Appendix M

Air Quality Assessment

NOTICE

The information contained in this Appendix was developed strictly for the purpose of evaluating the environmental impacts associated with the Ambassador Bridge Enhancement Project and responding to the regulatory requirements applicable to this proposal. Use of this information for other purposes is not intended, and any such use is at the risk of the user.

Air Quality Conformity Determination Report

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9 November 2007

Mr. Craig Stamper
Project Engineer
Detroit International Bridge Company
P.O. Box 32666
Detroit, Michigan 48232

Re: Air Conformity Determination Report
Ambassador Bridge Enhancement Project

W.O. No: 13814.003.001

Dear Mr. Stamper:

Weston Solutions of Michigan, Inc. (WESTON®) is pleased to present this Air Conformity Determination Report associated with the Ambassador Bridge Enhancement Project (ABEP), Detroit, Michigan. The Detroit International Bridge Company (DIBC) requested an assessment of the potential air quality impacts during the construction of a new cable-stayed bridge. Specifically, DIBC wishes to address the project's conformity with the applicable requirements of the Federal Clean Air Act.

AIR QUALITY ASSESSMENT

The proposed bridge construction is located in Wayne County (**see Figure 1**), which is designated marginal non-attainment area for ozone (O_3) and non-attainment for particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$). A portion of Wayne County is designated a maintenance area for carbon monoxide (CO) and the bridge is located within this designated area. All of Wayne County is designated a maintenance area for particulate matter equal to or less than 10 micrometers in aerodynamic diameter (PM_{10}). Lead (Pb) and sulfur dioxide (SO_2) are in attainment. Therefore, a conformity analysis for the ABEP is required if the emissions of nitrogen oxides (NO_x), volatile organic compounds (VOCs), $PM_{2.5}$, PM_{10}, and CO are emitted in quantities greater than the corresponding de minimus level.

The closest Prevention of Significant Deterioration Class I area is Seney National Wildlife Refuge, with the nearest border approximately 303 miles northwest from the Ambassador Bridge. Due to this distance emissions from the proposed bridge construction and operation will likely impact Seney National Wildlife Refuge.

Build Alternative - Bridge Construction

The following factors were considered in evaluating air quality: (1) the short- and long-term air emissions generated during site preparation, excavation for footings, loading excavated material to trucks, construction of drilled shafts and installation of piles, construction of piers, construction of the superstructure, concrete pouring and mixing in concrete batch plant, and

combustion engine exhaust; (2) the type of emissions generated; and (3) the potential for emissions to result in ambient air concentrations that exceed one of the National Ambient Air Quality Standards (NAAQS) or State Implementation Plan (SIP) requirements. The air pollutant emission calculations for United States portion of the proposed bridge construction included in the sections below are detailed in **Attachment A**.

No-Build and Build Alternative - Ambassador Bridge Operations

Annual air pollutant emissions from cars and trucks that will enter the U.S. and Canada by traveling over the existing and new bridge were estimated using emission factors calculated by the United States Environmental Protection Agency's (USEPA) Mobile Source Emission Factor Model (MOBILE6.2, version 24 September 2003). MOBILE6.2 is a computer program that calculates emission factors for the following parameters for gasoline-fueled and diesel highway motor vehicles:

- Hydrocarbon (HC), measured as VOC,
- CO,
- NO_x,
- Exhaust particulate matter (which consists of several components),
- Tire wear particulate matter,
- Brake wear particulate matter, and
- SO_2.

MOBILE6.2 incorporates certain user inputs and contains default values for some parameters. The input parameters used for this project were as follows:

- Emissions from idling when passing through the U.S. and Canadian inspection stations were estimated using the 2.5 miles per hour (mph) Mobile6.2 emission factor and the distance traveled in the U.S. and Canadian inspection stations (queuing distance).
- The free flow traffic speed across the bridge varies with traffic congestion. The emission factors predicted by Mobile6.2 do not vary much between 15 and 40 mph. Therefore, an average speed of 35 mph was used for all vehicles traveling the distance across the bridge between the U.S. and Canadian inspection stations.
- Seasonal changes were modeled using an average of summer and winter conditions from climatic data, obtained from the National Climatic Data Center (NCDC):
  - The minimum and maximum meteorological average summer temperatures were 40°F and 80°F, respectively.
  - The minimum and maximum meteorological average winter temperatures were 10°F and 50°F, respectively.

MOBILE6.2 includes default values for a wide range of conditions that affect emissions. These defaults are designed to represent "national average" input data values. The following are examples of the type of default parameters supplied by MOBILE6.2.

- Registration (age) distribution by vehicle class.
- Vehicle classifications.
- Distribution of vehicle miles traveled by vehicle class.
- Full, partial, and multiple diurnal distribution by hour.
- Humidity and solar load.

Emissions were calculated for vehicles traveling in both directions on the existing and new bridge and those vehicles passing through U.S. and Canadian inspection stations. **Emissions for each vehicle type and crossing were calculated separately and then combined to arrive at the total emissions for the existing and new bridge.** The air pollutant emission calculations for traffic traveling over the existing and new bridge are detailed in **Attachment B**.

AIR QUALITY STANDARDS AND REGULATIONS

The United States Environmental Protection Agency (USEPA) has established primary and secondary NAAQS under the Clean Air Act and Amendments of 1990 (CAA). The CAA also set emission limits for certain air pollutants from specific sources, set new source performance standards based on best demonstrated technologies, and established national emission standards for hazardous air pollutants.

The CAA specifies two sets of standards – primary and secondary – for each regulated air pollutant. Primary standards define levels of air quality necessary to protect public health, including the health of sensitive populations such as people with asthma, children, and the elderly. Secondary standards define levels of air quality necessary to protect against decreased visibility and damage to animals, crops, vegetation, and buildings. Federal air quality standards are currently established for six pollutants (known as criteria pollutants), including CO, nitrogen dioxide (NO_2), O_3, sulfur oxides (SO_x), commonly measured as SO_2, Pb, and particulate matter ($PM_{10}/PM_{2.5}$). Although O_3 is considered a criteria pollutant and is measurable in the atmosphere, it is often not considered as a pollutant when reporting emissions from specific sources, because O_3 is not typically emitted directly from most emissions sources. It is formed in the atmosphere from its precursors NO_x and VOCs that are directly emitted from various sources. Thus, emissions of NO_x and VOCs are commonly reported instead of O_3.

The NAAQS for the six criteria pollutants are shown in **Table 1**. Units of measure for the standards shown in this table are micrograms per cubic meter of air ($\mu g/m^3$), except for ozone, which is in parts per million (ppm).

The USEPA classifies the air quality within an Air Quality Control Region (AQCR) according to whether the region meets Federal primary and secondary air quality standards. An AQCR or portion of an AQCR may be classified as attainment, non-attainment, or unclassified with regard to the air quality standards for each of the criteria pollutants. "Attainment" describes a condition in which standards for one or more of the six pollutants are being met in an area. The area is considered an attainment area for only those criteria pollutants for which the NAAQS are being met. "Non-attainment" describes a condition in which standards for one or more of the six pollutants are not being met in an area. "Unclassified" indicates that air quality in the area cannot be classified and the area is treated as attainment. A maintenance area is any previously designated non-attainment area and subsequently redesignated to attainment subject to the maintenance plan developed by the SIP. An area may have all three classifications for different criteria pollutants.

The CAA requires Federal actions to conform to any applicable SIP. The USEPA has promulgated regulations implementing this requirement. A SIP must be developed to achieve the NAAQS in non-attainment areas (i.e., areas not currently attaining the NAAQS for any pollutant) or to maintain attainment of the NAAQS in maintenance areas (i.e., areas that were previously classified as non-attainment areas but are currently attaining that NAAQS).

For the ABEP a Federal action will be required by the Coast Guard, therefore, the conformity regulations apply. The CAA established two types of conformity programs: "transportation conformity" and "general conformity." Conformity determinations for Federal actions related to transportation plans, programs and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act, 49 U.S.C. 1601 et seq. are governed by the Transportation Conformity Rule found at 40 CFR Part 51, Subpart T rather than the General Conformity Rule. **This project is not developed, funded or approved under 23 U.S.C. or the Federal Transit Act, and therefore the General Conformity Rule applies to the ABEP rather than the Transportation Conformity Rule.**

As specified in 40 CFR Part 93, Subpart B, a determination of conformity in accordance with the General Conformity Rule must be made for all actions unless the total emissions are less than specified de minimis levels Both direct emissions from the action itself and indirect emissions that may occur at a different time or place but are an anticipated consequence of the action must be considered.

The applicability thresholds are given in **Table 2**.

A number of actions are exempted from the requirements of general conformity including:

- Actions that do not have emissions increases.

- Actions with an emissions increase that is clearly de minimis (21 actions are listed; primarily actions that are administrative, legal, or routine in nature including routine movement of mobile assets, material and personnel as well as routine maintenance and repair).
- Actions that are not reasonably foreseeable or that respond to natural disasters or emergencies.
- Actions that have been approved under specified Federal programs.
- If an action triggers the applicability thresholds and is not exempt from the requirements, the Federal agency must demonstrate and document that the direct and indirect emissions would conform to the SIP. In particular, it must be demonstrated that the proposed action will not:
  - Cause or contribute to a new violation of an NAAQS.
  - Interfere with the SIP.
  - Increase the frequency or severity of existing violations.
  - Delay attainment or any required progress toward that attainment.

The determination generally involves emission estimation and air quality modeling for the entire non-attainment or maintenance area (usually a multi-county area). If the initial conformity determination demonstrates that the proposed action does not conform to the SIP, measures must be established and committed to mitigate the projected air quality impacts. A timeline for implementation of these measures may be specified; however, enforcement measures must also be established to ensure that they are implemented as required.

Air quality compliance involves prevention, control, abatement, documentation, and reporting of air pollution from stationary sources and mobile sources if located in non-attainment areas. Maintaining compliance with air quality regulations may require reduction or elimination of pollutant emissions from existing sources and control of new pollution sources.

AMBASSADOR BRIDGE ENHANCEMENT PROJECT

Build Alternative – Bridge Construction

The proposed project would result in short-term emissions during bridge construction and infrastructure activities.

The combustion of fuel by the construction equipment and related vehicles involved in the bridge building would cause an increase in CO, VOC, NO_x, SO_2, PM_{10} and $PM_{2.5}$. Specific information describing the types of construction equipment required for a task, the hours the equipment is operated, and the operating conditions vary widely from project to project. For purposes of

analysis, these parameters were provided by DIBC. Combustive emissions from construction equipment and related vehicle exhaust were estimated by using USEPA approved emissions factors for heavy-duty diesel-powered construction equipment, along with the emission factors for the estimated types and numbers of equipment expected to be used during construction. These emission estimates are shown in **Table 3**. The construction emissions would produce slightly elevated air pollutant concentrations. However, the effects from construction activities would last only as long as the duration of construction activity, fall off rapidly with distance from the construction site, and would not result in long-term impacts.

It was estimated that the time to complete the new bridge and infrastructure activities would be approximately 2 years. Activities related to construction were assumed to occur 5 days per week, 10 hours per day. The calculation of emissions from construction activities, conservatively assumed that the construction equipment is in operation during the entire 10 hours per day. This is a conservative estimate since it does not account for holidays or days when construction activities cannot be conducted due to inclement weather. This also assumes that the equipment is run continuously for 10 hours each day.

Review of emissions from the ABEP in **Table 3** indicates that the greatest impact to the local emissions during construction would be NO_x with 24.9 tpy increase from the exhaust emissions during the project year 2010. The emissions would be temporary and would be eliminated after the activity is completed.

No Build and Build Alternative - Ambassador Bridge Operations

The no build alternative does not affect the annual predicted traffic that will use the Ambassador Bridge to enter the U.S. and Canada. The Detroit River International Crossing (DRIC) Study level 2 traffic operations analysis indicates that the build alternative 2030 traffic volume possibly would increase due to a shift from the Blue Water Bridge to Detroit if a new 6 lane bridge is built. If it is assumed that the ABEP receives all the DRIC level 2 predicted traffic shift to Detroit, this would add an additional 13,314 cars and 252,679 trucks to the 2030 predicted traffic volume traveling across the existing bridge.

The annual car and commercial traffic predicted to use the existing Ambassador Bridge was estimated using the 2030 traffic volumes from the DRIC Study Travel Demand Forecasts exhibit 52-23 and appropriate growth rates from the DRIC Study exhibits 5-9 and 5-20. It was assumed that the distances traveled on the new bridge would be similar to the existing Ambassador Bridge. A 0.091 mile queuing distance for all cars and a 0.33 mile queuing distance for all trucks were used to estimate the idling emissions when traveling through the U.S. inspection stations and a 0.16 mile queuing distance for all vehicle types was used when traveling through the Canadian inspection stations. The approximate distance of 1.9 miles was used for estimating emissions from free-flow truck traffic and 1.5 miles from free-flow car traffic traveling from the Canadian plaza to the U.S. customs. The approximate distance of 1.6 miles was used for

estimating emissions from both free-flow truck and car traffic traveling from the U.S. plaza to the Canadian. customs. These assumptions were used with MOBILE6.2 emission factors to estimate the annual emissions of $PM_{2.5}$, PM_{10}, CO, NO_x, SO_2, and VOCs assumed to be hydrocarbons (HC) (as a measure of ozone) for the years 2010 and 2030

The no build and build alternative annual operating emissions of CO, VOC, NO_x, SO_2, PM_{10} and $PM_{2.5}$ estimated for years 2010 and 2030 are shown in **Table 4**.

GENERAL CONFORMITY

The General Conformity rule is set forth in the Code of Federal Regulations (CFR), 40 CFR 51 Subpart W – Determining Conformity of General Federal Action to State and Federal Implementation Plans. According to 40 CFR 51.853(b), Federal actions require a conformity determination for each pollutant where the total of direct and indirect emissions in a non-attainment or maintenance area caused by a Federal action would equal or exceed any of the rates in paragraphs 40 CFR 51.853(b)1 or 2. The emission calculations used in this general conformity applicability determination are included in **Attachments A and B**.

Wayne County is designated marginal non-attainment area for O_3 and for $PM_{2.5}$. A portion of Wayne County is designated a maintenance area for CO and all of Wayne County is designated a maintenance area for PM_{10}. Therefore, for the ABEP O_3 precursors (NO_x and VOC), $PM_{2.5}$, PM_{10}, and CO emissions are subject to General Conformity requirements. In accordance with the requirements of 40 CFR 51.853(b)1, the de minimus threshold set for marginal O_3 non-attainment areas is 100 tpy for NO_x and 50 tpy for VOC. Similarly, the de minimus threshold for $PM_{2.5}$ is 100 tpy. The CO and PM_{10} maintenance area de minimus thresholds are 100 tpy for CO and 100 tpy for PM_{10}.

The annual emission increases associated with the proposed bridge construction and the comparison with the de minimus thresholds are presented in **Table 5**. **Table 5** shows that the emissions of VOCs, NO_x, CO, PM_{10}, and $PM_{2.5}$ during the construction of the proposed bridge are significantly less than the de minimus thresholds. Therefore, no further analysis is required.

The annual emission increase associated with the Build Alternative traffic emissions and the comparison with the de minimus thresholds are presented in **Table 6**. **Table 6** shows that the 2030 emission increases of VOCs, NO_x, CO, PM_{10}, and $PM_{2.5}$ from vehicle traffic are significantly less than the de minimus thresholds. Therefore, no further analysis is required.

Table 6 also shows the emissions in 2030 associated with the increase in traffic volumes between 2010 and 2030. Even this would show insignificant emission increases.

REGIONAL SIGNIFICANCE

Table 7 compares the net emissions from the proposed bridge construction and the Build Alternative 2030 emission increase to the 2002 Wayne County emissions. As defined by 40 CFR 51.852 and 93.152 the ABEP would not be considered a regionally significant Federal action because all emissions would fall well below the 10% level that would be considered regionally significant by the USEPA. 40 CFR 51.852 and 93.152 defines a "Regionally Significant Action" as a Federal action for which the direct and indirect emission increase of any pollutant represents 10 percent or more of a non-attainment or maintenance area's emissions inventory for that pollutant.

MITIGATIVE ACTIONS

Little impact to local air quality would be expected from the proposed bridge construction. As specified in 40 CFR 93.160, any measures that are intended to mitigate air quality impacts must be identified. Mitigative action during construction would be require that all construction equipment and vehicles be Tier 3 emission standard compliant. Best Management Practices would include: watering the disturbed area of the construction; covering dirt and aggregate trucks and/or piles; prevention of dirt carryover to paved roads; and, the use of erosion barriers and wind breaks. The affect on traffic emissions between the build and no build alternative are insignificant and would require no mitigative action.

CLIMATOLOGICAL DATA

The National Climatic Data Center (NCDC) 1930-1996 climatological wind data for Detroit shows that the predominant wind direction for this period is from the southwest. The attached **Figure 2** is a wind rose for the Detroit City Airport, showing the predominance of south westerly winds for the years of 1984-1992.

MONITORING DATA

WESTON reviewed the 2006 ambient air concentration data collected at four Michigan Department of Environmental Quality (MDEQ) air monitoring stations located north and east of the Ambassador Bridge to assess their contribution to Wayne County's current NAAQS attainment status for ozone and $PM_{2.5}$. Specifically, data from Detroit-Linwood, Detroit-E. Seven Mile, Detroit-Newberry, and Detroit-Lafayette stations. Although other MDEQ stations are located near the new bridge, they are upwind of the predominant wind directions and would be less impacted by the emissions from the bridge (see **Figure 3**). Canadian monitoring data was available for two stations, but similar to the other MDEQ stations, the Canadian stations are upwind of the predominant wind directions and would not be representative of the air emissions from the bridge. **Table 8** shows the comparison between the 2006 air monitoring data from the

four MDEQ stations and the NAAQS. MDEQ no longer monitors for CO and NO_x at these monitors.

CONCLUSIONS

As shown in **Tables 5 and 6**, The emissions from the construction phase and the traffic emission increase from the operation of the new bridge are less than the de minimus levels for VOCs, NO_x, CO, PM_{10}, and $PM_{2.5}$, therefore no further analysis is required. As shown in **Table 7**, The maximum annual air emissions of any individual criteria pollutant from the increase in vehicle traffic on the proposed bridge and construction is less than 10% of the annual emissions for Wayne County, Michigan for that pollutant. As defined by 40 CFR 51.852 and 93.152 the ABEP would not be considered a regionally significant Federal action.

WESTON appreciates the opportunity to serve DIBC on this important project. If you have any questions or concerns regarding this air quality assessment, please feel free to contact Mr. Kevin Eldridge at (919) 424-2222 or Mr. Kevin Bate at (313) 739-2525.

Sincerely,

WESTON SOLUTIONS OF MICHIGAN, INC.

Kevin Eldridge /KB

Kevin Eldridge
Senior Technical Manager

Kevin Bate, CHMM, CSP
Client Services Manager

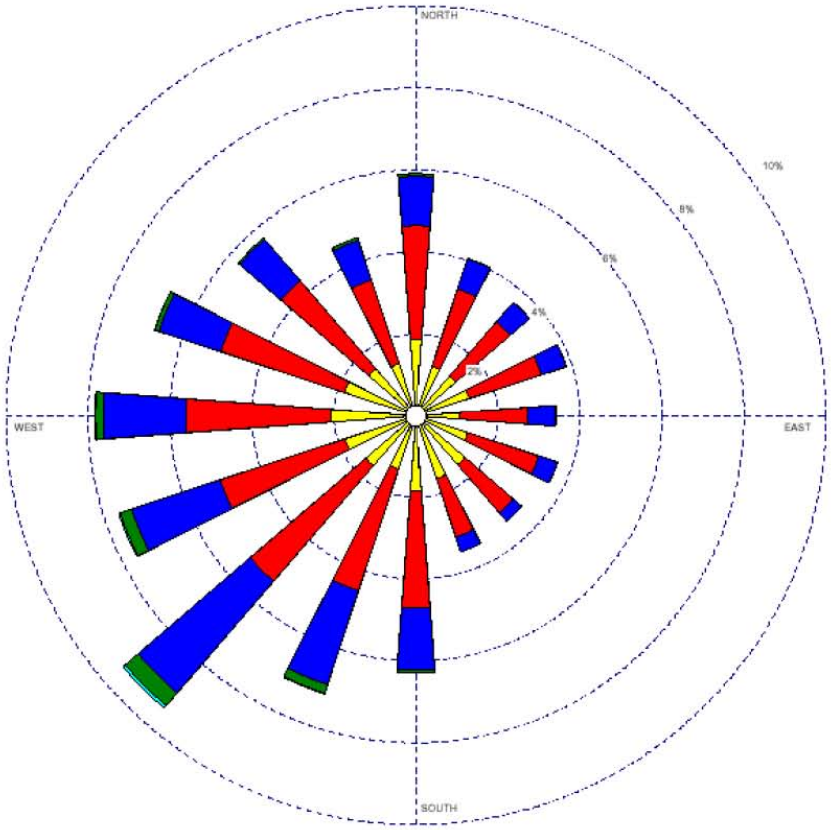
Attachments

cc: B. Peterson (WESTON)

FIGURES

Figure 1
Location of Existing Ambassador Bridge

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



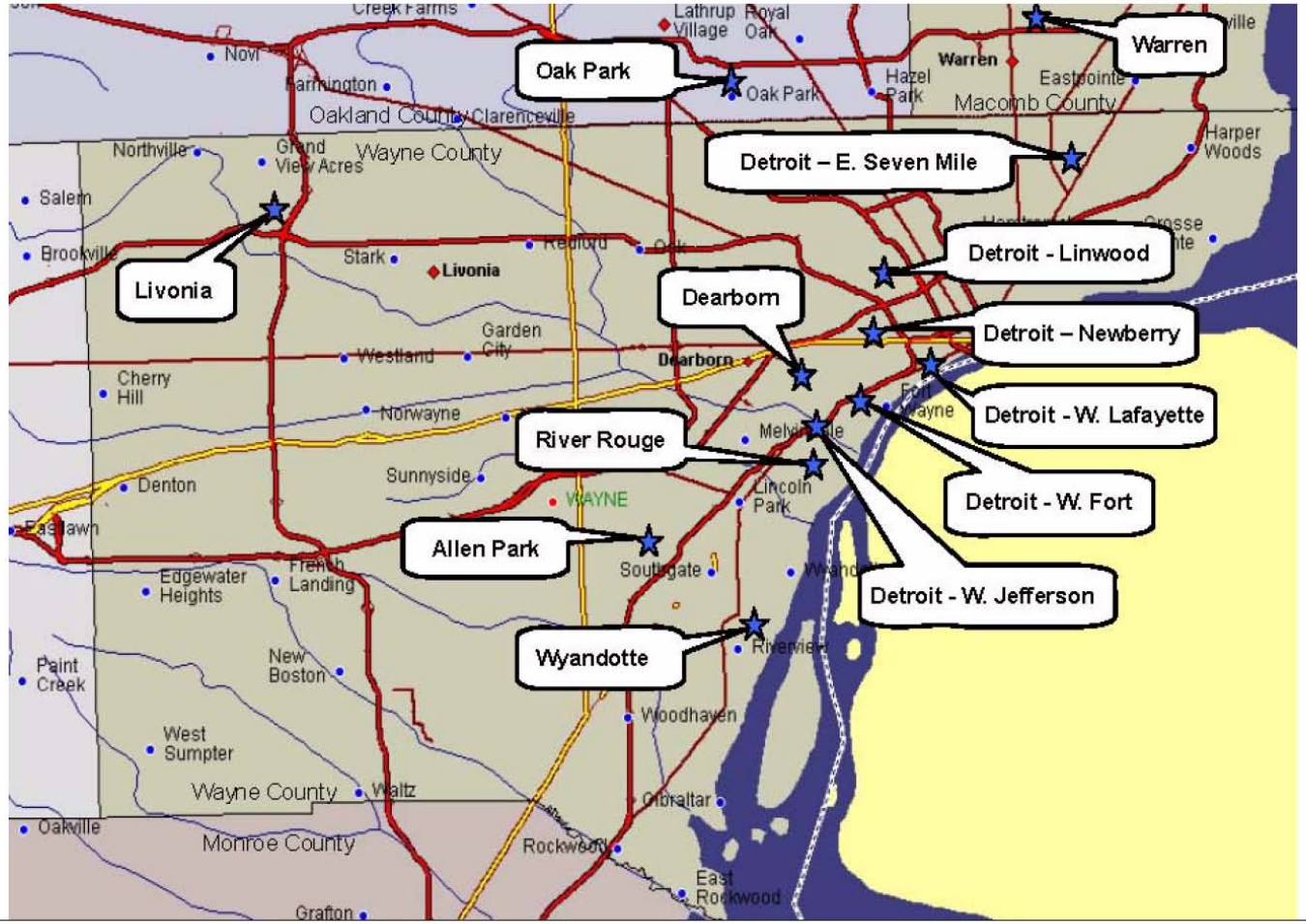
Station Number 14822- Detroit City Airport
Plot Years 1984-1992

Orientation: Direction wind blowing is from.

N
W E
S

Figure 2
Windrose From Detroit City Airport

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale In Kilometers

0 12 24

Source: Base map Michigan's 2005 Annual Air Quality Report, Dated August 2006.

N W E S

WESTON SOLUTIONS

Figure 3
Southeast Michigan Air Sampling Network

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan

TABLES

Table 1
National Ambient Air Quality Standards

Pollutant	Standard Value ($\mu g/m^3$)[a]	Standard Type
CO		
1-hr average	40,000	Primary
8-hr average	10,000	Primary
NO_2		
Annual average	100	Primary and secondary
O_3		
1-hr average[b]	0.12	Primary and secondary
8-hr average[c]	0.08	Primary
Lead		
Quarterly average	1.5	Primary
PM_{10}		
24-hr average[d]	150	Primary and secondary
$PM_{2.5}$		
24-hr average[e]	35	Primary
Annual average[f]	15	Primary
SO_2		
3-hr average	1,300	Secondary
24-hr average	365	Primary
Annual average	80	Primary

CO = carbon monoxide
$\mu g/m^3$ = micrograms per cubic meter.
NO_2 = nitrogen dioxide
O_3 = ozone
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
PM_{10} = particulate matter equal or less than 10 micrometers in diameter.
SO_2 = sulfur dioxide

[a] Units for ozone are ppm.

[b] The 1-hour ozone standard, as well as designations and classifications for all 1-hour ozone non-attainment and maintenance areas, have been revoked for Wayne County.

[c] To attain the 8-hour ozone standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

[d] The 24-hour standard for PM_{10} is not be exceeded more than once per year

[e] The $PM_{2.5}$ 24-hour standard is based on the 3-year average 98th percentile of 24-hour concentrations at each population-oriented monitor, must not exceed 35 $\mu g/m^3$.

[f] The $PM_{2.5}$ annual standard is based on 3-year average of weighted annual arithmetic mean concentrations, must not exceed 15.0 $\mu g/m^3$.

Table 2
General Conformity Applicability Thresholds

NAAQS Pollutant	Type of Non-attainment or Maintenance Area	Applicability Threshold (tpy)
Ozone	Extreme NAAs	10 tpy VOC or NO_x
	Severe NAAs	25 tpy VOC or NO_x
	Serious NAAs	50 tpy VOC or NO_x
	Other NAAs inside an ozone transport region	50 tpy VOC (100 tpy NO_x)
	Other NAAs outside an ozone transport region	100 tpy VOC or NO_x
Carbon Monoxide	All NAAs	100 tpy CO
	All Maintenance areas	100 tpy CO
Sulfur Dioxide	All NAAs	100 tpy SO_2
PM_{10}	Serious NAAs	70 tpy PM_{10}
	Moderate NAAs	100 tpy PM_{10}
	All Maintenance areas	100 tpy PM_{10}
$PM_{2.5}$	Direct emissions	100 tpy $PM_{2.5}$
Lead	All NAAs	25 tpy Pb
	All Maintenance areas	25 tpy Pb

CO = carbon monoxide
NAAs = non-attainment areas
NO_x = nitrogen oxides
O_3 = ozone
Pb = lead
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
PM_{10} = particulate matter equal or less than 10 micrometers in diameter.
SO_2 = sulfur dioxide
tpy = tons per year
VOC = volatile organic compounds

Table 3
Expected Emissions per Construction Year

Criteria Air Pollutant	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
2009 Proposed Bridge Construction Emissions (tpy)	12.2	2.9	22.1	6.9	6.8	3.7
2010 Proposed Bridge Construction Emissions (tpy)	14.7	3.1	24.9	7.3	2.9	2.6

CO = carbon monoxide
NO_x = nitrogen oxides
O_3 = ozone
Pb = lead
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
PM_{10} = particulate matter equal or less than 10 micrometers in diameter.
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds

Table 4
Ambassador Bridge Traffic Emissions[a]

Criteria Air Pollutant	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
2010 No-Build - Existing Bridge Traffic Annual Emissions (tpy)	213	17.1	67.3	4.1	2.5	1.9
2030 No-Build – Existing Bridge Traffic Annual Emissions (tpy)	191	11.9	12.9	6.9	1.7	1.1
2030 Build – New Bridge Traffic Annual Emissions (tpy)[b]	191	12.1	13.2	7.2	1.8	1.1
Annual Emissions from 2010 to 2030 Traffic Volume Increase - Existing Bridge (tpy)[c]	40.7	3.4	4.5	2.8	0.62	0.40
2030 Increase in Annual Emissions from New Bridge (tpy)[d]	0.45	0.17	0.33	0.24	0.047	0.032

CO = carbon monoxide
NO_x = nitrogen oxides
O_3 = ozone
Pb = lead
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
PM_{10} = particulate matter equal or less than 10 micrometers in diameter.
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds
Notes:
[a] Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.
[b] The DRIC Level 2 analysis's total increase in Detroit River crossings of 13,314 cars and 252,679 trucks due to new 6-lane bridge added to the 2030 predicted traffic volume for the existing Ambassador Bridge.
[c] Emissions are calculating using the difference between 2010 predicted traffic volume and those for 2030 (See Tables B-1 and B-5).
[d] The difference between the 2030 No-Build and the 2030 Build Alternative annual emissions.

Table 5
Comparison of Construction Emissions to De Minimus Thresholds

Pollutants	2009 Proposed Bridge Construction Emissions (tpy)	2010 Proposed Bridge Construction Emissions (tpy)	De minimus Threshold (tpy)
VOC	2.9	3.1	50
NO_x	22.1	24.9	100
$PM_{2.5}$	3.7	2.6	100
PM_{10}	6.8	2.9	100
CO	12.2	14.7	100

CO = carbon monoxide
NO_x=nitrogen oxides
$PM_{2.5}$=particulate matter equal or less than 2.5 micrometers in diameter
PM_{10}= particulate matter equal or less than 10 micrometers in diameter
tpy = tons per year
VOC=volatile organic compound

Table 6
Comparison of 2010 - 2030 Traffic Volume Increase and Build Alternative Traffic Emission Increase to De Minimus Thresholds

Pollutants	Emissions from Difference in 2010 to 2030 Traffic Volume (tpy)	2030 Build Alternative Traffic Emission Increase (tpy)	De minimus Threshold (tpy)
VOC	3.4	0.17	50
NO_x	4.5	0.33	100
$PM_{2.5}$	0.40	0.032	100
PM_{10}	0.62	0.047	100
CO	40.7	0.45	100

CO = carbon monoxide
NO_x=nitrogen oxides
$PM_{2.5}$=particulate matter equal or less than 2.5 micrometers in diameter
PM_{10}= particulate matter equal or less than 10 micrometers in diameter
tpy = tons per year
VOC=volatile organic compound

Table 7
Percent of Regional Emissions

Criteria Air Pollutant	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
2009 Proposed Bridge Construction Emissions (tpy)	12.2	2.9	22.1	6.9	6.8	3.7
Percent of Regional Emissions	1.99E-05	4.17E-05	1.97E-04	9.22E-05	4.58E-04	4.01E-04
2010 Proposed Bridge Construction Emissions (tpy)	14.7	3.1	24.9	7.3	2.9	2.6
Percent of Regional Emissions	2.40E-05	4.46E-05	2.22E-04	9.75E-05	1.95E-04	2.82E-04
Emissions from Traffic Volume Increase from 2010 to 2030 (tpy)	40.7	3.4	4.5	2.8	0.62	0.40
Percent of Regional Emissions	6.65E-05	4.89E-05	4.01E-05	3.74E-05	4.17E-05	4.33E-05
Build Alternative 2030 Traffic Emission Increase (tpy)	0.45	0.17	0.33	0.24	0.047	0.032
Percent of Regional Emissions	7.35E-07	2.45E-06	2.94E-06	3.21E-06	3.16E-06	3.46E-06
2002 Wayne County Emissions (tpy)[a]	611,991	69,476	112,120	74,875	14,858	9,236

CO = carbon monoxide
NO_x = nitrogen oxides
O_3 = ozone
Pb = lead
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
PM_{10} = particulate matter equal or less than 10 micrometers in diameter.
SO_x = sulfur oxides
tpy = tons per year
Notes:
VOC = volatile organic compounds
[a] Includes emissions from point, area, on-road, non-road mobile sources, and biogenic sources. Source: USEPA's NEI database. Data for year 2002 were extracted from NEI final version 3, February 2004. NEI is an emissions database developed by USEPA, 2002 is the latest year of emissions available. The MDEQ does not have emission data available later than 2002.

Table 8
MDEQ Monitor Data

Pollutant National Ambient Air Quality Standard	MDEQ Published Data for Station Detroit-Linwood	MDEQ Published Data for Station Detroit-E. Seven Mile	MDEQ Published Data for Station Detroit-Newberry	MDEQ Published Data for Station Detroit-W. Lafayette
Ozone				
8-hour average – 0.08 ppm	0.071 ppm	0.074 ppm	Not Available	Not Available
$PM_{2.5}$				
Annual Mean – 15 $\mu g/m^3$	14.2 $\mu g/m^3$	14.1 $\mu g/m^3$	12.8 $\mu g/m^3$	13.1 $\mu g/m^3$
24-hour avg. – 35 $\mu g/m^3$	42.3 $\mu g/m^3$	41.2 $\mu g/m^3$	41.0 $\mu g/m^3$	38.2 $\mu g/m^3$

MDEQ = Michigan Department of Environmental Quality
$\mu g/m^3$ = micrograms per cubic meter.
$PM_{2.5}$ =particulate matter equal or less than 2.5 micrometers in diameter.
ppm = parts per million

ATTACHMENT A
ABEP CONSTRUCTION EMISSION CALCULATIONS

Table A-1, Summary of Construction Emissions

Type	Total 2009 Emission Rates					
	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	NO_x (ton/yr)	CO (ton/yr)	SO_x (ton/yr)	VOC (ton/yr)
Construction Equipment Exhaust	2.0	2.0	22.1	12.2	6.9	2.9
Concrete Batch Plant[a]	0.70	0.40	-	-	-	-
Fugitive Dust[b]	4.1	1.3	-	-	-	-
Total (ton/yr)	**6.8**	**3.7**	**22.1**	**12.2**	**6.9**	**2.9**

Type	Total 2010 Emission Rates					
	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	NO_x (ton/yr)	CO (ton/yr)	SO_x (ton/yr)	VOC (ton/yr)
Construction Equipment Exhaust	2.2	2.2	24.9	14.7	7.3	3.1
Concrete Batch Plant[a]	0.70	0.40	-	-	-	-
Total (ton/yr)	**2.9**	**2.6**	**24.9**	**14.7**	**7.3**	**3.1**

Notes:

a Total emissions from concrete batch plant have been applied to both years of construction 2009 and 2010.

b Fugitive dust emissions occur only in 2009, during tower pier foundation shaft construction.

NewAmbassador Bridge
Construction of United States side of bridge, year 2009.

Construction Emissions: Calculations

Table A-2, Equipment Operation (Exhaust Emissions)

Type	Hours Operation (hr/yr)	Horsepower (hp)	Load Factor (%)	Emission Factors[a,b,c,d]					
				PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	NO_x (g/hp-hr)	CO (g/hp-hr)	SO_x (g/hp-hr)	VOC (g/hp-hr)
Delivery Truck	19,500	350	25	0.15	0.15	55.0	94	0.89	0.25
Pile Driver	650	470	50	0.15	0.15	3.0	2.6	0.93	0.35
Dump Truck	9,100	350	25	0.15	0.15	55.0	94	0.89	0.25
Concrete Mixer/Truck	26,000	350	25	0.15	0.15	55.0	94	0.89	0.25
Excavator ("Caterpillar")	1,300	241	50	0.15	0.15	3.0	2.6	0.93	0.19
Truck/Track Rotary Auger	1,300	670	50	0.15	0.15	3.0	2.6	0.93	0.35
Crane - Tower Pier Foundation Construction	1,300	470	50	0.15	0.15	3.0	2.6	0.93	0.33
Crane - Pylon Construction	1,300	201	50	0.15	0.15	3.0	2.6	0.93	0.33
Diesel Generator	14,300	268	25	See Diesel Generator Emission Calculations					

Table A-2, Equipment Operation (Exhaust Emissions Continued)

Type	Emission Rates					
	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	NO_x (ton/yr)	CO (ton/yr)	SO_x (ton/yr)	VOC (ton/yr)
Delivery Truck	0.28	0.28	1.2	2.0	1.7	0.46
Pile Driver	0.03	0.03	0.50	0.44	0.16	0.058
Dump Truck	0.13	0.13	0.55	0.94	0.78	0.22
Concrete Mixer/Truck	0.4	0.4	1.6	2.7	2.2	0.62
Excavator ("Caterpillar")	0.026	0.026	0.52	0.45	0.16	0.032
Truck/Track Rotary Auger	0.072	0.072	1.4	1.2	0.45	0.17
Crane - Tower Pier Foundation Construction	0.050	0.050	1.0	0.87	0.31	0.11
Crane - Pylon Construction	0.022	0.022	0.43	0.37	0.13	0.048
Diesel Generator	1.1	1.1	14.9	3.2	0.98	1.2
Totals	**2.0**	**2.0**	**22.1**	**12.2**	**6.9**	**2.9**

Notes:

[a] SO_x used Nonroad Engine and Vehicle Emission Study (11/91), Tabl and Table 2-07

[b] Delivery truck, dump truck and concrete mixer trucks used emission factors: 55 g/hr NO_x; and 94 g/hr CO.

[c] Used USEPA Tier 3 emission limits of 3.0 g/hp-hr for NO_x 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM_{10} and $PM_{2.5}$.

[d] Used ratio of NO_x and VOC emission factor from Nonroad Engine and Vehicle Emission Study (11/91), to estimate VOC portion of Tier 3 NOx/NMHC emission factor.

Delivery Trucks

Number of Trucks =	15	Heavy truck
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	350	hp Assumed average size.
Ave. Load Factor =	25	%

Pile Driver

Number of Scrapers =	1	Heavy truck
Hours of Operation per Year =	650	hours/yr (1/4 of the year @ 50/week)
Vehicle Ave.Horsepower =	470	hp (350 kW)
Ave. Load Factor =	50	%

Dump Truck

Number of Loaders=	7	Heavy Truck
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	350	hp Assumed average size.
Ave. Load Factor =	25	%

Concrete Mixer/Truck

Number of Mixing Trucks =	10	Heavy truck
Hours of Operation per Year =	2,600	hours/yr (Entire year 52 weeks @ 50 hours/week)
Vehicle Ave.Horsepower =	350	hp Assumed average size.
Ave. Load Factor =	25	%

Excavator

Number of Excavator =	1	Excavator
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	241	hp (180 kW)
Ave. Load Factor =	50	%

Truck/Track Rotary Auger

Number of Backhoes =	1	Heavy Trucks - Bore/Drill Rigs
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	670	hp (500 kW)
Ave. Load Factor =	50	%

Crane - Tower Pier Foundation Construction

Number of Cranes =	1	Crane - Tower Pier Foundation Construction
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	470	hp (350 kW)
Ave. Load Factor =	50	%

Crane - Pylon Construction

Number of Cranes =	1	Crane - Pylon Construction
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	201	hp (150 kW)
Ave. Load Factor =	50	%

Diesel Generators

Number of Generators =	NA	Diesel Generators
Hours of Operation per Year =	14,300	Combined total hours for all diesel generators in year 2010
Ave.Horsepower =	268	hp (200 kW)
Ave. Load Factor =	25	%

Year 2009 Construction Emissions: Diesel Generators

Horsepower Rating (hp)	Load Factor (%)	Operation Time (hr/yr)	CO (lb/yr)	NOx (lb/yr)	PM_{10} (lb/yr)	$PM_{2.5}$ (lb/yr)	SO_2 (lb/yr)	VOC (lb/yr)
268	25	14,300	6,400	29,701	2,108	2,108	1,964	2,409

Emission Factors For Internal Combustion Engines (lb/hp-hr) (AP-42 Section 3.3)

CO	NOx	PM	PM10	SO_2	VOC	PM2.5
0.00668	0.031	0.0022	0.0022	0.00205	0.0025141	0.0022

Fugitive Dust Emissions

	M (moisture content)	U (mean wind speed)	k_{PM10} (particle size multiplier)	$k_{PM2.5}$ (particle size multiplier)	Mass Soil Excavated (ton/yr)	Emission Rates	
						PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)
Fugitive Dust	3.4	10.7	0.35	0.11	2,842	**4.1**	**1.3**

Constants, Source Conditions, and Variables

Variable	Description of Variable	Value PM_{10}	Value $PM_{2.5}$	Units	Reference
k	Particle Size Multiplier	0.35	0.11	-	AP-42 Section 13.2.4 Page 3
U	Mean Wind Speed	10.7	10.7	mph	Detroit City Airport Annual Mean 1984-1992
M_1	Surface Material Moisture Content (dry)	3.4	3.4	%	AP-42 Table 13.2.4-1

Loading Excavated Material to Trucks and Truck Dumping[1]

$$EF_{PM10/2.5\ (lb/ton)} = (0.0032k)\frac{(U/5)^{1.3}}{(M_1/2)^{1.4}}$$ Eq. 2, AP-42 13.2.4

Notes:

[1]Emission factors based upon AP-42 Sections 13.2.3 (1/95) and 13.2.4 (1/95)

Mean Wind Speed Source: Detroit City Airport, Detorit, MI. Period of record 1984-1992.

Tower Pier Foundation Construction

An estimated 18 shafts will be drilled removing approximately 125 cubic yards in each shaft .

Quantity of Soil Moved =	2,250	cubic yard (shafts: 18 shafts * 125 cubic yards)
Density of Soil Moved =	2,526	lb/cubic yard (compacted soil excavated for shaft, based upon bulk dry density of compact soil = 1.5 g/cm^3)
Mass of Soil Moved =	2,842	tons/year (2009)

Table A-3, Concrete Batch Plant Emissions

Operation	PM (lb/yd^3)	PM_{10} (lb/yd^3)	PM_{10} (lb/yd^3)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Aggregate delivery to ground storage	6.40E-03	3.10E-03	3.10E-03	0.16	0.078	0.078
Sand delivery to groudn storage	1.50E-03	7.00E-04	7.00E-04	0.038	0.018	0.018
Aggregate transfer to conveyor	6.40E-03	3.10E-03	3.10E-03	0.16	0.078	0.078
Sand transfer to conveyor	1.50E-03	7.00E-04	7.00E-04	0.04	0.018	0.018
Aggregate transfer to elevated storage	6.40E-03	3.10E-03	3.10E-03	0.16	0.078	0.078
Sand transfer to elevated storage	1.50E-03	7.00E-04	7.00E-04	0.04	0.018	0.018
Cement delivery to silo	2.00E-04	1.00E-04	1.00E-04	5.03E-03	2.51E-03	2.51E-03
Cement supplement delivery to silo	3.00E-04	2.00E-04	2.00E-04	7.54E-03	5.03E-03	5.03E-03
Weigh hopper loading	7.90E-03	3.80E-03	3.80E-03	0.20	0.10	0.10
Central mix loading	0.039	0.012	2.25E-04	0.99	0.31	5.65E-03
			Total (tpy)	**1.8**	**0.70**	**0.40**

Total Cement Transfer 50260 cubic yards

Concrete Batch Plant

Operation	Cubic Yards	Units	Number of Units	Total cubic yards
Shafts	125	per shaft	36	4500
Tower pier footings	4500	per pier	2	9000
Pylon construction	15000	per pylon	2	30000
Pier table	250	per pylon	2	500
Footings	180	per pier	2	360
Pier	400	per pier	2	800
Deck	4000	Canada Side	1	4000
Deck	1100	US Side	1	1100
			Total	50,260

Central Mix Loading

Table 11.12-4. Equation Parameters for Central Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.19	0.95	0.9	0.0010
	PM_{10}	0.13	0.45	0.9	0.0010
	$PM_{10-2.5}$	0.12	0.45	0.9	0.0009
	$PM_{2.5}$	0.03	0.45	0.9	0.0002
Uncontrolled[1]	Total PM	5.90	0.6	1.3	0.120
	PM_{10}	1.92	0.4	1.3	0.040
	$PM_{10-2.5}$	1.71	0.4	1.3	0.036
	$PM_{2.5}$	0.38	0.4	1.3	0

Emission factors expressed in lbs/tons of cement and cement supplement

$E = (k*0.0032*(U^a/M^b)+c)*0.282$

	pm	pm10	pm2.5
K	5.9	1.92	0.38
a	0.6	0.4	0.4
b	1.3	1.3	1.3
c	0.12	0.04	0
U	10	10	10
M	2.8116	2.8116	2.8116
Factor	0.0393686	0.0124152	0.0002247

NewAmbassador Bridge
Construction of United States side of bridge, year 2010.

