CAPHE PHAP-RM

6.14 CENTRAL DETROIT

2016

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

Table of Contents

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

Tables

Figures

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

6.14 Central Detroit

Residents of Central Detroit residents live near several pollution sources that can increase pollution exposures, and also experience multiple exposures in the social environment that increase their risk of and vulnerability to adverse health outcomes. Central Detroit is home to approximately 29,000 residents. (See Section 6.14.3 below and Table 6-1).

Air quality monitoring in Central Detroit is described in Section 4. Below we describe pollutant sources of exposure for Eastside Detroit residents, along with a description of population and community characteristics that may influence vulnerability to adverse effects of exposures.

6.14.1 Point Sources

Table 6-5 shows point sources of pollutants located within the boundaries of Central Detroit. For each facility, the **Rank** indicates the rank order of this site in relation to others reporting to the Michigan Air Emissions Reporting System (MAERS), with 1 indicating the greatest number of pounds of emissions. Trends over time (2010-2014) are also shown, filtered to exclude some variations (see text in Section 4.3 for a more detailed description), as well as the **rate of change** over that same 5 year period (see text, Section 4.3). There are also several sources of pollution located outside of Central Detroit that contribute to pollutant levels, including coal fired power plants located downwind (see Figures 5-5A-5-7L, for example).

		NOx			SO2			PM2.5			PM10			VOC			CO		
Rank	Facility	5 Year Filtered Average	Note	Annual Change (%/yr)	5 Year Filtered Average	Note	Annual Change (%/yr)	5 Year Filtered Average	Note	Annual Change (%/yr)	5 Year Filtered Average	Note	Annual Change (%/yr)	5 Year Filtered Average	Note	Annual Change (%/yr)	5 Year Filtered Average	Note	Annual Change (%/yr)
57	**Beacon Heating Plant**	96	(1)	-30	0	(1)		4.6	(1)		4.6	(1)		3.7	(1)		48	(1)	
65	**Walsh-Higgins IRS Computer Center**	0	(1)	-99	0	(1)		0	(1)		0	(1)	-99	0			0	(1)	-99
79	**Wayne State University**	37		-4	1		14	3.0		-7	3.9			2.2		-6	32		-7

Table 6-5: Point Source Emissions of Conventional Pollutants (tons/year) in Central Detroit.

Table 6-5 shows 5-year average emissions (filtered to exclude some variations, see text in Section 4.3), and rate of change over 5 year period (see text in Section 4.3). Excerpted from full Table 5-4.

Health Effects: Health effects associated with exposure to the pollutants in Table 3-1 include increased risk of respiratory problems (e.g., asthma exacerbations and hospitalizations, COPD, cardiovascular effects). See Health Effects Table 3-1 for a complete listing. Section 5.5.3 provides quantitative estimates of health impacts from several of these point sources for three pollutants: $PM_{2.5}$, NO_x, and SO_2.

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

Rank	Facility	Acids	VOC	Metals and Metal Compounds	Nitrogen Compounds	Sulfur Compounds	Other
29	Difco Laboratories Inc	0	1227	0	0	0	0

Table 6-6: Emissions of Toxics (pounds/year) by facility in Central Detroit by pollutant type. Average 2010-2014. In approximate rank by total TRI emissions. Excerpted from Table 5-6.

Table 6-6 shows emissions of toxic air pollutants by facility located in Central Detroit, as reported in the Toxic Release Inventory (TRI). For each facility, pounds per year of toxics reported are shown. This table shows the rank order for each facility for SW Detroit, with 1 indicating the highest emissions. The full table is shown in Section 5.2.3.

Figure 6-14 maps locations of facilities that are point sources of air pollutants located in or immediately adjacent to Southwest Detroit. Symbols indicate facilities that emit conventional air pollutants reported in the Michigan Air Emissions Reporting System (MAERS) and air toxics reported in the Toxic Release Inventory (TRI), as described in the legend. Numbers indicated for each facility reflect its ranking in the listing of MAERS emissions (Table 5-6) and the listing of toxic emissions (Table 5-7).

