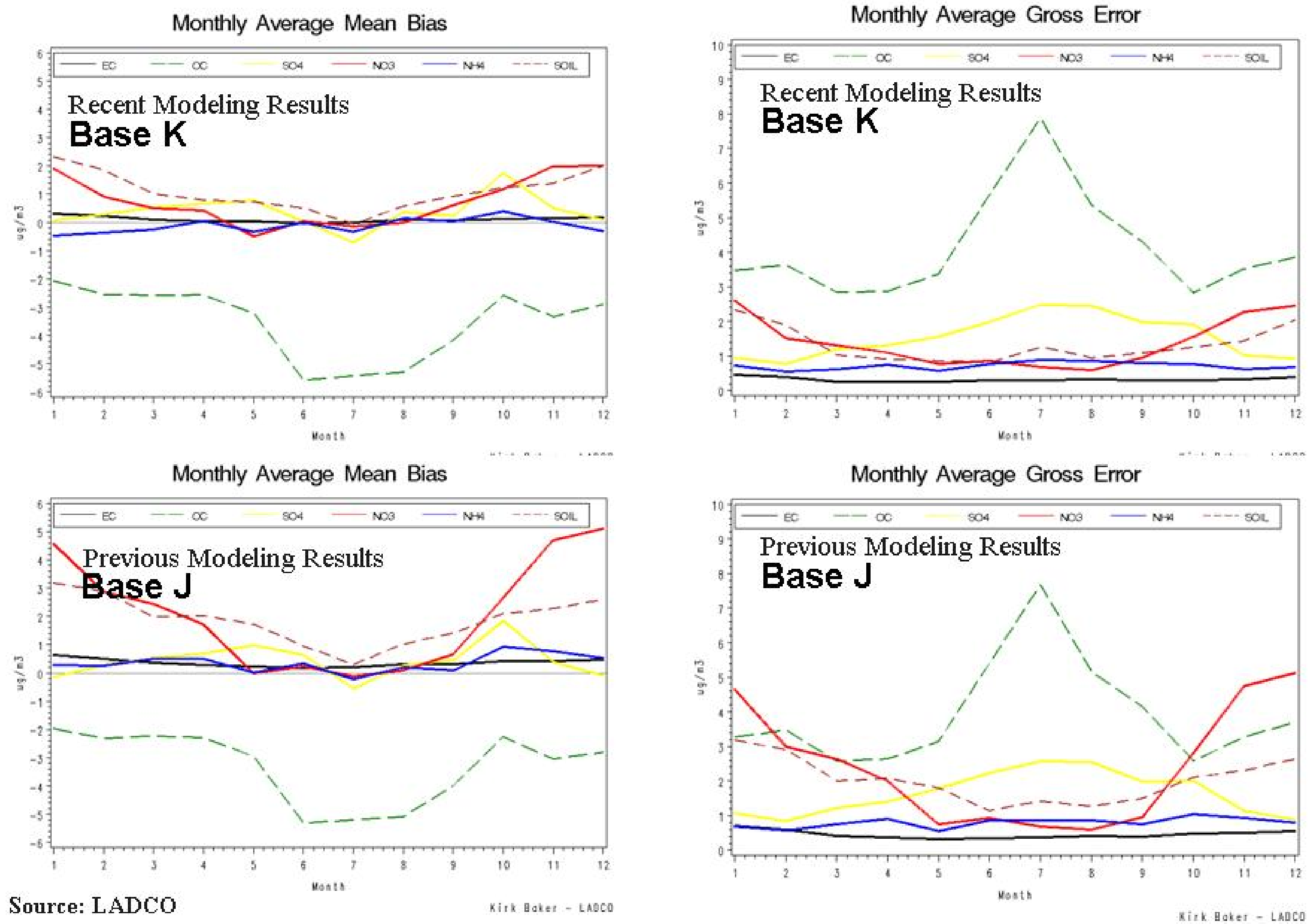
Figure 26



Source: "Preliminary Results from the Deployment of an Advanced Mobile Laboratory in Detroit", Jeff Brook, Environment Canada, May 7, 2007.