Construction Emissions: Calculations

Table A-4, Equipment Operation (Exhaust Emissions)

Type	Hours Operation (hr/yr)	Horsepower (hp)	Load Factor (%)	Emission Factors[a,b,c,d]					
				PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	NO_x (g/hp-hr)	CO (g/hp-hr)	SO_x (g/hp-hr)	VOC (g/hp-hr)
Delivery Truck	35,100	350	25	0.15	0.15	55.0	94	0.89	0.25
Barge/Tugboat	2,600	NA	NA	See Barge/Tugboat Calculations					
Concrete Finishing Machine	1,300	134	50	0.90	0.90	3.0	2.6	0.93	0.30
Concrete Mixer/Truck	18,200	350	25	0.15	0.15	55.0	94	0.89	0.25
Crane	8,450	201	50	0.15	0.15	3.0	2.6	0.93	0.33
Compactor	1,300	469	50	0.15	0.15	3.0	2.6	0.93	0.39
Paver	650	134	50	0.15	0.15	3.0	2.6	0.93	0.30
Diesel Generator	14,300	268	25	See Diesel Generator Calculations					

Table A-4, Equipment Operation (Exhaust Emissions Continued)

Type	Emission Rates					
	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	NO_x (ton/yr)	CO (ton/yr)	SO_x (ton/yr)	VOC (ton/yr)
Delivery Truck	0.51	0.51	2.1	3.6	3.0	0.83
Barge/Tugboat	0.13	0.13	2.6	2.3	0.42	0.10
Concrete Finishing Machine	0.086	0.086	0.29	0.25	0.089	0.029
Concrete Mixer/Truck	0.26	0.26	1.1	1.9	1.6	0.43
Crane	0.14	0.14	2.8	2.4	0.87	0.31
Compactor	0.050	0.050	1.0	0.87	0.31	0.13
Paver	7.19E-03	7.19E-03	0.14	0.12	0.045	0.014
Diesel Generator	1.1	1.1	14.9	3.2	0.98	1.2
Totals	**2.2**	**2.2**	**24.9**	**14.7**	**7.3**	**3.1**

Notes:

[a] SO_x used Nonroad Engine and Vehicle Emission Study (11/91), Table 2-(
and Table 2-07

[b] Delivery truck, dump truck and concrete mixer trucks used emission factors: 55 g/hr NO_x; and 94 g/hr CO.

[c] Used USEPA Tier 3 emission limits of 3.0 g/hp-hr for NO_x,2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM_0 and $PM_{2.5}$.

[d] Used ratio of NO_x and VOC emission factor from Nonroad Engine and Vehicle Emission Study (11/91), to estimate VOC portion of Tier 3 NOx/NMHC emission factor.

Year 2010 Construction Emissions: Calculation Assumptions

Delivery Trucks

Number of Trucks =	NA	Heavy truck
Hours of Operation per Year =	35,100	Combined total hours for all delivery trucks in year 2010
Vehicle Ave.Horsepower =	350	hp Assumed average size.
Ave. Load Factor =	25	%

Barge/Tugboat

Number of Scrapers =	1	Barge/Tugboat
Hours of Operation per Year =	2,600	hours/yr (Entire year 52 weeks @ 50 hours/week)
Vehicle Ave.Horsepower =	NA	hp (See Barge/Tugboat Calculations)
Ave. Load Factor =	NA	% (See Barge/Tugboat Calculations)

Concrete Finishing Machine

Number of Loaders=	1	Concrete Finishing Machine
Hours of Operation per Year =	1,300	hours/yr (1/2 of the year @ 50/week)
Vehicle Ave.Horsepower =	134	hp (100 kW)
Ave. Load Factor =	50	%

Concrete Mixer/Truck

Number of Mixing Trucks =	7	Heavy truck
Hours of Operation per Year =	2,600	hours/yr (Entire year 52 weeks @ 50 hours/week)
Vehicle Ave.Horsepower =	350	hp Assumed average size.
Ave. Load Factor =	25	%

Crane

Number of Cranes =	NA	Crane
Hours of Operation per Year =	8,450	Combined total hours for all cranes in year 2010
Vehicle Ave.Horsepower =	201	hp (150 kW)
Ave. Load Factor =	50	%

Diesel Generators

Number of Generators =	NA	Diesel Generators
Hours of Operation per Year =	14,300	Combined total hours for all diesel generators in year 2010
Ave.Horsepower =	268	hp (200 kW)
Ave. Load Factor =	25	%

Compactor

Number of Generators =	2	Compactor
Hours of Operation per Year =	650	hours/yr (1/4 of the year @ 50/week)
Ave.Horsepower =	469	hp (350 kW)
Ave. Load Factor =	50	%

Paver

Number of Loaders=	1	Paver
Hours of Operation per Year =	650	hours/yr (1/4 of the year @ 50/week)
Vehicle Ave.Horsepower =	134	hp (100 kW)
Ave. Load Factor =	50	%

Year 2010 Construction Emissions: Diesel Generators

Horsepower Rating (hp)	Load Factor (%)	Operation Time (hr/yr)	CO (lb/yr)	NOx (lb/yr)	PM_{10} (lb/yr)	$PM_{2.5}$ (lb/yr)	SO_2 (lb/yr)	VOC (lb/yr)
268	25	14,300	6,400	29,701	2,108	2,108	1,964	2,409

Emission Factors For Internal Combustion Engines (lb/hp-hr) (AP-42 Section 3.3)

CO	NOx	PM	PM10	SO_2	VOC	PM2.5
0.00668	0.031	0.0022	0.0022	0.00205	0.0025141	0.0022

Ship Type	Count	Activity Factor	kW/hr - Propulsion	Kw/hr - Auxilliary	Hours in propulsoion	Hours on auxiliary	Average kW	LF
Barges/Tugboats	1	2,600	1,532	82	1,043	1,207	754	31%

Emission Factors (g/kWhr)					
NO_x[b]	CO[c]	VOC[b]	PM_{10}[c]	$PM_{2.5}$[c]	SO_2[a]
3.9	3.5	0.15	0.20	0.20	0.63
Emissions (tons/yr)					
NO_x	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2
2.6	**2.35**	**0.10**	**0.13**	**0.13**	**0.42**

Tugboat Operations[a]

$$E = P \times N \times LF \times A \times EF \times AF \times C \times T$$

Where,

E – emissions (tons per year)

P – power rating (kW) (754 kW based on the average in propulsion and auxiliary mode shown in Table 2-15[a])

LF = load factor (%) (31% from Table 2-16[a])

N – number of tugs used per ship (1, Table 2-14[a])

A – activity factor assumed 50 hour/week for 52 weeks

EF_s – emission factor per ship type/activity (g/kW) (Table 2-18[a])

C – conversion from grams to pounds

T – conversion from pounds to tons

Notes:

[a]Best Practices in Preparing Port Emission Inventories, Draft for Review, U.S. Environmental Protection Agency, Office of Policy, Economics and Innovation, Washington DC, 2005

[b] Used ratio of NO_x and VOC emission factors from footnote a to estimate NO_x and VOC portion of Tier 3 limit of 4.0 g/kWhr.

[c] Tier 3 limits of 3.5 g/kWhr for CO, 0.20 g/kWhr for PM_{10} and $PM_{2.5}$.

ATTACHMENT B
AMBASSADOR BRIDGE TRAFFIC EMISSION CALCULATIONS

Table B-1. Ambassador Bridge Projected Traffic Data[a]

YEAR	CARS	COMMERCIAL VEHICLES	TOTAL
2010 Predicted Traffic Volume For Ambassador Bridge	7,197,295	4,166,664	11,363,959
2030 Predicted Traffic Volume For Ambassador Bridge	9,087,794	7,066,117	16,153,911
Build Alternative - 2030 Predicted Traffic Volume with Possible Increase in Detroit River Crossings For New Ambassador Bridge[b]	9,101,108	7,318,796	16,419,904
Predicted Traffic Volume Increase from 2010 to 2030 For Ambassador Bridge[c]	1,890,499	2,899,453	4,789,952

[a]Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.

[b]The DRIC Level 2 analysis's total increase in Detroit River crossings of 13,314 cars and 252,679 trucks due to new 6-lane bridge added to the 2030 predicted traffic volume for the existing Ambassador Bridge.

[c]The 2030 predicted traffic volume does not include the possible DRIC Level 2 analysis increase. Volume shown is the difference between the 2010 volumes and 2030 predicted volumes for the Ambassador Bridge

Table B-2. Projected 2010 Annual Emissions from Ambassador Bridge Traffic Calculated Using USEPA Mobile6.2 Model

Vehicle Type	Distance (mile)	Annual Traffic Count[e]	Emission Factor[f] (gram/mile)						Annual Emissions (lbs/year)					
			PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC
Cars Queuing U.S. Plaza[a]	0.091	3,527,350	0.025	0.011	35.70	1.15	0.007	4.51	17.7	8.1	25,241	815	4.7	3,186
Commercial Vehicles Queuing U.S. Plaza[a]	0.33	2,126,617	0.235	0.196	8.029	11.236	0.440	1.230	364	302	12,411	17,368	681	1,901
Cars Queuing Canadian Plaza[b]	0.16	3,669,945	0.025	0.011	35.70	1.153	0.007	4.506	32.3	14.8	46,173	1,491	9	5,828
Commercial Vehicles queuing Canadian Plaza[b]	0.16	2,040,047	0.235	0.196	8.029	11.236	0.440	1.230	169	141	5,773	8,078	317	884
Free-Flow Cars Entering U.S.[c]	1.5	3,527,350	0.025	0.011	12.775	0.579	0.007	0.685	290	131.7	148,883	6,748	79	7,977
Free-Flow Commercial Vehicles Entering U.S.[c]	1.9	2,126,617	0.235	0.196	1.394	5.761	0.440	0.352	2,095	1,740	12,407	51,273	3,919	3,133
Free-Flow Cars Entering Canada[d]	1.6	3,669,945	0.025	0.011	12.775	0.579	0.007	0.685	321	146	165,228	7,489	88	8,853
Free-Flow Commercial Vehicles Entering Canada[d]	1.6	2,040,047	0.235	0.196	1.394	5.761	0.440	0.352	1,693	1,406	10,022	41,419	3,166	2,531
								Total Annual Emissions (lbs/yr)	**4,983**	**3,890**	**426,138**	**134,680**	**8,262**	**34,293**
								Total Annual Emissions (tons/yr)	**2.5**	**1.9**	**213**	**67.3**	**4.1**	**17.1**

Notes:

[a]Approximate que distance in U.S. Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 2 minute idling time for all cars and 8 minute idling time for all trucks entering the U.S.

[b]Approximate que distance in Canadian Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 4 minute idling time for all vehicles entering Canada.

[c]Total of all vehicles entering the U.S., distance is from the Canadian Plaza to the U.S. Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]Total of all vehicles entering Canada, distance is from the U.S. Plaza to the Canadian Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]As Shown in Table 1. Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.

[f]Emission factors calculated by Mobile6.2. Average of emission factors for summer and winter conditions for 2010.

Table B-3. Projected 2030 Annual Emissions from Ambassador Bridge Traffic Calculated Using USEPA Mobile6.2 Model

Vehicle Type	Distance (mile)	Annual Traffic Count[e]	Emission Factor[f] (gram/mile)						Annual Emissions (lbs/year)					
			PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC
Cars Queuing U.S. Plaza[a]	0.091	4,453,872	0.025	0.011	25.800	0.448	0.007	2.177	22.1	10.0	23,033	400	6.0	1,943
Commercial Vehicles Queuing U.S. Plaza[a]	0.33	3,606,464	0.084	0.056	1.138	1.023	0.438	0.745	220	148	2,983	2,682	1149	1,952
Cars Queuing Canadian Plaza[b]	0.16	4,633,922	0.025	0.011	25.800	0.448	0.007	2.177	40.3	18.3	42,134	732	11	3,554
Commercial Vehicles queuing Canadian Plaza[b]	0.16	3,459,653	0.084	0.056	1.138	1.023	0.438	0.745	102	69	1,388	1,247	534	908
Free-Flow Cars Entering U.S.[c]	1.5	4,453,872	0.025	0.011	9.880	0.221	0.007	0.311	363	164.8	145,389	3,245	100	4,569
Free-Flow Commercial Vehicles Entering U.S.[c]	1.9	3,606,464	0.084	0.056	0.198	0.511	0.438	0.213	1,269	850	2,981	7,705	6,615	3,215
Free-Flow Cars Entering Canada[d]	1.6	4,633,922	0.025	0.011	9.880	0.221	0.007	0.311	403	183	161,350	3,601	111	5,071
Free-Flow Commercial Vehicles Entering Canada[d]	1.6	3,459,653	0.084	0.056	0.198	0.511	0.438	0.213	1,025	686	2,408	6,224	5,343	2,597
								Total Annual Emissions (lbs/yr)	**3,445**	**2,128**	**381,665**	**25,836**	**13,869**	**23,809**
								Total Annual Emissions (tons/yr)	**1.7**	**1.1**	**191**	**12.9**	**6.9**	**11.9**

Notes:

[a]Approximate que distance in U.S. Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 2 minute idling time for all cars and 8 minute idling time for all trucks entering the U.S.

[b]Approximate que distance in Canadian Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 4 minute idling time for all vehicles entering Canada.

[c]Total of all vehicles entering the U.S., distance is from the Canadian Plaza to the U.S. Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]Total of all vehicles entering Canada, distance is from the U.S. Plaza to the Canadian Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]As Shown in Table 1. Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.

[f]Emission factors calculated by Mobile6.2. Average of emission factors for summer and winter conditions for 2030.

Table B-4. Build Alternative - Projected 2030 Annual Emissions from New Bridge Traffic Calculated Using USEPA Mobile6.2 Model

Vehicle Type	Distance (mile)	Annual Traffic Count[e]	Emission Factor[f] (gram/mile)						Annual Emissions (lbs/year)					
			PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC
Cars Queuing U.S. Plaza[a]	0.091	4,460,397	0.025	0.011	25.800	0.448	0.007	2.177	22.1	10.0	23,066	401	6.0	1,946
Commercial Vehicles Queuing U.S. Plaza[a]	0.33	3,735,429	0.084	0.056	1.138	1.023	0.438	0.745	228	153	3,090	2,778	1190	2,021
Cars Queuing Canadian Plaza[b]	0.16	4,640,711	0.025	0.011	25.800	0.448	0.007	2.177	40.4	18.3	42,196	733	11.0	3,560
Commercial Vehicles queuing Canadian Plaza[b]	0.16	3,583,367	0.084	0.056	1.138	1.023	0.438	0.745	106	71	1,437	1,292	553	940
Free-Flow Cars Entering U.S.[c]	1.5	4,460,397	0.025	0.011	9.880	0.221	0.007	0.311	364	165.1	145,602	3,250	100	4,576
Free-Flow Commercial Vehicles Entering U.S.[c]	1.9	3,735,429	0.084	0.056	0.198	0.511	0.438	0.213	1,314	880	3,087	7,981	6,851	3,330
Free-Flow Cars Entering Canada[d]	1.6	4,640,711	0.025	0.011	9.880	0.221	0.007	0.311	404	183	161,587	3,606	111	5,078
Free-Flow Commercial Vehicles Entering Canada[d]	1.6	3,583,367	0.084	0.056	0.198	0.511	0.438	0.213	1,061	711	2,494	6,447	5,534	2,690
								Total Annual Emissions (lbs/yr)	**3,540**	**2,192**	**382,559**	**26,486**	**14,357**	**24,141**
								Total Annual Emissions (tons/yr)	**1.8**	**1.1**	**191**	**13.2**	**7.2**	**12.1**

Notes:

[a]Approximate que distance in U.S. Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 2 minute idling time for all cars and 8 minute idling time for all trucks entering the U.S.

[b]Approximate que distance in Canadian Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 4 minute idling time for all vehicles entering Canada.

[c]Total of all vehicles entering the U.S., distance is from the Canadian Plaza to the U.S. Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]Total of all vehicles entering Canada, distance is from the U.S. Plaza to the Canadian Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]As Shown in Table 1. Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.

[f]Emission factors calculated by Mobile6.2. Average of emission factors for summer and winter conditions for 2030.

Table B-5. Annual Emissions from Predicted Traffic Volume Increase from 2010 to 2030 for Ambassador Bridge Calculated Using USEPA Mobile6.2 Model

Vehicle Type	Distance (mile)	Annual Traffic Count[e]	Emission Factor[f] (gram/mile)						Annual Emissions (lbs/year)					
			PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	VOC
Cars Queuing U.S. Plaza[a]	0.091	926,522	0.025	0.011	25.800	0.448	0.007	2.177	4.6	2.1	4,791	83	1.2	404
Commercial Vehicles Queuing U.S. Plaza[a]	0.33	1,479,847	0.084	0.056	1.138	1.023	0.438	0.745	90	61	1,224	1,100	471	801
Cars Queuing Canadian Plaza[b]	0.16	963,977	0.025	0.011	25.800	0.448	0.007	2.177	8.4	3.8	8,765	152	2.3	739
Commercial Vehicles queuing Canadian Plaza[b]	0.16	1,419,606	0.084	0.056	1.138	1.023	0.438	0.745	42	28	569	512	219	372
Free-Flow Cars Entering U.S.[c]	1.5	926,522	0.025	0.011	9.880	0.221	0.007	0.311	76	34.3	30,245	675	21	951
Free-Flow Commercial Vehicles Entering U.S.[c]	1.9	1,479,847	0.084	0.056	0.198	0.511	0.438	0.213	521	349	1,223	3,162	2,714	1,319
Free-Flow Cars Entering Canada[d]	1.6	963,977	0.025	0.011	9.880	0.221	0.007	0.311	84	38	33,565	749	23	1,055
Free-Flow Commercial Vehicles Entering Canada[d]	1.6	1,419,606	0.084	0.056	0.198	0.511	0.438	0.213	421	282	988	2,554	2,193	1,066
								Total Annual Emissions (lbs/yr)	**1,246**	**797**	**81,371**	**8,987**	**5,645**	**6,707**
								Total Annual Emissions (tons/yr)	**0.62**	**0.40**	**40.7**	**4.5**	**2.8**	**3.4**

Notes:

[a]Approximate que distance in U.S. Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 2 minute idling time for all cars and 8 minute idling time for all trucks entering the U.S.

[b]Approximate que distance in Canadian Plaza. Average speed of 2.5 mph. Distance and 2.5 mph average speed is approximately a 4 minute idling time for all vehicles entering Canada.

[c]Total of all vehicles entering the U.S., distance is from the Canadian Plaza to the U.S. Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]Total of all vehicles entering Canada, distance is from the U.S. Plaza to the Canadian Customs. Derived from movement percentages from the HNTB Gateway Study and traffic volumes presented in Table 1. Average speed of 35 mph.

[d]As Shown in Table 1. Volumes derived from DRIC Study Travel Demand Forecasts exhibit 5-23 and appropriate growth rates from DRIC Study exhibits 5-9 and 5-20.

[f]Emission factors calculated by Mobile6.2. Average of emission factors for summer and winter conditions for 2030.

Table B-6. Comparison of Ambassador Bridge Enhancement Project Emissions

Pollutant	No Build - 2010 Annual Emissions From Cars, Trucks, and Buses crossing the Existing Ambassador Bridge and Entering U.S. Inspection Stations[a] (tons/year)	No Build - 2030 Annual Emissions From Cars, Trucks, and Buses crossing the Existing Ambassador Bridge and Entering U.S. Inspection Stations[a] (tons/year)	Build Alternative - 2030 Annual Emissions From Cars, Trucks, and Buses crossing the New Ambassador Bridge and Entering U.S. Inspection Stations[a] (tons/year)	Annual Emission Comparison of 2010 to 2030 Existing Ambassador Bridge (tons/year)	2030 Annual Emission Increase from No Build to Build Alternative (tons/year)
Carbon Monoxide	213	191	191	-22.2	0.45
Nitrogen Dioxide	67.3	12.9	13.2	-54.4	0.33
VOC	17.1	11.9	12.1	-5.2	0.17
Sulfur Dioxide	4.1	6.9	7.2	2.8	0.24
PM_{10}	2.5	1.7	1.8	-0.77	0.047
$PM_{2.5}$	1.9	1.1	1.1	-0.88	0.032

[a] See Tables B-2 through B-5 for emission calculations.

Air Quality Dispersion Analysis

AIR QUALITY MODELING ANALYSIS
FOR
AMBASSADOR BRIDGE ENHANCEMENT PROJECT
DETROIT, MICHIGAN

Submitted For:

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APPENDIX A

I. INTRODUCTION

An air quality dispersion modeling analysis was performed to assess the ambient air impacts from the operation of a new Ambassador Bridge span that would relocate traffic from the existing span. Although not a part of the Ambassador Bridge Enhancement Project (ABEP), the United States (U.S.) and Canadian plaza operations were included in this modeling analysis. Air quality dispersion modeling was conducted for the vehicle emissions from the new and existing bridge span and plaza operations. The new bridge was modeled for the year 2030 and the existing bridge was modeled for the year 2010.

Section II of this report describes the area surrounding the ABEP. Section III provides a brief traffic volume description and presents emissions characteristics. Section IV provides an overview of the modeling approach, including the model selection and model inputs. Section V provides the modeling results. Section VI provides the references used in this modeling analysis. The U.S. Environmental Protection Agency's (EPA) CAL3QHCR (Dated: 95221) model was used to assess the ambient air impacts from vehicular emissions. The modeling procedures followed the EPA's "Guideline on Air Quality Models".[1]

The modeling analysis shows that the maximum predicted impacts combined with the current background concentrations are less than National Ambient Air Quality Standards (NAAQS), the maximum predicted concentrations of air toxics are less than the Michigan Department of Environmental Quality (MDEQ) health based screening levels, and the transboundary effects from U.S Customs Plazas, existing bridge and new bridge are insignificant.

II. LOCATION

The proposed ABEP is located in Wayne County, Detroit, Michigan at Universal Transverse Mercator (UTM), North American Datum 1927 (NAD27) coordinates 328,760 meters (m) Easting and 4,686,920 m Northing, Zone 17.

The Ambassador Bridge connects Detroit, Michigan, U.S. and Windsor, Ontario, Canada. The Detroit International Bridge Company (DIBC) and Canadian Transit Company (CTC) own and operate the existing Ambassador Bridge as well as the connecting plazas. Figure 1 shows the location of the existing Ambassador Bridge and proposed new span.

III. TRAFFIC VOLUME AND EMISSION CHARACTERISTICS

The volume of cars and trucks traveling across the Ambassador Bridge varies greatly upon the hour and day of the week. During typical weekday morning and evening rush hours the volume is much greater than during other weekday periods and weekends. Traffic volumes and assumptions were based on DIBC operational experience and records. The U.S. customs plazas contain 16 truck booths and 20 passenger car booths. During operation of the new bridge in year 2030 it was assumed that all U.S. Customs booths were open and that with the use of the FAST lanes each truck booth processed one truck every 1.5 minutes and each car booth processed one car every minute. This is equivalent to 640 trucks and 1,200 northbound cars passing through the U.S. Customs booths each hour. The southbound volumes were assumed to be 645 trucks and 2,208 cars passing through the Canadian Customs booths each hour. In addition, it was conservatively assumed that the northbound trucks and cars entering the U.S. would be backed-up across the entire bridge span to the Canadian plaza, with the southbound traffic entering Canada experiencing only a short back-up. These assumptions are conservatively assumed to be constant for all 8,760 hours of the modeled year. In other words, the new bridge had a constant northbound back-up across the bridge for an entire year as 640 trucks and 1,200 cars passed through the U.S. Customs booths each hour and a small Canadian back-up as 645 trucks and 2,208 cars passed through the Canadian Customs booths each hour. The northbound back-up across the entire bridge span typically occurs for only a short period during the weekday morning and evening rush hours, not during every hour of the day for an entire year as was modeled. Modeling this conservative scenario ensured that the worst case ambient air impacts would be predicted by the model. The southbound traffic volumes were similar to those used in the Ambassador Bridge air quality analysis done by ORTECH Environmental.[4] The assumptions during the operation of the existing bridge in 2010 were the same, except for the following:

- The northbound truck volumes were based upon each U.S Customs booth processing a truck every two minutes (480 trucks per hour).

- The southbound volumes were 455 trucks and 1,558 cars passing through the Canadian Customs booths each hour.

The changes in volumes between 2010 and 2030 are due to the increased number of booths and the addition of FAST lanes in 2030. The annual traffic volumes used in this modeling analysis are shown in Tables 1 and 2.

Table 3 shows the modeled pollutants from cars and trucks traveling over the existing and new Ambassador Bridge. The emission factors for the pollutants shown in Table 3 were calculated using the United States Environmental Protection Agency's (USEPA) Mobile Source Emission Factor Model (MOBILE6.2, version 24 September 2003). MOBILE6.2 is a computer program that calculates emission factors for the following parameters for gasoline-fueled and diesel highway motor vehicles:

- Hydrocarbon (HC), measured as VOC,
- CO,
- NO_x,
- Exhaust particulate matter (which consists of several components),
- Tire wear particulate matter,
- Brake wear particulate matter,
- SO_2, and
- air toxics.

MOBILE6.2 incorporates certain user inputs and contains default values for some parameters. MOBILE6.2 input files containing local input parameters were supplied by the Southeast Michigan Council of Governments (SEMCOG). The SEMCOG input files were used to calculate the emission factors used in this modeling analysis. The speed input parameters were as follows:

- Emissions from idling when backed-up across the bridge and passing through the U.S. and Canadian inspection stations were estimated using 2.5 miles per hour (mph). The 2.5 mph emission factor and distance traveled is equal to the queuing (idling emissions).

- Free flow traffic speed of 20 mph in the southbound Gateway loop as cars access the elevated section of the southbound bridge.

- Southbound free flow traffic speed of 35 mph across the elevated section of the bridge.

- Northbound free flow traffic speed of 35 mph around Canadian Customs plaza as cars approach the northbound elevated bridge section.

The individual car (light duty gasoline vehicle-LDGV) and truck (heavy duty diesel vehicle-HDDV) MOBILE6.2 emission factors were used instead of the composite emission factor for all vehicle types. The average of the calculated winter and summer emission factors were used in CAL3QHCR. The year 2010 and 2030 emission factors for the modeled pollutants are shown in Tables 4 through 7.

IV. MODELING OVERVIEW

CAL3QHC is a CALINE3 based model for assessing queuing and free flow traffic emissions. It is one of the preferred / recommended models by the EPA. Accordingly, the CAL3QHCR model was used to assess the impact of emissions on air quality during the operation of the bridge and customs plazas. CAL3QHCR is an enhanced version of CAL3QHC that allows local meteorological data input and variable emission rates.

CAL3QCHR allows a two tiered approach. The first approach, called Tier I, is a conservative estimate that uses a full year of meteorology and a constant one hour emission rate over that year. The second approach, called Tier II, is a more refined analysis that utilizes variable hourly emission rates for a maximum of one week and one year of meteorological data. The maximum predicted ambient air impacts using the Tier 1 approach did not exceed the appropriate NAAQS or health based screening level, therefore Tier 2 was not utilized. The inputs that were used in the CAL3QCHR model are summarized below:

- MOBILE6.2 vehicle exhaust emission factors (i.e., gram/vehicle mile traveled (vmt)) for the road segments;

- Tier 1, the overall peak hourly traffic flow in each area for all hours of the day (i.e., the overall peak flow is assumed for all hours of the day);

- 60 minute run averaging time (minutes);

- surface roughness length (centimeter (cm)) – 400 cm, based upon the urban area surrounding the ABEP (see discussion below);

- default deposition velocity (cm/s) –0.0 centimeter/second was used;

- rural (R)/urban (U) switch – urban was used, based upon land use in the area surrounding the ABEP (see discussion below); and

- pollutant type (only PM or CO available) – the model was run in PM mode for all pollutants of interest except CO which was modeled in CO mode.

Five separate years of meteorological data were modeled (2001-2005). In PM mode, the CAL3QHCR 1-hour, 24-hour, and annual maximum predicted concentrations occurred using the year 2003 meteorological data. In CO mode, the CAL3QHCR maximum 1-hour and 8-hour concentrations occurred using the year 2005 meteorological data. For all pollutants other than CO, only the meteorological data from 2003 was used to predict the maximum concentrations for the modeling scenarios of the existing bridge in 2010 and new bridge in 2030. The meteorological data from the year 2005 was used to predict the maximum CO concentrations for both modeling scenarios.

IV.1 Link Parameters

A free flow link is defined as a straight segment of roadway having a constant width, height, traffic flow, travel speed, and vehicle emission factor. The location of the link is specified by its end point coordinates, XL1, YL1, and XL2, YL2. Link width or mixing zone width (WL) is defined as the width of the traveled roadway (lanes of moving traffic only) plus 3 meters on each side to account for the dispersion of the plume generated by the wake of moving vehicles. For the existing and new bridge, the lane width will be set at 3.5 meters. Link height (HL) was set to

10 meters for the bridge span across the Detroit River. Ten meters is the maximum link height allowed by the CAL3QHC model. On each side of the bridge, the link height on a sloping up section was set at 5 meters above grade. The southbound Gateway loop bridge access was incrementally increased by 2.5 meters until it reached the 10 meter height for the span across the river. The custom plazas were modeled at grade (0 meters). Figures 2 and 3 show the northbound and southbound link configurations used in the modeling analysis of the existing Ambassador Bridge and the new bridge span.

The input for free flow links are the emission factor (g/mile) and traffic flow (vehicles/hour). The emission factor depends on the traffic speed (miles per hour (mph)). The traffic speed for back-up links was 2.5 mph, the Gateway loop was 20 mph, and all other free flow links were 35 mph. All link parameters for each pollutant are shown in the tables included in Appendix A. Figures 4 and 5 show the modeled existing bridge and new bridge back-up links, Gateway loop links, and free flow 35 mph links.

IV.2 Land Use Determination and Dispersion Coefficients

The land use classification for the area was based on a qualitative review of land use patterns surrounding the ABEP. For the qualitative review, 7.5 minute United States Geological Survey (USGS) topography maps were used. The land use analysis followed the procedures recommended by the EPA and typing scheme developed by Auer.[2] The Auer technique, recommended in the EPA "Guideline on Air Quality Models"[1], established four primary land use types: industrial, commercial, residential, and agricultural. Industrial, commercial, and compact residential areas are classified as urban, while agricultural and common residential areas are considered rural. For modeling purposes, an area is defined as urban if more than 50 percent of the surface within 3 kilometers of the source falls under an urban land use type. Otherwise, the area is determined to be rural. A qualitative land use analysis indicated that the area within 3 kilometers of the ABEP is clearly urban. Therefore, urban dispersion coefficients will be used to assess the air quality impacts from the ABEP. Figure 6 shows the land use surrounding the ABEP.

The surface roughness parameter of 400 cm was determined using the guidance provided in the EPA's User's Guide to CAL3QHC Version 2.0 (Revised).[3] The 400 cm surface roughness parameter is representative of the urban area surrounding the ABEP.

IV.3 Receptor Grid Selection

Virtual receptor locations are specified in terms of X, Y, and Z coordinates. The virtual receptors are located outside the mixing zone of the free flow links. The mixing zone is considered to be the area of uniform emissions but with turbulent air flow extending 3 meters on either side of the edge of the road for free flow links.

The maximum predicted concentrations decreased significantly with distance from the modeled links, therefore it was not necessary to extend the receptor grid beyond 500 meters from the U.S. Customs plaza links. The virtual receptor grid was set up as follows:

- approximately 10 meters away from the edge of the mixing zone (i.e. about 13 meters from the edge of the existing and new bridge) with a 50 meter spacing out to 300 meters;
- discrete receptors at the Fort Street and W. Lafayette monitor locations;
- 50 meter spacing from U.S. customs plaza area out to 500 meters.

All the receptors were assigned a breathing height of 1.8 meters above grade. The receptor grid used in the modeling is shown in Figure 7.

Because of the limitation of 60 receptors per input file, the CAL3QHCR model with all links was run for groups of 60 receptors or less. To determine the receptor with the maximum predicted concentration, the results were merged together for all the receptors.

IV.4 Meteorological Data

The meteorological database for this air quality modeling analysis consisted of five years (2001-2005) of surface data collected at Detroit City Airport, Detroit, Michigan. Coincident mixing

heights were derived by merging surface temperatures with concurrent twice-daily rawinsonde data obtained from Flint, Michigan. The pre-processed meteorological files were obtained directly from MDEQ. As previously discussed the meteorological data for the year 2003 produced the maximum 1-hour, 24-hour, and annual concentrations in PM mode and the year 2005 produced the maximum 1-hour and 8-hour concentrations in CO mode. Therefore, the year 2005 was used to predict the maximum CO concentration and the year 2003 was used for all other pollutants.

V. MODELING RESULTS

V.1 Background Concentrations

The closest MDEQ monitor is located approximately 800 meters east of the U.S. Customs Truck Plaza, at 2000 West Lafayette Street. This monitor is the best choice for providing representative ambient air background concentrations in the area directly surrounding the U.S. side of the existing and new bridge. The next closest monitor is located 3,150 meters southwest of the U.S Customs Plaza, at 6921 West Fort Street. When possible the 2000 West Lafayette monitor was used for the criteria pollutant ambient air background concentration, with the 6921 West Fort Street being used only when data was not available at the 2000 West Lafayette monitor. In the case of NO_x, neither of these monitors measured annual NO_x concentrations. The monitor located at 6050 Linwood was used for the annual NO_x background concentration. The 6050 Linwood monitor is located approximately 4,600 meters north of the U.S. Customs Plaza. At this time, MDEQ does not provide guidance for determining background concentrations of $PM_{2.5}$. Therefore, the 24-hour background concentration was determined using the same procedure outlined for PM_{10} and the annual background concentration followed the annual averaging period guidance for all pollutants. Background levels of air toxics are not required for comparison to the MDEQ health based screening levels. Figure 7 shows the location of the West Lafayette and West Fort Street monitors.

The determination of criteria pollutant ambient air background concentrations followed the procedure outlined on the MDEQ website. The MDEQ guideline states that monitor data from

the last three years should be used when calculating ambient air background concentrations. The following is the MDEQ description of how to calculate ambient air background concentrations for the various pollutants / averaging periods:

- For pollutants with annual averaging periods, the highest of the three highest annual concentrations should be used.
- For pollutants with a 24-hour, 8-hour, 3-hour, or 1-hour averaging period (with the exception of PM_{10}), the highest of the second high values should be used.

The 2005-2007 measured monitor values and the representative ambient air background levels of the criteria pollutants are shown in Table 8.

V.2 Criteria Pollutant Maximum Predicted Ambient Air Impacts

The CAL3QHCR Tier I analysis was conducted using the very conservative traffic volume and back-up conditions described in Section III to predict the maximum ambient air concentrations for the existing bridge in 2010 and the new bridge in 2030. The CAL3QHCR Tier I maximum predicted ambient air concentration was added to the ambient air background concentration. The combined impacts were compared to the NAAQS. The combined maximum predicted ambient air impacts for 2010 and 2030 are presented in Tables 9 and 10. As shown in Tables 9 and 10 the combined maximum impacts for all pollutants are less than the appropriate NAAQS. The maximum predicted concentrations occur within 100 meters in the area just south of the U.S. Customs Plazas and the southbound Gateway loop. The CAL3QHCR maximum predicted 24-hour $PM_{2.5}$ concentration at the receptor placed at the West Lafayette monitor is 0.049 $\mu g/m^3$ for the year 2030 new bridge modeling scenario and 0.12 $\mu g/m^3$ for the year 2010 existing bridge scenario. The CAL3QHCR predicted pollutant concentrations decrease significantly with distance from the U.S. Customs Plazas. As shown with the West Layefette monitor, at distances greater than 800 meters from the plaza, the maximum year 2030 $PM_{2.5}$ concentrations are less than 0.1 $\mu g/m^3$. The maximum predicted impacts combined with the current background concentrations have been shown to be less than NAAQS, with the implementation of stricter fuel standards and the removal of older vehicles from the roads, it can be expected that the background concentrations for all pollutants will decrease over time. The CAL3QHCR Tier I

criteria pollutant maximum impact analysis showed no significant impacts, therefore a Tier II analysis was not required. Figure 8 shows the area where the maximum ambient impacts occur.

V.3 Air Toxic Pollutant Maximum Predicted Ambient Air Impacts

The maximum predicted concentrations of the air toxics shown in Table 3 were compared to the health based screening levels as determined by Michigan's Air Pollution Control Rule R 336.1225 (Rule 225). The DRIC annual traffic volumes shown in Tables 1 and 2 were divided by 8,760 to arrive at an hourly volume of north and southbound trucks and cars. These hourly traffic volumes were used as input into CAL3QHCR for those air toxics with annual averaging period screening levels. The link configuration remained the same (i.e. same back-ups and speeds) for the annual air toxics modeling analysis. The short-term averaging periods (24-hour or less) used the worst case traffic volumes described in Section III. The comparison is shown in Tables 11 and 12. As shown in Tables 11 and 12 the maximum predicted concentrations of the modeled air toxics are less than all the MDEQ health based screening levels, therefore a Tier II analysis was not required. The maximum predicted ambient impacts occur in the same area as shown in Figure 8.

V.4 Transboundary Effects

The International Boundary between the United States and Canada is located approximately midway across the Ambassador Bridge span. The CAL3QHCR maximum predicted impacts from the existing Ambassador bridge and the proposed new span occur in a small area just south of the U.S Customs Plazas. The maximum predicted impacts in the highest concentration area have been shown to be less than all applicable standards and health based screening levels. The predicted concentrations on the Canadian side of the International Boundary are less than the maximum predicted concentrations. Therefore, the transboundary effects from U.S Customs Plazas, existing bridge and new bridge are not significant.

VI. CONCLUSIONS

An air quality dispersion modeling analysis was performed to assess the ambient air impacts from the operation of a new Ambassador Bridge span that would relocate traffic from the existing span. The modeling analysis shows that:

- the maximum predicted impacts combined with the current background concentrations are less than NAAQS (see Tables 9 and 10)
- the maximum predicted concentrations of air toxics are less than the MDEQ health based screening levels (see Tables 11 and 12), and
- the transboundary effects from U.S Customs Plazas, existing bridge and new bridge are insignificant (see Section IV.4).

VII. REFERENCES

1. Guideline on Air Quality Models (Revised), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Appendix W of 40 CFR Part 51, 2005.

2. Auer, Jr., A.H., "Correlation of Land Use and Cover with Meteorological Anomalies," Journal of Applied Meteorology, 17: 636-643, 1978.

3. User's Guide and Addendum to the CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections (Revised), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC., EPA-454/R-92-006, September 1995.

4. ORTECH Environmental, Draft Report, "Air Quality Assessment for the Ambassador Bridge Enhancement Project", September 28, 2007.

TABLES

Table 1
Year 2010 Existing Bridge
Annual Traffic Volume

Vehicle Type	2010 Modeled Traffic Volume			DRIC Study Predicted 2010 Annual Volume
	Annual Southbound Entering Canada	Annual Northbound Entering US	Annual Total Volume	
Trucks	3,985,800	4,204,800	8,190,600	4,166,664
Cars	13,648,080	10,512,000	24,160,080	7,197,295
		Total All Vehicles	32,350,680	11,363,959

DRIC = Detroit River International Crossing (DRIC) Study Travel Demand Forecasts exhibit 52-23 and appropriate growth rates from the DRIC Study exhibits 5-9 and 5-20.

Table 2
Year 2030 New Bridge
Annual Traffic Volume

Vehicle Type	2030 Modeled Traffic Volume			DRIC Study Predicted 2030 Annual Volume
	Annual Southbound Entering Canada	Annual Northbound Entering US	Annual Total Volume	
Trucks	5,650,200	5,606,400	11,256,600	7,066,117
Cars	19,342,080	10,512,000	29,854,080	9,087,794
		Total All Vehicles	41,110,680	16,153,911

DRIC = Detroit River International Crossing (DRIC) Study Travel Demand Forecasts exhibit 52-23 and appropriate growth rates from the DRIC Study exhibits 5-9 and 5-20.

Table 3
Modeled Pollutants

Groups	Pollutants of Interest
Criteria Pollutants	carbon monoxide (CO) oxides of nitrogen (NO_x) sulfur dioxide (SO_2) particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}) particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
Air Toxics	acetaldehyde acrolein benzene 1,3-butadiene formaldehyde

Table 4
Year 2010 Existing Bridge
MOBILE6.2 Criteria Pollutant Emission Factors

Vehicle Type	Emission Factor (gram/mile)				
	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2
Cars 2.5 mph	0.0044	0.0041	29.8250	1.0925	0.0067
Commercial Vehicles 2.5 mph	0.1529	0.1411	7.5205	10.8485	0.0940
Cars 20 mph	0.0249	0.0114	11.0800	0.5935	0.0067
Commercial Vehicles 20 mph	0.1916	0.1530	2.3070	6.3105	0.0940
Cars 35 mph	0.0248	0.0113	10.5750	0.5235	0.0068
Commercial Vehicles 35 mph	0.1916	0.1530	1.3060	5.5515	0.0940

CO = carbon monoxide
mph = miles per hour
NO_x = oxides of nitrogen
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns (PM_{10})
SO_2 = Sulfur dioxide

Table 5
Year 2030 New Bridge
MOBILE6.2 Criteria Pollutant Emission Factors

Vehicle Type	Emission Factor (gram/mile)				
	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2
Cars 2.5 mph	0.0042	0.0039	20.695	0.4420	0.0067
Commercial Vehicles 2.5 mph	0.0150	0.0138	1.0705	1.0276	0.0132
Cars 20 mph	0.0247	0.0112	8.2200	0.2295	0.0067
Commercial Vehicles 20 mph	0.0536	0.0257	0.3280	0.5455	0.0132
Cars 35 mph	0.0247	0.0112	7.8200	0.2000	0.0068
Commercial Vehicles 35 mph	0.0536	0.0257	0.1855	0.4770	0.0132

CO = carbon monoxide
mph = miles per hour
NO_x = oxides of nitrogen
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns (PM_{10})
SO_2 = Sulfur dioxide

Table 6
Year 2010 Existing Bridge
MOBILE6.2 Air Toxic Pollutant Emission Factors

Vehicle Type	Emission Factor (milligram/mile)				
	Acetaldehyde	**Acrolein**	**Benzene**	**1,3 Butadiene**	**Formaldehyde**
Cars 2.5 mph	5.5500	0.8150	71.3000	8.3950	14.2950
Commercial Vehicles 2.5 mph	35.7500	4.3450	13.0350	7.5700	97.0700
Cars 20 mph	1.9400	0.2750	25.0550	2.9250	5.0150
Commercial Vehicles 20 mph	16.2350	1.9750	5.9200	3.4400	44.0850
Cars 35 mph	1.6750	0.2400	21.6050	2.5150	4.3200
Commercial Vehicles 35 mph	10.2300	1.2400	3.7300	2.1650	27.7750

mph = miles per hour

Table 7
Year 2030 New Bridge
MOBILE6.2 Air Toxic Pollutant Emission Factors

Vehicle Type	Emission Factor (milligram/mile)				
	Acetaldehyde	**Acrolein**	**Benzene**	**1,3 Butadiene**	**Formaldehyde**
Cars 2.5 mph	2.5550	00.3750	32.3800	3.6650	6.7300
Commercial Vehicles 2.5 mph	22.520	2.7400	8.2100	4.7700	61.1550
Cars 20 mph	0.9350	0.1300	11.8850	1.3350	2.4650
Commercial Vehicles 20 mph	10.2300	1.2400	3.7300	2.1700	27.7750
Cars 35 mph	0.8100	0.1150	10.3250	1.1150	2.1350
Commercial Vehicles 35 mph	6.4450	0.7800	2.3500	1.3650	17.5000

mph = miles per hour

Table 8
Criteria Pollutant Ambient Air Background Concentrations

Year	Pollutants								
	PM_{10}	$PM_{2.5}$		NO_x	SO_2			CO	
	24-hr	Annual	24-hr	Annual	Annual	24-hr	3-hr	8-hr	1-hr
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	(ppm)	(ppm)
Monitor located at 2000 West Lafayette									
2005	NA	16.2	25	NA	NA	NA	NA	1.1	2.8
2006	NA	13.1	32	NA	NA	NA	NA	0.7	1.5
2007	NA	13.4	27	NA	NA	NA	NA	NA	NA
Monitor located at 6921 West Fort Street									
2005	69	-	-	NA	18.3	113	280	NA	NA
2006	45	-	-	NA	15.7	128	286	NA	NA
2007	39	-	-	NA	13.1	68.1	210	NA	NA
Monitor located at 6050 Linwood									
2005	-	-	-	37.6	-	-	-	-	-
2006	-	-	-	30.1	-	-	-	-	-
2007	-	-	-	32.0	-	-	-	-	-
Representative Background Concentration	**69.0**	**13.4**	**32.0**	**37.6**	**18.3**	**128**	**286**	**1.1**	**2.8**

CO = carbon monoxide
hr = hour
$\mu g/m^3$ = micrograms/cubic meter
NA = not available
NO_x = oxides of nitrogen
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns (PM_{10})
ppm = parts per million
SO_2 = Sulfur dioxide

Table 9
Year 2010 Existing Bridge
NAAQS Modeling Results

	Pollutants								
	PM_{10}	$PM_{2.5}$[b]		NO_x	SO_2			CO	
	24-hr	Annual	24-hr	Annual	Annual	24-hr	3-hr[c]	8-hr	1-hr
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	(ppm)	(ppm)
Maximum Modeled Impacts[a]	2.5	0.60	1.8	30.0	0.38	1.13	3.2	0.75	1.0
Background	69.0	13.4	32.0	37.6	18.3	128	286	1.1	2.8
Total	71.5	14.0	33.8	67.6	18.7	130	289	1.9	3.8
NAAQS	150	15	35	100	80	365	1,300	9	35

CO = carbon monoxide
$\mu g/m^3$ = micrograms/cubic meter
NAAQS = National Ambient Air Quality Standards
NO_x = oxides of nitrogen
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns (PM_{10})
ppm = parts per million
SO_2 = Sulfur dioxide
Notes:
a Maximum predicted concentrations occur in the area within 100 meters south of the southbound Gateway Loop and U.S.Truck Plaza.
b Maximum predicted 24-hour $PM_{2.5}$ model impact at the monitor location = 0.12 $\mu g/m^3$.
c CAL3QHCR does not predict 3-hour concentrations, therefore the maximum predicted 1-hour concentration was multiplied by the 0.9 conversion factor.