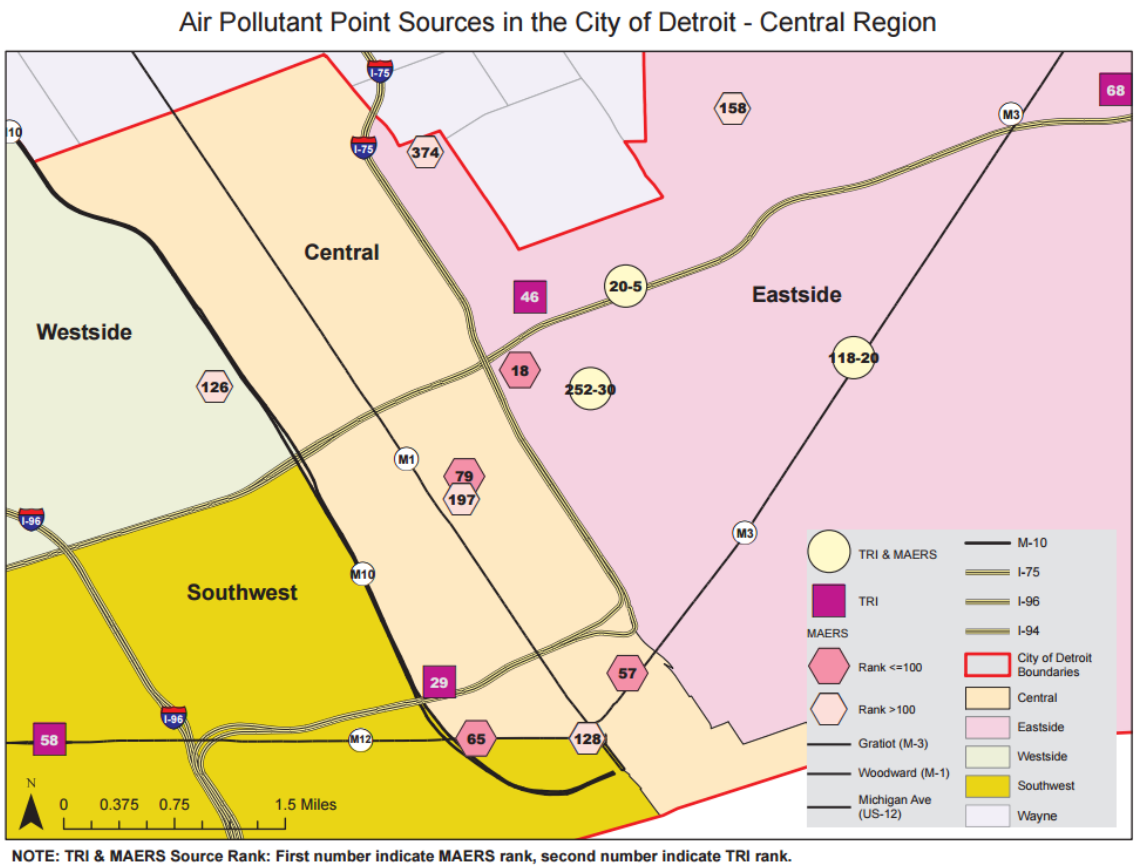


Figure 6-14: Air Pollutant Point Sources in Central Detroit.

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

Section 5.5.2 quantifies health impacts of SO_2, $PM_{2.5}$ and NO_x in Detroit, and includes maps showing concentrations of each of these pollutants across Detroit.

6.14.2 Mobile Sources

Mobile sources emit NO_x, $PM_{2.5}$, VOCs, CO, and diesel exhaust, which significantly increase the exposure of Central Detroit residents to air pollutants. Emissions result when a vehicle is idling and on the road, and also when refueling. Importantly, a large truck produces considerably more emissions than a car, and trucks are responsible for a large share of both $PM_{2.5}$ and NO_x emissions. The area also contains extensive off-road sources; these are quantified in Section 5.4.

Main Sources: Major highways, including M-1 (Woodward Avenue), M-10 (John C. Lodge Freeway), I-94 (Edsel Ford Freeway), and I-75/I-375 (Chrysler Freeway) run through and around Central Detroit. The sections of highway that pass through Central Detroit are some of the most heavily trafficked in the city. According to Michigan Department of Transportation (MDOT) data, I-75, I-94, and M-10 have average daily traffic volumes of over 100,000 vehicles.[1] These highways also host large amounts of commercial truck traffic. In 2013, I-94 and I-75 both had an average of more than 10,000 trucks per day.[2] Emissions from commercial truck traffic, which include particulate matter from burned diesel fuel, are of particular concern due to adverse effects on human health. These large vehicles produce most of the on-road mobile source emissions of $PM_{2.5}$ (See Section 5.3).