Figure 27

Observed vs. Modeled PM2.5 Concentrations



Source: LADCO

Table 7

Forecasted Impact of National On-The-Books Controls on Southeast Michigan PM2.5 Concentrations

Monitor	Base Year Design Value*	Forecasted 2009 PM2.5 Concentration (CAMx Model)	Forecasted Range of Reduction
Dearborn	19.3	17.1 - 17.7	1.6 - 2.2
SWHS	17.3	15.2 - 15.8	1.5 - 2.1
Wyandotte	16.6	14.6 - 15.1	1.5 - 2.0
Linwood	15.5	13.7 - 14.1	1.4 - 1.8
Allen Park	15.9	14.0 - 14.5	1.4 - 1.9
E. 7 Mile	14.7	12.9 - 13.4	1.3 - 1.8
Luna Pier	15.0	13.0 - 13.5	1.5 - 2.0
Ypsilanti	14.4	12.7 - 13.1	1.3 - 1.7
Oak Park	14.6	12.9 - 13.4	1.2 - 1.7
Livonia	14.2	12.4 - 12.8	1.4 - 1.8
Port Huron	13.8	12.2 - 12.7	1.1 - 1.6
New Haven	13.1	11.4 - 11.9	1.2 - 1.7

*Average of '00-'02, '01-'03 & '02-'04 3-year averages

Source: LADCO

Table 8

Forecasted Impact of Local Stationary Source Controls on PM2.5 Concentrations

AERMOD Hot Spot Modeling Results - 2002

Dearborn Monitor Total Reduction	**2.274 ug/m3**
Sverstal Contribution (166 tpy)	2.234 ug/m3
Marathon Contribution (100 tpy)	0.035 ug/m3
US Steel Contribution (66 tpy)	0.005 ug/m3

Wyandotte Monitor Total Reduction	**0.104 ug/m3**
Sverstal Contribution (166 tpy)	0.091 ug/m3
Marathon Contribution (100 tpy)	0.008 ug/m3
US Steel Contribution (66 tpy)	0.005 ug/m3

SWHS Monitor Total Reduction	**0.325 ug/m3**
Sverstal Contribution (166 tpy)	0.286 ug/m3
Marathon Contribution (100 tpy)	0.025 ug/m3
US Steel Contribution (66 tpy)	0.014 ug/m3

Source: MDEQ

Table 9

Forecasted Impact of Local Stationary Source Controls on PM2.5 Concentrations

AERMOD Hot Spot Modeling Results - 2002

Railyard	Number of Locomotives[1]		Retrofit of all Switch Locomotives		Estimated Reduction in PM2.5 Concentrations		
	Switch	Running	Average PM Reduction (tons/day)[4]	PM Reduction (lb/day)	Dearborn µg/m³	SWHS µg/m³	Wyandotte µg/m³
Conrail - Livernois	6	6	0.001	2.51	0.004	0.005	0.000
Conrail - River Rouge[2]	4	6	0.001	1.67	0.002	0.001	0.000
CSX	6	6-10	0.001	2.51	0.213	0.003	0.001
Delray Connecting Rail yard (Zug Island)	2	NA	0.000	0.84	0.001	0.007	0.000
Norfolk Southern	7	15	0.001	2.93	0.004	0.001	0.001
Severstal[3]	2	NA	0.000	0.84	0.004	0.001	0.000
U.S. Steel (River Rouge and Ecorse)	13	NA	0.003	5.43	0.003	0.010	0.002
Total	40		0.008	7.58	0.231	0.028	0.004

[1]MDEQ, gathered from discussions with railroad representatives.

[2]Sometimes operates as many as 8 switch engines but minimum of 4.

[3]Severstal has 4 locomotives, 2 are currently in operation.

[4]EPA, Case Study: Chicago Locomotive Idle Reduction Project, March, 2004. 335 average switch engine service days/year, reduction of 2.4 tons NOx and 0.7 tons of PM per retrofitted engine per year.

Source: SEMCOG & MDEQ