Table 10
Year 2030 New Bridge
NAAQS Modeling Results

	Pollutants								
	PM_{10}	$PM_{2.5}$[b]		NO_x	SO_2			CO	
	24-hr	Annual	24-hr	Annual	Annual	24-hr	3-hr[c]	8-hr	1-hr
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	(ppm)	(ppm)
Maximum Modeled Impacts[a]	1.7	0.33	0.85	23.3	0.36	0.82	1.5	1.9	2.4
Background	69.0	13.4	32.0	37.6	18.3	128	286	1.1	2.8
Total	70.7	13.7	32.9	60.9	18.7	129	287	3.0	5.2
NAAQS	150	15	35	100	80	365	1,300	9	35

CO = carbon monoxide
$\mu g/m^3$ = micrograms/cubic meter
NAAQS = National Ambient Air Quality Standards
NO_x = oxides of nitrogen
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$)
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns (PM_{10})
ppm = parts per million
SO_2 = Sulfur dioxide
Notes:
a Maximum predicted concentrations occur in the area within 100 meters south of the southbound Gateway Loop and U.S.Truck Plaza.
b Maximum predicted 24-hour $PM_{2.5}$ model impact at the monitor location = 0.049 $\mu g/m^3$.
c CAL3QHCR does not predict 3-hour concentrations, therefore the maximum predicted 1-hour concentration was multiplied by the 0.9 conversion factor.

Table 11
Year 2010 Existing Bridge
Air Toxics Modeling Results

Pollutant	CAS #	Maximum Predicted Concentration[a] µg/m^3	Michigan 1 ITSL µg/m^3	Michigan 1 ITSL Avg Time	Maximum Predicted Concentration[a] µg/m^3	Michigan 2 ITSL µg/m^3	Michigan 2 ITSL Avg Time	Maximum Predicted Concentration[a] µg/m^3	Michigan SRSL µg/m^3	Michigan IRSL/SRSL Avg Time
acetaldehyde	75070	0.26	9	24-hour	-	-	-	0.039	5	annual
acrolein	107028	4.96E-03	0.02	annual	0.11	0.5	1-hour	-	-	-
benzene	71432	1.1	30	24-hour	-	-	-	0.15	1	annual
1,3 butadiene	106990	0.16	2	24-hour	-	-	-	0.022	0.30	annual
formaldehyde	50000	-	-	-	-	-	-	0.10	0.80	annual

Avg = averaging
µg/m^3 = micrograms/cubic meter
Notes:
a Maximum predicted concentrations occur in the area within 100 meters south of the southbound Gateway Loop and U.S.Truck Plaza.

Table 12
Year 2030 New Bridge
Air Toxics Modeling Results

Pollutant	CAS #	Maximum Predicted Concentration[a] µg/m^3	Michigan 1 ITSL µg/m^3	Michigan 1 ITSL Avg Time	Maximum Predicted Concentration[a] µg/m^3	Michigan 2 ITSL µg/m^3	Michigan 2 ITSL Avg Time	Maximum Predicted Concentration[a] µg/m^3	Michigan SRSL µg/m^3	Michigan SRSL Avg Time
acetaldehyde	75070	0.66	9	24-hour	-	-	-	0.16	5	annual
acrolein	107028	0.0198	0.02	annual	0.16	0.5	1-hour	-	-	-
benzene	71432	2.4	30	24-hour	-	-	-	0.56	1	annual
1,3 butadiene	106990	0.35	2	24-hour	-	-	-	0.082	0.30	annual
formaldehyde	50000	-	-	-	-	-	-	0.42	0.80	annual

Avg = averaging
µg/m^3 = micrograms/cubic meter
Notes:
a Maximum predicted concentrations occur in the area within 100 meters south of the southbound Gateway Loop and U.S.Truck Plaza.

FIGURES

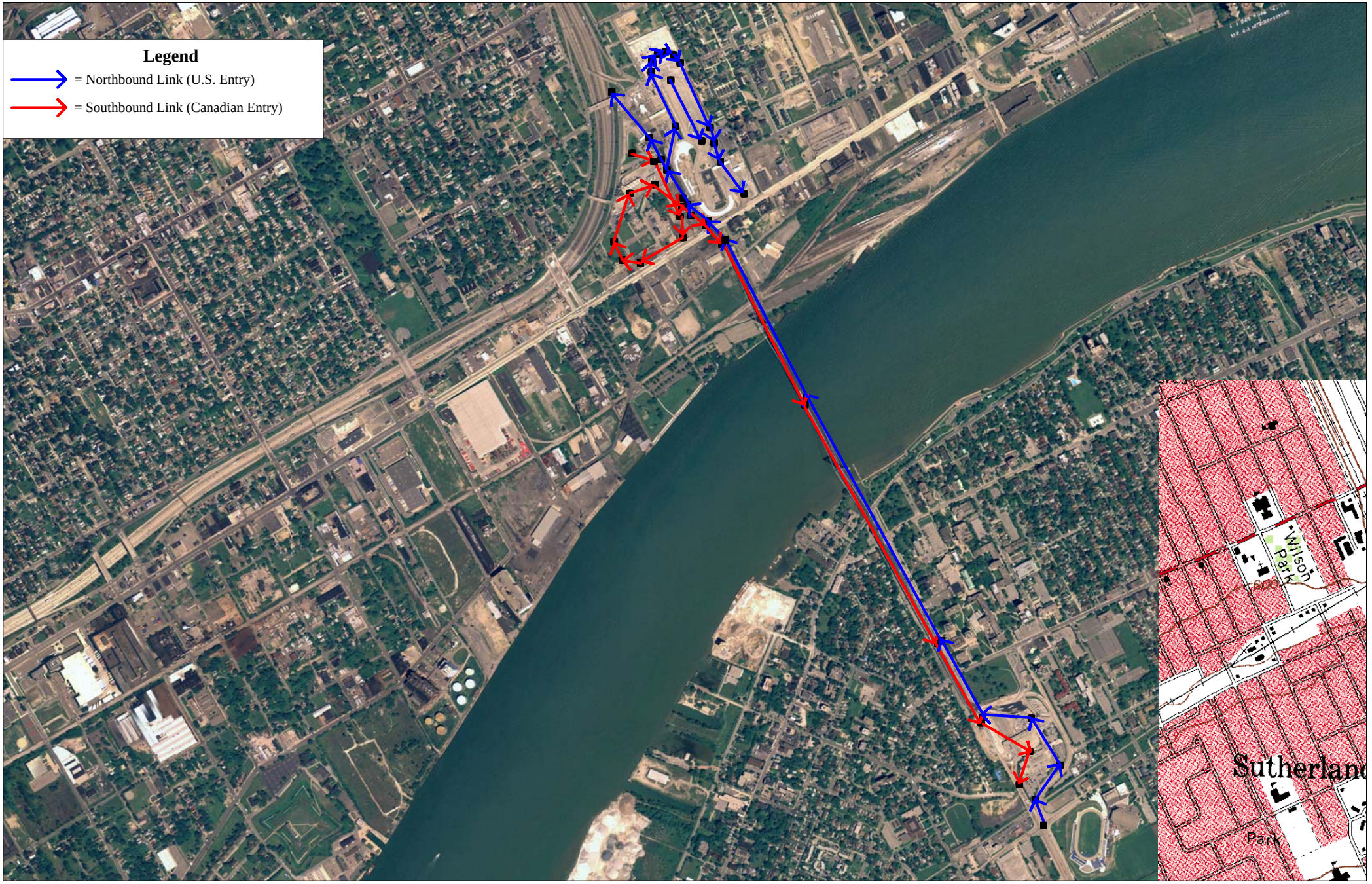
Scale In Meters

0 600 1,200

N W E S

Figure 1
Location of Existing Ambassador Bridge

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

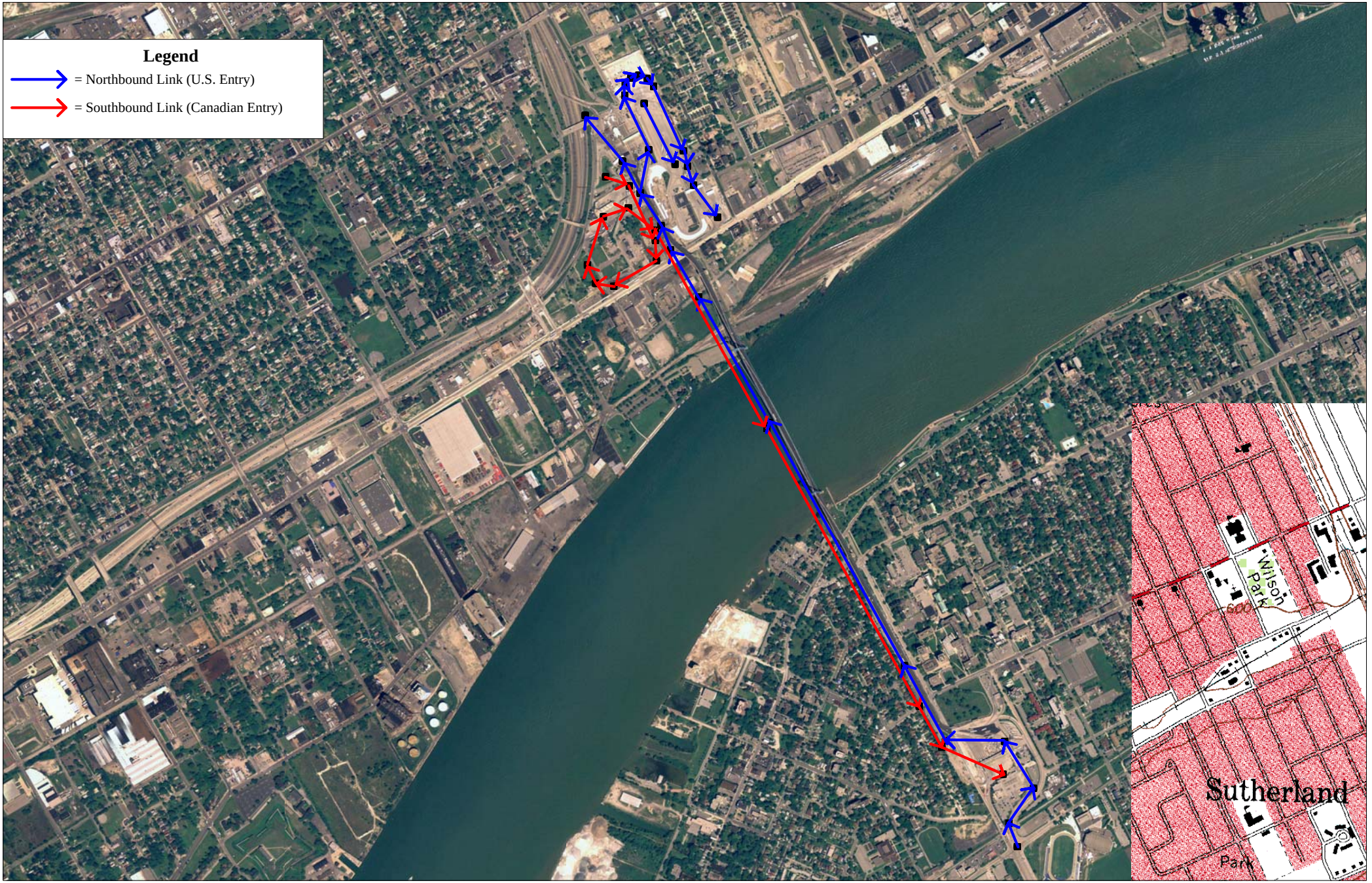
0 1,000 2,000

N
W E
S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 2
Existing Ambassador Bridge Links

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

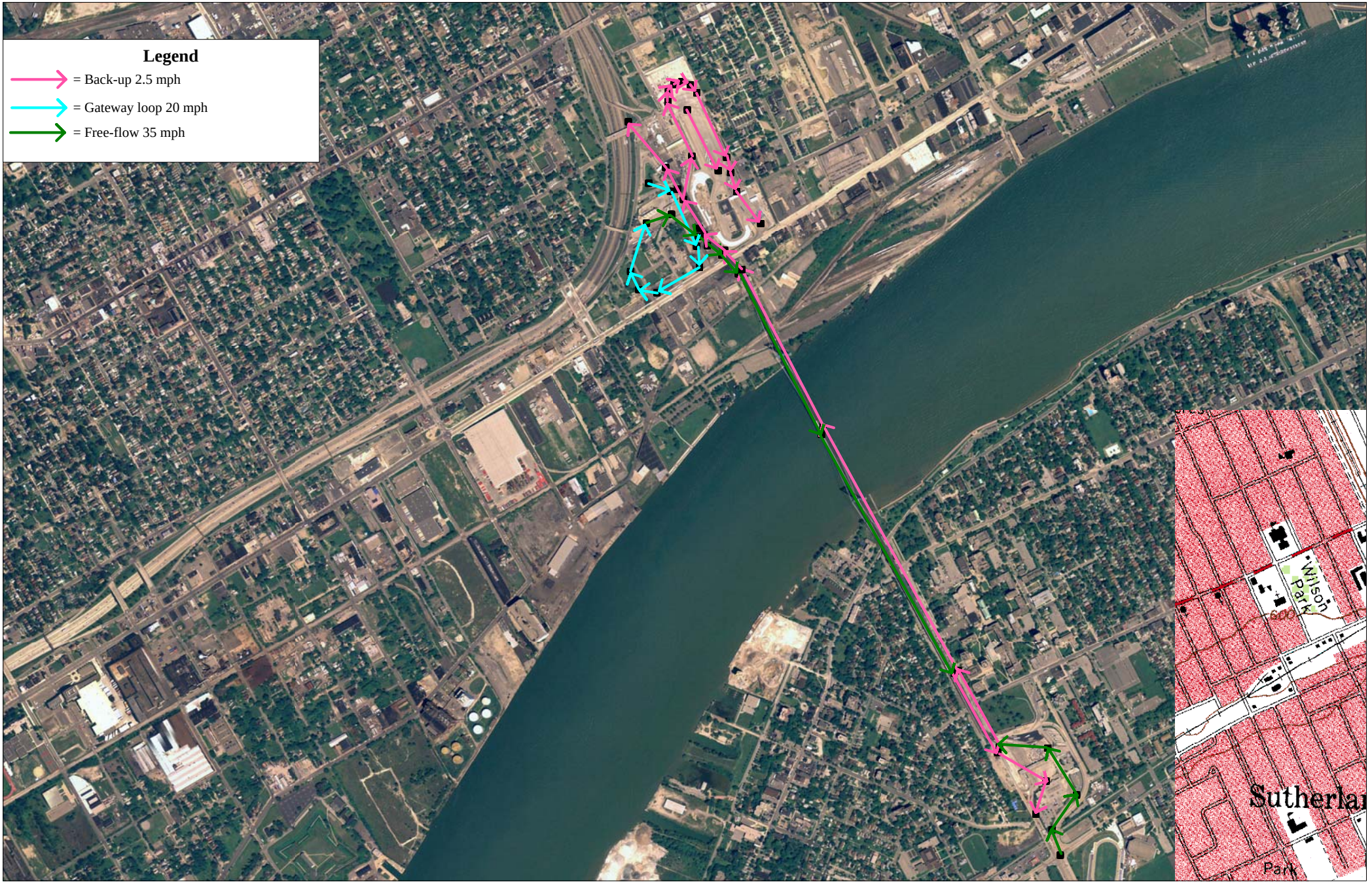
0 1,000 2,000

N
W E
S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 3
Proposed New Bridge Links

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

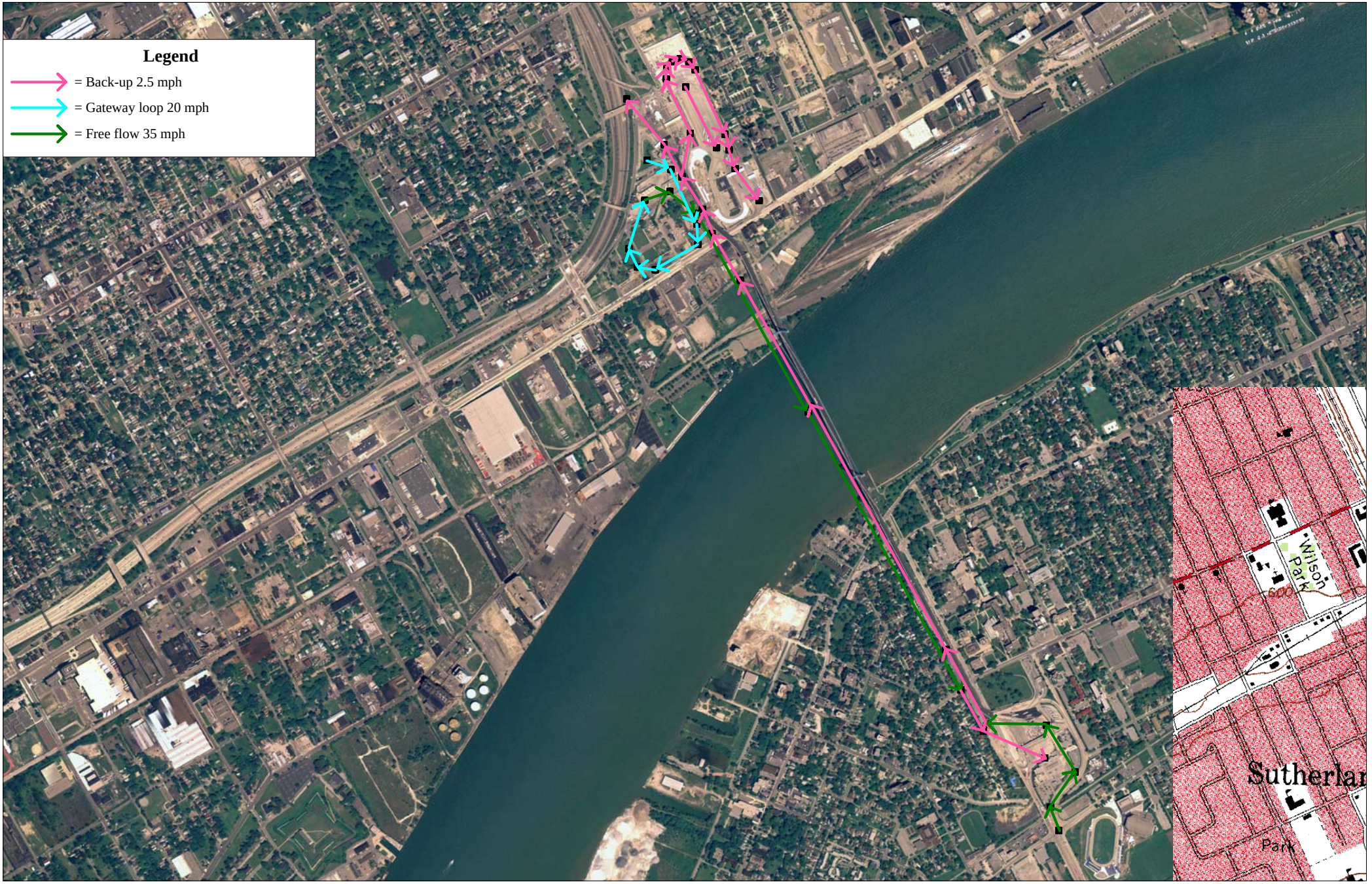
0 1,000 2,000

N
W E
S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 4
Modeled Existing Bridge Link Speeds

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

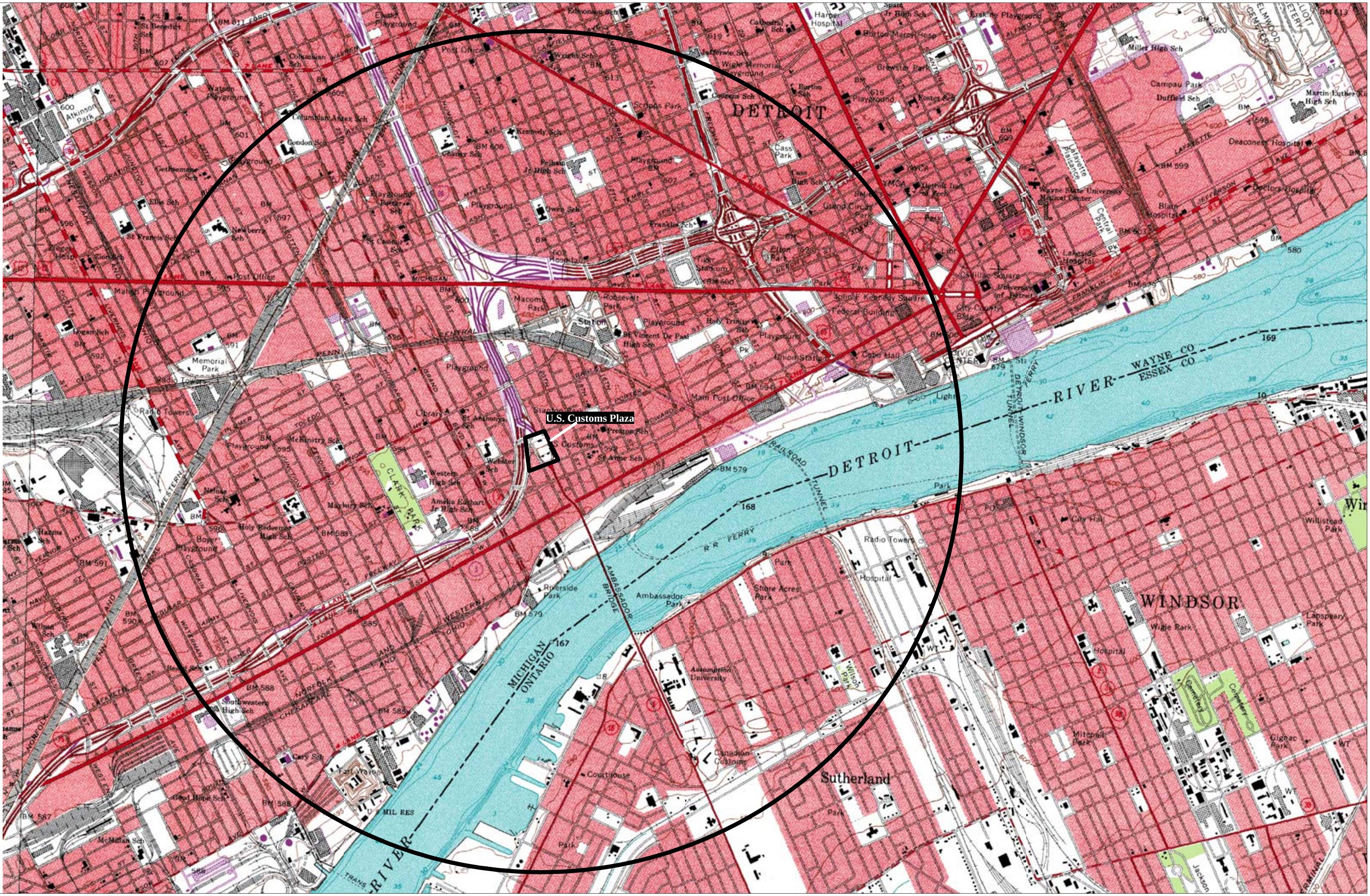
0 1,000 2,000

N
W E
S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 5
Modeled New Bridge Link Speeds

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

0 2,000 4,000

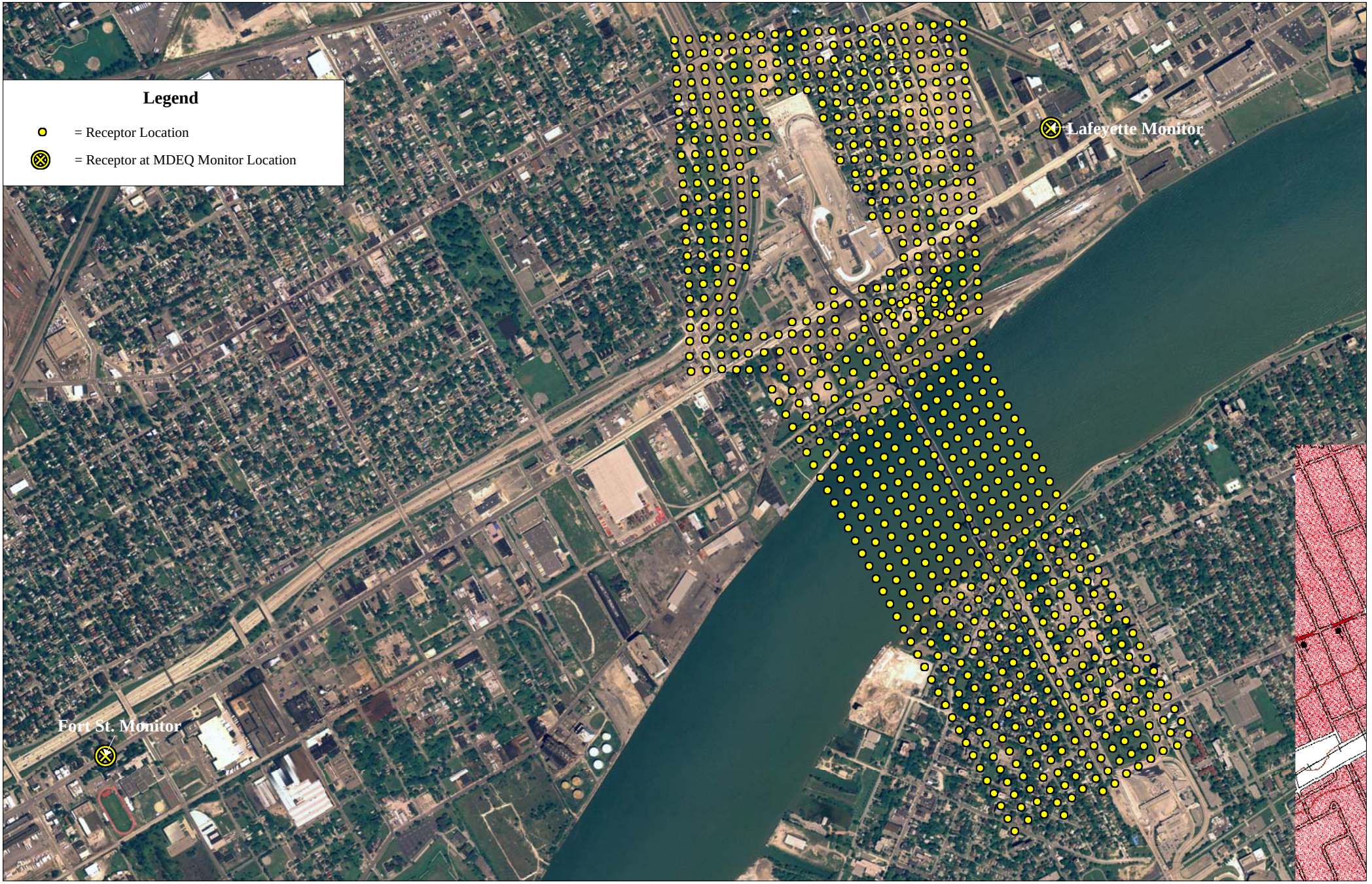
Source: Base map USGS 7.5 minute quadrangle (1:24,000), Detroit, Dated 1980.

N
W E
S

WESTON SOLUTIONS

Figure 6
Land Use Surrounding ABEP

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

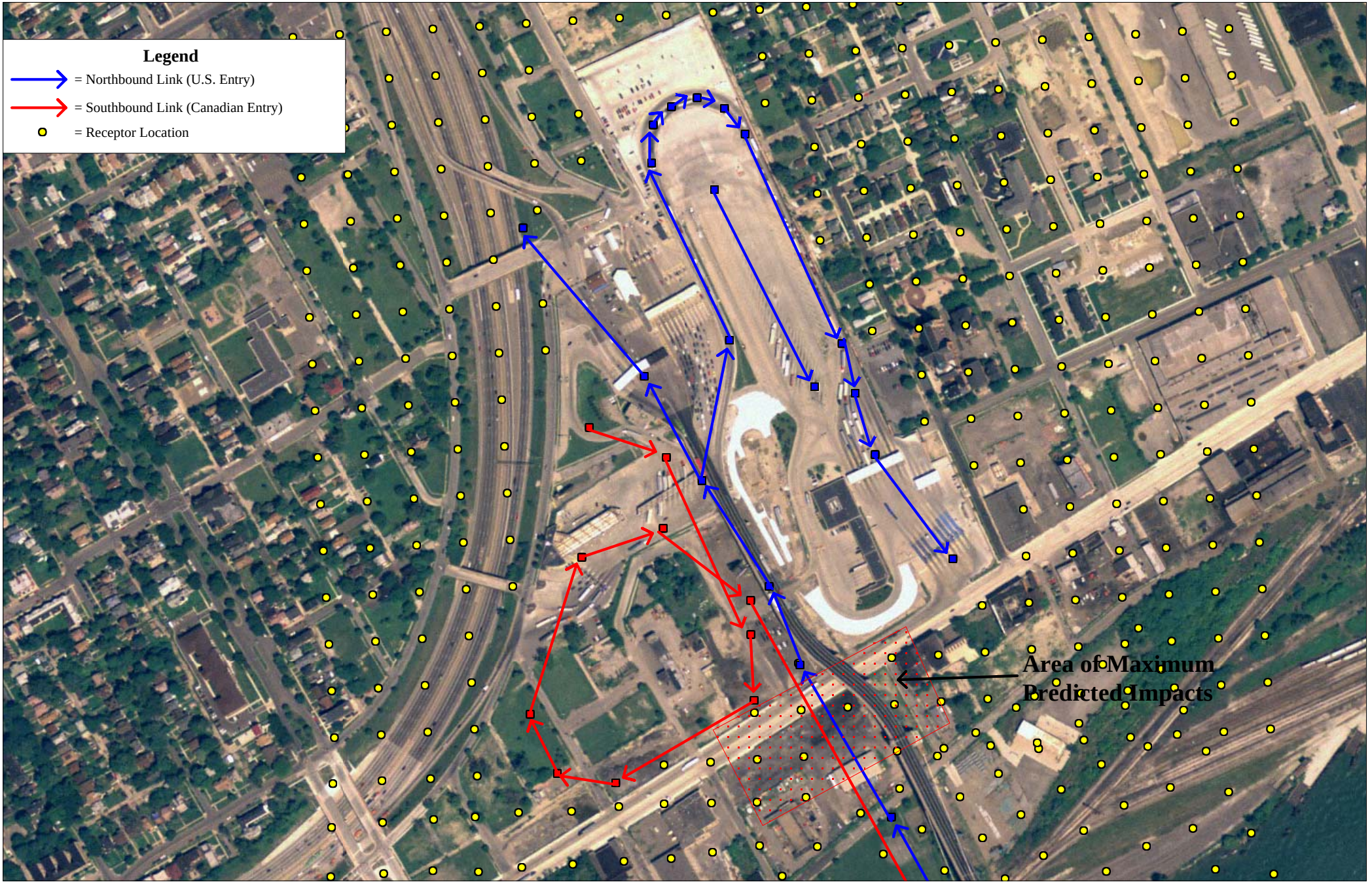
0 1,000 2,000

N W E S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 7
Receptor Grid

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan



Scale in Meters

0 300 600

N W E S

Source: Base map Remote Sensing & GIS Research and Outreach Services (RS&GIS), Michigan Georef NAIP Digital Ortho Photo Image, Detroit NE, NW, and SW, Dated 2005.

Figure 8
Location of Maximum Predicted Ambient Impacts

Ambassador Bridge Enhancement Project
Wayne County
Detroit, Michigan

APPENDIX A

Modeled Link Parameter Tables

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **PM10**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0042	0.0150
20	0.0247	0.0536
30		
35	0.0247	0.0536
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	0.0347	34.735								passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	0.0347	34.735								passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	0.0347	34.735								passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	0.0347	34.735								passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	0.0079	7.939								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0042	4.200								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0042	4.200								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	0.0312	31.222								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	0.0312	31.222								bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	0.0312	31.222								bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	0.0312	31.222								bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	0.0066	6.630								bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	0.0066	6.630								Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	0.0150	14.950								US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.0150	14.950								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **PM10**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0044	0.1529
20	0.0249	0.1916
30		
35	0.0248	0.1916
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	480.0	1680.0	0.0724	72.443								passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	480.0	1680.0	0.0724	72.443								passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	480.0	1680.0	0.0724	72.443								passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329590	4685157	0.0	16.5	1200.0	480.0	1680.0	0.0724	72.443								passing canadian plaza (NB) no stop 4
5	BR	329590	4685157	329463	4685430	5.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB (sloping up)
6	BR	329463	4685430	329045	4686300	10.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB elevated section (canada)
7	BR	329045	4686300	328783	4686850	10.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB elevated section (US)
8	BR	328783	4686850	328740	4686934	10.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB slopdown 1
9	BR	328740	4686934	328657	4687015	10.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB slopdown 2
10	BR	328657	4687015	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	0.0468	46.814								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0044	4.400								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0044	4.400								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	0.0626	62.568								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	0.0625	62.491								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	0.0625	62.491								bridge SB elevated section 1
22	BR	328652	4686987	328730	4686918	10.0	16.5	1558.0	455.0	2013.0	0.0625	62.491								bridge SB elevated section (end of US)
23	BR	328730	4686918	329038	4686276	10.0	16.5	1558.0	455.0	2013.0	0.0625	62.491								bridge SB elevated (Canada)
24	BR	329038	4686276	329449	4685422	10.0	16.5	1558.0	455.0	2013.0	0.0625	62.491								bridge SB elevated (Canada)
25	AG	329449	4685422	329583	4685138	5.0	16.5	1558.0	455.0	2013.0	0.0380	37.954								bridge SB sloping down
26	AG	329583	4685138	329745	4685029	0.0	30.0	1558.0	455.0	2013.0	0.0380	37.954								Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	0.1529	152.850								US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.1529	152.850								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **PM2.5**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0039	0.0138
20	0.0112	0.0257
30		
35	0.0112	0.0257
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	0.0162	16.226								passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	0.0162	16.226								passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	0.0162	16.226								passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	0.0162	16.226								passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	0.0073	7.343								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0039	3.900								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0039	3.900								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	0.0145	14.467								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	0.0145	14.467								bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	0.0145	14.467								bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	0.0145	14.467								bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	0.0061	6.138								bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	0.0061	6.138								Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	0.0138	13.800								US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.0138	13.800								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **PM2.5**
Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0041	0.1411
20	0.0114	0.1530
30		
35	0.0113	0.1530
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	0.0518	51.786								passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	0.0518	51.786								passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	0.0518	51.786								passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	0.0518	51.786								passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	0.0432	43.243								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0041	4.100								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0041	4.100								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	0.0434	43.406								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	0.0433	43.329								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	0.0433	43.329								bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	0.0433	43.329								bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	0.0433	43.329								bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	0.0433	43.329								bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	0.0351	35.066								bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	0.0351	35.066								Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	0.1411	141.100								US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.1411	141.100								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **CO**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	20.695	1.071
20	8.220	0.328
30		
35	7.820	0.186
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	5.1645									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	5.1645									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	5.1645									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	5.1645									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	13.8691									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	20.6950									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	20.6950									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	6.4358									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	6.0940									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	6.0940									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	6.0940									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	6.0940									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	16.2583									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	16.2583									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	1.0705									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	1.0705									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	1.0705									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	1.0705									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	1.0705									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **CO**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	29.825	7.521
20	11.080	2.307
30		
35	10.575	1.306
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	7.9267									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	7.9267									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	7.9267									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	7.9267									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	23.452									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	29.825									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	29.825									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	9.0970									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	8.4799									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	8.4799									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	8.4799									bridge SB elevated section 1
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	8.4799									bridge SB elevated section (end of US)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	8.4799									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	24.783									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	24.783									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	7.5205									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	7.5205									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	7.5205									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	7.5205									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	7.5205									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **NOx**
Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.4420	1.0276
20	0.2295	0.5455
30		
35	0.2000	0.4770
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*10	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	0.2963	2.963								passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	0.2963	2.963								passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	0.2963	2.963								passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	0.2963	2.963								passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	0.6457	6.457								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.4420	4.420								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.4420	4.420								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	0.3009	3.009								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	0.2626	2.626								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	0.2626	2.626								bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	0.2626	2.626								bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	0.2626	2.626								bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	0.5744	5.744								bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	0.5744	5.744								Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	1.0276	10.276								US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	1.0276	10.276								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **NOx**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	1.093	10.849
20	0.594	6.311
30		
35	0.524	5.552
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	1.9601									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	1.9601									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	1.9601									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	1.9601									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	3.8799									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	1.0925									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	1.0925									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	1.8857									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	1.6600									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	1.6600									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	1.6600									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	1.6600									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	1.6600									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	3.2977									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	3.2977									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	10.849									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	10.849									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	10.849									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	10.849									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	10.849									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **SO2**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0067	0.0132
20	0.0067	0.0132
30		
35	0.0068	0.0132
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	0.0090	9.026								passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	0.0090	9.026								passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	0.0090	9.026								passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	0.0090	9.026								passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	0.0090	8.961								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0067	6.700								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0067	6.700								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	0.0082	8.170								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	0.0082	8.247								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	0.0082	8.247								bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	0.0082	8.247								bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	0.0082	8.247								bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	0.0082	8.170								bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	0.0082	8.170								Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	0.0132	13.200								US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.0132	13.200								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **SO2**

Bridge

Average Speed (mph)	Emission Factor (g/mile) -> car	truck
2.5	0.0067	0.0940
20	0.0067	0.0940
30		
35	0.0068	0.0940
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL*1000	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	0.0317	31.714								passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	0.0317	31.714								passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	0.0317	31.714								passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	0.0317	31.714								passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	0.0316	31.643								bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.0067	6.700								bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.0067	6.700								US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	0.0264	26.432								SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	0.0265	26.510								SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	0.0265	26.510								bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	0.0265	26.510								bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	0.0265	26.510								bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	0.0265	26.510								bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	0.0264	26.432								bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	0.0264	26.432								Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	0.0940	94.000								US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	0.0940	94.000								US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACETALDEHYDE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	2.5550	22.5250
20	0.9350	10.2300
30		
35	0.8100	6.4450
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	2.7700									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	2.7700									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	2.7700									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	2.7700									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	9.5011									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	2.5550									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	2.5550									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	3.0364									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	2.0839									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	2.0839									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	2.0839									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	2.0839									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	7.0698									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	7.0698									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	22.5250									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	22.5250									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	22.5250									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	22.5250									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	22.5250									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACETALDEHYDE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	5.5500	35.7500
20	1.9400	16.2350
30		
35	1.6750	10.2300
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	4.1193									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	4.1193									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	4.1193									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	4.1193									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	14.179									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	5.550									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	5.550									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	5.1711									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	3.609									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	3.609									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	3.609									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	3.609									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	3.609									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	12.376									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	12.376									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	35.750									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	35.750									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	35.750									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	35.750									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	35.750									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACROLEIN**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	0.3750	2.7400
20	0.1300	1.2400
30		
35	0.1150	0.7800
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	0.3463									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	0.3463									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	0.3463									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	0.3463									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	1.1976									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.3750									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.3750									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	0.3809									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	0.2653									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	0.2653									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	0.2653									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	0.2653									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	0.9097									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	0.9097									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	2.7400									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	2.7400									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	2.7400									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	2.7400									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	2.7400									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Annualized (DRIC) Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACROLEIN**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) ->	car	truck
2.5		0.3750	2.7400
20		0.1300	1.2400
30			
35		0.1150	0.7800
40			

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	365	402.0	767.0	0.4635									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	365	402.0	767.0	0.4635									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	365	402.0	767.0	0.4635									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	365	402.0	767.0	0.4635									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	365	402.0	767.0	1.6145									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	365	402.0	767.0	1.6145									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	365	402.0	767.0	1.6145									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	365	402.0	767.0	1.6145									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	365	402.0	767.0	1.6145									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	365	402.0	767.0	1.6145									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	365		365.0	0.3750									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	365		365.0	0.3750									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	672	405.0	1077.0	0.5474									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	672	405.0	1077.0	0.5474									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	672	405.0	1077.0	0.3651									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	672	405.0	1077.0	0.3651									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	672	405.0	1077.0	0.3651									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	672	405.0	1077.0	0.3651									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	672	405.0	1077.0	1.2643									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	672	405.0	1077.0	1.2643									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		402.0	402.0	2.7400									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		402.0	402.0	2.7400									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		402.0	402.0	2.7400									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		402.0	402.0	2.7400									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	2.7400									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACROLEIN**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	0.8150	4.3450
20	0.2750	1.9750
30		
35	0.2400	1.2400
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	0.5257									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	0.5257									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	0.5257									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	0.5257									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	1.8236									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	0.8150									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	0.8150									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	0.6593									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	0.4660									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	0.4660									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	0.4660									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	0.4660									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	0.4660									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	1.6129									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	1.6129									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	4.3450									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	4.3450									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	4.3450									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	4.3450									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	4.3450									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Annualized (DRIC) Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **ACROLEIN**

Average Speed (mph)	Bridge Emission Factor (mg/mile) -> car	truck
2.5	0.8150	4.3450
20	0.2750	1.9750
30		
35	0.2400	1.2400
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	358.0	244.0	602.0	0.6453									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	358.0	244.0	602.0	0.6453									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	358.0	244.0	602.0	0.6453									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	358.0	244.0	602.0	0.6453									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	358.0	244.0	602.0	2.2458									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	358.0	244.0	602.0	2.2458									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	358.0	244.0	602.0	2.2458									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	358.0	244.0	602.0	2.2458									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	358.0	244.0	602.0	2.2458									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	358.0	244.0	602.0	2.2458									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	358.0		358.0	0.8150									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	358.0		358.0	0.8150									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	464.0	232.0	696.0	0.8417									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	464.0	232.0	696.0	0.5733									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	464.0	232.0	696.0	0.5733									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	464.0	232.0	696.0	0.5733									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	464.0	232.0	696.0	0.5733									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	464.0	232.0	696.0	0.5733									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	464.0	232.0	696.0	1.9917									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	464.0	232.0	696.0	1.9917									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		232.0	232.0	4.3450									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		232.0	232.0	4.3450									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		232.0	232.0	4.3450									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		232.0	232.0	4.3450									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	4.3450									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **1,3 BUTADIENE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	3.6650	4.7700
20	1.3350	2.1700
30		
35	1.1550	1.3650
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	1.2280									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	1.2280									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	1.2280									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	1.2280									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	4.0493									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	3.6650									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	3.6650									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	1.5238									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	1.2025									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	1.2025									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	1.2025									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	1.2025									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	3.9148									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	3.9148									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	4.7700									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	4.7700									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	4.7700									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	4.7700									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	4.7700									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **1,3 BUTADIENE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	8.3950	7.5700
20	2.9250	3.4400
30		
35	2.5150	2.1650
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	2.4150									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	2.4150									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	2.4150									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	2.4150									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	8.1593									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	8.3950									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	8.3950									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	3.0414									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	2.4359									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	2.4359									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	2.4359									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	2.4359									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	2.4359									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	8.2085									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	8.2085									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	7.5700									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	7.5700									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	7.5700									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	7.5700									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	7.5700									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **BENZENE**

Average Speed (mph)	Bridge Emission Factor (mg/mile) -> car	truck
2.5	32.3800	8.2100
20	11.8850	3.7300
30		
35	10.3250	2.3500
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	7.5511									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	7.5511									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	7.5511									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	7.5511									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	23.9730									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	32.3800									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	32.3800									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	10.0413									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	8.5220									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	8.5220									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	8.5220									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	8.5220									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	26.9157									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	26.9157									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	8.2100									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	8.2100									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	8.2100									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	8.2100									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	8.2100									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **BENZENE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	71.300	13.035
20	25.055	5.920
30		
35	21.605	3.730
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	16.4979									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	16.4979									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	16.4979									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	16.4979									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	54.6529									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	71.3000									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	71.3000									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	20.7299									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	17.5646995									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	17.5647									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	17.5647									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	17.5647									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	17.5647									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	58.1303									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	58.1303									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	13.0350									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	13.0350									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	13.0350									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	13.0350									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	13.0350									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2030 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q:	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **FORMALDEHYDE**