Highway	2013 Average Daily Vehicle Traffic (cars/day)[3]	2013 Average Daily Truck Volume (trucks/day)[4]
I-75/I-375 (Chrysler Fwy)	133,000 – 162,200	Approx. 10,500
I-94	136,200 – 144,100	6,700 – 11,000
M-10 (John C. Lodge Fwy)	95,300 – 132,900	1,001 – 5000
M-1 (Woodward Ave)	17,700 – 20,700	301 – 1000

Table 6-7: Average Daily Vehicle Traffic and Average Daily Truck Volume, Central Detroit

Health Effects: Substantial health effects have been demonstrated for people who live, work, or go to school near major freeways. In particular, those who live within about 150 meters (about 500 feet) of roadways with high volumes of traffic, and in particular, diesel truck traffic, experience increased risk of respiratory and cardiovascular health effects. See Health Effects Table 3-1 greater detail. Approximately 69,000 (about 10%) of Detroit's population lives within 150 meters of such heavily trafficked roadways

[1] MDOT (Michigan Department of Transportation). 2014. MDOT Traffic Volumes. Available: http://mdot.maps.arcgis.com/apps/Viewer/index.html?appid=18a4b2f2ba3b4e079e935f8835862c73 [Accessed 17 March 15].

[2] MDOT (Michigan Department of Transportation). 2014. MDOT Traffic Volumes. Available: http://mdot.maps.arcgis.com/apps/Viewer/index.html?appid=18a4b2f2ba3b4e079e935f8835862c73 [Accessed 17 March 15].

[3] MDOT (Michigan Department of Transportation). 2014. MDOT Traffic Volumes. Available: http://mdot.maps.arcgis.com/apps/Viewer/index.html?appid=18a4b2f2ba3b4e079e935f8835862c73 [Accessed 17 March 15].

[4] MDOT (Michigan Department of Transportation). 2014. MDOT Traffic Volumes. Available: http://mdot.maps.arcgis.com/apps/Viewer/index.html?appid=18a4b2f2ba3b4e079e935f8835862c73 [Accessed 17 March 15].