Bridge

Average Speed (mph)	Emission Factor (mg/mile) -> car	truck
2.5	6.730	61.155
20	2.465	27.775
30		
35	2.135	17.500
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684776	329756	4684859	0.0	16.5	1200.0	640.0	1840.0	7.4793									passing canadian plaza (NB) no stop 1
2	AG	329756	4684859	329848	4684975	0.0	16.5	1200.0	640.0	1840.0	7.4793									passing canadian plaza (NB) no stop 2
3	AG	329848	4684975	329758	4685143	0.0	16.5	1200.0	640.0	1840.0	7.4793									passing canadian plaza (NB) no stop 3
4	AG	329758	4685143	329555	4685158	0.0	16.5	1200.0	640.0	1840.0	7.4793									passing canadian plaza (NB) no stop 4
5	BR	329555	4685158	329426	4685426	5.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB (sloping up)
6	BR	329426	4685426	329007	4686297	10.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB elevated section (canada)
7	BR	329007	4686297	328789	4686747	10.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB elevated section (US)
8	BR	328789	4686747	328701	4686915	10.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB slopdown 1
9	BR	328701	4686915	328673	4687001	10.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB slopdown 2
10	BR	328673	4687001	328608	4687118	10.0	16.5	1200.0	640.0	1840.0	25.660									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	6.7300									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	6.7300									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	2208.0	645.0	2853.0	8.1870									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	2208.0	645.0	2853.0	5.6087									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	2208.0	645.0	2853.0	5.6087									bridge SB elevated section 1
22	BR	328652	4686987	328998	4686277	10.0	16.5	2208.0	645.0	2853.0	5.6087									bridge SB elevated section (end of US)
23	BR	328998	4686277	329469	4685283	10.0	16.5	2208.0	645.0	2853.0	5.6087									bridge SB elevated (Canada)
24	BR	329469	4685283	329539	4685136	5.0	16.5	2208.0	645.0	2853.0	19.0343									bridge SB sloping down
25	AG	329539	4685136	329745	4685030	0.0	30	2208.0	645.0	2853.0	19.0343									Canadian plaza for SB inspection
26	AG	328608	4687118	328646	4687266	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
27	AG	328646	4687266	328574	4687460	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
28	AG	328574	4687460	328578	4687501	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
29	AG	328578	4687501	328599	4687519	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
30	AG	328599	4687519	328627	4687527	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
31	AG	328627	4687527	328655	4687514	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
32	AG	328655	4687514	328676	4687485	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
33	AG	328676	4687485	328766	4687255	0.0	9.5		640.0	640.0	61.155									US truck plaza for NB inspection
34	AG	328766	4687255	328777	4687202	0.0	31.0		640.0	640.0	61.155									US truck plaza for NB inspection
35	AG	328777	4687202	328794	4687135	0.0	62.0		640.0	640.0	61.155									US truck plaza for NB inspection
36	AG	328794	4687135	328871	4687019	0.0	62.0		640.0	640.0	61.155									US truck plaza for NB inspection
37	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	61.155									US truck plaza physical inspection

Note coordinates are NAD27

CAL3QHCR - 2010 Link Parameters (METERS)

Variabl	Type	Unit	Description
LNK=	Character	na	Link ID (up to 20 characters)
TYP=	Character	na	Link Type: AG = at grade, FL = fill, BR = bridge, DP = depressed
XL1=	Real	Meters	X coordinate for Endpoint 1 at intersection stopping line
YL1=	Real	Meters	Y coordinate for Endpoint 1 at intersection stopping line
XL2=	Real	Meters	X coordinate for Endpoint 2
YL2=	Real	Meters	Y coordinate for Endpoint 2
HL=	Real	Meters	Source height
WL=	Real	Meters	Mixing zone width
VPHL=	Real	vehicle/hour	Traffic volume for free flow links and approach traffic volume for queue links
EFL=	Real	gram/vehicle-mile	Free flow emission factor
EFL_Q=	Real	grams/vehicle-hour	Idle emission factor for queue links
NLANE	Integer	na	Number of travel lanes in queue link
CAVG	Integer	Seconds	Average total signal cycle length
RAVG	Integer	Seconds	Average red total signal cycle length
YFAC	Real	Seconds	Clearance lost time (portion of the yellow phase that is not used by motorist)
SFR=	Interger	vehicle/hour-lane	Saturation flow rate [vehicles per hour of effective green time]
ST=	Integer	na	Traffic signal type [pretimed (=1), actuated (=2), or semiactuated (=3)]
AT=	Integer	na	Arrival type of vehicle platoon [worst (=1) through most favorable (=5)]
DESCR	Character	na	Link description

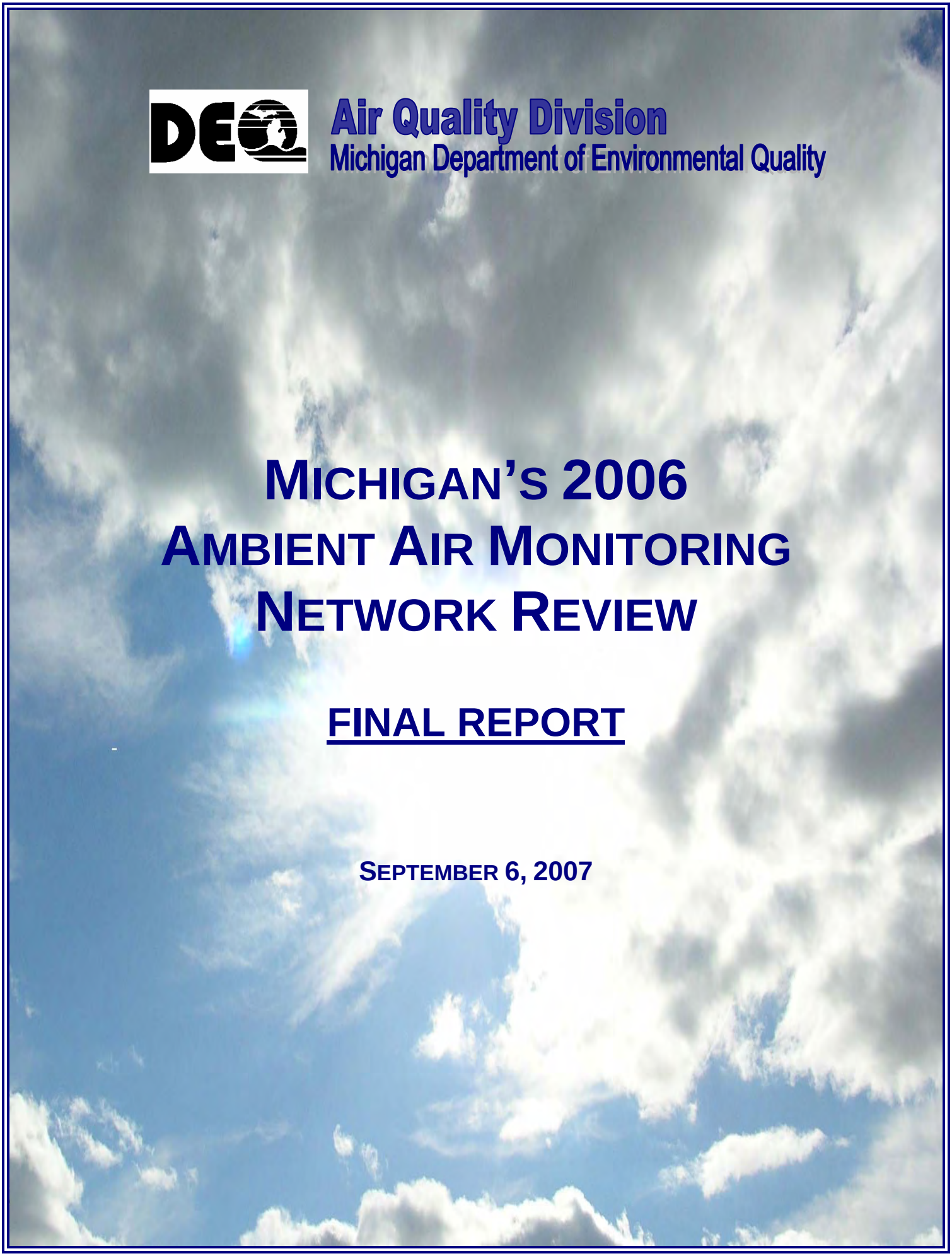
Variable for Free Flow and Queue Links
Variable for Free Flow Links Only
Variables for Queue Links Only

Mobile 6.2 Emission Factor for: **FORMALDEHYDE**

Average Speed (mph)	Bridge Emission Factor (mg/mile) -> car	truck
2.5	14.295	97.070
20	5.015	44.085
30		
35	4.320	27.775
40		

LNK	TYP	XL1	YL1	XL2	YL2	HL	WL	VPHL (car)	VPHL (truck)	VPHL (all)	EFL (all)	EFL_Q	NLANES	CAVG	RAVG	YFAC	SFR	ST	AT	DESCRIP
1	AG	329780	4684775.95	329756	4684858.95	0.0	16.5	1200.0	480.0	1680.0	11.0214									passing canadian plaza (NB) no stop 1
2	AG	329756	4684858.95	329848	4684974.95	0.0	16.5	1200.0	480.0	1680.0	11.0214									passing canadian plaza (NB) no stop 2
3	AG	329848	4684974.95	329758	4685142.95	0.0	16.5	1200.0	480.0	1680.0	11.0214									passing canadian plaza (NB) no stop 3
4	AG	329758	4685142.95	329590	4685156.95	0.0	16.5	1200.0	480.0	1680.0	11.0214									passing canadian plaza (NB) no stop 4
5	BR	329590	4685156.95	329463	4685429.95	5.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB (sloping up)
6	BR	329463	4685429.95	329045	4686299.95	10.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB elevated section (canada)
7	BR	329045	4686299.95	328783	4686849.96	10.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB elevated section (US)
8	BR	328783	4686849.96	328740	4686933.96	10.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB slopdown 1
9	BR	328740	4686933.96	328657	4687014.96	10.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB slopdown 2
10	BR	328657	4687014.96	328608	4687118	10.0	16.5	1200.0	480.0	1680.0	37.9450									bridge NB slopdown 3
11	BR	328608	4687118	328553	4687233	5.0	16.5	1200.0		1200.0	14.2950									bridge NB sloping down 4
12	AG	328553	4687233	328433	4687399	0.0	30.0	1200.0		1200.0	14.2950									US plaza for NB inspection
13	AG	328491	4687182	328571	4687145	0.0	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop starts
14	BR	328571	4687145	328650	4686951	2.5	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
15	BR	328650	4686951	328649	4686880	5.0	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
16	BR	328649	4686880	328497	4686801	5.0	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
17	BR	328497	4686801	328435	4686815	7.5	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
18	BR	328435	4686815	328409	4686880	7.5	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
19	BR	328409	4686880	328475	4687044	7.5	13.0	1558.0	455.0	2013.0	13.8460									SB Gateway loop
20	BR	328475	4687044	328563	4687070	10.0	13.0	1558.0	455.0	2013.0	9.6216									SB Gateway loop
21	BR	328563	4687070	328652	4686987	10.0	16.5	1558.0	455.0	2013.0	9.6216									bridge SB elevated section 1
22	BR	328652	4686987	328730	4686917.96	10.0	16.5	1558.0	455.0	2013.0	9.6216									bridge SB elevated section (end of US)
23	BR	328730	4686917.96	329038	4686275.95	10.0	16.5	1558.0	455.0	2013.0	9.6216									bridge SB elevated (Canada)
24	BR	329038	4686275.95	329449	4685421.95	10.0	16.5	1558.0	455.0	2013.0	9.6216									bridge SB elevated (Canada)
25	AG	329449	4685421.95	329583	4685137.95	5.0	16.5	1558.0	455.0	2013.0	33.0047									bridge SB sloping down
26	AG	329583	4685137.95	329745	4685028.95	0.0	30	1558.0	455.0	2013.0	33.0047									Canadian plaza for SB inspection
27	AG	328608	4687118	328646	4687266	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
28	AG	328646	4687266	328574	4687460	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
29	AG	328574	4687460	328578	4687501	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
30	AG	328578	4687501	328599	4687519	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
31	AG	328599	4687519	328627	4687527	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
32	AG	328627	4687527	328655	4687514	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
33	AG	328655	4687514	328676	4687485	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
34	AG	328676	4687485	328766	4687255	0.0	9.5		480.0	480.0	97.0700									US truck plaza for NB inspection
35	AG	328766	4687255	328777	4687202	0.0	31.0		480.0	480.0	97.0700									US truck plaza for NB inspection
36	AG	328777	4687202	328794	4687135	0.0	62.0		480.0	480.0	97.0700									US truck plaza for NB inspection
37	AG	328794	4687135	328871	4687019	0.0	62.0		480.0	480.0	97.0700									US truck plaza for NB inspection
38	AG	328639	4687428	328734	4687211	0.0	31.0		80.0	80.0	97.0700									US truck plaza physical inspection

Note coordinates are NAD27



Air Quality Division
Michigan Department of Environmental Quality

MICHIGAN'S 2006 AMBIENT AIR MONITORING NETWORK REVIEW

FINAL REPORT

SEPTEMBER 6, 2007

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Michigan Department of Environmental Quality

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EXECUTIVE SUMMARY:

The purpose of this document is to examine Michigan's ambient air monitoring network in operation during 2006-2007 and recommend changes based on monitor history, population distribution, and modifications to federal monitoring requirements under the Clean Air Act (CAA), 40 Code of Federal Regulations (CFR) Part 58. Recommended changes to this network will be implemented during the 2008 calendar year, contingent upon adequate levels of funding.

BACKGROUND

In April 2007, loss of federal Section 105 State Aid Grant (STAG) funds resulted in cuts to the monitoring network. Although Congress restored these funds, they were distributed to other programs rather than returned to the air programs. Due to the current status of Michigan's budget, these federal funding cuts could not be absorbed by the Michigan Department of Environmental Quality (MDEQ) and monitoring was discontinued. This document summarizes the impact of those cuts on the monitoring program.

There are a number of discussions at the federal level that may impact the future design of Michigan's monitoring network. The U.S. Environmental Protection Agency (EPA) has proposed changing the National Ambient Air Quality Standard (NAAQS) for ozone, which could include a reduction in the level of the standard and the addition of a secondary standard. This could have implications in the design of the ozone network as well as the length of the ozone season. If the EPA adopts a more stringent form of the lead NAAQS, Michigan's monitoring network for lead may need to be modified. If the form of the federal grant funding for the fine particulate matter ($PM_{2.5}$) program is changed to require that states provide a 40 percent (%) match, Michigan will not be able to do so and will likely have to discontinue various forms of $PM_{2.5}$ monitoring. Finally, the federal budget may once again cut funding to the air programs in fiscal year 2008.[1] Although these funds may be restored, if they are not earmarked specifically for air programs, more cuts to the ambient monitoring program may be necessary.

RECOMMENDATIONS FOR MICHIGAN'S AIR MONITORING NETWORK

No monitors are recommended for closure at this time. However, if adequate levels of funding are unavailable, changes in the monitoring network will have to occur. Retention of the ozone and $PM_{2.5}$ federal reference method (FRM) monitoring sites will be given highest priority. The following are recommended additions to Michigan's air monitoring network:

- An ozone monitor in either Saginaw or Bay City, contingent upon the adoption of the EPA's W126 secondary ozone standard[2] or a level of 0.070 ppm or less as the primary ozone standard and contingent upon receiving adequate levels of funding.
- Change ozone monitoring season from April 1 through September 30 to March 15 through October 15 if the primary ozone NAAQS becomes more stringent.
- Establish a $PM_{2.5}$ FRM monitor at Tecumseh (260910007) if the MDEQ is a recipient of a community monitoring grant award.
- The $PM_{2.5}$ FRM sampler in Grand Rapids (260810020) will increase sampling frequency to daily beginning January 1, 2008.
- Add trace carbon monoxide (CO) monitor to Grand Rapids (260810020) and Allen Park (261630001) as a future National Core Network (NCORE) sites.
- Add trace NO_Y (nitrogen oxide + nitric acid + organic and inorganic nitrates) monitors to Grand Rapids (260810020) and Allen Park (261630001) as future NCORE sites.

[1] Fiscal year 2008 begins October 1, 2007 and runs through September 30, 2008.
[2] The general form of the W126 secondary standard is a weighted sum of hourly ozone values that are measured during daylight hours for a greater level of protection to crops and vegetation.

- Add trace sulfur dioxide (SO_2) monitors to Grand Rapids (260810020) and Allen Park (261630001) as future NCORE sites.

NETWORK REVIEW GOALS

The Michigan Ambient Air Monitoring Network Review will describe the ambient air monitoring network, show how the network meets the EPA's monitoring regulations, discuss the public comment procedure, summarize recent changes to the network and address potential impacts of other actions in greater detail. All discussions of air monitors reference a unique nine-digit site identification code to remove all ambiguity about the monitor location.

PUBLIC COMMENT PROCESS

One of EPA's requirements for the network review is that it must document the process for obtaining public comments and will need to include any comments received through the public notification process. For Michigan, a draft network review document was placed on the Internet to solicit comments from the general public and stakeholders. Reviewers were given 30 calendar days from the date the draft network review report was posted to the Internet to provide written comments. Written comments were accepted either by e-mail or by parcel post (verbal comments were not accepted) and were sent to:

Dr. Mary Ann Heindorf
MDEQ – Air Quality Division
P.O. Box 30260
525 West Allegan Street
Lansing MI 48909
Heindorm@Michigan.gov

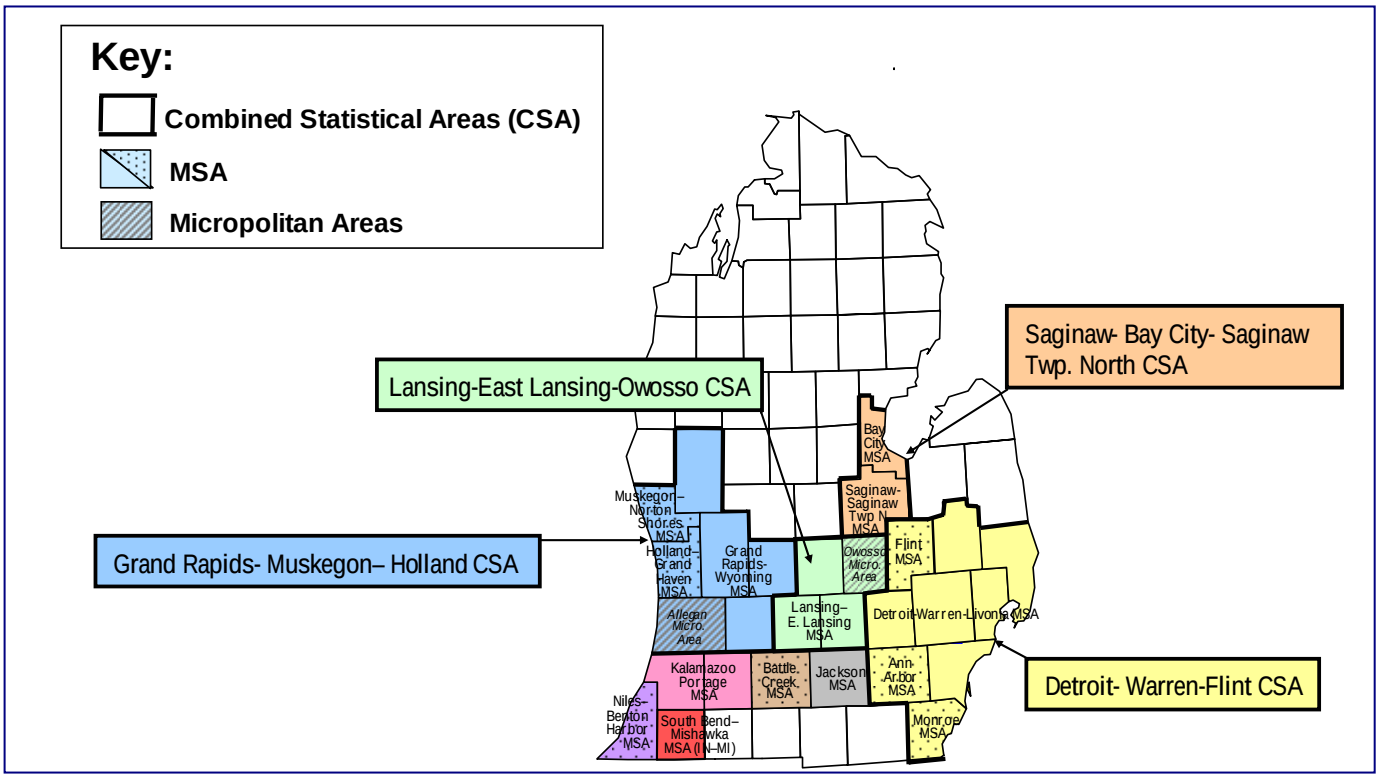
Appendix B contains a summary of comments received organized by topic and addressed in a general format and where applicable, in specific terms. All written comments received are available in **Appendix C**. In response to these comments, some changes have been incorporated into this final version of Michigan's 2006 Ambient Air Monitoring Network Review.

The final network review document will be sent to EPA Region 5 for approval and will be placed on the Air Quality Division's (AQD's) website at http://www.michigan.gov/deqair. Hardcopies of the final version may be inspected free of charge at the MDEQ's AQD offices located in Lansing (525 West Allegan Street) or Detroit (3058 West Grand Boulevard, Suite 2-300). Requests for hard copies of the plan may incur a nominal fee to cover copying and/or mailing costs. These requests should be directed to Mr. Craig Fitzner, AQD, 517-373-7044, Fitzner@michigan.gov.

AMBIENT AIR MONITORING NETWORK REQUIREMENTS:

On October 17, 2006, the ambient monitoring requirements were changed under the CAA, 40 CFR Part 58. The minimum network design criteria for ozone, $PM_{2.5}$ (particulate matter with an aerodynamic diameter less than or equal to [≤] 2.5 micrometers) and PM_{10} (≤10 micrometers) are now based on the 2000 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. Minimum network requirements no longer exist for SO_2, nitrogen dioxide (NO_2), and CO. Based on the 2000 census, the new MSA outlines for Michigan's Lower Peninsula are shown in **Figure 1**.

FIGURE 1: MSAS IN MICHIGAN'S LOWER PENINSULA



The composition of each MSA or Combined Statistical Area (CSA) is a critical factor in network design for eligibility in receiving an air monitor under the new regulations. Each MSA must have an urban core population totaling at least 50,000 people in the most recent decennial census. MSAs achieving that population density requirement are shown in **Figure 1**. Micropolitan Statistical Areas are one or more counties that have a sizeable urban cluster or have a high level of commuting to or from an urban cluster. MSAs and/or micropolitan areas are grouped to form CSAs, also shown in **Figure 1**. Note: Only those micropolitan areas that are part of larger CSA are shown in **Figure 1**. The CSA is defined as a geographical area consisting of two or more adjacent Core-Based Statistical Areas (CBSA) with employment interchange of at least 15%. A CBSA is defined as an entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least 10,000 population, plus adjacent counties having a high degree of social and economic integration. MSAs and micropolitan areas are the two categories of a CBSA. The specific counties that make up each MSA or micropolitan area are listed in **Table 1**.[3] These geographical areas, coupled with their population totals and

[3] **Table 1** was obtained from the Library of Michigan, LDDS, Department of History, Arts, and Libraries, June 10, 2003.

historical ambient monitoring data were used to develop the minimum monitoring network design for ozone, $PM_{2.5}$, and PM_{10}.

TABLE 1: COMPOSITION OF MSAS IN MICHIGAN

MSA	URBAN CORE	CENTRAL METROPOLITAN COUNTIES	OUTLYING METROPOLITAN COUNTIES
Ann Arbor	Ann Arbor Urbanized Area	Washtenaw	
Battle Creek	Battle Creek Urban Area	Calhoun	
Bay City	Bay City Urbanized Area	Bay	
Detroit-Warren-Livonia*	Detroit Urbanized Area	Macomb, Oakland, Wayne	
	Port Huron Urbanized Area	St. Clair	
	Lapeer Urban Cluster		Lapeer
	South Lyon- Howell- Brighton Urbanized Area	Livingston	
Flint	Flint Urbanized Area	Genesee	
Grand Rapids-Wyoming	Grand Rapids Urbanized Area	Kent	Barry, Newaygo
	Ionia Urban Cluster		Ionia
Holland-Grand Haven	Holland Urbanized Area	Ottawa	
Jackson	Jackson Urbanized Area	Jackson	
Kalamazoo-Portage	Kalamazoo Urbanized Area	Kalamazoo	
	Paw Paw Urban Cluster		Van Buren
Lansing-East Lansing	Lansing Urbanized Area	Clinton, Eaton, Ingham	
Monroe	Monroe Urbanized Area	Monroe	
Muskegon-Norton Shores	Muskegon Urbanized Area	Muskegon	
Niles-Benton Harbor	Benton Harbor – St Joseph Urbanized Area	Berrien	
Saginaw-Saginaw Twp. North	Saginaw Urbanized Area	Saginaw	
South Bend-Mishawaka Indiana-Michigan (IN-MI)	South Bend, IN-MI Urbanized Area (part)	Cass	

* The Detroit-Warren-Livonia MSA is subdivided into the Detroit-Livonia-Dearborn Metropolitan Division (Wayne Co.) and the Warren-Farmington Hills-Troy Metropolitan Division (Lapeer, Livingston, Macomb, Oakland and St. Clair Counties).

OTHER MONITORING NETWORK REQUIREMENTS

The October 17, 2006 changes to the ambient monitoring regulations eliminated the National Air Monitoring Stations (NAMS) category of monitors that were primarily used for trend purposes. Instead, National Core (NCORE) network sites would replace the NAMS sites providing a full suite of measurements at one location. The NCORE network, when complete, will consist of about 75 sites nationwide, two of which may be in Michigan. The NCORE sites will leverage the existing infrastructure and be collocated, if possible, with existing Photochemical Assessment Monitoring Stations (PAMS), National Air Toxics Trends Sites (NATTS), Clean Air Status and Trends Network (CASTNET), or speciation monitoring network sites. The NCORE stations will collect the following measurements: ozone, SO_2 (trace), CO (trace), NO_Y (trace), continuous $PM_{2.5}$, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for $PM_{10-2.5}$ on a once every three day sampling frequency, PM coarse ($PM_{10-2.5}$) speciation, and $PM_{2.5}$. Ten of the sites nationwide must measure lead. The NCORE monitoring plan is due by July 1, 2009, and all stations must be operational by 2011.

Although the NAMS monitors will be replaced with the NCORE sites, the State and Local Air Monitoring Stations (SLAMS) monitors will remain to supplement the network and improve

spatial coverage. Specific network design criteria are contained in the monitoring regulations that describe the SLAMS monitoring networks for criteria pollutants. These requirements are discussed in detail in the remainder of this review.

$PM_{2.5}$ MONITORING NETWORK CHANGES

Michigan has not opted to spatially average $PM_{2.5}$ values from multiple sites to determine attainment with the annual $PM_{2.5}$ NAAQS. Therefore, if a $PM_{2.5}$ monitor that is violating the NAAQS must be removed due to loss of site access or loss of adequate levels of funding, a replacement site need not be found, if the annual and/or 24-hour design value site(s) in that MSA are still operational. The attainment status of the area is dependent upon the design value sites. Thus, the loss of the subject site will affect the spatial coverage of the data set, but will have no impact on attainment status.

If access to a design value site is lost, MDEQ will attempt to locate a new site physically as close to the design value site as possible. The new monitor will have the same scale of representativeness and monitoring objectives as the closed site. If subsequent data indicate that the new site is not the design value site, one of the pre-existing sites will become the design value site and the new site will be shut down.

NETWORK REVIEW REQUIREMENTS

According to 40 CFR, an air monitoring network review should:

- Be conducted at least once a year.
- Determine if the system meets the monitoring objectives stated in Appendix D of 40 CFR, Part 58 "Network Design Criteria for Ambient Air Quality Monitoring."[4]
- Determine if the system meets the appropriate spatial scales and monitoring objectives, population-driven requirements, and the minimum number of stations that are required, based on the likelihood of exceeding the NAAQS.
- Identify needed modifications to the network including termination and relocation of unnecessary stations.
- Identify new stations as deemed necessary.
- Correct any inadequacies identified previously.
- Be used as a starting point for the five-year assessment due July 1, 2010.

Elements that must be included in the network review are:

- the EPA's Air Quality System (AQS) site identification number,
- the location including coordinates and street address,
- sampling and analysis methods,
- operating schedule,
- monitoring objective and spatial scales,
- identification of those sites that are suitable and not suitable for comparison to the NAAQS (for $PM_{2.5}$ only),
- the MSA, CBSA, or CSA represented by the monitor,
- evidence that the siting and operation of the monitor meets 40 CFR Part 58 Appendices A (quality assurance requirements), C (ambient air quality monitoring), D (network design criteria) and E (probe and monitoring path siting criteria).

[4] "Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR part 58 Appendix D, October 17, 2006.

For Michigan, the site-specific data is summarized in various tables throughout the review. The modifications to the network should address:

- New census data.
- Changes in air quality levels.
- Changes in emission patterns.

The time frame for implementation of modifications is one year from the time of the previous network review. Changes will be made on a calendar year whenever possible.

In previous years, the particulate network was reviewed in a separate review that was submitted to the EPA each July. Recent changes to the monitoring regulations have incorporated the particulate review into the overall monitoring network review.

QUALITY ASSURANCE

The Air Monitoring Unit (AMU) has a strong quality assurance program and a Quality Assurance Project Plan (QAPP), which covers the operation of the ambient air monitoring network. As part of the network review process, it is important to ensure that each monitor meets the specific requirements in 40 CFR Part 58, Appendix A governing proper calibration and operation of each monitor, proper probe height and monitor path length. In addition, the site itself must meet specific criteria governing distances from large trees and buildings, exhaust vents, highways, etc. To address the adequacy of these operational parameters, various types of audits are performed.

Audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The audits are conducted on the particulate-based monitors every six months ($PM_{2.5}$ FRM, continuous $PM_{2.5}$ TEOM [tapered element oscillating microbalance], $PM_{2.5}$ Speciation, High Volume TSP [total suspended particulate], and PM_{10}) and the gaseous monitors (CO, SO_2, ozone, and NO_2) at least once a year. The toxics monitors (volatile organics compounds [VOCs] and carbonyl compounds) are also audited once a year by the QA Team. These audits are conducted with independent equipment and gases, which are only used for quality assurance. The AMU's QA Coordinator reviews the results from all audits.

External audits are conducted annually by the EPA. The EPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers (eight sites a year) and National Performance Audit Program (NPAP) for the gaseous monitors (20% of the sites per year) using a Thru-the-Probe audit system. The EPA also conducts program-wide Technical Systems Audits every three to five years to evaluate overall program operations, and assess adequacy of documentation and records retention. External audits are also conducted on the laboratory operations for $PM_{2.5}$ and air toxics (VOCs and carbonyls) and metals through the use of performance evaluation samples. The concentrations of the audit samples are unknown to both the AQD staff and the MDEQ Environmental Laboratory staff.

MONITOR DEPLOYMENT BY LOCATION

This review will summarize the distribution of ambient air monitors throughout Michigan in 2006 and the evaluation of each monitor. Those monitors that were closed in April 2007 due to budget shortfalls are outlined by a dark line and shown in yellow ( ) in **Table 2**. Sites where the number of trace metals analyzed per sample was reduced are shown in green ( ). These changes and future plans for network operations are discussed in greater detail throughout the network review report.

TABLE 2: MICHIGAN MONITOR DISTRIBUTION THROUGHOUT THE 2007 MONITORING NETWORK

(A BOX INDICATES SITE CLOSURE)

Site Name	AQS ID	O_3	$PM_{2.5}$	$PM_{2.5}$ TEOM	Speciation	PM_{10}	CO	trace CO	NO_2	trace NOy	SO_2	trace SO2	Metals (TSP), Inc. Lead	VOCs	Carbonyls	Meteor-ological para-	Building or Trailer
Holland	260050003	x	x							x						x	T
Bay City	260170014		x	x													
Benzonia	260190003	x															T
Coloma	260210014	x	x													x	T
Cassopolis	260270003	x														x	B
Rose Lake	260370001	x															B
Flint	260490021	x	x	x		x					x		Mn Only			x	T
Otisville	260492001	x														x	T
Harbor Beach	260630007	x														x	T
Lansing	260650012	x	x	x												x	T
Kalamazoo	260770008	x	x	x	x											x	T
Wealthy St, GR	260810007		x			x											
Monroe St. GR	260810020	x	x	x	x	x	x	x	x	♦	x	♦	x	x	x	x	T
Evans	260810022	x														x	T
Peshaw bestow n +	260890001	x														x	
Tecumseh	260910007	x														x	T
New Haven	260990009	x	x													x	T
Warren	260991003	x					x				x						T
Manistee +	261010922	x	x														
Scottville	261050007	x														x	T
Houghton Lake	261130001	x	x	x	x								x	x	x	x	T
Luna Pier	261150005		x		x												
Muskegon, Green Ck Rd	261210039	x														x	T
Muskegon, Apple St	261210040		x														
Oak Park	261250001	x	x				x									x	T
Jenison	261390005	x	x													x	T
Port Huron	261470005	x	x	x							x					x	T
Seney	261530001	x		x												x	T
Ypsilanti	261610008	x	x	x	x								x	x	x	x	T
Allen Park	261630001	x	x	x	x	x	x	x		♦		♦	4			x	T
River Rouge	261630005												4		x		T
Fort St (SW HS)	261630015	x	x			x					x		4	x	x	x	T
Linw ood	261630016	x	x				x		x		x						B
E. 7 Mile	261630019	x	x						x		x		x	GC		x	T
Livonia	261630025		x				x									x	T
S Delray/ Jefferson	261630027												4				T
Dearborn	261630033		x	x	x	x							x	x	x	x	T
Wyandotte	261630036		x														
New berry School	261630038		x	x												x	T
FIA/Ambassador Bridge	261630039		x	x												x	T
Total		**29**	**26**	**13**	**7**	**6**	**6**	**2**	**3**	**3**	**7**	**2**	**10**	**6**	**6**		

'+ = Tribal

☐ = Changes implemented April 2007

♦ = Planned

4 = Site reduced to monitoring Mn, As, Cd, Ni

x Have been shut down

Retained but operating in reduced capacity

GC GC shut down

OZONE MONITORING NETWORK:

As a result of the October 17, 2006 monitoring regulations, the minimum number of required ozone sites in a MSA has changed. In addition, due to the 2000 census, MSA boundaries have been modified and population totals tied to measurements of ambient air quality have increased. Any monitors with a design value using the most recent three years of data that is greater than or equal to (≥) 85% of the ozone NAAQS have a higher probability of violating the standard. Therefore, more monitors are required in these MSAs. **Table 3** illustrates the differences in the number of monitors required for the design value concentrations that are either ≥ or less than (<) 85% of the ozone NAAQS. [5] Note: background and transport ozone monitors are still required, but are not shown in **Table 3**.

TABLE 3: SLAMS MINIMUM OZONE MONITORING REQUIREMENTS

MSA POPULATION[1,2]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY OZONE NAAQS[3]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS < 85% OF ANY OZONE NAAQS[3,4]
> 10 million	4	2
4 - 10 million	3	1
350,000 - < 4 million	2	1
50,000 - < 350,000[5]	1	0

[1] Minimum monitoring requirements apply to the MSA.
[2] Population based on the latest available census figures.
[3] The ozone NAAQS levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] MSA must contain an urbanized area of 50,000 or more population.

Applying **Table 3** requirements to Michigan's MSAs, population totals and the most recent three-year design values results in a minimum ozone network design summarized in **Table 4**. As shown, only three ozone monitors are now required in the Detroit-Warren-Livonia MSA. New Haven (260990009) has been the design value site for many years, measuring maximum ozone concentrations downwind from Detroit, and this monitor needs to be retained. Allen Park (261630001) is upwind of the central business district and since it is a likely NCORE site for the Detroit-Warren-Livonia MSA, it is required to measure ozone. This leaves one remaining yet to be identified required ozone monitor in the Detroit-Warren-Livonia MSA. When the budget reduction occurred in April 2007, the monitors at Southwest High School (SW HS) (261630015) and Linwood (261630016) were shut down. The Southwest High School site was part of a special mercury measuring project with the University of Michigan. The Linwood monitor was in an area with elevated nitrogen oxide (NO_X) concentrations that scavenge the ozone. As a result, ozone levels at Linwood were often lower than other sites in the Detroit area.

Two monitors are required in the Ann Arbor MSA and consist of the Ypsilanti monitor (261610008) and the downwind monitor in Oak Park (261250001). The urban center city location coupled with a downwind maximum concentration site is a carry over from the defunct NAMS network. There is not sufficient space in Washtenaw County to site a downwind monitor to measure maximum ozone concentrations, so Oakland County houses the downwind site at Oak Park (261250001), although Oakland County is outside of the boundary of the Ann Arbor MSA. The upwind/downwind configuration will be retained wherever possible to preserve historical trend data.

Two monitors are required in the Flint MSA and consist of the urban center city site in Flint (260490021) and the downwind site at Otisville (260492001).

[5] Table D-2 of Appendix D to Part 58.

TABLE 4: APPLICATION MINIMUM OZONE REQUIREMENTS IN THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S OZONE NETWORK

85% of NAAQS: 0.072 ppm
NOTE: The MSA Design Value Monitoring Site is bolded.

MSA	2000 Population	Counties	Existing Monitors	3-Year Ozone Design Value (2004-2006)	Minimum # of Monitors Required
Detroit-Warren-Livonia Metro Area	4,452,557	Macomb	**New Haven**	**0.082**	3
			Warren	0.079	
		Oakland	Oak Park	0.075	
		Wayne	Allen Park	0.070	
			Linwood	0.071	
			E 7 Mile	0.074	
			SW HS	3 yrs of data not available	
		Lapeer	---	---	
		St Clair	Port Huron	0.080	
		Livingston		---	
Flint Metro Area	436,141	Genesee	Flint	0.075	2
			Otisville	**0.077**	
Monroe Metro Area	145,945	Monroe	---	---	
Ann Arbor Metro Area	322,895	Washtenaw	**Ypsilanti**	**0.076**	2
Grand Rapids-Wyoming Metro Area	740,482	Kent	Grand Rapids	0.077	2
			Evans	**0.078**	
		Barry	---	---	
		Newaygo	---	---	
		Ionia	---	---	
Holland-Grand Haven Metro Area	238,314	Ottawa	**Jenison**	**0.079**	1
Muskegon-Norton Shores Metro Area	170,200	Muskegon	**Muskegon**	**0.083**	1
Lansing-East Lansing Metro Area	447,728	Clinton	**Rose Lake**	**0.073**	2
		Ingham	Lansing	0.073	
		Eaton	---	---	
Bay City Metro Area	110,157	Bay	---	---	
Saginaw-Saginaw Twp N Metro Area	210,039	Saginaw	---	---	
Kalamazoo-Portage Metro Area	314,866	Kalamazoo	**Kalamazoo**	**0.074**	1
		Van Buren	---		
Niles-Benton Harbor Metro Area	162,453	Berrien	**Coloma**	**0.079**	1
Jackson Metro Area	158,422	Jackson	---	---	
Battle Creek Metro Area	137,985	Calhoun	---	---	
South Bend Mishawaka Metro Area IN/MI	51,104	Cass	**Cassopolis**	**0.078**	1
Other areas (and description of site if applicable):					
	(transport site)	Lenawee	Tecumseh	0.076	
		Benzie	Frankfort	0.080	
		Huron	Harbor Beach	0.072	
	(violating monitor)	Allegan	**Holland**	**0.088**	
	(background site)	Missaukee	Houghton lake	0.072	
	(tribal site)	Leelanaw	Peshawbestow	0.074	
		Mason	Scottville	0.077	
		Schoolcraft	Seney	0.078	
	(tribal site)	Manistee	Manistee	new site	

Two ozone monitors are also required in the Grand Rapids-Wyoming MSA and consist of the urban center city site in Grand Rapids on Monroe Street (260810020) and the downwind site at Evans (260810022).

Two monitors are required in the Lansing-East Lansing MSA and consist of the urban center city site in Lansing (260650012) and the downwind Rose Lake (260370001) location.

A single ozone monitor is required in the MSAs of Holland-Grand Haven, Muskegon-Norton Shores, Kalamazoo-Portage, Niles-Benton Harbor, and South Bend-Mishawaka. The Jenison

(26139005), Muskegon (261210039), Kalamazoo (260770008), Coloma (260210014) and Cassopolis (260270003) monitors fulfill these requirements, respectively.

The ozone monitor in Holland (260050003 is in Allegan County) is in violation of the ozone NAAQS. Although Allegan County is only a micropolitan area, the violation status of this monitor requires that it continue operation. This site measures the highest ozone values in the state.

Ozone monitors are not required in Jackson, Battle Creek, Saginaw and Bay City, respectively.

Tecumseh (260910007) measures ozone transport into Southeast Michigan and is required by Michigan's maintenance plan. Harbor Beach (260650007) measures transport out of Southeast Michigan under southwest winds. Scottville (261050007) and Benzonia (260190003) are sited to measure transport of ozone along Lake Michigan and have been in operation for 8 and 14 years, respectively. These two sites are also an important part of Michigan's maintenance plan. Houghton Lake (261130001) and Seney (261530001) measure background ozone levels in the Lower and Upper Peninsulas, respectively.

Two tribal ozone sites are in operation in Michigan at Peshawbestown (260890001) in Leelanau County and in Manistee (261010922) in Manistee County.

In **Table 4**, the 4th highest 8-hour ozone value averaged over 2004-2006 for the ozone transport sites [Coloma (260210014), Muskegon (261210039), Scottville (251050007) and Benzonia (260190003)] aligned along the shoreline of Lake Michigan, all show attainment of the ozone NAAQS except for Holland (260050003). The Peshawbestown (260890001) monitor, located inland from Lake Michigan also shows attainment. These shoreline monitors are sited to detect maximum ozone concentrations. Field studies have shown that as ozone traverses inland, concentrations decrease possibly through scavenging by flora and increased mixing due to turbulence caused by rougher surfaces over the land. If the shoreline monitors are in attainment for ozone and they measure maximum concentrations, it is reasonable to assume that other locations in northern Michigan's Lower Peninsula are in attainment of the current ozone NAAQS.

Table 5 summarizes the ozone monitoring site information for sites that were in existence in 2006. **Table 6** shows the ozone sites that are currently in operation. **Figure 2** compares the ozone network in 2006 with the current design.

TABLE 5: MICHIGAN'S 2006 OZONE MONITORING NETWORK

SLAMS Stations

Operating Schedule: Hourly, April 1 to September 30
Method: Ultra Violet Absorption Continuous Monitor

Former NAMS sites are shown in Bold.

Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Rose Lake	**260370001**	**8562 E STOLL RD**	42.7983	-84.39389	**max conc**	**urban**	**Clinton**	**6/7/79**	**LEL**	**LELO**	**447,728**
Flint	**260490021**	**WHALEY PARK, 3610 IOWA**	43.0472	-83.67028	**pop exp**	**nghbrhd**	**Genesee**	**6/16/92**	**Flint**	**DWF**	**5,456,428**
Otisville	**260492001**	**WASHBURN RD**	43.1683	-83.46167	**max conc**	**urban**	**Genesee**	**5/13/80**	**Flint**	**DWF**	**5,456,428**
Lansing	**260650012**	**220 N PENNSYLVANIA**	42.7386	-84.53472	**pop exp**	**nghbrhd**	**Ingham**	**9/5/80**	**LEL**	**LELO**	**447,728**
Grand Rapids	**260810020**	**1179 MONROE NW**	42.9842	-85.67139	**pop exp**	**nghbrhd**	**Kent**	**4/24/80**	**GRW**	**GRMH**	**1,088,514**
Warren	**260991003**	**WARREN FIRE STATION COMMON & HOOVER**	42.5133	-83.00611	**max conc**	**urban**	**Macomb**	**1/1/77**	**DWL**	**DWF**	**5,456,428**
Linwood	**261630016**	**6050 LINWOOD**	42.3578	-83.09617	**pop exp**	**nghbrhd**	**Wayne**	**1/1/80**	**DWL**	**DWF**	**5,456,428**
Holland	260050003	OTTOGAN ST. BETWEEN 61ST & 62ND STS.	42.7678	-86.14861	max conc	regional	Allegan	8/25/92	Allegan Micro	GRMH	1,088,514
Frankfort / Benzonia	260190003	WEST ST., BENZONIA TWP.	44.61694	-86.10944	max conc	regional	Benzie	7/28/92	Not in MSA	Not in CSA	N/A
Coloma	260210014	PAW PAW WWTP, 4689 DEFIELD RD.,COLOMA	42.1978	-86.30972	max conc	regional	Berrien	8/3/92	NBH	Not in CSA	162,453
Cassopolis	260270003	ROSS BEATTY HIGH SCHOOL	41.8956	-86.00167	pop exp	urban	Cass	5/16/91	SBM	Not in CSA	N/A
Harbor Beach	260630007	1172 S.M25,SAND BEACH TWP.	43.8364	-82.64306	backgrd	regional	Huron	4/1/94	Not in MSA	Not in CSA	N/A
Kalamazoo	260770008	FAIRGROUNDS, 2500 LAKE ST	42.2781	-85.54194	pop exp	nghbrhd	Kalamazoo	6/1/92	KP	Not in CSA	452,851
Evans	260810022	10300 14 MILE ROAD, NE	43.1767	-85.41667	max conc	urban	Kent	4/1/99	GRW	GRMH	1,088,514
Tecumseh	260910007	6792 RAISIN CENTER HIGHWAY	41.9956	-83.94667	up w ind backgrd	regional	Lenaw ee	7/6/93	Not in MSA	Not in CSA	N/A
New Haven	260990009	57700 GRATIOT	42.7314	-82.79361	max conc	urban	Macomb	7/14/80	DWL	DWF	5,456,428
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	regional	Mason	4/1/98	Not in MSA	Not in CSA	N/A
Muskegon	261210039	1340 GREEN CREEK ROAD	43.2781	-86.31111	pop exp	regional	Muskegon	5/1/91	MNS	GRMH	1,088,514
Oak Park	261250001	13701 OAK PARK BLVD.	42.4631	-83.18333	pop exp	urban	Oakland	1/9/81	Ann Arbor	DWF	5,456,428
Jenison	261390005	6981 28TH AVE. GEORGETOWN TWP.	42.8944	-85.85278	pop exp	regional	Ottaw a	4/1/89	HGH	DWF	1,088,514
Port Huron	261470005	2525 DOVE RD	42.9533	-82.45639	pop exp	regional	Saint Clair	2/28/81	DWL	DWF	5,456,428
Seney	261530001	SENEY WILDLIFE REFUGE	46.2889	-85.95027	bkgrd	regional	Schoolcraft	1/15/02	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.2406	-83.59972	pop exp	nghbrhd	Washtenaw	4/1/00	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.2286	-83.20833	pop exp	nghbrhd	Wayne	1/1/80	DWL	DWF	5,456,428
E 7 Mile	261630019	11600 EAST SEVEN MILE ROAD	42.4308	-83.00028	max conc	nghbrhd	Wayne	4/11/77	DWL	DWF	5,456,428

Special Purpose and Tribal Stations

Site Name	AIRS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Houghton Lake	261130001	1769 S JEFFS ROAD	44.3106	-84.89194	background	regional	Missaukee	4/1/98	Not in MSA	Not in CSA	N/A
W Fort (SW HS)	261630015	6921 WEST FORT	42.3028	-83.10667	pop exp	urban	Wayne	10/1/05	DWL	DWF	5,456,428
Peshaw bestow n	260890001	3155 W. PESHAWBESTOWN ROAD	45.0289	-85.6292	transport	regional	Leelanau	4/21/03	Not in MSA	Not in CSA	N/A
Manistee	261010922	3031 DOMRES RD	44.307	-86.24268	transport	regional	Manistee	4/1/06	Not in MSA	Not in CSA	N/A

[1] PMSA Key:

DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
HGH = Holland-Grand Haven Metro. Area
KP= Kalamazoo-Portage Metro. Area
LEL= Lansing-E. Lansing Metro. Area
MNS = Muskegon-Norton Shores Metro. Area
NBH = Niles-Benton Harbor Metro. Area
SBM= South Bend-Mishawaka Metro. Area (IN/MI)

[2] CSA Key:

DWF = Detroit-Warren-Flint Combined Statistical Area
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TABLE 6: 2007 OZONE MONITORING NETWORK IN MICHIGAN

SLAMS Stations

Operating Schedule: Hourly, April 1 to September 30
Method: Ultra Violet Absorption Continuous Monitor

Network as of May, 2007
Former NAMS sites are shown in Bold.

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Rose Lake	**260370001**	**8562 E STOLL RD**	42.7983	-84.39389	**max conc**	**urban**	**Clinton**	**6/7/79**	**LEL**	**LELO**	**447,728**
Flint	**260490021**	**WHALEY PARK, 3610 IOWA**	43.0472	-83.67028	**pop exp**	**nghbrhd**	**Genesee**	**6/16/92**	**Flint**	**DWF**	**5,456,428**
Otisville	**260492001**	**WASHBURN RD**	43.1683	-83.46167	**max conc**	**urban**	**Genesee**	**5/13/80**	**Flint**	**DWF**	**5,456,428**
Lansing	**260650012**	**220 N PENNSYLVANIA**	42.7386	-84.53472	**pop exp**	**nghbrhd**	**Ingham**	**9/5/80**	**LEL**	**LELO**	**447,728**
Grand Rapids	**260810020**	**1179 MONROE NW**	42.9842	-85.67139	**pop exp**	**nghbrhd**	**Kent**	**4/24/80**	**GRW**	**GRMH**	**1,088,514**
Warren	**260991003**	**WARREN FIRE STATION COMMON & HOOVER**	42.5133	-83.00611	**max conc**	**urban**	**Macomb**	**1/1/77**	**DWL**	**DWF**	**5,456,428**
Holland	260050003	OTTOGAN ST. BETWEEN 61ST & 62ND STS.	42.7678	-86.14861	max conc	regional	Allegan	8/25/92	Allegan Micro	GRMH	1,088,514
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[2] CSA Key:

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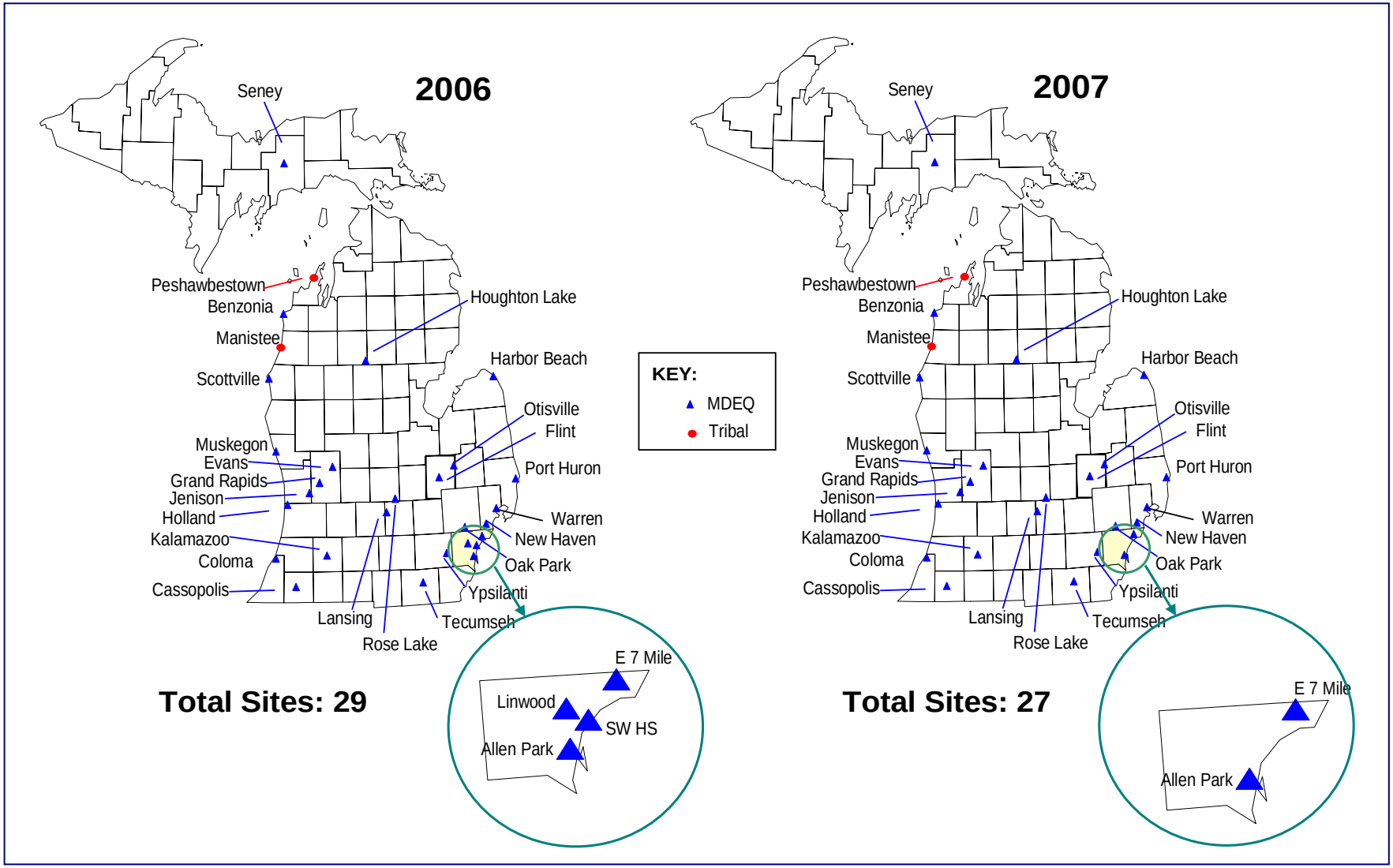
LELO = Lansing-East Lansing-Owosso Combined Statistical Area

FIGURE 2: COMPARISON OF MICHIGAN'S 2006 AND 2007 OZONE NETWORK



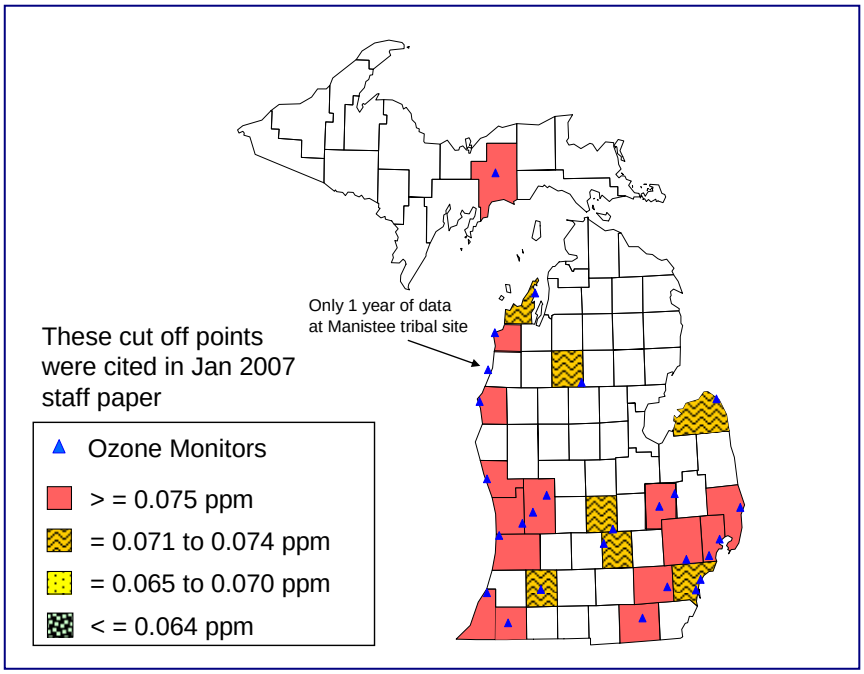
IMPACT OF THE NEW OZONE NAAQS

The current primary ozone NAAQS is calculated by selecting the 4th highest 8-hour ozone value in a given year. This value is averaged with the corresponding values from the two previous years and is expressed in parts per million (ppm). The three-year average is rounded up to the nearest one hundredth, so an average of 0.085 ppm would round up to 0.09 ppm. This value is compared to the level of the NAAQS, which is currently set at 0.08 ppm. Any values greater than 0.08 ppm violate the NAAQS.

The EPA is considering changing the level of the primary NAAQS from 0.08 ppm to 0.070 ppm, 0.064 or 0.060 ppm (note the extra decimal place used in the proposed levels of the standard).

Figure 3 compares the most recent 8-hour design values (using three decimal points) for all ozone sites in Michigan with various levels of the proposed primary NAAQS. As shown, all of the design value sites have a three-year average greater than 0.070 ppm. The counties with design values above 0.070 but below 0.074 ppm are Kalamazoo, Wayne, Clinton, Ingham, Huron, Missaukee, and Leelanau. It is important to retain these monitors to track progress. A monitor may be needed in the Saginaw-Bay City area to fill in a gap in the network design and better define the extent of nonattainment.

FIGURE 3: 4TH HIGHEST 8-HOUR OZONE VALUES AVERAGED OVER THREE-YEARS (2004-2006)



The EPA has proposed a secondary NAAQS to provide a greater level of protection to crops and vegetation. Either the primary NAAQS will also serve as the secondary form or a weighted sum may be selected. The general form of the weighted sum is hourly ozone values that are measured during daylight hours (8 a.m. to 8 p.m.) when the plants are most susceptible to damage. A monthly sum is calculated, then the totals from the three months that will give the greatest three-month average are added together. For the proposed secondary ozone standard, this total could be between 7 to 21 ppm hours. This form of the standard is called W126, with the W standing for a "weighting" factor.

Since the exact weighting factors were not cited in proposals discussing the secondary NAAQS, research was needed to determine the source of the concept and determine the impact that a

possible W126-based standard would have on Michigan. The W126 concept was first developed by Lafohn and Runeckles[6] to describe effects of ozone on vegetation. They proposed using a sigmoidal weighting function that gives greater weight to higher ozone concentrations and retaining the middle and lower concentrations. Specifically, the equation that they used is:

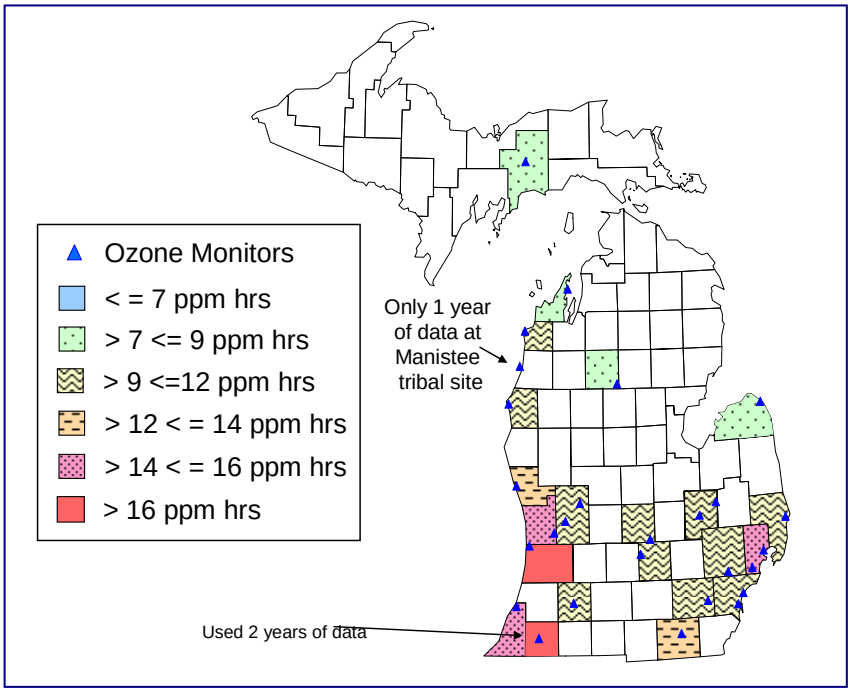
(equation 1) $W_i = 1/ [1 + M \times e^{-(A \times C)_i}]$

Where:

W_i is the weighting factor that is multiplied by ozone concentration, C_i
M is a constant and equals 4403 ppm^{-1}
A is a constant and equals 126 ppm^{-1}
Ozone concentrations are in ppm

If W126 is adopted as a secondary standard, it is unknown if EPA will retain this particular sigmoidal function *(equation 1)*, or modify it. In addition, it is unknown if the W126 value for a particular year will be averaged with data from the two previous years. Analysis performed by MDEQ shows that there is much year to year variability. Using a three-year average would provide greater year to year stability in attainment status and be consistent with techniques used in other NAAQS. Applying these assumptions, **Figure 4** shows the impact that a W126 secondary ozone standard could have on Michigan. If the level of a W126 secondary standard using the sigmoidal function in equation 1 is set between 7 and 12 ppm hours, a monitor could be needed in the Saginaw-Bay City area to determine if the area is attaining the NAAQS.

FIGURE 4: W126 AVERAGED OVER THREE-YEARS (2004-2006)



As illustrated in **Figures 3** and **4**, all areas could be in danger of violating a more stringent form of the ozone NAAQS, depending on the level that is selected by EPA. A change to the ozone NAAQS could have ramifications on the network design, impacting areas other than the MSAs

[6] LaFohn, A.S. and Runeckles V.C. (1987) Establishing a Standard to protect vegetation- ozone exposure/dose considerations. Atmos. Environ. 21: 561-568.

that currently have monitors. In the previous **Table 4**, the use of 0.070 ppm as the level of the primary NAAQS shows that all monitors in Michigan have a probability of greater than 85% of violating the NAAQS. This could require ozone monitors in Jackson, Battle Creek, Saginaw and Bay City unless changes are made to the monitoring regulations, or waivers from EPA are granted. Areas not within MSAs could also be impacted by changes in the NAAQS.

Depending on the level and form of the secondary standard that is selected, the design of the current ozone network may be inadequate to assess impact on crops and vegetation. The majority of the ozone sites are located in urban areas, away from major agricultural areas and forests. Since agriculture is one of the top three "industries" in Michigan, and ozone inhibits plant yields, MDEQ may need to design an ozone monitoring network targeting agricultural areas. Tourism is another important Michigan "industry." Certain species of trees are highly sensitive to the effects of ozone, so monitoring may be required in selected wooded areas. In any case, until the ozone NAAQS becomes final, it is too premature to design an ozone network focusing on rural, forested areas.

OZONE SEASON

If the level of the primary NAAQS is reduced, the length of the ozone season in Michigan may need to be extended from the current April 1 to September 30. To identify possible changes to the ozone season, historical ozone data was analyzed to determine how close 8-hour ozone averages in March and October are to the proposed levels of 0.060 to 0.070 ppm. Usually, most of the monitors in Michigan conform to the established ozone season, but as part of two special research projects conducted in conjunction with Lake Michigan Air Directors Consortium and University of Michigan, the ozone monitors at Seney (261530001) and Southwest High School (261630015) operated for up to 12 months. In addition, in 1998, the MDEQ operated its ozone network during October to determine the necessity of changing the ozone season after the last revision to the ozone NAAQS.

Table 7 summarizes the 4th highest 8-hour ozone values that were measured during the months of October through March at Seney (261530001) and Southwest High School (261650015). When the data are compared to 85% of the proposed level of the NAAQS, five readings at Seney fall within this range. The EPA has classified any values within 85% of a NAAQS as more likely to violate that NAAQS. The dates that these relatively large values were measured fall within the last week of March or within the first two weeks of October. Although the spatial coverage is poor and the data set is very limited, it is the most recent available year-round data.

TABLE 7: IMPACT OF A REDUCED OZONE NAAQS ON MICHIGAN'S OZONE SEASON

Top Four 8-Hour Values from Recently Available Monitoring Data

		Jan				Feb				Mar				Oct			Nov				Dec			
Site	Year	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Seney	2003	---	---	---	---	---	---	---	---	48	48	46	46	60	49	41	39	38	38	37	43	40	39	38
261530001	2004	42	41	40	40	---	---	---	---	---	---	---	---	56	39	38	37	36	36	36	40	40	39	39
	2005	42	40	39	39	46	45	44	44	66	62	60	53	---	---	---	---	---	---	---	---	---	---	---
	2006	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	2007	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SW HS	2003	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
261630015	2004	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	2005	---	---	---	---	---	---	---	---	---	---	---	---	32	28	26	25	23	21	19	22	22	21	20
	2006	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	2007	23	22	21	19	30	30	29	29	48	41	40	39	---	---	---	---	---	---	---	---	---	---	---

Values within 85% of NAAQS

8-hr Value, ppb	Date
66	3/29/05
62	3/28/05
60	3/27/05
60	10/9/03
56	10/10/04

85 % of NAAQS	
0.070 NAAQS	60 ppb
0.0640 NAAQS	54 ppb

Table 8 shows historical data collected during October 1998 from all sites across Michigan, which gives a better indication of spatial variability of elevated ozone concentrations. Unfortunately, Seney (261530001) and Southwest High School (261630015) were not in operation during 1998, so changes in ozone concentration over time cannot be estimated. However, it can be inferred that ozone concentrations have dropped since 1998 because the number of ozone nonattainment areas in Michigan has been reduced from 25 counties to only one. The data in **Table 8** show that elevated values were measured during the first three weeks of October in 1998. Although values have decreased, continuing to operate ozone monitors through October 15 may be a new requirement. Depending on the level that is selected for the primary ozone NAAQS, the ozone season in Michigan could begin as early as March 15 and extend through October 15.

TABLE 8: ANALYSIS USING MULTIPLE SITES TO DETERMINE IMPACT OF A REDUCED OZONE NAAQS ON MICHIGAN'S OZONE SEASON

Top 4 8-Hr Values from Historical Monitoring Data

			Oct				Dates			
Area	Site	Year	1st	2nd	3rd	4th	1st	2nd	3rd	4th
West Michigan	Holland	1998	58	49	46	45	10/16/98	10/17/98	10/12/98	10/18/98
	Frankfort	1998	62	52	47	46	10/16/98	10/17/98	10/11/98	10/10/98
	Coloma	1998	60	55	53	51	10/16/98	10/17/98	10/11/98	10/10/98
	Parnell	1998	54	53	52	49	10/16/98	10/12/98	10/17/98	10/18/98
	Scottville	1998	60	53	42	42	10/16/98	10/18/98	10/18/98	10/10/98
	Muskegon	1998	56	50	44	42	10/16/98	10/17/98	10/18/98	10/11/98
	Traverse City	1998	53	52	46	39	10/16/98	10/17/98	10/18/98	10/10/98
	Grand Rapids	1998	43	42	40	40	10/17/98	10/18/98	10/16/98	10/11/98
	Grand Rapids	**1997**	53	49	49	46	10/5/97	10/3/97	10/8/97	10/12/97
SE Michigan	Tecumseh	1998	63	50	46	40	10/17/98	10/12/98	10/18/98	10/11/98
	New Haven	1998	46	44	41	39	10/17/98	10/12/98	10/5/98	10/18/98
	Warren	1998	39	39	39	35	10/17/98	10/18/98	10/5/98	10/4/98
	Oak Park	1998	49	47	38	36	10/17/98	10/18/98	10/5/98	10/10/98
	Port Huron	1998	48	47	36	34	10/17/98	10/18/98	10/10/98	10/5/98
	Ann Arbor	1998	55	45	42	36	10/17/98	10/12/98	10/18/98	10/11/98
	Allen Park	1998	40	37	35	34	10/17/98	10/6/98	10/18/98	10/5/98
	E 7 Mile	1998	45	42	39	36	10/17/98	10/5/98	10/18/98	10/6/98
Central Michigan	Rose Lake	1998	54	53	52	43	10/12/98	10/17/98	10/18/98	10/11/98
	Flint	1998	44	44	37	35	10/17/98	10/18/98	10/5/98	10/4/98
	Otisville	1998	56	55	54	40	10/17/98	10/18/98	10/12/98	10/11/98
	Lansing	1998	58	56	55	43	10/17/98	10/18/98	10/12/98	10/11/98
	Houghton Lake	1998	59	50	49	46	10/12/98	10/17/98	10/18/98	10/10/98

85 % of NAAQS	
0.070 NAAQS	60 ppb
0.064 NAAQS	54 ppb

OZONE QUALITY ASSURANCE

The site operator conducts a precision check on the monitor every two weeks. Each ozone monitor is audited annually by the AMU's QA Team. The audit utilizes a dedicated ozone generator to assess the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and the inlet probe), siting, and documentation of precision checks. The results of the ozone audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audits and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits of 20% of the ozone monitors each year. The audit consists of delivering four levels of ozone to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

PLANS FOR 2008 OZONE MONITORING NETWORK

The current design of the ozone network meets the minimum design specifications in 40 CFR Part 58. However, if the ozone NAAQS is made more stringent and/or a secondary ozone standard is added, the design may need to be re-evaluated. A new site may be needed in Saginaw or Bay City to improve the spatial coverage of the ozone network if a more stringent primary standard or the introduction of a secondary standard is introduced.

In light of the uncertain status of the level of the NAAQS and form of the secondary standard, the MDEQ may not have to implement these plans. Although no ozone site reductions are planned at this time, budget reductions may necessitate a reduction in the ozone network. The following monitors should be retained as part of the 2008 ozone network:

- Cassopolis (260270003)
- Rose Lake (260370001)
- Flint (260490021)
- Otisville (260492001)
- Lansing (260650012)
- Grand Rapids (260810020)
- Evans (260810022)
- Oak Park (261250001)
- Ypsilanti (261610008)
- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Harbor Beach (260630007) (downwind monitor)
- Kalamazoo Fairgrounds (260770008)
- Tecumseh (260910007) (background monitor)
- New Haven (260990009)
- Warren (260991003)
- Scottville (261050007)
- Muskegon (261210039)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Allen Park (261630001)
- E. Seven Mile (261630019)
- Houghton Lake (261130001) (special purpose monitor)

To the best of our knowledge, these tribal monitors will continue operation:

- Peshawbestown (260890001) (tribal monitor)
- Manistee (261050922) (tribal monitor)

The following may be additions to the 2008 ozone network:

- A monitor in either Saginaw or Bay City.

$PM_{2.5}$ FRM MONITORING NETWORK:

The October 17, 2006 changes to the monitoring regulations impacted $PM_{2.5}$ (fine particulate) measurements in a number of ways. The minimum number of $PM_{2.5}$ sites using a FRM in a MSA has been changed and is shown in **Table 9**.[7] In addition to these minimum requirements, background and transport monitors are required. A new element of the regulations is that any FRM monitors that are within +/- 5% of the level of the 24-hour NAAQS, must sample on a daily sampling frequency. The monitoring regulations also state that 50% of all FRM sites must have continuous $PM_{2.5}$ measurements.

Although speciation monitoring is required, details specifying the exact number of sites and their sampling frequency were not stated in the October 17 regulations. However, the continued operation of the speciation trends site (Allen Park 261630001) on a once every three day sampling schedule is required.

The regulations also allow states to discontinue FRM monitors if they can operate continuous samplers in a way that qualifies them to be Approved Regional Methods (ARMs). Due to the high levels of nitrate and humidity in the Midwest, the continuous monitors used by MDEQ (Tapered Element Oscillating Microbalances or TEOMs), as well of many of the other monitors operated by the states in the Midwest cannot achieve this ARM status. The MDEQ is not proposing to use any ARM monitors.

TABLE 9: $PM_{2.5}$ MINIMUM MONITORING REQUIREMENTS

MSA POPULATION[1,2]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY $PM_{2.5}$ NAAQS[3]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS < 85% OF ANY $PM_{2.5}$ NAAQS[3,4]
> 1,000,000	3	2
500,000 – < 1,000,000	2	1
50,000 - ≤ 500,000[5]	1	0

[1] Minimum monitoring requirements apply to the MSA.
[2] Population based on the latest available census figures.
[3] The $PM_{2.5}$ NAAQS levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] MSA must contain an urbanized area of 50,000 or more.

Applying **Table 9** to Michigan's MSAs, population totals and most recent three-year design values results in **Table 10**. The monitors with design values that are within 5% of the 24-hour NAAQS are shaded yellow. Only three $PM_{2.5}$ FRM monitors are now required in the Detroit-Warren-Livonia MSA. Dearborn (261630033) is the highest annual design value site with annual averages typically above 17 micrograms per cubic meter ($\mu g/m^3$). Allen Park (261630001) is the population-oriented trend site, and as such, is also required to collect speciated $PM_{2.5}$ samples on a once every three day schedule. In years prior to the 2004-2006 time period, Linwood (261630016) was the 24-hour design value site, but in the most recent three-year interval, Dearborn became the 24-hour design value site. Monitoring needs to be continued at Linwood as the backup 24-hour design value site. Therefore, the three required $PM_{2.5}$ FRM sites in the Detroit-Warren-Livonia MSA are Dearborn (061630033), Allen Park (261630001) and Linwood (261630016).

[7] Table D-5 of Appendix D to Part 58.

TABLE 10: APPLICATION MINIMUM $PM_{2.5}$ MONITORING REQUIREMENTS IN THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S $PM_{2.5}$ FRM NETWORK

	annual	24-hr			
	85% of 15 ug/m_3	85% of 35 ug /m_3			
All ambient air monitoring data as units of ug/m_3	12.75	29.75			
The 3-year PM2.5 average at MSA Design Value site is shown in bold.			2004-2006	2004-2006	
MSA	**2000 Population**	**Counties**	**Existing Monitors**	**most recent 3-year PM2.5 design value (annual)**	**most recent 3-year PM2.5 design value (24-Hr)**	**Min No monitors Required**
Detroit-Warren-Livonia Metro Area	4,452,557	Macomb	New Haven	12.5	35.9	3
		Oakland	Oak Park	13.4	39.2	
		Wayne	Allen Park	14.5	38.0	
			SW HS	15.8	40.6	
			Linwood	14.2	42.3	
			E 7 Mile	14.1	41.2	
			Livonia	13.1	34.3	
			Dearborn	**17.2**	**44.2**	
			Wyandotte	14.3	37.4	
			Newberry*	12.8	41.0	
			FIA*D46	13.1	38.2	
		Lapeer	---			
		St Clair	Port Huron	13.1	39.2	
		Livingston	---	---	---	
Flint Metro Area	436,141	Genesee	**Flint**	11.4	**30.2**	1
Monroe Metro Area	145,945	Monroe	**Luna Pier**	**13.8**	**39.0**	1
Ann Arbor Metro Area	322,895	Washtenaw	**Ypsilanti** Ann Arbor (closed)	**13.7**	**38.3**	1
Grand Rapids-Wyoming Metro Area	740,482	Kent	**Grand Rapids**	**12.8**	**36.6**	2
		Barry	---			
		Newaygo	---	---	---	
		Ionia	---	---	---	
Holland-Grand Haven Metro Area	238,314	Ottawa	**Jenison**	**12.4**	**34.5**	1
Muskegon-Norton Shores Metro Area	170,200	Muskegon	**Muskegon**	**11.5**	**34.5**	1
Lansing-East Lansing Metro Area	447,728	Clinton	---			1
		Ingham	**Lansing**	**12.0**	**31.9**	
		Eaton	---			
Bay City Metro Area	110,157	Bay	**Bay City**	10.8	**32.1**	1
Saginaw-Saginaw Twp N Metro Area	210,039	Saginaw	Saginaw (closed)			1
Kalamazoo-Portage Metro Area	314,866	Kalamazoo	**Kalamazoo**	**12.6**	**29.9**	1
		Van Buren	---			
Niles-Benton Harbor Metro Area	162,453	Berrien	**Coloma**	11.4	**30.2**	1
Jackson Metro Area	158,422	Jackson	---	---	---	
Battle Creek Metro Area	137,985	Calhoun	---	---	---	
South Bend-Mishawaka Metro Area IN/MI	51,104	Cass	---	----	---	
* only two years worth of data available						
Other areas						
		Allegan	Holland	11.7	33.5	
		Missaukee	Houghton lake	8.1	24.5	
incomplete (3/4 year only)		Manistee	Manistee	8.6	25.9	

Both New Haven (260990009) and Livonia (261630025) have design values within 5% of the 24-hour NAAQS. According to the October 17, 2006 regulations, they are exempted from the daily sampling requirement because there is another monitor in the MSA that is the design value site. The Oak Park (261250001) site is the only monitor in Oakland County and it is important to retain this sampler to show that Oakland County meets the $PM_{2.5}$ NAAQS. The Southwest High School (261630015) $PM_{2.5}$ monitor is very important to the development of attainment strategies. By comparing the $PM_{2.5}$ data at the nonattaining sites (Dearborn [261630033], Southwest High School [261630015], Allen Park [261630001] and Wyandotte [261630036]) differences in source impacts can be elucidated. The sites at Newberry School (261630038) and Lafayette (261630039) are special purpose monitors that have been located to measure

impacts from diesel powered mobile sources and from the international border crossing at the Ambassador bridge, respectively.

Two monitors are required in the Grand Rapids-Wyoming MSA. Prior to January 2007, only the Grand Rapids Monroe Street monitor (260810020) existed in this MSA. The MDEQ has conducted PM_{10} monitoring in Wyoming for a number of years, so a $PM_{2.5}$ FRM monitor was added to the Wyoming site (260810007) in January 2007 to correct this deficiency in the new network design. Through evaluation of more recent monitoring data, it has become apparent that the Grand Rapids Monroe Street (260810020) monitor must sample on a daily frequency. The sampling frequency will increase to daily beginning January 2008.

One monitor is required in the Flint MSA (260490021) and the Monroe MSA (Luna Pier site 261150005). The Luna Pier site is the only $PM_{2.5}$ site in Monroe County, located east of I-75, close to the Ohio border. It was selected to help determine transport into the Detroit MSA, and meets the requirement for a monitor in Monroe County.

One monitor is required in the Ann Arbor MSA. Previously, the MDEQ operated a $PM_{2.5}$ site in Ann Arbor (261610005) on a rooftop at the University of Michigan. Access became problematic and siting deteriorated due to excessive tree growth, so the site was closed on January 1, 2006. While the Ann Arbor site was operational, the MDEQ also ran a $PM_{2.5}$ monitor in Ypsilanti (261610008). The ambient concentrations at Ypsilanti were approximately 1 $\mu g/m^3$ greater than the levels at Ann Arbor, so the design value site was not lost when Ann Arbor was closed. The Ypsilanti site is located in a zip code with some of the highest incidences of asthma in Michigan, and will be retained to meet the monitoring requirement for the Ann Arbor MSA.

A single $PM_{2.5}$ FRM monitor is required in the Holland-Grand Haven MSA. This requirement is fulfilled by the monitor in Jenison (261390005). The FRM requirement for Muskegon-Norton Shores MSA is met by the monitor in Muskegon (261210040). Budget cuts in April 2006 prompted a reduction in the sampling frequency of both of these monitors from once every three days to once every six days. [8] When the monitoring regulations were changed in October 2006, they specified that all monitors with a 24-hour design value for 2004-2006 within +/- 5% of the NAAQS must sample daily. On January 1, 2007, the sampling frequency was changed from once every six days to daily for both Jenison (261390005) and Muskegon (261210040).

The Lansing monitor (260650012) fulfills the requirement for one site in the Lansing-East Lansing MSA. The Bay City MSA has a $PM_{2.5}$ FRM site in Bay City (260170014).

The Saginaw-Saginaw Township North MSA is required to have a $PM_{2.5}$ FRM site. The MDEQ used to operate a $PM_{2.5}$ monitoring site at Saginaw Valley University (261450018) but access was lost due to rapid increases in enrollment at the university. The monitoring trailer was located close to student dormitories and had to be removed for expansion of student housing. The site was shut down January 1, 2006. Annual average $PM_{2.5}$ levels at the Saginaw site were less than those measured at the Bay City site. The 98^{th} percentiles of the 24-hour values that were measured at Saginaw were either within 0.2 $\mu g/m^3$ of those measured at Bay City or were 2 to 6 $\mu g/m^3$ less than Bay City, depending upon the year. The EPA Regional Administrator has granted a waiver for the $PM_{2.5}$ Saginaw monitor.

[8] To cut approximately $173,000 from the budget, the sampling schedules of the Bay City, Coloma, New Haven, Muskegon, Oak Park, Jenison, Port Huron, E. Seven Mile, and Livonia monitors were changed from once every three day to once every six day sampling. In addition, Holland, Grand Rapids, and Linwood were reduced from daily sampling to once every six day sampling. The continuous monitor and speciation sampler were removed from Holland.

In April 2006, the sampling frequency of the Bay City monitor (260170014) was reduced to once every six days due to a budget cut. As a result of changes in the monitoring regulations, the once every three day sampling frequency was restored January 2007. This monitor meets the requirement for one site in the Bay City MSA.

The Kalamazoo monitor (260770008) fulfills the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Likewise, Coloma (260210014) fulfills the requirement for the Niles-Benton Harbor MSA. In April 2006, the sampling frequency of the Coloma monitor (260210014) was reduced to once every six days due to a budget cut. As a result of changes in the monitoring regulations, the once every three day sampling frequency was restored January 2007.

The $PM_{2.5}$ monitor in Holland (260050003) in Allegan County is a micropolitan area. Although the monitor's design value is within 5% of the NAAQS, daily sampling is not required in micropolitan areas.

Houghton Lake (261130001) is the background $PM_{2.5}$ FRM site in Michigan.

A tribal $PM_{2.5}$ monitor is located in Manistee (261010922). Tribal monitors are also operational in the Sault Ste Marie area. The MDEQ no longer contracts with the Inter-Tribal Council in Sault Ste. Marie to weigh these filters so has no knowledge of the nuances of the $PM_{2.5}$ network design in that area of the state.

Table 11 summarizes the $PM_{2.5}$ FRM monitoring site information for sites that existed in 2006. **Table 12** shows the $PM_{2.5}$ FRM sites that are currently in operation. **Figure 5** compares the $PM_{2.5}$ FRM monitoring network in 2006 with the current design.

TABLE 11: 2006 $PM_{2.5}$ FRM NETWORK IN MICHIGAN

Operating Schedule: Once every 6 days, once every 3 days or daily see below. The first number is Jan to March sampling frequency; the second is April to Dec.
Method: Partisol 2025 Rupprecht & Patashnick Samplers

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	2006 Sampling Frequency	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Holland	260050003	970 W. 32ND, HOLLAND	42.768	-86.14861	1:1; 1:6	Pop. Exp.	Neighborhoo	Allegan	10/31/98	Allegan Micro.	GRMH	1,088,514
Bay City	260170014	1001 JENNISON ST	43.571	-83.89083	1:3, 1:6	Pop. Exp.	Neighborhoo	Bay	8/24/00	Bay City	SBCSTN	403,070
Coloma	260210014	4689 DEFIELD RD., PAW PAW WWTP	42.198	-86.30972	1:3, 1:6	Transport	Regional	Berrien	11/7/98	NBH	Not in CSA	162,453
Flint	260490021	WHALEY PARK, 3610 IOWA ST., FLINT	43.047	-83.67028	1:3; 1:3	Pop. Exp.	Neighborhoo	Genesee	12/16/98	Flint	DWF	5,456,428
Lansing	260650012	220 N. PENNSYLVANIA	42.739	-84.53472	1:3; 1:3	Pop. Exp.	Neighborhoo	Ingham	11/7/98	LEL	LELO	447,728
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	1:3; 1:3	Pop. Exp.	Neighborhoo	Kalamazo	11/19/98	KP	Not in CSA	452,851
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	1:1; 1:3	Pop. Exp.	Neighborhoo	Kent	10/23/98	GRW	GRMH	1,088,514
New Haven	260990009	57700 GRATIOT	42.731	-82.79361	1:3, 1:6	Pop. Exp. Max. Conc.	Neighborhoo	Macomb	12/22/98	DWL	DWF	5,456,428
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	1:3; 1:3	Background	Regional	Missaukee	2/8/03	Not in MSA	Not in CSA	N/A
Luna Pier	261150005	ERIE SHOOTING CLUB	41.764	-83.47194	1:3; 1:3	Transport	Regional	Monroe	12/17/99	Monroe	DWF	5,456,428
Muskegon	261210040	199 E. APPLE	43.233	-86.23861	1:3, 1:6	Pop. Exp.	Neighborhoo	Muskegon	12/18/98	MNS	GRMH	1,088,514
Oak Park	261250001	13701 OAK PARK BLVD.	42.463	-83.18333	1:3, 1:6	Pop. Exp.	Urban	Oakland	12/25/98	DWL	DWF	5,456,428
Jenison	261390005	6981 28th AVE, GEORGETOWN TWP	42.894	-85.85278	1:3, 1:6	Pop. Exp.	Neighborhoo	Ottawa	11/7/98	HGH	GRMH	1,088,514
Port Huron	261470005	2525 DOVE RD.	42.953	-82.45639	1:3, 1:6	Pop. Exp.	Regional	Saint Clair	2/11/99	DWL	DWF	5,456,428
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	1:3; 1:3	Pop. Exp.	Neighborhoo	Washtena	8/4/99	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	1:1; 1:1	Pop. Exp.	Neighborhoo	Wayne	5/12/99	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST	42.303	-83.10667	1:3; 1:3	Pop. Exp. Max. Conc.	Neighborhoo	Wayne	2/26/99	DWL	DWF	5,456,428
Linwood	261630016	6050 LINWOOD, McMICHAEL SCHOOL	42.358	-83.09617	1:1; 1:6	Pop. Exp.	Neighborhoo	Wayne	5/12/99	DWL	DWF	5,456,428
E. 7 Mile	261630019	11600 E. 7 MILE, OSBORNE SCHOOL	42.431	-83.00028	1:3, 1:6	Pop. Exp.	Neighborhoo	Wayne	4/30/00	DWL	DWF	5,456,428
Livonia	261630025	38707 SEVEN MILE RD	42.423	-83.42639	1:3, 1:6	Pop. Exp.	Neighborhoo	Wayne	8/21/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	1:3; 1:3	Pop. Exp. Max. Conc.	Neighborhoo	Wayne	2/5/99	DWL	DWF	5,456,428
Wyandotte	261630036	3625 BIDDLE, WYANDOTTE	42.187	-83.15404	1:3; 1:3	Pop. Exp.	Neighborhoo	Wayne	2/20/99	DWL	DWF	5,456,428

2006 Special Purpose and Tribal $PM_{2.5}$ Monitors in Michigan

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	2006 Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	(2000 Census)
Manistee	261010922	3031 DOMRES RD	44.307	-86.24268	1:3; 1:3	Tribal	Tribal	Regional	Manistee	4/2/06	Not in MSA	Not in MSA	N/A
Newberry School	261630038	4045 29th ST	42.335	-83.1097	1:3; 1:3	SPM	Oriented	Neighborh	Wayne	12/26/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	1:3; 1:3	SPM	Source Oriented	Neighborh	Wayne	8/26/05	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
HGH = Holland-Grand Haven Metro. Area
KP= Kalamazoo-Portage Metro. Area
LEL= Lansing-E. Lansing Metro. Area
MNS = Muskegon-Norton Shores Metro. Area
NBH = Niles-Benton Harbor Metro. Area
SBM= South Bend-Mishawaka Metro. Area (IN/MI)

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area
LELO = Lansing-East Lansing-Owosso Combined Statistiacl Area

TABLE 12: 2007 $PM_{2.5}$ FRM NETWORK IN MICHIGAN

Operating Schedule: Once every 6 days, once every 3 days or daily see below. Network as of May, 2007
Method: Partisol 2025 Rupprecht & Patashnick Samplers

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	2007 Sampling Frequency	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Holland	260050003	970 W. 32ND, HOLLAND	42.768	-86.14861	1:3	Pop. Exp.	Neighborhoo	Allegan	10/31/98	Allegan Micro.	GRMH	1,088,514
Bay City	260170014	1001 JENNISON ST	43.571	-83.89083	1:3	Pop. Exp.	Neighborhoo	Bay	8/24/00	Bay City	SBCSTN	403,070
Coloma	260210014	4689 DEFIELD RD., PAW PAW WWTP	42.198	-86.30972	1:3	Transport	Regional	Berrien	11/7/98	NBH	Not in CSA	162,453
Flint	260490021	WHALEY PARK, 3610 IOWA ST., FLINT	43.047	-83.67028	1:3	Pop. Exp.	Neighborhoo	Genesee	12/16/98	Flint	DWF	5,456,428
Lansing	260650012	220 N. PENNSYLVANIA	42.739	-84.53472	1:3	Pop. Exp.	Neighborhoo	Ingham	11/7/98	LEL	LELO	447,728
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	1:3	Pop. Exp.	Neighborhoo	Kalamazo	11/19/98	KP	Not in CSA	452,851
Wyoming	260810007	507 WEALTHY ST	42.956	-85.67917	1:3	Pop. Exp.	Neighborhoo	Kent	1/1/07	GRW	GRMH	1,088,514
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	1:3	Pop. Exp.	Neighborhoo	Kent	10/23/98	GRW	GRMH	1,088,514
New Haven	260990009	57700 GRATIOT	42.731	-82.79361	1:3	Pop. Exp. Max. Conc.	Neighborhoo	Macomb	12/22/98	DWL	DWF	5,456,428
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	1:3	Background	Regional	Missaukee	2/8/03	Not in MSA	Not in CSA	N/A
Luna Pier	261150005	ERIE SHOOTING CLUB	41.764	-83.47194	1:3	Transport	Regional	Monroe	12/17/99	Monroe	DWF	5,456,428
Muskegon	261210040	199 E. APPLE	43.233	-86.23861	1:1	Pop. Exp.	Neighborhoo	Muskegon	12/18/98	MNS	GRMH	1,088,514
Oak Park	261250001	13701 OAK PARK BLVD.	42.463	-83.18333	1:3	Pop. Exp.	Urban	Oakland	12/25/98	DWL	DWF	5,456,428
Jenison	261390005	6981 28th AVE, GEORGETOWN TWP	42.894	-85.85278	1:1	Pop. Exp.	Neighborhoo	Ottawa	11/7/98	HGH	GRMH	1,088,514
Port Huron	261470005	2525 DOVE RD.	42.953	-82.45639	1:3	Pop. Exp.	Regional	Saint Clair	2/11/99	DWL	DWF	5,456,428
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	1:3	Pop. Exp.	Neighborhoo	Washtena	8/4/99	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	1:1	Pop. Exp.	Neighborhoo	Wayne	5/12/99	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST	42.303	-83.10667	1:3	Pop. Exp. Max. Conc.	Neighborhoo	Wayne	2/26/99	DWL	DWF	5,456,428
Linwood	261630016	6050 LINWOOD, McMICHAEL SCHOOL	42.358	-83.09617	1:3	Pop. Exp.	Neighborhoo	Wayne	5/12/99	DWL	DWF	5,456,428
E. 7 Mile	261630019	11600 E. 7 MILE, OSBORNE SCHOOL	42.431	-83.00028	1:3	Pop. Exp.	Neighborhoo	Wayne	4/30/00	DWL	DWF	5,456,428
Livonia	261630025	38707 SEVEN MILE RD	42.423	-83.42639	1:3	Pop. Exp.	Neighborhoo	Wayne	8/21/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	1:3	Pop. Exp. Max. Conc.	Neighborhoo	Wayne	2/5/99	DWL	DWF	5,456,428
Wyandotte	261630036	3625 BIDDLE, WYANDOTTE	42.187	-83.15404	1:3	Pop. Exp.	Neighborhoo	Wayne	2/20/99	DWL	DWF	5,456,428