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

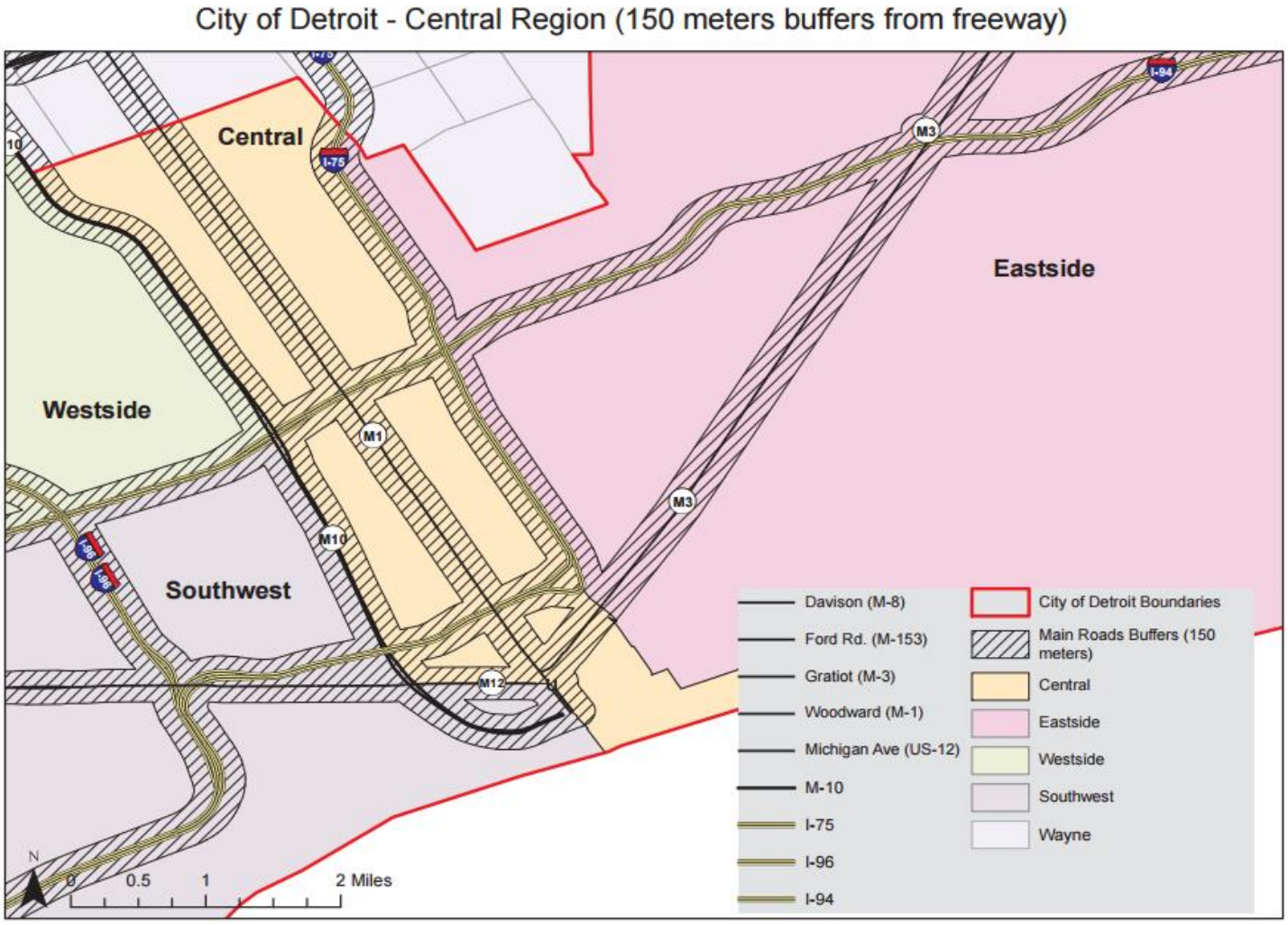


Figure 6-15: 150 Meter Roadway Buffers in Central Detroit

6.14.3 Vulnerability

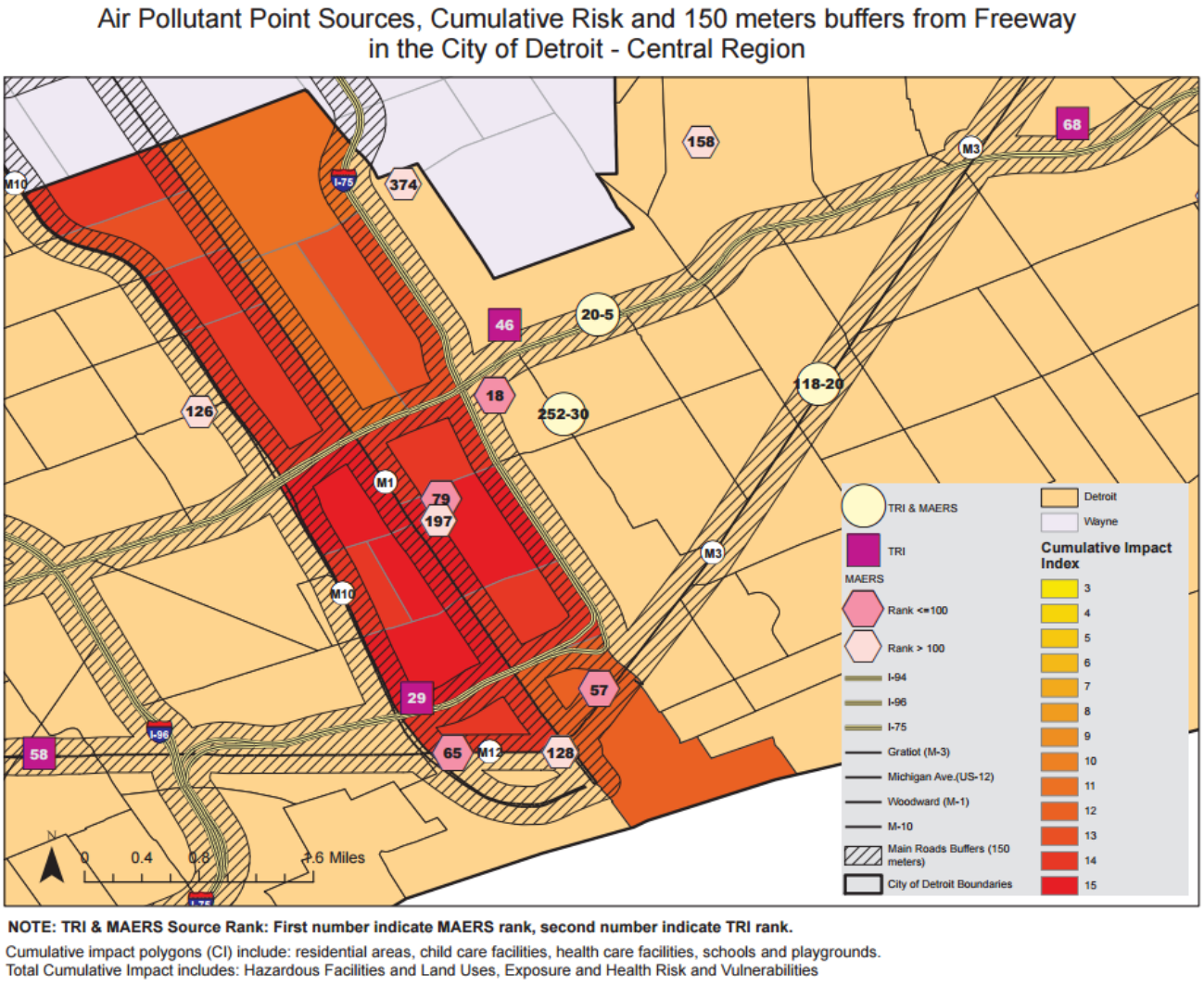
Some communities or individuals may be more vulnerable to the adverse effects of exposure to air pollutants. Existing health conditions, low levels of some nutrients in the diet, young age, older age, and poor housing condition can place people at increased risk of exposure to air pollutants. As shown in Table 6-1, residents of Central Detroit are more likely to be exposed to higher levels of Diesel PM and have higher cancer mortality risk than the Tri-County Area.