2007 Special Purpose and Tribal $PM_{2.5}$ Monitors in Michigan

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	2007 Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	(2000 Census)
Manistee	261010922	3031 DOMRES RD	44.307	-86.24268	1:3	Tribal	Tribal	Regional	Manistee	4/2/06	Not in MSA	Not in MSA	N/A
Newberry School	261630038	4045 29th ST	42.335	-83.1097	1:3	SPM	Oriented	Neighborh	Wayne	12/26/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	1:3	SPM	Source Oriented	Neighborh	Wayne	8/26/05	DWL	DWF	5,456,428

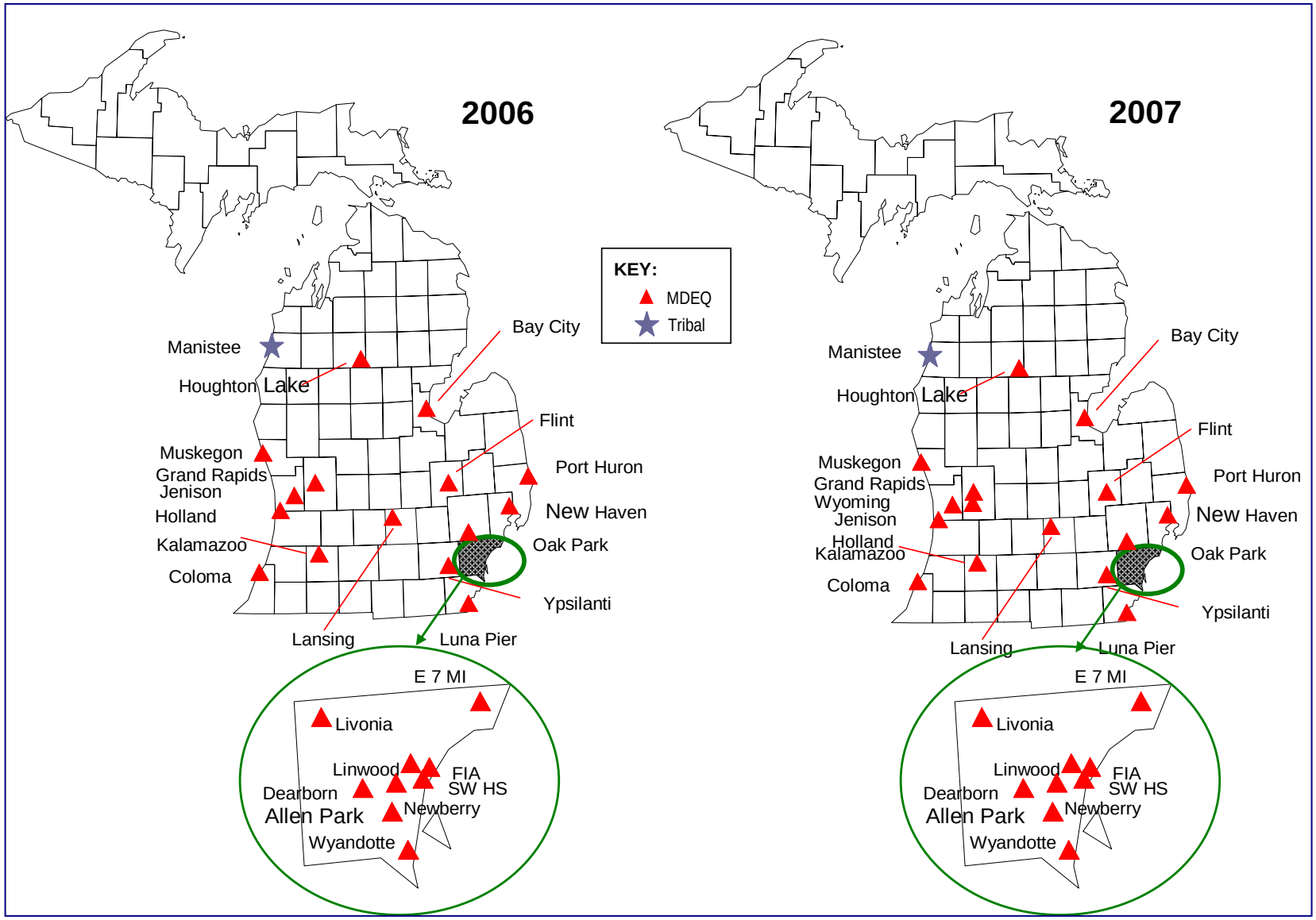
[1] PMSA Key:

DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
HGH = Holland-Grand Haven Metro. Area
KP= Kalamazoo-Portage Metro. Area
LEL= Lansing-E. Lansing Metro. Area
MNS = Muskegon-Norton Shores Metro. Area
NBH = Niles-Benton Harbor Metro. Area
SBM= South Bend-Mishawaka Metro. Area (IN/MI)

[2] CSA Key:

DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area
LELO = Lansing-East Lansing-Owosso Combined Statistiacl Area

FIGURE 5: COMPARISON OF MICHIGAN'S 2006 AND 2007 $PM_{2.5}$ FRM MONITORING NETWORK

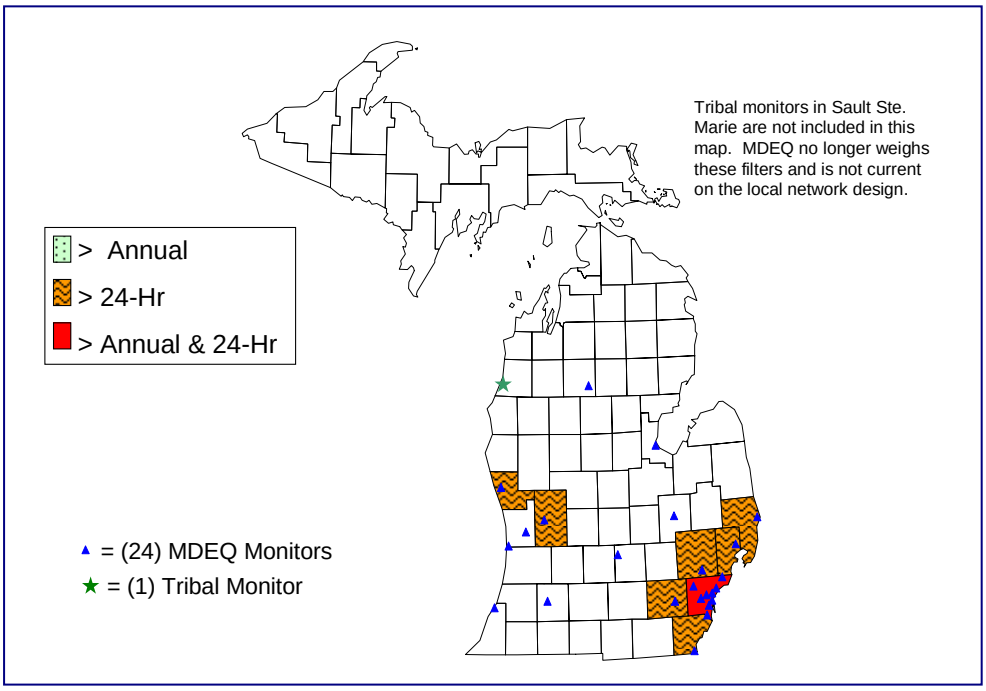


NEW $PM_{2.5}$ NAAQS

Effective December 18, 2006, EPA made the 24-hour $PM_{2.5}$ NAAQS more stringent. The 98th percentile nature of the 24-hour standard remained the same, but the level was reduced from 65 µg/m^3 to 35 µg/m^3. Many sites in Michigan measure levels of $PM_{2.5}$ that are at the standard. These sites include Grand Rapids (260810020), Muskegon (261210040), Jenison (261390005), Holland (260050003), New Haven (260990009), and Livonia (261630025). These monitors need to be retained to better determine their compliance with the standard.

Figure 6 shows the possible impact of the new NAAQS on the attainment status in Michigan. While the actual attainment status will be determined using data from future years, nonattainment status based on current data can be estimated. The $PM_{2.5}$ FRM monitors at Muskegon (261210040), Grand Rapids (260810020), New Haven (260990009), Oak Park (261250001), Port Huron (261460005), Ypsilanti (261610008), Dearborn (261630033), Linwood (261630016), and Luna Pier (261150005) need to be retained because they have the potential to violate the more stringent 24-hour NAAQS.

FIGURE 6: IMPACT OF $PM_{2.5}$ NAAQS ON MICHIGAN AVERAGED OVER THREE-YEARS (2004-2006)
ANNUAL 15 µG/M^3; 24-HOUR 98TH PERCENTILE = 35 µG/M^3



CONVERSION OF $PM_{2.5}$ GRANT DOLLARS

Currently the $PM_{2.5}$ monitoring networks are funded through a Section 103 Grant. However, the EPA is considering changing the Section 103 Grant to a conventional Section 105 Grant, which requires the receiving agency to supply a 40% match to the federal funds. The National Association of Clean Air Agencies has recommended that these grants not be shifted. However, if the funds are converted and a match is required, this will be the equivalent of cutting more than $400,000 from the $PM_{2.5}$ monitoring program. If this occurs, a number of $PM_{2.5}$ monitors will need to be shut down, because Michigan cannot supply the match due to the current budget situation.

$PM_{2.5}$ QUALITY ASSURANCE

The MDEQ operates four collocated $PM_{2.5}$ FRM samplers, meeting the precision monitoring requirement of 15%. The sampling frequency of the precision samplers at Grand Rapids (260810020), Kalamazoo (260770008), Ypsilanti (261610008), and Allen Park (261630001) has been reduced from once every six days to once every 12 days, as specified in 40 CFR Part 58 modifications to the regulations.

Every four weeks, the station operator conducts flow checks to ensure the flow difference from the device and compared to the set point is meeting the measurement quality objectives. Every six months, each $PM_{2.5}$ sampler is audited by a member of the AMU's QA Team. The auditor has a separate line of supervision from the site operator and uses dedicated equipment for audits. The audit assesses the accuracy of the flow, as well as the monitor sampling and siting criteria. Every flow audit is reviewed by the QA Coordinator, copies are retained in the QA files, and the audits are uploaded to the EPA's AQS database. The AMU's auditor also performs a systems audit for each sampler. The systems audit evaluates the siting criteria, condition of the sampling site/station, and other parameters. Copies of the systems audit forms are reviewed by the QA Coordinator and are retained in the QA central files.

The EPA conducts PEP audits at eight sites each year. The EPA auditor sets up a $PM_{2.5}$ monitor to run side-by-side with the station $PM_{2.5}$ sampler on a run day. The filter from the PEP audit is sent to an independent laboratory for analysis. Once the filter weight is entered into the EPA's AQS database, the concentrations are compared between the PEP audit filter and the station filter. The EPA auditor also assesses the station and monitor siting criteria to evaluate adequacy of the location, distances from trees, exhaust vents, and large building. Probe heights and separation distances are also assessed.

PLANS FOR 2008 $PM_{2.5}$ FRM MONITORING NETWORK

The design of the network is contingent upon receiving adequate levels of funding to continue operation of the $PM_{2.5}$ FRM network. At this time, the MDEQ does not foresee the addition or elimination of any monitors. An increase in the sampling frequency to daily is planned at the Grand Rapids (260810020) monitor beginning January 1, 2008.

If at the end of 2007, the three-year, 24-hour design values are within 5% of the NAAQS at any design value sites, their sampling frequency will increase to daily. If the design values for Jenison (261390005) and Muskegon (261210040) are no longer within 5% of the NAAQS, their sampling frequency will be reduced to once every three days beginning January 1, 2008.

The MDEQ submitted a Community Monitoring Grant Application to study organic aerosols in Southeast Michigan. If this grant is funded by EPA, Tecumseh (260910007) will be used as a background $PM_{2.5}$ site. $PM_{2.5}$ FRM measurements and a host of other metrics will be added to this site.

The following $PM_{2.5}$ monitors will be retained as part of the 2008 network:

- The one in three day $PM_{2.5}$ FRM monitor in Holland (260050003)
- The one in three day $PM_{2.5}$ FRM monitor in Grand Rapids (260810020) will change to a one in one day sampling frequency on January 1, 2008
- The one in one day $PM_{2.5}$ FRM monitor in Allen Park (261630001)
- The one in three day $PM_{2.5}$ FRM monitor at Linwood in Detroit (261630016)
- The one in three day $PM_{2.5}$ FRM monitor in Flint (260490021)
- The one in three day $PM_{2.5}$ FRM monitor in Lansing (260650012)
- The one in three day $PM_{2.5}$ FRM monitor in Kalamazoo (260770008)
- The one in three day $PM_{2.5}$ FRM Wyoming (260810007)

- The one in three day $PM_{2.5}$ FRM Oak Park monitor (261250001)
- The one in three day $PM_{2.5}$ FRM Livonia monitor (261630025)
- The one in three day $PM_{2.5}$ FRM Wyandotte monitor (261630036)
- The one in three day $PM_{2.5}$ FRM monitor at Bay City (260170014)
- The one in three day transport $PM_{2.5}$ FRM monitor at Coloma (260210014)
- The one in three day $PM_{2.5}$ FRM monitor in New Haven (260990009)
- The one in three day $PM_{2.5}$ FRM monitor in Houghton Lake (261130001)
- The one in three day $PM_{2.5}$ FRM transport monitor in Luna Pier (261150005)
- The one in one day $PM_{2.5}$ FRM monitor in Muskegon (261210040) may be reduced to a one in three day sampling schedule depending upon the impact the 2007 data on the design value
- The one in one day $PM_{2.5}$ FRM monitor in Jenison (261390005) may be reduced to a one in three day sampling schedule depending on the impact the 2007 data on the design value
- The one in three day $PM_{2.5}$ FRM monitor in Port Huron (261470005)
- The one in three day $PM_{2.5}$ FRM monitor in Ypsilanti (261610008)
- The one in three day $PM_{2.5}$ FRM monitor in Southwest High School in Detroit (261630015)
- The one in three day $PM_{2.5}$ FRM monitor at E. Seven Mile in Detroit (261630019)
- The one in three day $PM_{2.5}$ FRM monitor in Dearborn (261630033)
- The one in three day $PM_{2.5}$ FRM monitors at Newberry School in Detroit (261630038)
- The one in three day $PM_{2.5}$ FRM monitors at Lafayette in Detroit (261630039)

To the best of our knowledge, the following tribal FRM monitor will continue operation:

- A one in three day $PM_{2.5}$ FRM tribal monitoring site at Manistee (261010922), contingent upon the Little River Band of Ottawa Indians plans for 2008

Possible additions to the $PM_{2.5}$ FRM network in 2008 :

- A one in three day $PM_{2.5}$ FRM monitoring site in Tecumseh (260910007), contingent upon the MDEQ receiving Community Monitoring Grant Award.

CONTINUOUS $PM_{2.5}$ MONITORING NETWORK:

According to the October 17, 2006 changes to the monitoring regulations, 50% of all of the FRM sites are now required to have a continuous $PM_{2.5}$ monitor. The MDEQ operates Rupprecht & Patashnick TEOM continuous samplers at its monitoring sites. In 2005, the MDEQ operated a $PM_{2.5}$ TEOM at Saginaw (2614500018). Access to the site was lost in November 2005 when Saginaw Valley University needed the space for additional student housing. As a result, the Saginaw TEOM was shut down on January 1, 2006. A TEOM was added to the Bay City site (260170014) on November 19, 2005 as a replacement for Saginaw.

Due to a 10% recision in STAG funds and to provide funds for monitoring in the wake of hurricane Katrina, the $PM_{2.5}$ 103 funds were cut in April 2006. As a result, the MDEQ was forced to shut down the $PM_{2.5}$ TEOM at the Holland site (260050003) on March 31, 2006. As shown in **Table 13** (and the previous **Figure 5**), the MDEQ operated 24 $PM_{2.5}$ FRM sites in 2006. Currently the MDEQ is meeting the minimum 50% collocation requirement.

TABLE 13: MICHIGAN'S 2006 CONTINUOUS $PM_{2.5}$ MONITORING NETWORK

Operating Schedule: continuous
Method: Rupprecht & Patashnick TEOM Samplers

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Holland	260050003	970 W. 32ND, HOLLAND	42.768	-86.14861	Pop. Exp.	Neighborhood	Allegan	4/8/04	Allegan Micro.	GRMH	1,088,514
Bay City	260170014	1001 JENNISON ST	43.571	-83.89083	Pop. Exp.	Neighborhood	Bay	11/19/05	Bay City	SBCSTN	403,070
Flint	260490021	WHALEY PARK, 3610 IOWA ST., FLINT	43.047	-83.67028	Pop. Exp.	Neighborhood	Genesee	5/23/02	Flint	DWF	5,456,428
Lansing	260650012	220 N. PENNSYLVANIA	42.739	-84.53472	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	LELO	447,728
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	Not in CSA	452,851
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	Pop. Exp.	Neighborhood	Kent	11/4/99	GRW	GRMH	1,088,514
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	Background	Regional	Missaukee	10/9/03	Not in MSA	Not in CSA	N/A
Port Huron	261470005	2525 DOVE RD.	42.953	-82.45639	Pop. Exp.	Regional	Saint Clair	9/18/03	DWL	DWF	5,456,428
Seney	261530001	SENEY WILDLIFE REFUGE	46.289	-85.95027	bkgrd	regional	Schoolcraft	1/1/02	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428
New berry School	261630038	4045 29th ST	42.335	-83.1097	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area
LEL= Lansing-E. Lansing Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area
LELO = Lansing-East Lansing-Owosso Combined Statistiacl Area
SBCSTN=Saginaw-Bay City-Saginaw Twp. North Combined Stat. Area

In 2007, the MDEQ operates TEOM continuous samplers at 13 locations in Michigan, as described in **Table 14** and illustrated in **Figure 7**. The two TEOMs at Newberry School (261630038) and Lafayette (261630039) are on loan from the EPA. Because these two borrowed units are an older style, they cannot be equipped with the inlets previously used through out Michigan. Therefore, to promote better comparability with the other stations in Michigan's continuous network, a newer TEOM unit that was equipped with the Filter Dynamic Measurement System (FDMS) inlet was also placed at Lafayette (261630039).

TABLE 14: 2007 CONTINUOUS $PM_{2.5}$ MONITORING NETWORK IN MICHIGAN

Operating Schedule: continuous — Network as of May, 2007

Method: Rupprecht & Patashnick TEOM Samplers

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Bay City	260170014	1001 JENNISON ST	43.571	-83.89083	Pop. Exp.	Neighborhood	Bay	11/19/05	Bay City	SBCSTN	403,070
Flint	260490021	WHALEY PARK, 3610 IOWA ST., FLINT	43.047	-83.67028	Pop. Exp.	Neighborhood	Genesee	5/23/02	Flint	DWF	5,456,428
Lansing	260650012	220 N. PENNSYLVANIA	42.739	-84.53472	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	LELO	447,728
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	Not in CSA	452,851
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	Pop. Exp.	Neighborhood	Kent	11/4/99	GRW	GRMH	1,088,514
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	Background	Regional	Missaukee	10/9/03	Not in MSA	Not in CSA	N/A
Port Huron	261470005	2525 DOVE RD.	42.953	-82.45639	Pop. Exp.	Regional	Saint Clair	9/18/03	DWL	DWF	5,456,428
Seney	261530001	SENEY WILDLIFE REFUGE	46.289	-85.95027	bkgrd	regional	Schoolcraft	1/1/02	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428
Newberry School	261630038	4045 29th ST	42.335	-83.1097	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	DWF	5,456,428

[1] PMSA Key:

DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area
LEL= Lansing-E. Lansing Metro. Area

[2] CSA Key:

DWF = Detroit-Warren-Flint Combined Statistical Area
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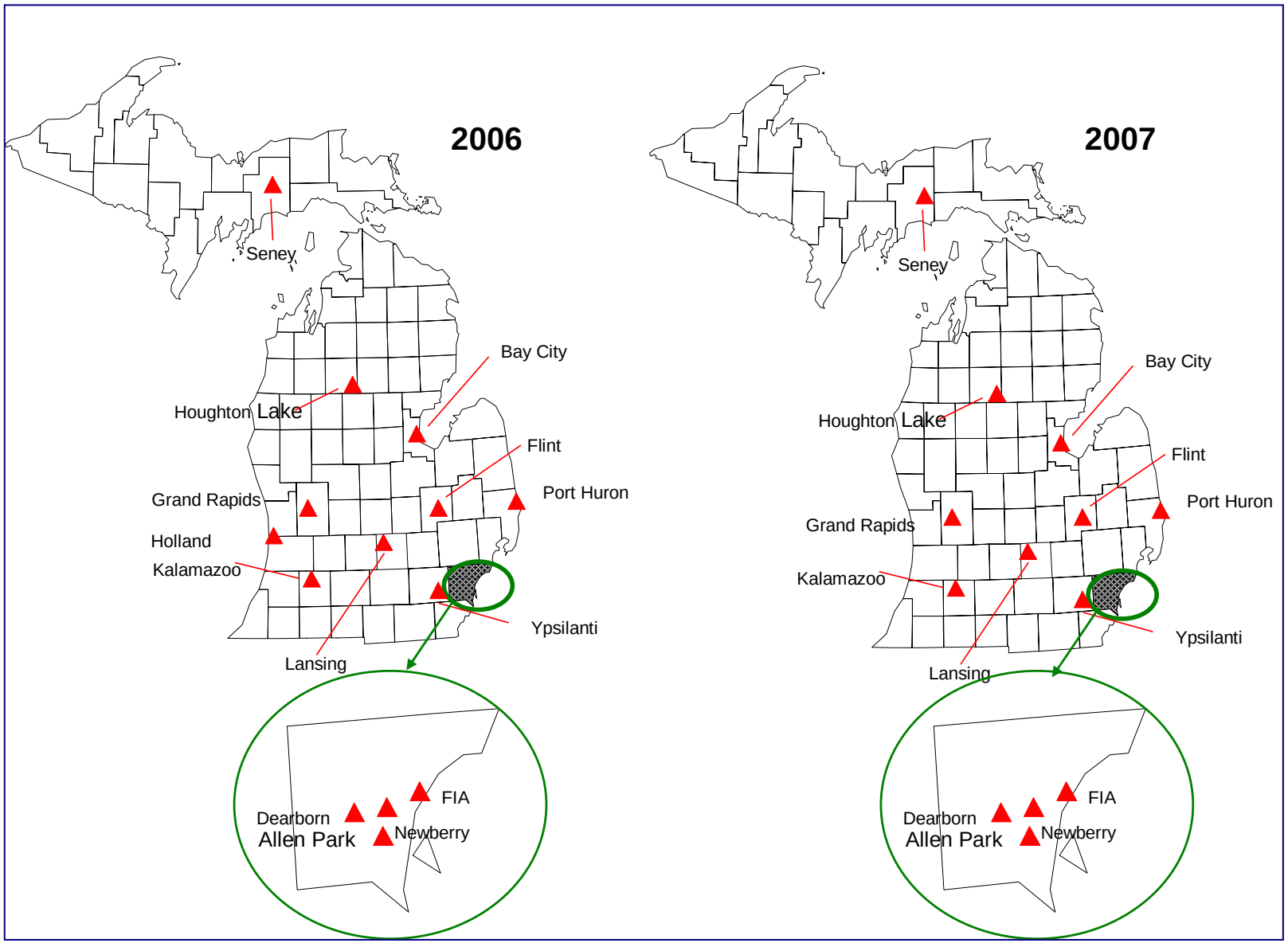
LELO = Lansing-East Lansing-Owosso Combined Statistiacl Area
SBCSTN=Saginaw-Bay City-Saginaw Twp. North Combined Stat. Area

FIGURE 7: COMPARISON OF MICHIGAN'S 2006 AND 2007 CONTINUOUS $PM_{2.5}$ NETWORK



FILTER DYNAMIC MEASUREMENT SYSTEM (FDMS) INLETS

Initially, the MDEQ operated all TEOM units with an inlet temperature of 50°C. Because this high inlet temperature was volatilizing nitrate during the winter months, and due to the EPA's desire to make the continuous data as "FRM-like" as possible, FDMS inlets were installed on the TEOMs between October 2003 and April 2004, allowing the inlet temperature to be reduced. Data was collected through April 2005. The data from units with the FDMS inlets showed good correlation with the FRM data during the winter months, but during the summer, the correlation was poor. The FDMS units captured much more nitrate than the FRMs during the summer and thus yielded much higher TEOM readings than recorded by the FRMs. During summer days with high humidity, condensation occurred in the FDMS lines, interfering with data capture and creating maintenance problems. As a possible solution to both the condensation problem and data comparability issue, the MDEQ proposed to operate the TEOMs with the FDMS inlets during the winter months and without the FDMS inlets during the summer. The MDEQ selected the week of April 1, 2006 to remove the inlets and the week of October 1, 2006 to replace them, corresponding to Michigan's ozone monitoring season. Performance was worse than during the previous year, and was most likely due to a degradation of the nafion driers in the FDMS inlets. In March 2007, the chillers broke on two units and could not be replaced because the instrument manufacturer discontinued the parts in the version of the FDMS units operated by the MDEQ. Rather than buying the version C upgrades to the FDMS units, all FDMS units were removed from the TEOMs in February 2007.

During 2007, the MDEQ will not be redeploying the FDMS inlets. Instead, the MDEQ plans to operate the TEOMs during the summer months of 2007 at an inlet temperature of 50°C, and reduce the inlet temperature to 30°C in the winter months to minimize loss of nitrates.

According to the revisions to the monitoring regulations, it is likely that Michigan will have two NCORE stations, one in Detroit and one in Grand Rapids. These stations will be required to operate a continuous $PM_{2.5}$ sampler. Therefore, a $PM_{2.5}$ TEOM is required in Grand Rapids (260810020) and at Allen Park (261630001), which will likely be the NCORE site for Detroit.

The remaining $PM_{2.5}$ TEOM sites will be operated in support of AIRNOW real time data reporting and to provide adequate spatial coverage, as long as adequate levels of funding are received.

TEOM QUALITY ASSURANCE

The site operator conducts flow checks for precision every four weeks. An independent flow rate audit is conducted by a member of the AMU's QA Team every six months. During the flow rate audit, the auditor assesses the condition of the station, sample probe, and siting criteria. The QA Coordinator reviews all audit results and hard copies of the results are retained in the QA files.

PLANS FOR 2008 $PM_{2.5}$ TEOM NETWORK

The two TEOMs at Newberry (261630038) and Lafayette (261630039) are on loan from the EPA. The units may need to be returned in January 2008. Since the Lafayette (261630039) site also contains an MDEQ TEOM with an FDMS inlet, a single TEOM may remain in 2008. The MDEQ has a spare TEOM, formerly at Holland (260050003), which could be deployed to Newberry (261630038) if necessary. No other changes are anticipated, but due to the uncertain nature of the funding, operation of some other TEOMs may need to be discontinued in 2008. Continued operation of the $PM_{2.5}$ TEOMs at Dearborn (261630033), Allen Park (261630001),and Grand Rapids (260610020) will be given the highest priority. The Dearborn (261630033) monitor measures the highest concentrations of $PM_{2.5}$ in Michigan and is needed for the development of attainment strategies, AIRNOW reporting, and estimation of risk. The Allen Park (261630001) monitor is needed to provide a counterpoint to the measurements

taken at Dearborn. Allen Park is a population-oriented site designated as the trend site for Michigan. Dearborn is the maximum concentration site, so comparisons between these sites are important to characterize point source impacts on ambient air quality.

During 2008, contingent upon adequate levels of funding, Michigan is planning to continue to operate $PM_{2.5}$ TEOM monitors at:

- Flint (260490021)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids (260810020)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Port Huron (261470005)
- Dearborn (261630033)
- Newberry (261630038)
- Lafayette (261630039)
- Bay City (260170014)
- Houghton lake (261130001)

SPECIATED $PM_{2.5}$ MONITORING NETWORK:

The October 17, 2006 changes to the monitoring regulations specify that speciation monitoring is required but offer little detail. Continued operation of the speciation trend site network is required on a national level and these sites sample on an increased sampling frequency of once every three days. There is a single speciated trend site in Michigan, located at Allen Park (261630001). All remaining supplemental speciation sites operate on a once every six day schedule. The speciation network that was operational in 2006 is described in **Table 15** and the current network is shown in **Table 16**. **Figure 8** illustrates the coverage across Michigan.

TABLE 15: MICHIGAN'S $PM_{2.5}$ SPECIATED NETWORK IN 2006

Operating Schedule: Once every 3 days (Allen Park), once every 6 days all others
Method: Met One Spiral aerosol sampler

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Holland	260050003	970 W. 32ND, HOLLAND	42.768	-86.14861	1:6	Pop. Exp.	Neighborhood	Allegan	4/8/04	Allegan Micro.	GRMH	1,088,514
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	1:6	Pop. Exp.	Neighborhood	Kalamazo	8/17/00	KP	Not in CSA	452,851
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	11/4/99	GRW	GRMH	1,088,514
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	1:6	Background	Regional	Missauke	10/9/03	Not in MSA	Not in CSA	N/A
Luna Pier	261150005	ERIE SHOOTING CLUB	41.764	-83.47194	1:6	Transport	Regional	Monroe	12/17/99	Monroe	DWF	5,456,428
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	1:6	Pop. Exp.	Neighborhood	Washtena	2/24/00	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	1:3	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428

Continuous Speciation Measurements

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428
Newberry School	261630038	4045 29th ST	42.335	-83.1097	McGee small spot Aethalometer (carbon black)	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	McGee small spot Aethalometer (carbon black)	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	DWF	5,456,428
Newberry School	261630038	4045 29th ST	42.335	-83.1097	Sunset EC/OC	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 16: MICHIGAN'S 2007 $PM_{2.5}$ SPECIATED NETWORK

Operating Schedule: Once Every 3 days (Allen Park), once every 6 days all others — Network as of May, 2007
Method: Met One Spiral aerosol sampler

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Kalamazoo	260770008	FAIRGROUNDS, 1400 OLMSTEAD RD	42.278	-85.54194	1:6	Pop. Exp.	Neighborhood	Kalamazo	8/17/00	KP	Not in CSA	452,851
Grand Rapids	260810020	1179 MONROE ST., NW,	42.984	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	11/4/99	GRW	GRMH	1,088,514
Houghton lake	261130001	1769 S JEFFS RD	44.311	-84.89194	1:6	Background	Regional	Missaukee	10/9/03	Not in MSA	Not in CSA	N/A
Luna Pier	261150005	ERIE SHOOTING CLUB	41.764	-83.47194	1:6	Transport	Regional	Monroe	12/17/99	Monroe	DWF	5,456,428
Ypsilanti	261610008	555 TOWNER AVE	42.241	-83.59972	1:6	Pop. Exp.	Neighborhood	Washtena	2/24/00	Ann Arbor	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	1:1	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428

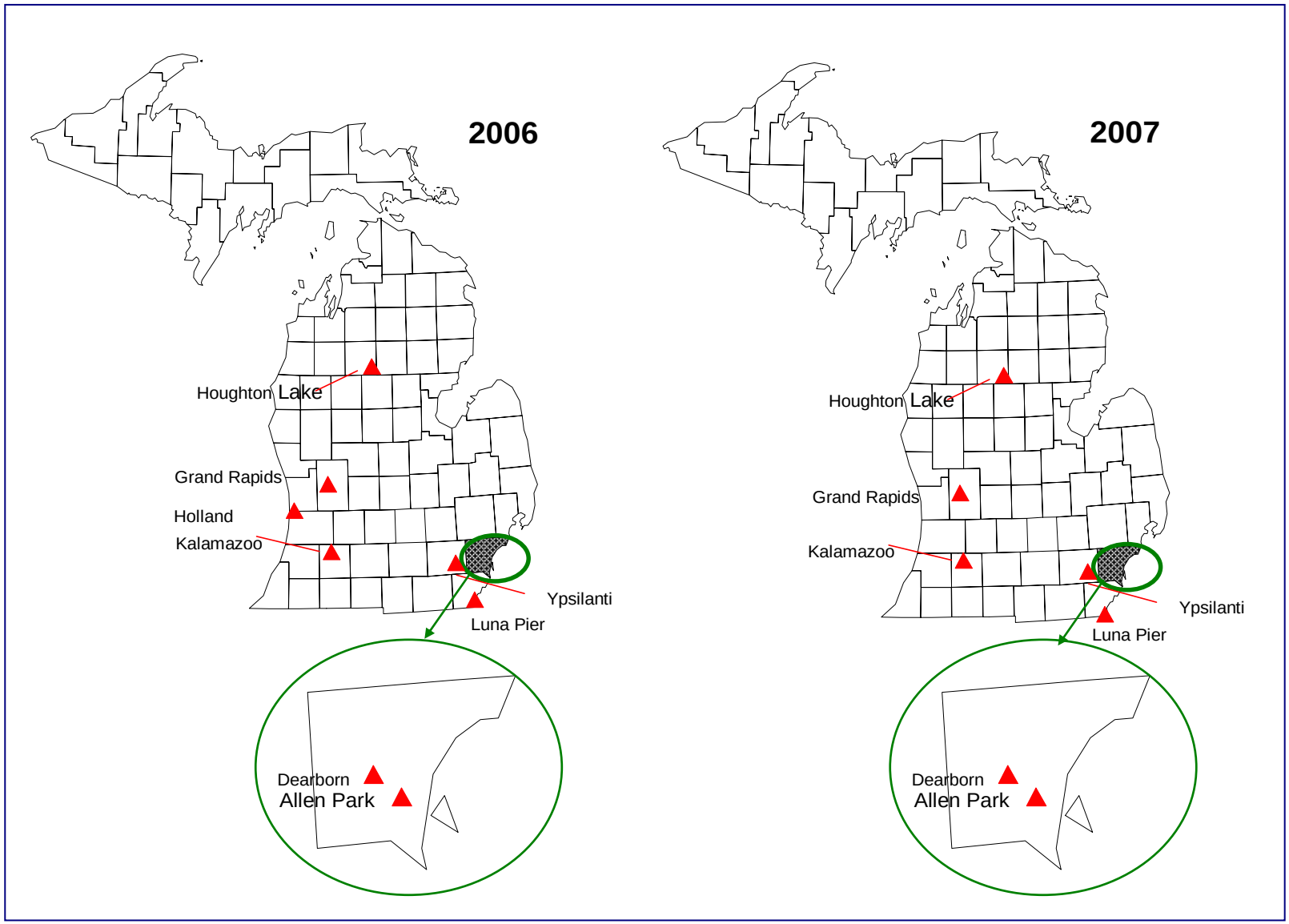
Continuous Speciation Measurements

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	DWF	5,456,428
Newberry School	261630038	4045 29th ST	42.335	-83.1097	McGee small spot Aethalometer (carbon black)	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428
FIA/Lafayette St	261630039	2000 W LAFAYETTE	42.323	-83.06861	McGee small spot Aethalometer (carbon black)	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	DWF	5,456,428
Newberry School	261630038	4045 29th ST	42.335	-83.1097	Sunset EC/OC	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING, SALINA SCHOOL	42.307	-83.14889	Sunset EC/OC	Pop. Exp. Max. Conc.	Neighborhood	Wayne	6/11/07	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 8: COMPARISON OF MICHIGAN'S 2006 AND 2007 $PM_{2.5}$ SPECIATED NETWORK



CONTINUOUS SPECIATION MEASUREMENTS

In addition to the speciated measurements integrated over a 24-hour time period, described above, Michigan operates continuous monitors for carbon black and elemental carbon/organic carbon (EC/OC). Two large spot aethalometers from Magee Scientific began operation at Dearborn (261630033) and Allen Park (261630001) on December 19, 2003. These units measure carbon black, which is very similar and correlates well with elemental carbon. Then, two small spot aethalometers from Magee, on loan from the EPA, were deployed at Newberry School (261630038) in Detroit on December 26, 2004 and at Lafayette (261630039), also in Detroit, on August 9, 2005. The units may need to be returned in January 2008. However, the MDEQ has requested funds to purchase two replacement units for these sites in a competitive grant.

A continuous EC/OC monitor from Sunset Laboratories was deployed to the Newberry School (261630038) site on February 1, 2005 to determine diurnal variation in elemental carbon and organic carbon. To help in the development of attainment strategies, the Southeast Michigan Council of Governments purchased a second Sunset EC/OC unit that was deployed at Dearborn (261630033) on June 11, 2007.

CHEMICAL COMPOSITION OF $PM_{2.5}$, ORGANIC CARBON SPECIATION AND LAB COSTS

Historical speciation data indicates that $PM_{2.5}$ in Michigan is made up of approximately 30% nitrate compounds, 30% sulfate compounds and 30% organic carbon. The rest is made up of unidentified or trace elements. The exact composition varies by site, meteorology, and time of year. It is important to understand the chemical composition of the organic carbon fraction because it makes up such a large percentage of the total $PM_{2.5}$. By improving our understanding of the nature of the organic carbon, control strategies to reduce $PM_{2.5}$ levels to meet the NAAQS can be developed. Therefore, a number of studies have been conducted in Southeast Michigan, by the Lake Michigan Air Directors Consortium, the University of Wisconsin, and the MDEQ to further investigate organic carbon.

In these studies, samples are analyzed by University of Wisconsin to identify isomer specific marker compounds present in organic carbon. The results are used in source apportionment studies to identify possible sources contributing to the $PM_{2.5}$.

In more routine operation of the speciation network, samples are sent to the national contract laboratory, Research Triangle Institute (RTI), for analysis that includes ions such as sulfate and nitrate, trace metals, elemental carbon, and organic carbon. A single sample consists of a set of three filters: nylon, Teflon, and quartz. Each filter is analyzed for a different set of parameters. However, RTI provides the only total organic carbon content and does not identify individual isomers. The entire suite of tests costs approximately $300 per sample.

If the Section 103 grant funds are converted into Section 105 funds, chemical speciation costs will have to be reduced. One possible solution is to not routinely analyze the Teflon filter for trace metals. Archiving it for later reference would save about $70 per sample. The organic carbon, nitrate, and sulfate measurements would continue to be made. Another possible cost saving opportunity is to reduce the sampling frequency at non-trend sites, perhaps even temporarily discontinuing speciation monitoring in all areas that meet the 1997 $PM_{2.5}$ NAAQS. Once designations are made in 2009 for the 2006 NAAQS, speciation monitoring would resume generating data to support Michigan's state implementation plan due in 2012. In this way, historical speciation data can be compared with the data collected in 2009 – 2011 to understand any changes in chemical composition and adjust the control strategies accordingly. While not optimal as having a continuous data record, it may be the best solution in a resource constrained environment. **Table 17** gives the expected time line for the 2006 $PM_{2.5}$ NAAQS. The time lines for the 1997 version of the standard are given for comparison purposes.

TABLE 17: EXPECTED TIMELINE FOR REVISED $PM_{2.5}$ NAAQS

Milestone	1997 $PM_{2.5}$ Primary NAAQS	2006 $PM_{2.5}$ Primary NAAQS
Promulgation of Standard	July 1997	Dec. 2006
State Recommendations to EPA	Feb. 2004 (based on 2001-2003 monitoring data)	Dec. 2007 (based on 2004-2006 monitoring data)
Final Designations Signature	Dec. 2004	Dec. 2009 (Oct 2008)*
Effective Date of Designations	April 2005	April 2010 (Oct 2009)*
SIPs Due	April 2008	April 2013 (Oct 2012)*
Attainment Date	April 2010 (based on 2007-2009 monitoring data)	April 2015 (based on 2012-2014 monitoring data)
Attainment Date with Extension	Up to April 2015	April 2020

* At an EPA Region 5 training conference for the Clean Air Mercury Rule/Clean Air Interstate Rule, June 07, these accelerated dates were mentioned.

Taken From: Overview: **September 2006 Revisions to the National Ambient Air Quality Standards for Particle Pollution, EPA OAQPS 9-06.**

SPECIATION QUALITY ASSURANCE

The QA team conducts flow rate audits on the $PM_{2.5}$ speciation monitors every six months. The auditor also assesses the monitoring station and siting criteria to ensure it continues to meet the measurement quality objectives. The audit results are reviewed by the AMU's QA Coordinator, and hard copies are retained in the QA files. The audit data is also uploaded to the EPA's AQS database.

The EPA conducted flow rate and system audits of the $PM_{2.5}$ speciation monitors in 2006. All four stations that were audited were found to be acceptable and meeting the measurement quality objectives. The EPA also conducts audits of RTI National Laboratory who supplies speciation analysis services for the entire nation.

PLANS FOR 2008 $PM_{2.5}$ SPECIATION MONITORING NETWORK

A community monitoring grant application was submitted to the EPA by the MDEQ and partners to investigate secondary organic aerosols in the residual nonattainment area in Southeast Michigan. If this grant is received, continuous EC/OC samplers will be added to Tecumseh (260910007) and to Southwest High School (261630015). The grant would also replace the two borrowed aethalometers at Newberry (261630038) and at Lafayette (261630039), as well as add one to Tecumseh (260910007). Another component of the study will provide real time particle-bound PAH (polynuclear aromatic hydrocarbon) measurements at Tecumseh (260910007) and at Dearborn (261630033) using an Eco-Chem Analytical PAS 2000 unit.

During 2008, contingent upon adequate levels of funding, Michigan is planning to continue to operate 24-hour $PM_{2.5}$ speciation monitors at:

- Luna Pier (261150005) every six days
- Kalamazoo (260770008) every six days
- Grand Rapids (260810020) every six days
- Houghton Lake (261130001) every six days
- Ypsilanti (261610008) every six days
- Allen Park (261630001) every three days
- Dearborn (261630033) every six days

PM_{10} MONITORING NETWORK:

The October 17, 2006 monitoring regulations modified the minimum number of PM_{10} samplers required in MSAs as shown in **Table 18**. [9]

TABLE 18: PM_{10} MINIMUM MONITORING REQUIREMENTS (NUMBER OF STATIONS PER MSA)[1]

POPULATION CATEGORY	HIGH CONCENTRATION[2]	MEDIUM CONCENTRATION[3]	LOW CONCENTRATION[4,5]
> 1,000,000	6-10	4-8	2-4
500,000 – 1,000,000	4-8	2-4	1-2
250,000 – 500,000	3-4	1-2	0-1
100,000 – 250,000	1-2	0-1	0

[1] Selection of urban areas and actual numbers of stations per area within the ranges shown in this table will be jointly determined by EPA and the State Agency.
[2] High concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding the PM_{10} NAAQS by 20% or more.
[3] Medium concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding 80% of the PM_{10} NAAQS.
[4] Low concentration areas are those for which ambient PM_{10} data show ambient concentrations < 80% of the PM_{10} NAAQS.
[5] These minimum monitoring requirements apply in the absence of a design value.

Applying **Table 18** to Michigan's urban areas, population totals and historical PM_{10} data results in the design requirements that are shown in **Table 19.** On June 12, 2007, the EPA amended the rule to allow EPA Regional Administrators to approve departures from the minimum number of PM_{10} monitors specified in the rule. Therefore, if approval is granted, three PM_{10} sites in the Detroit-Warren-Livonia MSA will be sufficient to meet the monitoring regulations for PM_{10}.

According to the requirements, either no or one PM_{10} monitors are required in the Flint MSA. In 2006, the MDEQ operated a PM_{10} sampler in Flint (260490021) but as a result of budget cuts, PM_{10} sampling was discontinued on April 1, 2007.

[9] Table D-4 of Appendix D to Part 58.

TABLE 19: APPLICATION OF MINIMUM PM_{10} MONITORING REQUIREMENTS IN THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S PM_{10} NETWORK

MSA	2000 Population	Counties	Existing Monitors	Most Recent 3-year PM_{10} design value (24-Hr)	Conc. Class.	Min No monitors Required
Detroit-Warren-Livonia Metro Area	4,452,557	Macomb	---	**---**		4 - 8
		Oakland	---	**---**		
		Wayne	Allen Park	55	low	
			SW HS	73	low	
			Dearborn	**87**	low	
		Lapeer	---	**---**		
		St Clair	---	**---**		
		Livingston	---	---		
Flint Metro Area	436,141	Genesee	**Flint**	**52**	low	0 -1
Monroe Metro Area	145,945	Monroe	---	**---**		
Ann Arbor Metro Area	322,895	Washtenaw	---	**---**		
Grand Rapids-Wyoming Metro Area	740,482	Kent	Monroe St GR	44		1-2
			Wyoming	**50**	low	
		Barry	---	---		
		Newaygo	---	---		
		Ionia	---	---		
Holland-Grand Haven Metro Area	238,314	Ottawa	---	---		
Muskegon-Norton Shores Metro Area	170,200	Muskegon	---	---		
Lansing-East Lansing Metro Area	447,728	Clinton	---	---		
		Ingham	---	---		
		Eaton	---	---		
Bay City Metro Area	110,157	Bay	---	---		
Saginaw-Saginaw Twp N Metro Area	210,039	Saginaw	---	---		
Kalamazoo-Portage Metro Area	314,866	Kalamazoo	---	---		
		Van Buren	---	---		
Niles-Benton Harbor Metro Area	162,453	Berrien	---	---		
Jackson Metro Area	158,422	Jackson	---	---		
Battle Creek Metro Area	137,985	Calhoun	---	---		
South Bend-Mishawaka Metro Area IN/IM	51,104	Cass	---	---		

MSAs with populations greater than 500,000 require at least 1 PM_{10} monitor.

The PM_{10} monitoring requirements specify that one to two PM_{10} sites are required in the Grand Rapids-Wyoming MSA. There are two sites currently in operation, one in Wyoming (260810007) and one in Grand Rapids (260810020). Both of these sites are operational at the request of EPA Region 5.

Table 20 summarizes the PM_{10} monitoring site information for sites that were in existence in 2006. **Table 21** shows the PM_{10} sites that are currently in operation. **Figure 9** compares the PM_{10} network in 2006 with the current design.

TABLE 20: MICHIGAN'S 2006 PM_{10} MONITORING NETWORK

Operating Schedule: Once Every 6 days (Continuous measurements are also available at Dearborn)
Method: Manual High Volume Sampler (Dearborn also uses a R&P TEOM to make continuous measurements) Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Allen Park	**261630001**	**14700 GODDARD**	42.2286	-83.20833	**1:6**	**High Vol**	**pop exp**	**nghbrhd**	**Wayne**	**9/12/87**	DWL	**DWF**	**5,456,428**
W Fort (SW HS)	**261630015**	**6921 WEST FORT**	42.3028	-83.10667	**1:6**	**High Vol**	**max conc**	**nghbrhd**	**Wayne**	**3/27/87**	DWL	**DWF**	**5,456,428**
Dearborn	**261630033**	**2842 WYOMING**	42.3067	-83.14889	**1:6**	**High Vol**	**max conc**	**nghbrhd**	**Wayne**	**6/12/90**	DWL	**DWF**	**5,456,428**
Flint	260490021	WHALEY PARK, 3610 IOWA	43.0472	-83.67028	**1:6**	**High Vol**	pop exp	nghbrhd	Genesee	7/17/92	Flint	DWF	5,456,428
Grand Rapids	260810020	1179 MONROE NW	42.9842	-85.67139	**1:6**	High Vol	pop exp	nghbrhd	Kent	3/20/87	GRW	GRMH	1,088,514
Grand Rapids	260810007	509 WEALTHY	42.9561	-85.67917	**1:6**	High Vol	SPM	nghbrhd	Kent	2/3/89	GRW	GRMH	1,088,514
Grand Rapids	260810007	509 WEALTHY	42.9561	-85.67917	**1:6**	High Vol for precision	Co-loc	nghbrhd	Kent	2/3/89	GRW	GRMH	1,088,514
Dearborn	261630033	2842 WYOMING	42.3067	-83.14889	**1:6**	High Vol for precision	Co-loc	nghbrhd	Wayne	6/12/90	DWL	DWF	5,456,428
Dearborn	261630033 continuous	2842 WYOMING	42.3067	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 21: 2007 PM_{10} MONITORING NETWORK IN MICHIGAN

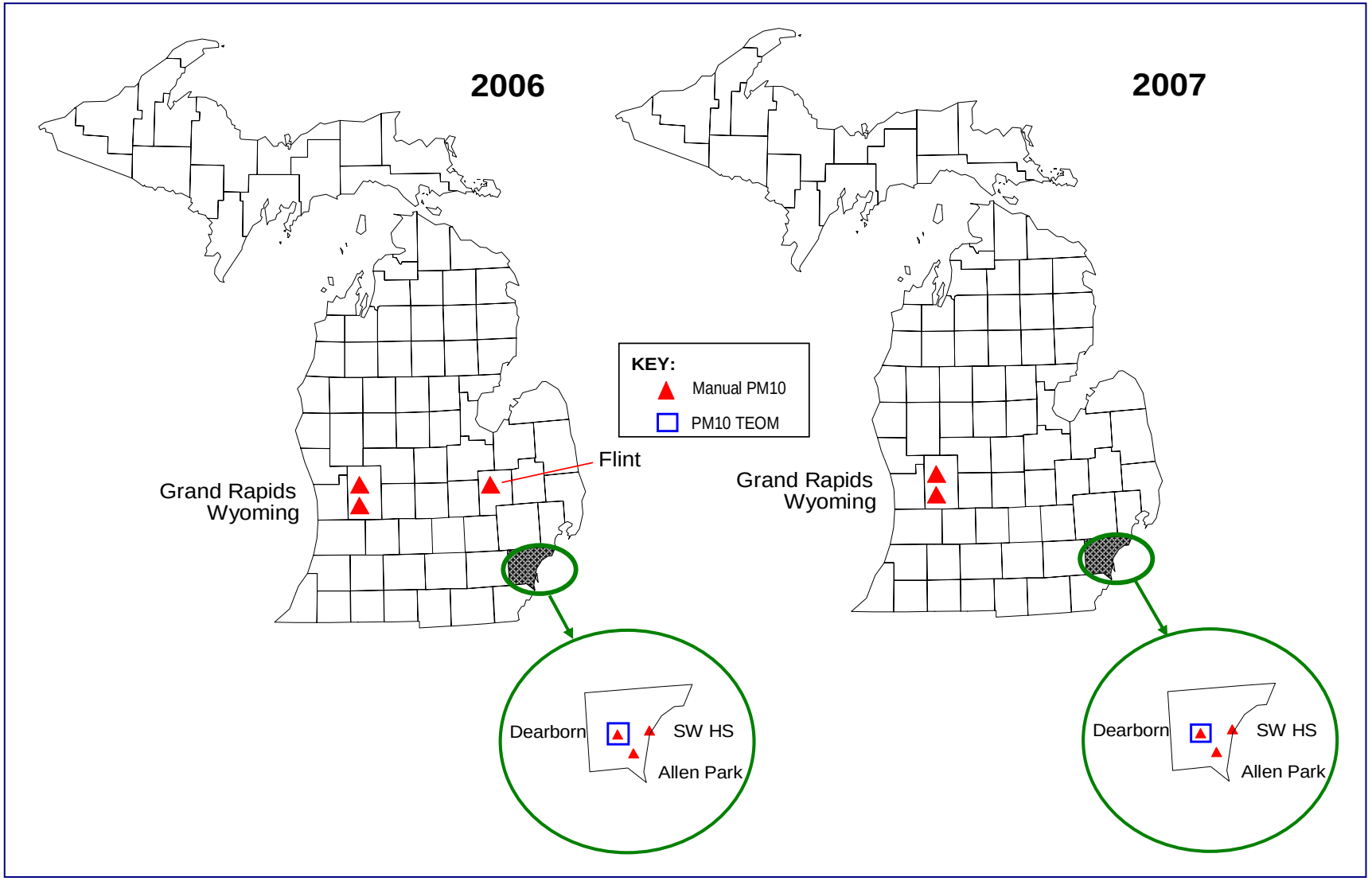
Operating Schedule: Once Every 6 days (Continuous measurements are also available at Dearborn)
Method: Manual High Volume Sampler (Dearborn also uses a R&P TEOM to make continuous measurements) Network as of May, 200

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Allen Park	**261630001**	**14700 GODDARD**	42.2286	-83.20833	**1:6**	**High Vol**	**pop exp**	**nghbrhd**	**Wayne**	**9/12/87**	DWL	**DWF**	**5,456,428**
W Fort (SW HS)	**261630015**	**6921 WEST FORT**	42.3028	-83.10667	**1:6**	**High Vol**	**max conc**	**nghbrhd**	**Wayne**	**3/27/87**	DWL	**DWF**	**5,456,428**
Dearborn	**261630033**	**2842 WYOMING**	42.3067	-83.14889	**1:6**	**High Vol**	**max conc**	**nghbrhd**	**Wayne**	**6/12/90**	DWL	**DWF**	**5,456,428**
Grand Rapids	260810020	1179 MONROE NW	42.9842	-85.67139	**1:6**	High Vol	pop exp	nghbrhd	Kent	3/20/87	GRW	GRMH	1,088,514
Grand Rapids	260810007	509 WEALTHY	42.9561	-85.67917	**1:6**	High Vol	pop exp	nghbrhd	Kent	2/3/89	GRW	GRMH	1,088,514
Grand Rapids	260810007	509 WEALTHY	42.9561	-85.67917	**1:6**	High Vol for precision	pop exp	nghbrhd	Kent	2/3/89	GRW	GRMH	1,088,514
Dearborn	261630033	2842 WYOMING	42.3067	-83.14889	**1:6**	High Vol for precision	max conc	nghbrhd	Wayne	6/12/90	DWL	DWF	5,456,428
Dearborn	261630033 continuous	2842 WYOMING	42.3067	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area
KP= Kalamazoo-Portage Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 9: COMPARISON OF MICHIGAN'S 2006 AND 2007 PM_{10} MONITORING NETWORK



HISTORY OF PM_{10} COLLOCATED AND CONTINUOUS PM_{10} MEASUREMENTS

Prior to 2001, both the MDEQ and the Wayne County Department of the Environment, Air Quality Management Division was responsible for operating PM_{10} networks outside of and within Wayne County, respectively. The monitoring site that measured the highest concentration of PM_{10} in each of these monitoring networks was subject to special monitoring requirements, as specified in the air monitoring regulations in effect during that time. In Wayne County, the highest PM_{10} levels were measured at the Dearborn site (261630033) and were sufficiently high to trigger a daily sampling requirement. As time progressed, PM_{10} levels dropped and the EPA allowed the sampling frequency of the manual sampler at Dearborn to be reduced to a once every six day frequency, if a continuous PM_{10} sampler was added to the site. A Rupprecht & Patashnick PM_{10} TEOM became operational on April 1, 2000, and the sampling frequency of the manual monitor was reduced to once every six days.

In the network outside of Wayne County, the Wyoming (260810007) monitor had the highest PM_{10} values. Historically, PM_{10} was sampled on a once every other day schedule, but as PM_{10} levels dropped, the sampling frequency was reduced to once every six days.

To determine precision for the PM_{10} networks, a collocated monitor was operated on a once every six day sampling schedule at the two highest sites, Wyoming (260810007) and Dearborn (261630033). When a $PM_{2.5}$ FRM sampler had to be added to Wyoming to meet the modifications in network design, the collocated PM_{10} sampler was removed on December 31, 2006 due to limited power. Two precision samplers were no longer required because the MDEQ had assumed responsibility for the entire air monitoring network in October 2002.

PM QUALITY ASSURANCE

The site operator conducts a flow check each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

PLANS FOR 2008 PM_{10} MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, the MDEQ is planning to operate 24-hour PM_{10} monitors at:

- The PM_{10} monitor in Allen Park (261630001) on a once every six day schedule
- The PM_{10} monitor in Fort Street/Southwest High School (261630015) on a once every six day schedule
- The PM_{10} monitor in Dearborn (261630033) and the collocated PM_{10} monitor on a once every six day schedule.
- The PM_{10} monitor at Monroe Street in Grand Rapids (260810020) on a once every six day schedule
- The PM_{10} monitor at Wealthy Street in Grand Rapids (260810007) on a once every six day schedule
- The special purpose monitor PM_{10} TEOM at Dearborn (261630033) on a daily schedule

CARBON MONOXIDE (CO) MONITORING NETWORK:

The new monitoring regulations no longer require CO monitoring. Therefore, when the budget was cut April 2007, the following CO monitors were shut down: Warren (260991003), Oak Park (261250001), Livonia (261630025), and Linwood (261630016). In the previous year, the trace level CO monitors at Newberry School (261630038) and at Lafayette (261630039) were shut down on March 31st. Since Grand Rapids and Detroit may be future NCORE sites and trace CO is a required component of the NCORE program, the CO monitors at Grand Rapids (260810020) and Allen Park (261630001) were shut down and replaced with trace gas CO monitors.

Table 22 summarizes the CO monitoring site information for sites that were in existence in 2006. **Table 23** shows the CO sites that are currently in operation. **Figure 10** compares the CO network in 2006 with the current design.

TABLE 22: MICHIGAN'S 2006 CO MONITORING NETWORK

Operating Schedule: Continuous
Method: Non-dispersive Infrared Continuous Monitor

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Grand Rapids	260810020	1179 MONROE NW	42.9842	-85.671389	pop exp	nghbrhd	Kent	4/24/80	GRW	GRMH	1,088,514
Warren	260991003	WARREN FIRE STATION COMMON & HOOVER	42.5133	-83.006111	pop exp	nghbrhd	Macomb	11/1/76	DWL	DWF	5,456,428
Oak Park	261250001	13701 OAK PARK BLVD.	42.4631	-83.183333	pop exp	nghbrhd	Oakland	1/9/81	DWL	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.2286	-83.208333	pop exp	nghbrhd	Wayne	4/6/72	DWL	DWF	5,456,428
Linwood	261630016	6050 LINWOOD	42.3578	-83.09617	pop exp	nghbrhd	Wayne	1/1/72	DWL	DWF	5,456,428
Livonia	261630025	38707 SEVEN MILE ROAD	42.4231	-83.426389	pop exp	nghbrhd	Wayne	9/11/92	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 23: 2007 CO MONITORING NETWORK IN MICHIGAN

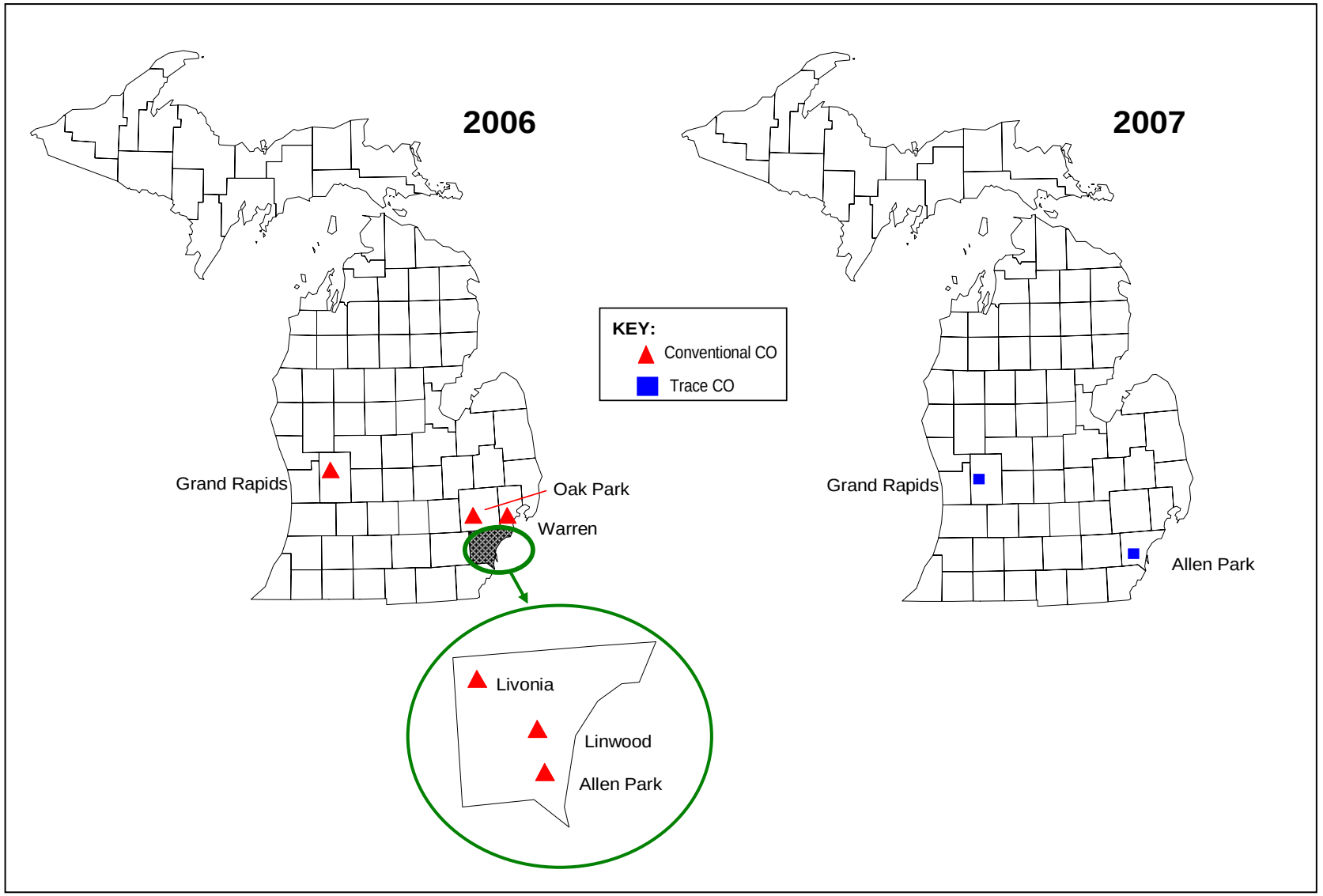
Operating Schedule: Continuous
Network as of May, 2007
Method: Gas Filter Correlation Analyzer- Trace CO

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Grand Rapids	260810020	1179 MONROE NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	4/10/07	GRW	GRMH	1,088,514
Allen Park	261630001	14700 GODDARD	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	5/24/07	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 10: COMPARISON OF MICHIGAN'S 2006 AND 2007 CO MONITORING NETWORK



CO QUALITY ASSURANCE

The site operator performs a precision check of the analyzer every two weeks. Each monitor is audited annually by the AMU's QA Team. The auditor has a separate reporting line of authority from the site operator. The audit utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits to 20% of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

PLANS FOR 2008 CO MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, Michigan is planning operate trace level CO monitors in preparation for NCORE deployment at:

- Grand Rapids (26810020)
- Allen Park (261630001)

NITROGEN DIOXIDE (NO_2) AND NO_Y MONITORING NETWORK:

The October 17, 2006 regulations no longer require NO_2 monitoring. Therefore, when the budget was cut in April 2007, the following NO_2 monitors were shut down: Grand Rapids (260810020) and Linwood (261630016). The Holland NO_Y (260050003) monitor was also shut down. Detroit's E. Seven Mile (261630019) monitor was retained because it is the downwind NO_2 site in the Detroit area. The Linwood monitor (261630016) was shut down because it was thought less useful in modeling exercises.

Trace NO_Y monitors for the NCORE sites at Grand Rapids (260810020) and Allen Park (261630001) will be deployed before January 2008.

Table 24 summarizes the NO_2 and NO_Y monitoring site information for sites that were in existence in 2006. **Table 25** shows the NO_2 and NO_Y sites that are currently in operation. **Figure 11** compares the NO_2 and NO_Y monitoring network in 2006 with the current design.

TABLE 24: MICHIGAN'S 2006 NO_2 AND NO_Y MONITORING NETWORK

Operating Schedule: Continuous
Method: Chemiluminescense
Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Linwood	**261630016**	**6050 LINWOOD**	42.358	-83.09617	NO2	**max conc**	**nghbrhd**	**Wayne**	**1/1/75**	**DWL**	**DWF**	**5,456,428**
E 7 Mile	**261630019**	**11600 EAST SEVEN MILE ROAD**	42.431	-83.00028	NO2	**pop exp**	**urban**	**Wayne**	**12/1/90**	**DWL**	**DWF**	**5,456,428**
Holland	260050003	OTTOGAN_ST. BETWEEN 61ST & 62ND STS.	42.768	-86.14861	NOY	max conc	regional	Allegan	6/2/96	Allegan Micro	GRMH	1,088,514
Grand Rapids	260810020	1179 MONROE NW	42.984	-85.67139	NO2	pop exp	nghbrhd	Kent	1/14/02	GRW	GRMH	1,088,514

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Are

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 25: 2007 NO_2 AND NO_Y MONITORING NETWORK IN MICHIGAN

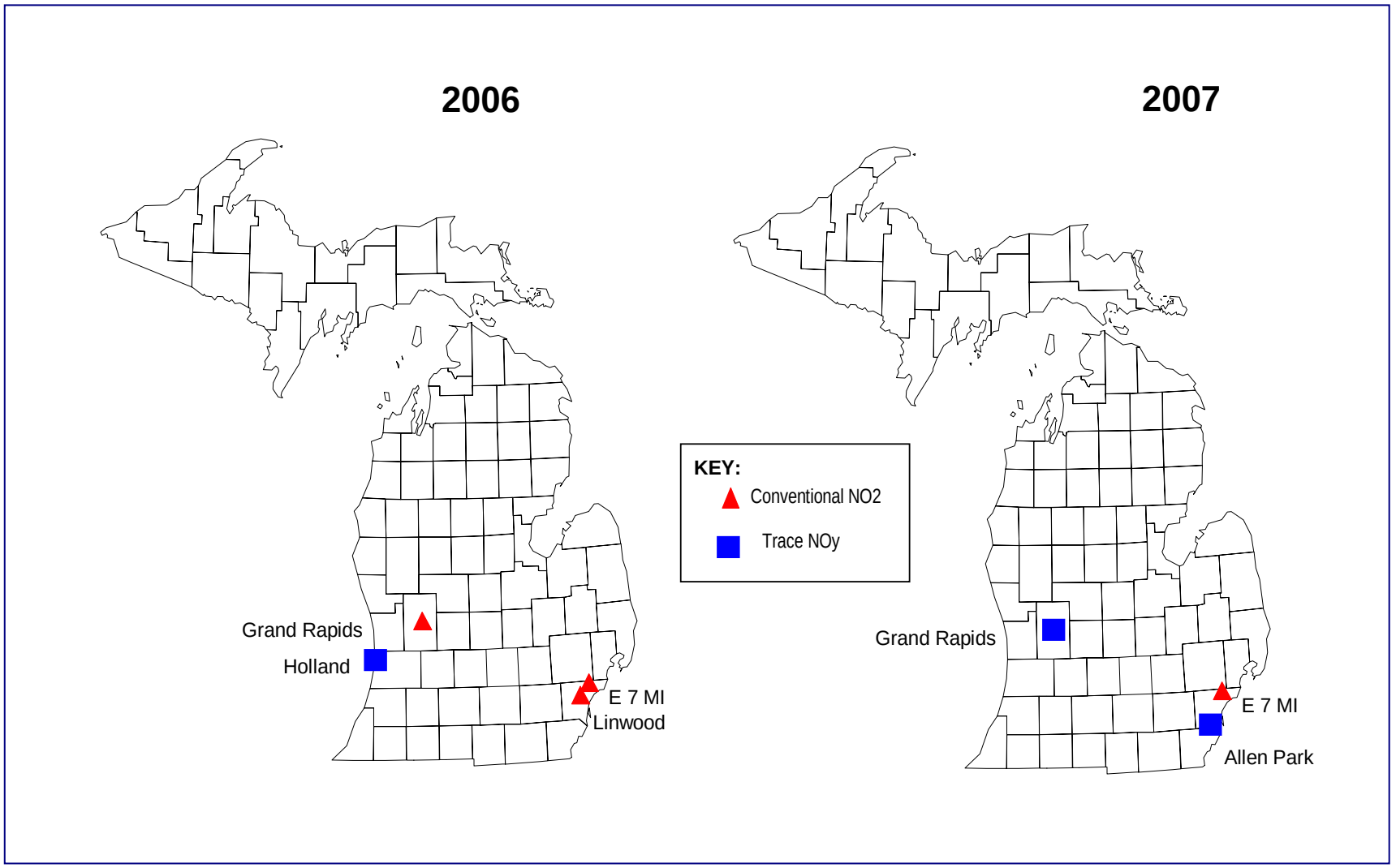
Operating Schedule: Continuous
Method: Chemiluminescense
Network as of May, 2007
Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
E 7 Mile	**261630019**	**11600 EAST SEVEN MILE ROAD**	42.431	-83.00028	**NO_2**	**pop exp**	**urban**	**Wayne**	**12/1/90**	**DWL**	**DWF**	**5,456,428**
Grand Rapids	260810020	1179 MONROE NW	42.984	-85.67139	trace	pop exp	nghbrhd	Kent	before 1/1/2008	GRW	GRMH	1,088,514
Allen Park	261630001	14700 GODDARD	42.229	-83.20833	trace	pop exp	nghbrhd	Wayne	before 1/1/2008	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Are

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 11: COMPARISON OF MICHIGAN'S 2006 AND 2007 NO_2 AND NO_Y MONITORING NETWORK



NO_2 AND NO_Y QUALITY ASSURANCE

The site operator performs a precision check of the analyzer every two weeks. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The audit utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the precision check results and audit results to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits to 20% of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

PLANS FOR 2008 NO_2 AND NO_Y MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, the MDEQ is planning operate NO_2 at:

- E. Seven Mile Road in Detroit (261630019)

Beginning in 2008, Michigan is planning operate a trace level NO_Y monitor in preparation for NCORE deployment at:

- Grand Rapids site (26810020)
- Allen Park site (261630001)

SULFUR DIOXIDE (SO_2) MONITORING NETWORK:

The October 27, 2006 monitoring regulations no longer require SO_2 monitoring. Therefore, when the budget was cut in April 2007, the following SO_2 monitors were shut down: Warren (260991003), Grand Rapids (260810020), Flint (260490021), Port Huron (261470005), Linwood (261630016) and E. Seven Mile in Detroit (261630019).

The SO_2 monitor was retained at Southwest High School (261630015) because it has the highest annual average SO_2 levels in Southeast Michigan, is located in the old nonattainment area for SO_2, was a NAMS site, and is important for trend levels. This monitor has been in operation for 32 years.

Trace SO_2 monitors for the NCORE sites at Grand Rapids (260810020) and Allen Park (261630001) will be deployed before January 2008, after the purchasing has been completed.

Table 26 summarizes the SO_2 monitoring site information for sites that were in existence in 2006. **Table 27** shows the SO_2 sites that are currently in operation. **Figure 12** compares the SO_2 network in 2006 with the current design.

TABLE 26: MICHIGAN'S 2006 SO_2 MONITORING NETWORK

Operating Schedule: Continuous

Method: Ultra Violet Stimulated Fluorescence

Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Warren	**260991003**	**WARREN FIRE STN COMMON & HOOVER**	42.51333	-83.006111	**SO2**	**pop exp**	**nghbrhd**	**Macomb**	**11/1/76**	**DWL**	**DWF**	**5,456,428**
Fort St. (SWHS)	**261630015**	**6921 W. FORT**	42.30278	-83.106667	**SO2**	**max conc**	**nghbrhd**	**Wayne**	**1/1/71**	**DWL**	**DWF**	**5,456,428**
E 7 Mile	**261630019**	**11600 EAST SEVEN MILE ROAD**	42.43083	-83.000278	**SO2**	**pop exp**	**nghbrhd**	**Wayne**	**1/5/71**	**DWL**	**DWF**	**5,456,428**
Flint	260490021	WHALEY PARK, 3610 IOWA	43.04722	-83.670278	**SO2**	pop exp	nghbrhd	Genesee	7/1/92	Flint	**DWF**	5,456,428
Port Huron	261470005	2525 DOVE RD	42.95333	-82.456389	**SO2**	max conc	nghbrhd	Saint Clair	2/28/81	**DWL**	**DWF**	5,456,428
Linwood	261630016	6050 LINWOOD	42.3578	-83.09617	**SO2**	pop exp	nghbrhd	Wayne	1/1/72	**DWL**	**DWF**	5,456,428
Grand Rapids	260810020	1179 MONROE NW	42.98417	-85.671389	**SO2**	pop exp	nghbrhd	Kent	4/24/80	GRW	GRMH	1,088,514

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 27: 2007 SO_2 MONITORING NETWORK IN MICHIGAN

Operating Schedule: Continuous

Network as of May, 2007

Method: Ultra Violet Stimulated Fluorescence

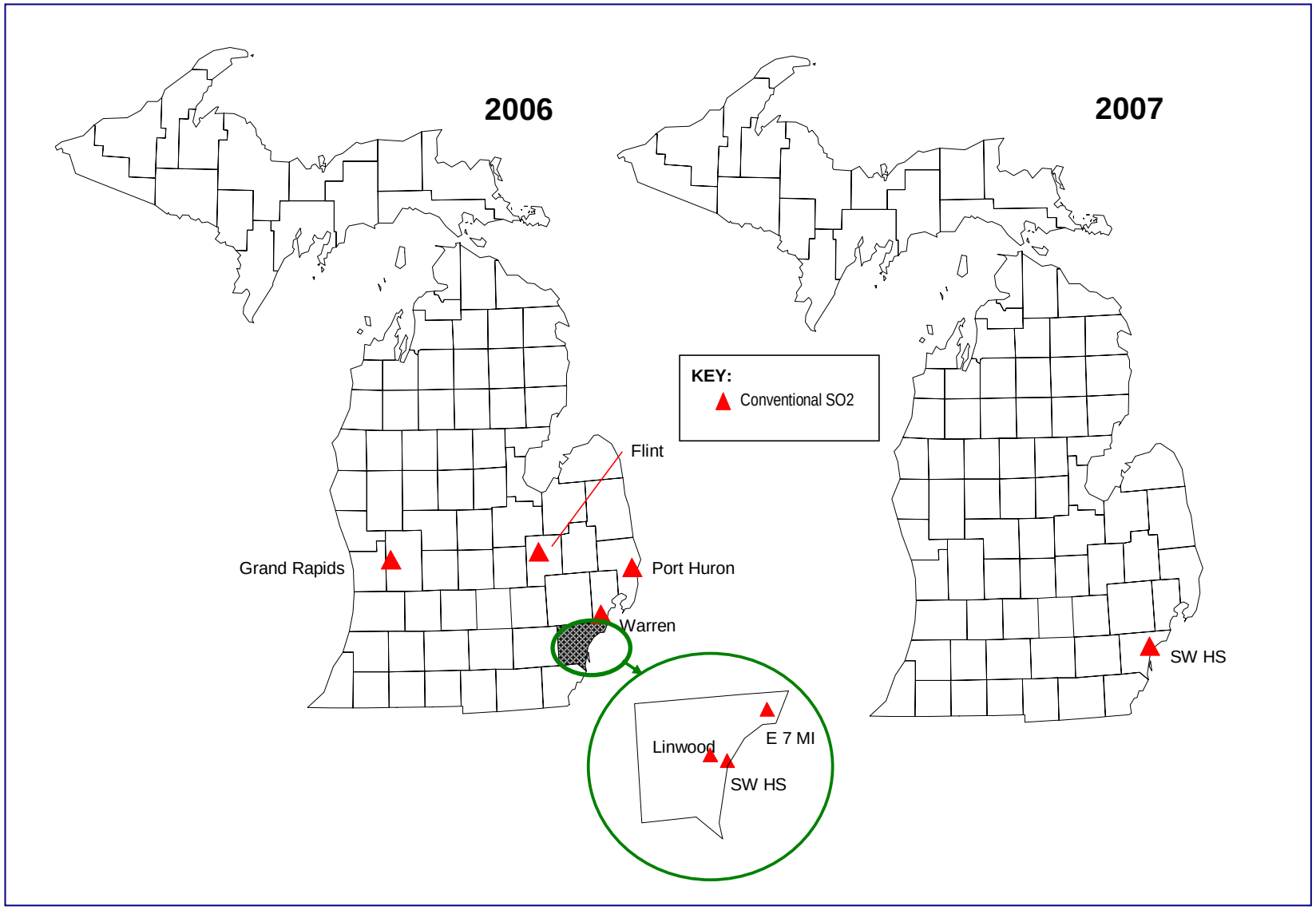
Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Fort St. (SWHS)	**261630015**	**6921 W. FORT**	42.30278	-83.106667	**SO2**	**max conc**	**nghbrhd**	**Wayne**	**1/1/71**	**DWL**	**DWF**	**5,456,428**
Grand Rapids	260810020	1179 MONROE NW	42.98417	-85.671389	trace	pop exp	nghbrhd	Kent	before 1/1/2008	GRW	GRMH	1,088,514
Allen Park	261630001	14700 GODDARD	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	before 1/1/2008	DWL	DWF	5,456,428

[1] PMSA Key:
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] CSA Key:
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 12: COMPARISON OF MICHIGAN'S 2006 AND 2007 SO_2 MONITORING NETWORK



SO_2 QUALITY ASSURANCE

The site operator performs a precision check of the analyzer every two weeks. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The audit utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the precision check results and audit results to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits of 20% of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to the AQS.

PLANS FOR 2008 SO_2 MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, the MDEQ is planning operate SO_2 at:

- Southwest High School site (261630015).

Beginning in 2008, the MDEQ is planning operate a trace level SO_2 monitors in preparation for NCORE deployment at:

- Grand Rapids site (26810020)
- Allen Park site (261630001).

LEAD MONITORING NETWORK:

The January 20, 1999 monitoring requirements for lead state that a single NAMS site must be located in one of the two cities with the greatest population in each region. In Region 5, the Chicago-Gary-Kenosha CSA and the Detroit-Ann Arbor-Flint CSA have the largest populations, with Chicago exceeding the population level in Detroit. Although the formal NAMS lead monitor for the region should remain in Chicago due to its larger population, the NAMS monitor at Detroit's E. Seven Mile (261630019) continued its operation as a trace metals site.

The October 17, 2006 monitoring requirements also de-emphasized monitoring for lead. Historically, lead levels in Michigan have been far below the NAAQS. Therefore, as a result of the budget cuts in April 2007, most of the lead sites that were collecting lead levels as part of the Michigan Toxics Air Monitoring Program (MITAMP) were either shut down, or the number of elements that are measured by the laboratory was curtailed as a cost-savings practice. Lead was discontinued at Ypsilanti (261610008), Southwest High School (261630015), River Rouge (261630005), Allen Park (261630001), Grand Rapids (260810020), Flint (260490021), and at the background site at Houghton Lake (261130001). In the future, more lead monitoring may be required if a more stringent lead NAAQS is enacted.

Dearborn (261630033) has been designated as a NATTS and as such, must determine trace metal concentrations from PM_{10} filters. The MDEQ is continuing to measure trace metals from TSP to maintain continuity with our historical database and provide a full suite of trace metal measurements by various size fractions ($PM_{2.5}$, PM_{10}, TSP) at the NATTS site. Since operation of this site is funded through another grant source, monitoring of lead and the other trace metals, both as TSP and as PM_{10} continued without interruption. TSP metals will continue to be measured at Dearborn, retaining continuity with the MDEQ's historical database. Lead measurements as $PM_{2.5}$ are made through out the speciation network.

Table 28 summarizes the lead monitoring site information for sites that were in existence in 2006. **Table 29** shows the lead site that is currently in operation. **Figure 13** compares the lead network in 2006 with the current design.

TABLE 28: MICHIGAN'S 2006 LEAD MONITORING NETWORK

Operating Schedule: 1:6 and 1:12

Method: High Volume Sampler & ICAP Spectra

Former NAMS sites are shown in bold.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
E.7 Mile	**261630019**	**11600 E. SEVEN MILE RD**	42.430833	-83.000278	1:6	**pop exp**	**nghbrhd**	**Wayne**	**1/5/71**	DWL	DWF	**5,456,428**
Flint	260490021	WHALEY PARK, 3610 IOWA	43.04722	-83.670278	1:6	max conc	nghbrhd	Genesee	6/17/92	Flint	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.228611	-83.208333	1:6	pop exp	nghbrhd	Wayne	5/1/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Grand Rapids	260810020	1179 MONROE NW	42.984167	-85.671389	1:12	pop exp	nghbrhd	Kent	1/4/05	GRW	GRMH	1,088,514
Houghton Lake	261130001	1769 S. JEFFS ROAD	44.310556	-84.891944	1:6	bkgrd	regional	Missaukee	6/10/98	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.240556	-83.599722	1:12	pop exp	nghbrhd	Washtenaw	5/30/00	Ann Arbor	DWF	5,456,428
River Rouge	261630005	315 GENESEE	42.267222	-83.132222	1:6	max conc	nghbrhd	Wayne	1/1/94	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428
Delray (Yellow Freight)	261630027	7701 W JEFFERSON	42.292222	-83.106944	1:6	max conc	nghbrhd	Wayne	10/6/04	DWL	DAAF	3,697,529
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 29: 2007 LEAD MONITORING NETWORK IN MICHIGAN

Operating Schedule: 1:6 and 1:12

Method: High Volume Sampler & ICAP Spectra

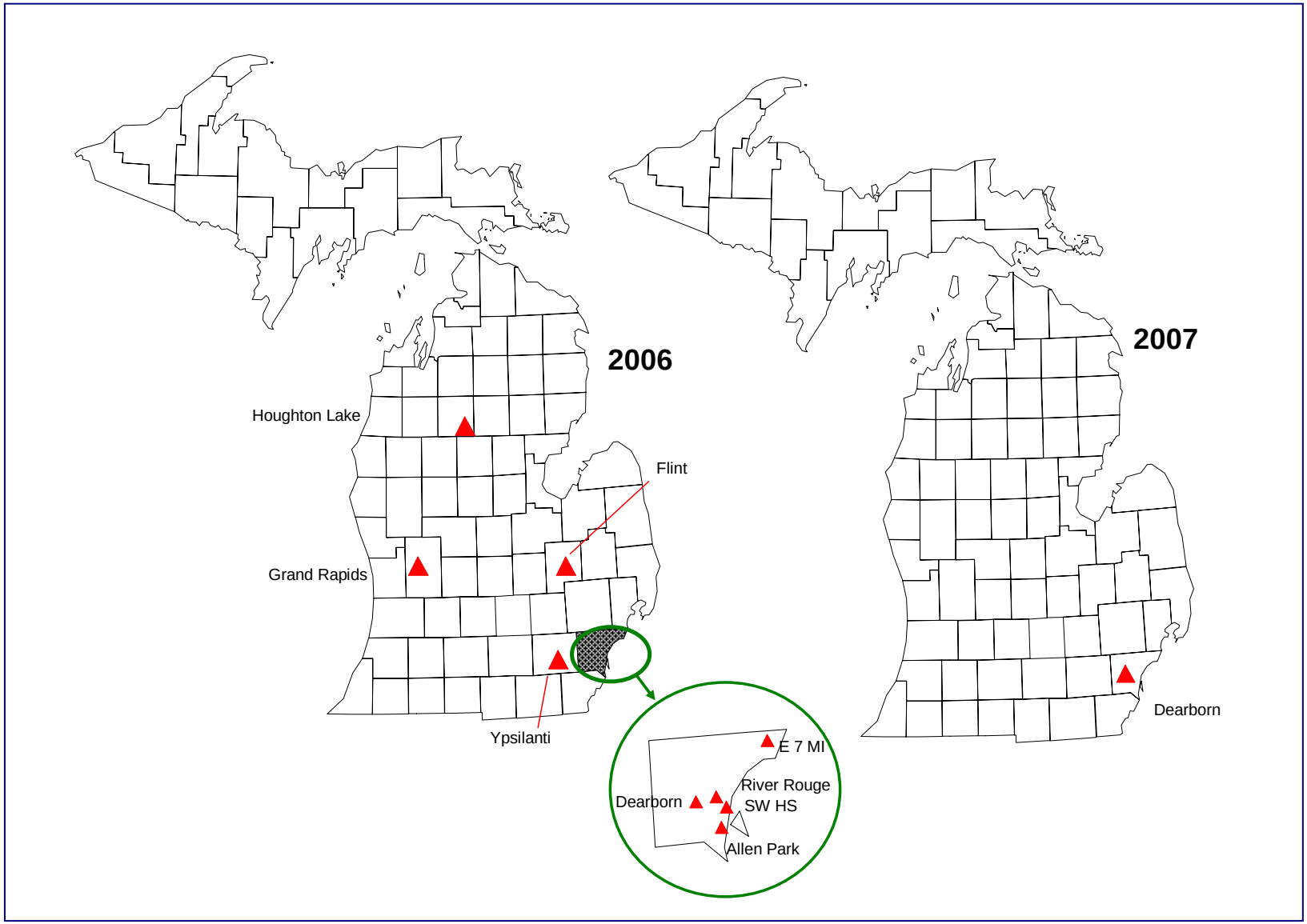
Network as of May, 2007

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA [2]	MSA Pop. (2000 Census)
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 13: COMPARISON OF MICHIGAN'S 2006 AND 2007 LEAD MONITORING NETWORK



LEAD QUALITY ASSURANCE

The site operator conducts a precision flow check each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

The MDEQ Laboratory participates in an external performance testing programs that is administered by the EPA. The audit program is part of the NPAP and is required by the CFR. Annually, the EPA sends a filter strip that is spiked with a known concentration of lead. The laboratory reports the result to the EPA and it is compared to the "true" value.

PLANS FOR 2008 LEAD MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, the MDEQ is planning to continue to collect lead measurements at:

- Dearborn NATTS site (261630033)

TRACE METAL MONITORING NETWORK:

Since 1981, monitoring for trace metals as TSP has been conducted as part of the MITAMP. Over the years, the program gradually expanded to nine sites that collected TSP samples on a once every six or once every 12 day schedule. The samples were analyzed for trace levels of metals. The suite of elements has been modified over the years, with the most recent list including beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, lead, and iron.

Monitoring for trace metals is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program for trace metals so that other required monitors could be retained. To save some of the trace metals monitoring sites, some sites were completely shut down, while the number of elements measured at others was reduced.

Trace metals as PM_{10} are determined as part of the NATTS program at Dearborn (261630033). To promote comparability with the TSP-size trace metals collected at other monitoring stations, and to assess both inter-sampler precision and method precision, collocated PM_{10} and TSP trace metals are also collected at Dearborn.

As a result of the April 2007 budget cuts, trace metal monitors at the following sites were shut down:

- Grand Rapids (260810020).
- Houghton Lake (261130001)
- Ypsilanti (261610008)
- E. Seven Mile (261630019)

Laboratory analysis for trace metals was limited to only manganese at:

- Flint (260490021)

Laboratory analysis for trace metals was reduced to manganese, arsenic, cadmium, and nickel at:

- Allen Park (261630001)
- Southwest High School (261630015)
- South Delray (261630027)
- River Rouge (261630005)

Table 30 summarizes the trace metal monitoring site information for sites that were in existence in 2006. **Table 31** shows the trace metal sites that are currently in operation as well as the elements that are measured at each. **Figure 14** compares the trace metal monitoring network in 2006 with the current design.

TABLE 30: MICHIGAN'S 2006 TRACE METAL MONITORING NETWORK

Operating Schedule: 1:6 and 1:12

Method: TSP: High Volume sampler using glass fiber filter ; Emission Spectra ICAP for lead; ICP MS for remaining m

PM_{10}: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metal

Former NAMS sites are shown in bold.

Monitoring Sites														
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
E.7 Mile	**261630019**	**11600 E. SEVEN MILE RD**	42.430833	-83.000278	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	**pop exp**	**nghbrhd**	**Wayne**	**1/5/71**	DWL	DWF	**5,456,428**
Flint	260490021	WHALEY PARK, 3610 IOWA	43.04722	-83.670278	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Genesee	6/17/92	Flint	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.228611	-83.208333	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Grand Rapids	260810020	1179 MONROE NW	42.984167	-85.671389	1:12	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	pop exp	nghbrhd	Kent	1/4/05	GRW	GRMH	1,088,514
Houghton Lake	261130001	1769 S. JEFFS ROAD	44.310556	-84.891944	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	bkgrd	regional	Missaukee	6/10/98	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.240556	-83.599722	1:12	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	pop exp	nghbrhd	Washtenaw	5/30/00	Ann Arbor	DWF	5,456,428
River Rouge	261630005	315 GENESEE	42.267222	-83.132222	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428
Delray (Yellow Freight)	261630027	7701 W JEFFERSON	42.292222	-83.106944	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL	DAAF	3,697,529
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428

[1] PMSA Key:

DWL= Detroit-Warren-Livonia Metro. Area

GRW=Grand Rapids-Wyoming Metro. Area

[2] CSA Key:

DWF = Detroit-Warren-Flint Combined Statistical Area

GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 31: 2007 TRACE METAL MONITORING NETWORK IN MICHIGAN

Operating Schedule: 1:6 and 1:12

Method: TSP: High Volume sampler using glass fiber filter ; Emission Spectra ICAP for lead; ICP MS for remaining m

PM_{10}: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metal

Former NAMS sites are shown in bold.