Central Detroit has a larger proportion of people of color (82%) compared with the Tri-County Area, and a larger proportion of renters (76%) which may increase health risks associated with exposure to air pollutants. A greater proportion of residents of Central Detroit have completed high school (83%) and a smaller proportion of households have children under the age of 5 (4%) compared with other areas of the city, or with the Tri County Area. Figures 6-5 and 6-10 for maps show the Cumulative Vulnerability Index for census tracts in the Tri-County Area and Detroit, respectively, including the Central Detroit area.

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.

6.14.4 Cumulative Risk

Figure 6-16 shows the cumulative risk scores for residents of Central Detroit, along with point and mobile pollutant sources. Cumulative risk is the sum of three indices assessing proximity of population to hazardous land uses (e.g., railyards, freeways), exposure to air pollutants and associated health risks (e.g., Diesel PM, respiratory risk, cancer risk), and vulnerabilities (e.g., percent below poverty, percent children under age 5). Briefly, these are calculated by rank ordering census tracts in the Tri-County area by each indicator, and constructing quintiles with 1=low and 5=high exposure or vulnerability. The sum of the risk and vulnerability scores creates a cumulative risk score ranging from 3 (lowest cumulative risk) to 15 (highest cumulative risk). Note that all census tracts in Central Detroit fall into the upper ranges of risk (darker oranges and reds) when ranked against all census tracts in the Tri County Area Figure 6-6. See Appendix (TBD) for a more complete description of the methods for constructing the cumulative risk scores.



NOTE: TRI & MAERS Source Rank: First number indicate MAERS rank, second number indicate TRI rank.

Cumulative impact polygons (CI) include: residential areas, child care facilities, health care facilities, schools and playgrounds.
Total Cumulative Impact includes: Hazardous Facilities and Land Uses, Exposure and Health Risk and Vulnerabilities

Figure 6-16: Cumulative Risk, 150 Meter Roadway Buffers, Pollutant Sources in Central Detroit.

This work is made possible by National Institute of Health and Environmental Sciences, RO1ES022616, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by the Michigan Center on Lifestage Environmental Exposures and Disease (M-LEEaD), #P30ES017885.