Network as of May, 2007

Monitoring Sites														
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Flint	260490021	WHALEY PARK, 3610 IOWA	43.04722	-83.670278	1:6	Mn	TSP	max conc	nghbrhd	Genesee	6/17/92	Flint	DWF	5,456,428
Allen Park	261630001	14700 GODDARD	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
River Rouge	261630005	315 GENESEE	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428
Delray (Yellow Freight)	261630027	7701 W JEFFERSON	42.292222	-83.106944	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL	DAAF	3,697,529
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428

[1] PMSA Key:

DWL= Detroit-Warren-Livonia Metro. Area

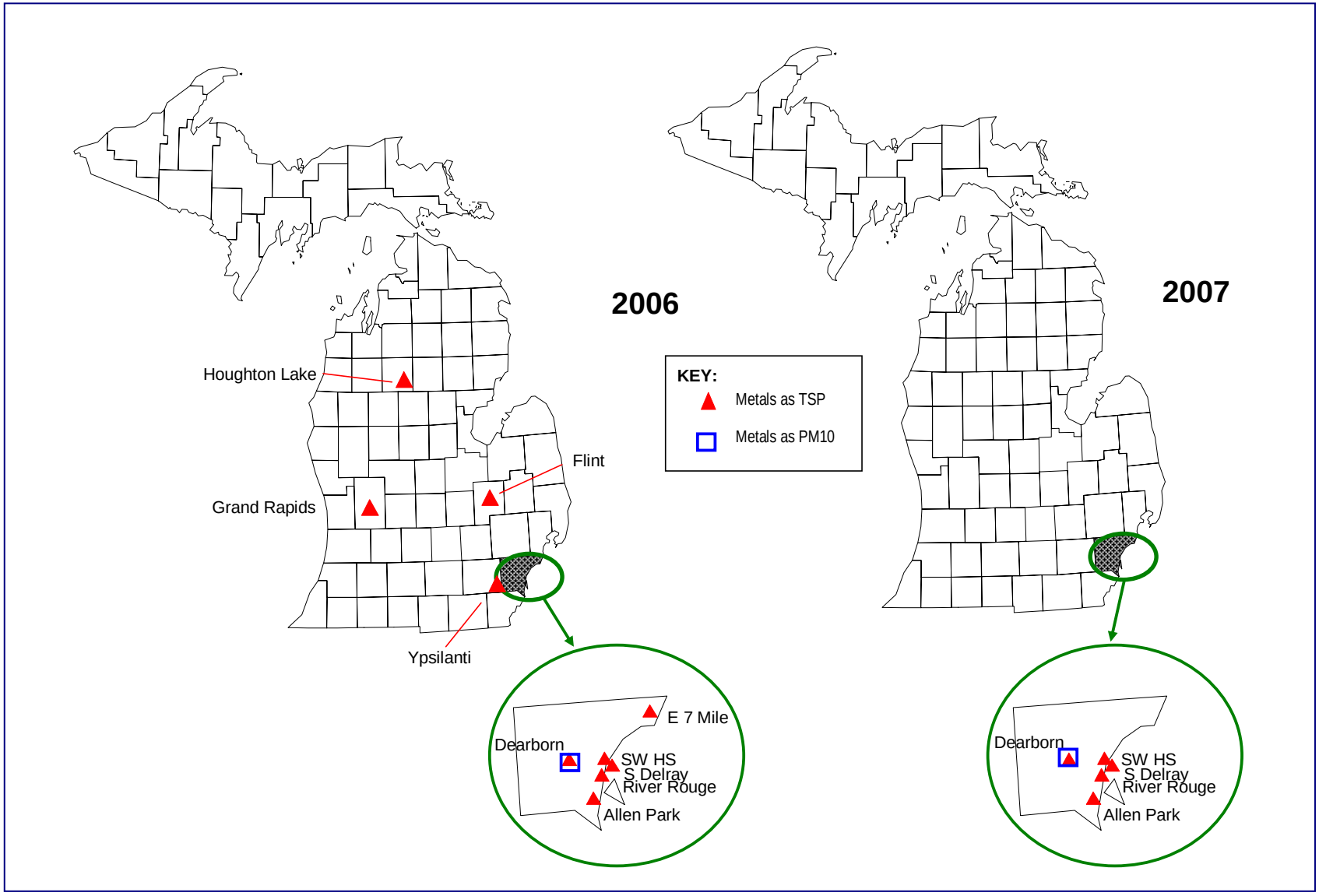
GRW=Grand Rapids-Wyoming Metro. Area

[2] CSA Key:

DWF = Detroit-Warren-Flint Combined Statistical Area

GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 14: COMPARISON OF MICHIGAN'S 2006 AND 2007 TRACE METAL MONITORING NETWORK



TRACE METAL QUALITY ASSURANCE

The site operator conducts a precision flow check each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

The MDEQ Laboratory participates in two types of external performance testing programs. Each quarter, a nationally based audit sample is sent that has a known concentration of metals spiked on to a filter. The results are compared to a "true" value. Each quarter, the MDEQ Laboratory also receives a regional round robin audit. The regional audit sample is collected by running an ambient air monitor for 24 hours. The filter is cut into strips and sent to the several laboratories. The results for the participating laboratories are compared to each other since a "true" value is not known.

Precision samples for both PM_{10} and TSP-sized trace metals are collected at Dearborn (261630033) on a once every six day frequency.

PLANS FOR 2008 TRACE METAL NETWORK:

During 2008, contingent upon adequate levels of funding, the MDEQ is planning to continue to collect trace metal measurements, as described for the above elements at:

- Flint (260490021)
- Allen Park (261630001)
- Southwest High School (261630015)
- South Delray (261630027)
- River Rouge (261630005)
- Dearborn NATTS site (261630033) for both PM_{10} and TSP

VOLATILE ORGANIC COMPOUND (VOC) MONITORING NETWORK:

The collection of more than 50 VOCs per sample began at various sites in 1990 as part of MITAMP. Either a once every six day or once every 12 day sampling frequency has been used depending on the site and budget status. The Southwest High School (261630005) site in Detroit has been the trend site and has collected VOC samples every year since 1993. The determination of VOC samples on a one every six day sampling frequency using Method TO-15 is required for the NATTS site at Dearborn (261630033).

At most sites, monitoring for VOCs is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. To save some of the VOC monitoring sites, other sites were completely shut down.

As a result of the April 2007 budget cuts, the VOC samplers at the following sites were shut down:

- Grand Rapids (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008)

Table 32 summarizes the VOC monitoring site information for sites that were in existence in 2006. **Table 33** shows the VOC sites that are currently in operation. **Figure 15** compares the VOC monitoring network in 2006 with the current design.

TABLE 32: MICHIGAN'S 2006 VOC MONITORING NETWORK

Operating Schedule: 1:6 and 1:12; PAMS site has hourly measurements via GC
Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples)

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Grand Rapids	260810020	1179 MONROE NW	42.984167	-85.671389	1:12	pop exp	nghbrhd	Kent	1/4/05	GRW	GRMH	1,088,514
Houghton Lake	261130001	1769 S. JEFFS ROAD	44.310556	-84.891944	1:6	bkgrd	regional	Missaukee	6/10/98	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.240556	-83.599722	1:12	pop exp	nghbrhd	Washtenaw	5/30/00	Ann Arbor	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
E.7 Mile	261630019	11600 E. SEVEN MILE RD	42.430833	-83.000278	hourly GC	pop exp	nghbrhd	Wayne	1/5/71	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 33: 2007 VOC MONITORING NETWORK IN MICHIGAN

Operating Schedule: 1:6 and 1:12; PAMS site has hourly measurements via GC
Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr sam Network as of May, 2007

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
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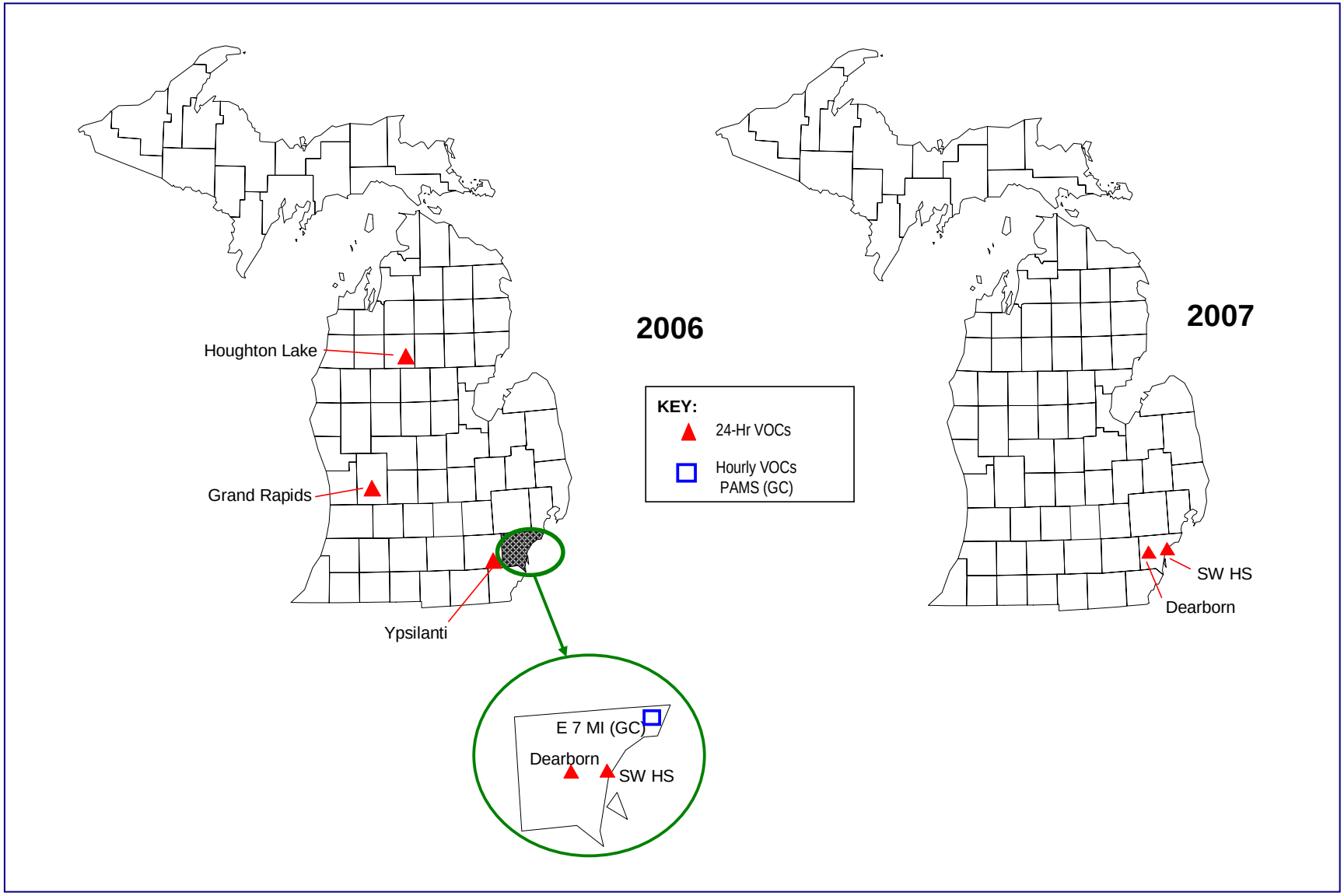
[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

FIGURE 15: COMPARISON OF MICHIGAN'S 2006 AND 2007 VOC MONITORING NETWORK



VOC QUALITY ASSURANCE

Once a year, the QA Team conducts as gaseous thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected into a clean, evacuated 6-liter Summa canister, and analyzed using EPA Method TO-15. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The MDEQ Laboratory also participates in both a national and regional performance test program. The national program sends a spiked sample of known compounds and concentrations to the laboratory. The results are compared to the "true" value. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples.

Performance evaluation samples containing known levels of various VOCs are analyzed by the MDEQ Laboratory on a quarterly basis. The MDEQ Laboratory also participates in regional round robin samples.

PLANS FOR 2008 VOC MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, the MDEQ is planning to continue to collect VOCs on a once every six day sampling frequency at:

- Southwest High School (261630015)
- Dearborn NATTS site (261630033)

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS) MONITORING NETWORK

An automated gas chromatograph (GC) was operating at the Type 3 PAMS site in Holland from 1997 through the end of PAMS season 1999. The GC was moved to Detroit's E. Seven Mile Road (261630019) to provide data to support the Southeast Michigan Ozone Study modeling effort. Operation of the GC was discontinued with the start of the 2007 ozone season, due to the budget cuts. The location of the E. Seven Mile site is shown in the previous **Figure 15**.

CARBONYL MONITORING NETWORK:

The collection of carbonyl compounds, including formaldehyde and acetaldehyde as part of MITAMP began at various sites in 1995. Either a once every six day or once every 12 day sampling frequency has been used depending on the site and budget status. The Southwest High School (261630005) site in Detroit has been the trend site and has collected carbonyl samples every year since 1995.

Levels of formaldehyde in Southeast Michigan are very heterogeneous, unlike other areas of the United States. Historical concentrations at River Rouge (261630005) are elevated, so the continuation of this monitor is important for the characterization of risk and for the determination of trends. Southwest High School (261630015) is MDEQ's air toxic trend site, so monitoring is continued. Monitoring for carbonyl compounds on a one in six day frequency using Method TO-11A is required at the Dearborn NATTS site (261630033).

At most sites, monitoring for carbonyls is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. To save some of the carbonyl monitoring sites, other sites were completely shut down. As a result of the April 2007 budget cuts, the carbonyl samplers at the following sites were shut down:

- Grand Rapids (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008)

Table 34 summarizes the carbonyl monitoring site information for sites that were in existence in 2006. **Table 35** shows the carbonyl sites that are currently in operation. **Figure 16** compares the carbonyl monitoring network in 2006 with the current design.

TABLE 34: MICHIGAN'S 2006 CARBONYL MONITORING NETWORK

Operating Schedule: 1:6 and 1:12

Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
Grand Rapids	260810020	1179 MONROE NW	42.984167	-85.671389	1:12	pop exp	nghbrhd	Kent	1/4/05	GRW	GRMH	1,088,514
Houghton Lake	261130001	1769 S. JEFFS ROAD	44.310556	-84.891944	1:12	bkgrd	regional	Missaukee	6/10/98	Not in MSA	Not in CSA	N/A
Ypsilanti	261610008	555 TOWNER AVE	42.240556	-83.599722	1:12	pop exp	nghbrhd	Washtenaw	5/30/00	Ann Arbor	DWF	5,456,428
River Rouge	261630005	315 GENESEE	42.267222	-83.132222	1:6	max conc	nghbrhd	Wayne	1/1/94	DWL	DWF	5,456,428
SW Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GRW=Grand Rapids-Wyoming Metro. Area

[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
GRMH = Grand Rapids-Muskegon-Holland Combined Stat. Area

TABLE 35: 2007 CARBONYL MONITORING NETWORK IN MICHIGAN

Operating Schedule: 1:6 and 1:12

Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption

Network as of May, 2007

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	PMSA[1]	CSA[2]	MSA Pop. (2000 Census)
Dearborn	261630033	2842 WYOMING	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	DWF	5,456,428
River Rouge	261630005	315 GENESEE	42.267222	-83.132222	1:6	max conc	nghbrhd	Wayne	1/1/94	DWL	DWF	5,456,428
Highsch., Detroit	261630015	SW HIGHSCHOOL, 6921 W. FORT ST., DETROIT	42.302778	-83.106667	1:6	pop exp	nghbrhd	Wayne	2/26/99	DWL	DWF	5,456,428

[1] **PMSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
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[2] **CSA Key:**
DWF = Detroit-Warren-Flint Combined Statistical Area
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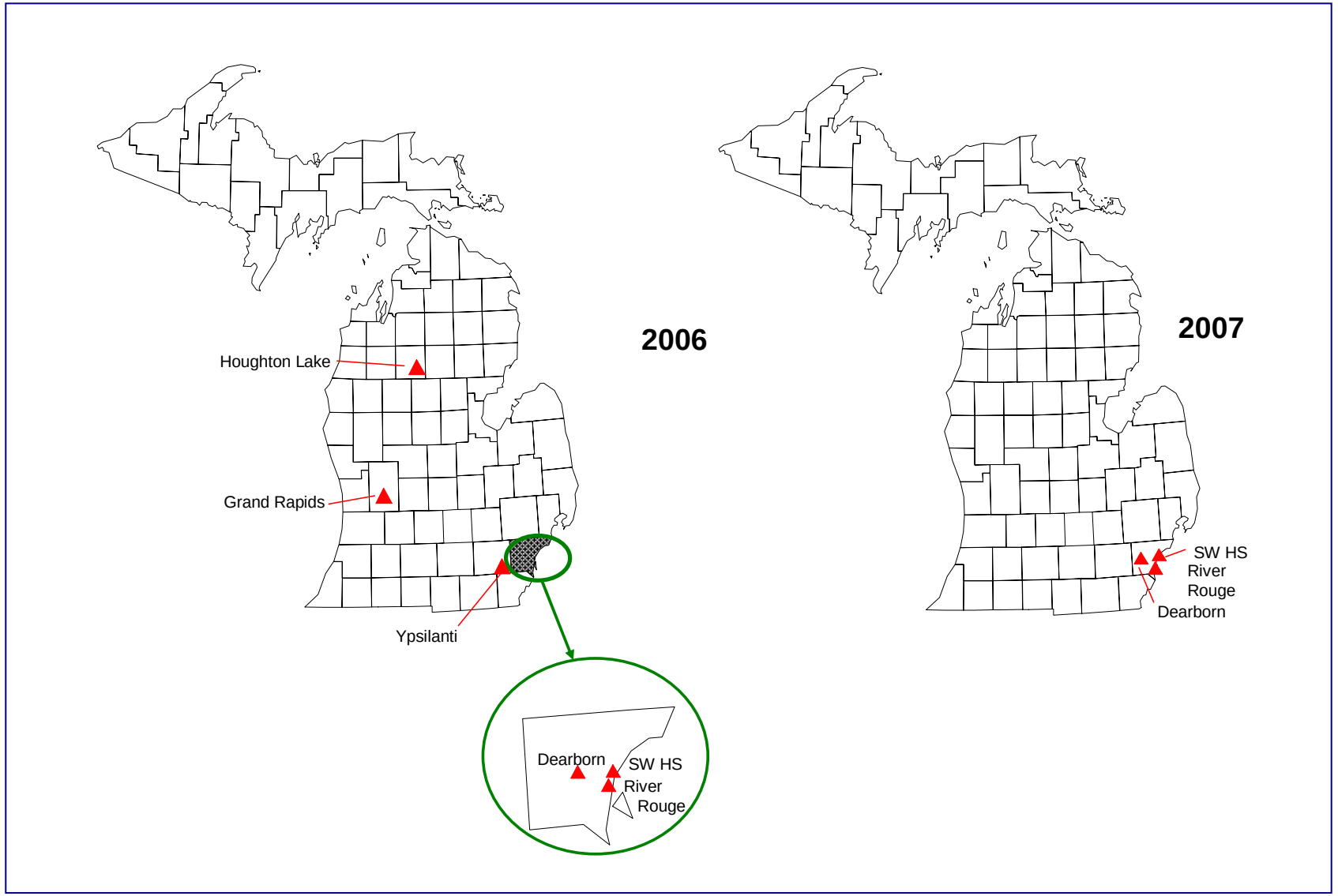
FIGURE 16: COMPARISON OF MICHIGAN'S 2006 AND 2007 CARBONYL MONITORING NETWORK



CARBONYL QUALITY ASSURANCE

Once a year, the QA Team conducts as gaseous thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected into a clean, evacuated 6-liter Summa canister, and analyzed using EPA Method TO-11A. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The MDEQ Laboratory also participates in both a national and regional performance test program. The national program sends a spiked sample of known compounds and concentrations to the Laboratory. The results are compared to the "true" value. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples.

The MDEQ Laboratory received bi-annual performance evaluation samples from a contract through EPA that are analyzed for carbonyl compounds. The MDEQ Laboratory also analyzes regional round robin samples.

PLANS FOR 2008 CARBONYL MONITORING NETWORK

During 2008, contingent upon adequate levels of funding, Michigan is planning to continue to collect carbonyls on a once every six day sampling frequency at:

- Southwest High School (261630015)
- River Rouge (261630005)
- Dearborn NATTS site (261630033)

METEOROLOGICAL MEASUREMENTS:

Various meteorological measurements have been added to sites across the network to supplement the ambient monitoring network and enhance data analysis activities. No changes are planned to the meteorological network.

METEOROLOGICAL EQUIPMENT QUALITY ASSURANCE

On an annual basis, an Equipment Technician conducts a multi-speed and directional certification of the propeller anemometer and vane systems. The QA Team staff or senior Environmental Technician performs a "sun shot" to check the station meteorological systems at the monitoring stations. A comparison check is conducted for indoor and outdoor temperature, barometric pressure, and relative humidity. The comparison is done between the station's measurements and the auditor's certified thermometer, barometer, and hygrometer.

ADEQUACY OF MICHIGAN'S MONITORING SITES:

The suitability of the monitoring sites locations is frequently assessed by the AMU's QA Team and by the EPA. The EPA assesses the adequacy of the stations during $PM_{2.5}$ PEP audits, gaseous NPAP audits, and systems audits. The results indicate that the stations are properly sited which includes distances away from obstructions, large trees, and set backs from roadways. Suitability of probe heights and separation distances are assessed by both MDEQ and EPA auditors.

APPENDIX A: ACRONYMS AND THEIR DEFINITIONS:

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
µg/m^3	Micrograms per cubic meter
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQS	Air Quality System (EPA air monitoring data archive)
ARM	Automotive Recyclers of Michigan
As	Arsenic (trace metal)
Ba	Barium (trace metal)
Be	Beryllium (trace metal)
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
Cd	Cadmium (trace metal)
CFR	Code of Federal Regulations
Co	Cobalt (trace metal)
CO	Carbon monoxide
Cr	Chromium (trace metal)
CSA	Consolidated Statistical Area
Cu	Copper
EC	Elemental carbon
EPA	U.S. Environmental Protection Agency
FDMS	Filter Dynamic Measurement System
Fe	Iron (trace metal)
FIA	Family Independence Agency
FRM	Federal Reference Method
GC	Gas chromatograph (instrument providing hourly VOC measurements)
hr	Hour
IN-MI	Indiana-Michigan
MDEQ	Michigan Department of Environmental Quality
MITAMP	Michigan Toxics Air Monitoring Program
Mn	Manganese (trace metal)
Mo	Molybdenum (trace metal)
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trend Sites
NCORE	National Core Monitoring Sites
Ni	Nickel (trace metal)
NO_2	Nitrogen dioxide
NO_X	Oxides of Nitrogen
NO_Y	Oxides of nitrogen + nitric acid + organic and inorganic nitrates
NPAP	National Performance Audit Program
OC	Organic carbon
PAH	Polynuclear Aromatic Hydrocarbon

APPENDIX A: ACRONYMS AND THEIR DEFINITIONS:

>	Greater than
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
PEP	Performance Evaluation Program
PM	Particulate matter
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter with a diameter of 10 microns or less
$PM_{10-2.5}$	Coarse PM equal to the concentration difference between PM_{10} and $PM_{2.5}$
ppm	Parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA	Quality assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated $PM_{2.5}$)
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network ($PM_{2.5}$)
SW HS	Southwest High School (261630015)
TEOM	Tapered element oscillating microbalance (hourly $PM_{2.5}$ measurement monitor)
TSP	Total Suspended Particulate
U of M	University of Michigan
U.S.	United States
V	Vanadium (trace metal)
VOC	Volatile organic compounds
W126	Weighted sum of hourly ozone values measured during daylight hours for greater level of protection to crops and vegetation (EPA's proposed secondary standard)
Zn	Zinc (trace metal)

APPENDIX B: SUMMARY OF COMMENTS RECEIVED AND MDEQ'S RESPONSE

On July 17, 2007, as part of the network review process, a draft of Michigan's 2006 Ambient Air Monitoring Network Review was placed on the Internet for a 30-day public comment period. Environmental groups and stakeholders were also notified by e-mail. This section of the network review responds to those comments received.

A total of four letters were received (see **Appendix C**) which included comments from an Indian tribe, a community health department, a non-profit agency with governmental and community based members, and from a Michigan city. General themes discussed by the respondents included:

- Links between air pollution and exacerbation of health problems.
- Reliance of various programs on air monitoring data.
- The need for more monitoring data in urban Grand Rapids and Detroit.
- The need to target hot spots.
- The need to reduce environmental exposures.
- The impact of budget cuts on the collection of ambient monitoring data needed by these respondents.
- The FY 2008 budget seems to be exactly the opposite of recommendations in the draft review.
- Information for the attainment status of Unclassified areas needs to be included.
- Long range ozone transport is a problem.
- Add a discussion on areas that don't qualify as MSAs and potential air quality problems in these areas.
- The geographical distribution of monitoring sites in the northern portion of Michigan's Lower Peninsula is sparse.

Specific concerns entailed:

- Restoration of ozone monitors to the Detroit area, specifically to: Linwood (261630016) and Fort Street/Southwest High School (261630015).
- Restoration of CO, NO_2 and SO_2 to Linwood in Detroit (261630016).
- Restoration of metals and SO_2 to Detroit's E. Seven Mile site (261630019).
- Restoration of the full suite of metals to Allen park (261630001), River Rouge (261630005), Fort Street/Southwest High School (261630015) and South Delray (261630027)
- Restore chromium monitoring at trace metal sites in Detroit that include Allen Park (261630001), Fort Street/Southwest High School (261630015), River Rouge (261630005) and South Delray (261630027).
- Due to the high levels of manganese in the Detroit area, it would be useful to collect PM_{10} and $PM_{2.5}$ sized trace metals at River Rouge (261630005). The complete suite of 14 trace metals is preferred for the PM_{10} sized fraction, but manganese alone would help.
- A reduction in the trace metals analysis conducted by the $PM_{2.5}$ speciation program is not suggested.
- Restore or increase monitoring in West Michigan, especially in Grand Rapids
- Restore VOCs to Grand Rapids (260810020)

The following section discusses the general themes first, then the specific concerns. MDEQ's responses to each comment is indented and *italicized.*

GENERAL THEMES

Links between air pollution and exacerbation of health problems.

MDEQ agrees that ambient monitoring data is an important metric and is happy to share its data with agencies conducting research between the relationship between air quality and health impacts. We are supportive of research to aid our understanding of the impacts of air pollution and encourage respondents to communicate ambient monitoring data needs to us. We have collaborated with various agencies on special studies in the past and will continue to do so in the future.

Reliance of various programs on air monitoring data.

MDEQ is happy to supply stakeholders with ambient monitoring data.

The need for more monitoring data in urban Grand Rapids and Detroit.

*MDEQ agrees that ambient monitoring data in Michigan's two largest cities is important. This item is addressed in more detail in the **Specific Issues** section that follows.*

The need to target hot spots.

MDEQ agrees that heterogeneous distribution of various pollutants can create hot spots that should be investigated to better understand the range of concentrations in ambient air. The Detroit Pilot project investigated some possible hot spots during 2001 to 2002. In 2004, MDEQ received a Community Monitoring Grant to investigate hot spots in the Delray Area and monitoring has continued on this project. More recently, MDEQ has continued to seek additional grant funds to investigate hot spot monitoring further.

The need to reduce environmental exposures.

MDEQ agrees that this is an important objective.

The impact of budget cuts on the collection of ambient monitoring data needed by these respondents.

MDEQ has attempted to retain as many monitoring sites and as many measurements as possible in spite of the budget cut. We will continue to try to retain as much spatial coverage as possible because establishing a monitoring station can be very costly. Access can also be problematic, so we wish to retain as many stations as we can. We anticipate that budget issues will continue to present challenges with the operation of a monitoring network and we will continue to investigate possible collaborations to keep the network operational.

The FY 2008 budget seems to be exactly the opposite of recommendations in the draft review.

MDEQ agrees that the STAG budget allocations are shrinking while the federal monitoring requirements are expanding. Over the past few years, the air monitoring programs have taken repeated cuts to the budget leaving an inadequate amount available for all our monitoring activities.

Information for the attainment status of Unclassified areas needs to be included.

MDEQ has done so. If a secondary standard of W126 becomes finalized by EPA, the existing ozone network may need to be supplemented with additional stations capable of assessing plant damage from exposure to ozone. Plant species especially susceptible to ozone may need to be targeted. At this time, it is too premature to create too much detail describing a W126–based network. MDEQ will wait until the ozone NAAQS becomes final.

Long range ozone transport is a problem.

MDEQ agrees. In spite of budget cuts, MDEQ has retained the ozone transport monitors along the Lake Michigan shoreline: Holland (260050003), Jenison (261390005), Muskegon

(261210039), Scottville (261050007) and Benzie (260190003). The tribal sites at Manistee (261010922) and Peshawbestown (260890001) also provide ozone transport data.

Add a discussion on areas that don't qualify as MSAs and potential air quality problems in these areas.

*MDEQ has done so. Also, if the primary ozone NAAQS is made more stringent, the minimum numbers of monitoring sites listed in **Table 3** will need to be modified. If the NAAQS is set at 0.070 ppm, all MSAs in Michigan will have a design value > 85% of the NAAQS. For areas from 50,000 to less than 350,000 population totals, one monitoring site will be required. At this point is too premature to speculate in detail on the level of the primary NAAQS and the impact it could have on the design of the monitoring networks because waivers or changes to the tables could be created.*

The geographical distribution of monitoring sites in the northern portion of Michigan's Lower Peninsula is sparse.

MDEQ received funding based on population totals and their distribution into major MSAs. Also, as described in the Network Review, the monitoring network is designed based on population distribution and ambient levels. However, background and transport sites are still a requirement of the network designs so some transport monitors are maintained along the Lake Michigan shoreline and at Houghton Lake (261130001).

SPECIFIC ISSUES

Most of the comments received relating to measurements at specific sites pertained to restoration of monitoring activities that were discontinued as a result of budget cuts.

If the budget is reinstated, MDEQ will prioritize monitoring needs and contemplate restoration of monitoring activities.

These comments included:

- Restoration of ozone monitors to the Detroit area, specifically to Linwood (261630016) and Fort Street/Southwest High School (261630015)
- Restoration of CO, NO_2 and SO_2 to Linwood in Detroit (261630016)
- Restoration of metals and SO_2 to Detroit's E. Seven Mile site (261630019)
- Restoration of the full suite of metals to Allen park (261630001), River Rouge (261630005), Fort Street/Southwest High School (261630015) and South Delray (261630027)
- Restore chromium monitoring at trace metal sites in Detroit's Allen Park (261630001), Fort Street/Southwest High School (261630015), River Rouge (261630005) and South Delray (261630027).
- Restore VOC monitoring to Grand Rapids (260810020)

New monitoring initiatives include the suggestion to add PM_{10} sized trace metals to River Rouge (26163005) either as a suite of 14 elements or as manganese alone.

This suggestion has merit because particle size impacts the toxicity of trace metals, depending on the metal. To date, Dearborn (261630033) is the only station to ever have measured trace metals as PM_{10} in the Detroit MSA[10]. Given the large degree of spatial variability of TSP metals in the Detroit MSA, it would be interesting to assess the variability of PM_{10}. Then, an analysis of risk could be performed based on spatial variability and as a

[10] In 1994, a special study was performed that measured PM_{10} trace metals at Pellston (260310001), Deckerville (261510002), South Haven (260050002) and Dexter (2616180001). These sites are located in Cheboygan, Sanilac, Allegan and Washtenaw counties, respectively. Industrial sampling for PM_{10} metals was performed in Alpena from 1995 to 1996. Another special study in 2001 focused on PM_{10} trace metals at various locations near a major point source in Holland.

function of size fraction. Within the next two years, there could be an opportunity to leverage some upcoming special studies.

Long range transport of ozone is a problem in Michigan and some monitors on the west side of the state have exceeded the NAAQS.

*The 4th highest 8-hour ozone value averaged over 2004 through 2006 for ozone sites in Michigan can be found in **Table 4** of the Network Review. Historically, the ozone transport sites [Coloma (260210014), Muskegon (261210039), Scottville (251050007) and Benzonia (260190003)] along the shoreline of Lake Michigan have indicated ozone transport is a problem. Currently all show attainment of the ozone NAAQS except for Holland (260050003). The Peshawbestown (260890001) monitor, located inland from Lake Michigan also shows attainment. These shoreline monitors are sited to detect maximum ozone concentrations. Field studies have shown that as ozone traverses inland, concentrations decrease possibly through scavenging by flora and increased mixing due to turbulence caused by rougher surfaces over the land. If the shoreline monitors are in attainment for ozone and they measure maximum concentrations, it is reasonable to assume that other locations in northern Michigan's Lower Peninsula are in attainment of the current ozone NAAQS.*

*As illustrated in **Figures 3** and **4**, if a more stringent form of the ozone NAAQS is adopted, all areas could be in danger of violating a more stringent form of the ozone NAAQS, depending on the level that is selected by EPA. A change to the ozone NAAQS could have ramifications on the network design, impacting areas other than the MSAs that currently have monitors. If **Table 4** is examined using 0.070 ppm as the level of the primary NAAQS, all monitors in Michigan have a probability of greater than 85% of violating the NAAQS. This could require ozone monitors in Jackson, Battle Creek, Saginaw and Bay City, unless changes are made to the monitoring regulations, or waivers from EPA are granted. Areas not within MSAs could also be impacted by changes in the NAAQS.*

Depending on the level and form of the secondary standard that is selected, the design of the current ozone network may be inadequate to assess impact on crops and vegetation. The majority of the ozone sites are located in urban areas, away from major agricultural areas and forests. Since agriculture is one of the top three "industries" in Michigan, and ozone inhibits plant yields, MDEQ may need to design an ozone monitoring network targeting agricultural areas. Tourism is another important Michigan "industry." Certain species of trees are highly sensitive to the effects of ozone, so monitoring may be required in selected wooded areas. In any case, until the ozone NAAQS becomes final, it is too premature to design an ozone network focusing on rural, forested areas.

A reduction in the trace metals analysis conducted by the $PM_{2.5}$ speciation program is not suggested.

If the budget is cut, MDEQ may archive the Teflon filters from the speciation program from selected sites for analysis at a later date. This may conserve enough resources to allow sites to be retained until an adequate budget can be obtained.

Increase monitoring in West Michigan, especially in Grand Rapids.

More specific information would help our network planning process. What measurements are desired and where? Also, what is the rational used to make this request? MDEQ agrees that the restoration of VOC monitoring to Grand Rapids (260810020) is important and will be considered if additional funding is obtained.

APPENDIX C: WRITTEN COMMENTS RECEIVED

CITY OF DETROIT
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
OFFICE OF THE DIRECTOR

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RECEIVED
AUG 0 1 2007
AIR QUALITY DIV.

July 25, 2007

Dr. Mary Ann Heindorf
MDEQ-Air Quality Division
PO Box 30260
Lansing, MI 48909

Re: Comments for the Michigan Annual Ambient Air Monitoring Network Review

Dear Dr. Heindorf:

The city of Detroit, through the Department of Environmental Affairs (DEA), is submitting the following comments to the draft 2007 Michigan Annual Ambient Air Monitoring Network Review.

Research has shown that certain air pollutants NO_2, SO_2, PM and ozone have associations with asthma exacerbations. Some studies indicate that ambient levels of these pollutants are associated with adverse respiratory effects even at levels below the current National Ambient Air Quality Standards (NAAQS). Some research suggests ozone may be associated with the development of new cases of asthma in children exercising outdoors. Some toxic air pollutants, including carbonyls and some trace metals, have also been shown to have associations with asthma. Federal grant funds have allowed researchers in Michigan to examine these associations more closely. The urban areas of Detroit and Grand Rapids are of special concern due to the elevated incidence of asthma, especially among children. Furthermore, both regions of the State have gained attainment compliance for the NAAQS ozone standard.

Research has also shown associations with adverse birth outcomes from exposures to CO, ozone, NO_2 and SO_2. In some cases, these associations have been at levels below NAAQS. Federal grant money also has allowed some research of these associations in Michigan.

Thus, a lack of monitoring data, especially in the urban locations of Detroit and Grand Rapids (which are the only Michigan urban comparable areas) will impede future public health efforts in disease surveillance and reduction. Targeting hot spots and reducing environmental exposures in identified areas are ways of accomplishing these goals. Indeed, one of the objectives identified in the Asthma in Michigan 2010: Blueprint for Action plan is to reduce the effects of exposure to $PM_{2.5}$ and ozone on people with asthma,

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especially among disparately impacted populations. The April, 2007 cuts and 2008 plans to continue these losses to the monitoring network will prevent future research into the degree of associations between these air pollutants and asthma or adverse birth outcomes. Any future associations between cardiovascular health and air pollutants will also be compromised. It is our understanding that the $PM_{2.5}$ monitors are safe at this time, but could be threatened after 2008

Specifically, the following Detroit monitoring locations and pollutants would be most useful for the above-noted research: Linwood and Fort St. ozone monitors; Linwood, CO, NO_2 and SO_2; and E7 mile – Metals and SO_2. Also, restoring the full metals at the Allen Park, River Rouge, Fort St. and South Delray.

If the Network is continued and fully implemented, it would be a much needed and very good environmental public health prevention program. Environmental public health tracking is a cost-effective long-term strategy for disease reduction. Ironically, the decisions reflected in the 2008 FY budget seem to be exactly the opposite of the recommendations in the draft review. It now seems to be a classic case of good report but bad policy.

Sincerely:

Vincent R. Nathan, PhD, MPH
Director

cc: George Jackson, DEGC

MaryAnn Heindorf - Comment on Ambiant Air Quality Monitoring

From: "Joan Dyer" <Joan.Dyer@kentcounty.org>
To: <heindorm@Michigan.gov>
Date: 8/16/2007 4:51:25 PM
Subject: Comment on Ambiant Air Quality Monitoring

Dear Ms. Heindorf:

Since July, 2006, the West Michigan Children's Environmental Health Initiative (CEHI) has been meeting as a collaborative body of non-profit, community-based, and governmental organizations. The mission of the CEHI is to improve the quality of life, as it relates to environmental health, for the children of West Michigan. This group of 22 organizations has started to gather community data and synthesize a preliminary prioritization of local children's environmental health issues.

As a member of this Initiative I urge the Michigan DEQ to restore, or even increase, the air monitors in Western Michigan. One of our sub-committees assigned to creating the environmental indicators prioritization has found air monitoring information useful in demonstrating concerns for children's health issues. From our perspective:

1. Air monitoring data is an important tool for assessing air quality in Grand Rapids.
2. The CEHI is concerned with environmental exposures to children and monitoring data gives us one measure to track.
3. Compliance with air quality standards will be difficult to demonstrate without these monitors.

As an advocate for children and their good health, I request that you consider restoring the ambiant air quality monitoring in West Michigan and specifically in Grand Rapids.

Thank you.

Joan R. Dyer, MPA, Program Supervisor
Kent County Health Department
Childhood Lead Poisoning Prevention Program
President of Healthy Homes Coalition Member of Get the Lead Out!
Member of the Governor's Childhood Lead Poisoning Prevention and Control Commission
Phone 616-632-7026, Fax 616-632-7016

Dr. Mary Ann Heindorf
MDEQ – Air Quality Division
P.O. Box 30260
525 West Allegan Street
Lansing, MI 48909

August 16, 2007

Re: Michigan's 2007 Annual Ambient Air Monitoring Network Review

Dr. Heindorf,

The Little Traverse Bay Bands of Odawa Indians (Band) is providing comments on the MDEQ's public comment draft version of Michigan's Annual Ambient Air Monitoring Network Review. These comments are submitted as official involvement in the review process.

The Annual Ambient Air Monitoring Network Review document provides a good summary of present and future ambient air monitor activity in Michigan. The document does not include necessary information on Unclassified areas. These Counties are classified as Attainment/Unclassified for a National Ambient Air Quality Standard (NAAQS) despite the absence of ambient air monitors and, consequently, no direct information available for assessing ambient air quality.

The Little Traverse Bay Bands of Odawa Indians Reservation is located in the northern portion of Michigan's Lower Peninsula. The Band's federally recognized Reservation covers approximately 336 square miles of land and includes the northeastern shoreline of Lake Michigan. Along with the rest of the northernmost portion of Michigan's Lower Peninsula, the Reservation is not included in the MDEQ's ambient air monitoring network. These areas are characterized as rural or small city and classified as Attainment/Unclassified for each NAAQS. The closest monitors are located at Grand Traverse Bay Bands of Ottawa and Chippewa Indians Reservation, Houghton Lake, Benzie County, Manistee County, and Seney National Wildlife Refuge.

Long-range transport of ozone across Lake Michigan and along shoreline Counties is a documented problem. As described in the Network Review document, the monitor at Grand Traverse Bay Bands of Ottawa and Chippewa Indians Reservation exceeded the proposed 8-hour ozone NAAQS with 2004-2006 averaged values. The monitor in Benzie County exceeded current 8-hour ozone NAAQS during years 2004, 2005, and 2006. Other Counties located along the Lake Michigan shoreline and without monitors may also exceed ozone and other pollutant NAAQS.

While present fiscal restraints do not facilitate new monitors sited in Counties with relatively low population concentrations, the lack of information associated with these Unclassified areas requires attention. The Annual Ambient Air Monitoring Network Review document does not mention these areas at all. The Tribe suggests that a brief

discussion of Attainment/Unclassified areas lacking monitors be included in the Network Review document. The Ambient Air Monitoring Network Requirements section (p. 3) may include a discussion on areas not qualifying as Metropolitan Statistical Areas and the potential for ambient air quality issues in these areas.

The Little Traverse Bay Bands of Odawa Indians is working to better understand and protect Northern Michigan air quality and plans to contribute to future ambient air monitoring efforts in presently Unclassified areas. The tribal community and greater Northern Michigan community deserve consideration in ambient air quality issues; the Tribe hopes to work with MDEQ to ensure that the ambient air quality of these communities are considered and protected.

Thank you for your time and consideration of our comments. If you have any questions or comments, please contact me at 231-242-1425. You may also contact the Little Traverse Bay Bands of Odawa Indians Environmental Services Director, Rachel Schwarz, at 231.242.1571.

Sincerely,

Robin Clark
Air Quality Specialist
Little Traverse Bay Bands of Odawa Indians
Environmental Services
7500 Odawa Circle
Harbor Springs, MI 49740

Cc: Rachel Schwarz, Director, Environmental Services, Little Traverse Bay Bands of Odawa Indians
Stephanie Cheney, Project Officer, Air and Radiation Division, EPA Region 5

MICHIGAN DEPARTMENT OF COMMUNITY HEALTH

MEMORANDUM

August 17, 2007

TO: Dr. MaryAnn Heindorf, MDEQ Air Quality Division

FROM: Christina Bush, MDCH Division of Environmental Health, Toxicology and Response Section Christina Rose Bush

RE: Comments on MDEQ Air Quality Division Draft Report "Michigan Annual 2006 Ambient Air Monitoring Network Review" (July 17, 2007)

You had requested that I comment on the Ambient Air Monitoring Network review document and suggest any changes, or emphasize any monitoring activities, that may be necessary to enhance public health activities at sites of concern.

The federal Agency for Toxic Substances and Disease Registry (ATSDR) conducts public health activities (assessments/consultations, advisories, education) at sites of environmental contamination and concern. The MDCH Toxicology and Response Section conducts health consultations for ATSDR under a cooperative agreement.

I am currently conducting a health consultation, at the request of the MDEQ Remediation and Redevelopment Division (RRD), regarding manganese soil concentrations in the cities of River Rouge and Ecorse. Soil levels of this metal are greater than the soil-to-ambient-air criterion for a 1,000-acre source size. It is unclear to what extent the soil is contributing to the Total Suspended Particulate (TSP) levels. More information is needed before a public health opinion can be formed. RRD is conducting a Phase III investigation, further characterizing residential and industrial soils. Ambient air data would be beneficial as well.

I read the entire review document but focused on air monitoring activities in the downriver area of Detroit. The monitoring stations of greatest interest were those whose data indicated that ambient levels of manganese, as TSP and when averaged annually, exceeded regulatory and health-based comparison values during the Detroit Air Toxics Initiative study (MDEQ 2005). These stations are, from highest exceedance to lowest: South Delray, Dearborn, North Delray (Southwest High School), and River Rouge.

The review document indicates that the Dearborn station collects and speciates TSP as well as fine and coarse Particulate Matter (PM2.5 and PM10). The other three stations of interest analyze for manganese but only collect TSP. Although the data collected at the

Dearborn station can be extrapolated, with caution, to these other sites, it would be better to have site-specific data from which to draw public health conclusions.

I am suggesting that the River Rouge station also collect PM10 and PM2.5 and analyze for at least manganese. It would preferable to analyze for all 14 metals that are listed for the Dearborn site. This data may enable me, along with RRD, to determine a "fingerprint" to compare with the results from soil analysis and determine what risk the soil, if inhaled, poses. It would also help MDEQ determine which medium, soil or air (or both), needs addressing.

Please do not hesitate to contact me for more information or to inform me as to whether this suggested additional sampling and analysis will take place.

CC: ATSDR
MDEQ Toxics Steering Group Detroit-Area Manganese PSIC Workgroup
Steven Hoin, MDEQ-RRD