



BRIDGING THE GAP

Planning for Neighborhood Quality of Life in Southwest Detroit

TAUBMAN COLLEGE OF ARCHITECTURE & URBAN PLANNING
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EXECUTIVE SUMMARY

THE PROJECT

The Gordie Howe International Bridge (GHIB), scheduled to open in 2024, is expected to increase large truck traffic in Southwest Detroit neighborhoods, leading to growth in noise, air pollution, and traffic hazards. The opening of the GHIB will also increase industrial land conversion for businesses that generate freight traffic within Delray, the Southwest Detroit neighborhood that will house the bridge's Port of Entry (POE). This will add to the noise, vibrations, and pollutants from trucks traveling to the POE from Interstate 75 (I-75) and to and from local industrial businesses. These direct challenges stand to exacerbate systemic inequality and environmental justice issues which have long been prevalent in this area, particularly within Delray, as resident health, economic well-being, and safety have been impacted by industry moving into residential communities since the 1940s.

In partnership with the Southwest Detroit Community Benefits Coalition (SWDCBC), this research investigates urban planning, design, and policy approaches to strategically maximize resident quality of life throughout Southwest Detroit in anticipation of the bridge's construction and the impacts that will follow.

RESEARCH FOCUS AREAS

To develop this plan, the report team focused on three primary areas for intervention within Southwest Detroit:

- 1. Truck-related land use:** Where should Industrial businesses that generate freight traffic be located in order to reduce health and safety impacts to the community, and what approaches can direct these uses to the best locations?
- 2. Truck movement:** What analysis model should be used to designate truck routes across Southwest Detroit to minimize the interaction between trucks and residents, and what policies can increase trucks' adherence to these routes?
- 3. Truck noise and pollution mitigation:** How effectively would the Michigan Department of Transportation (MDOT)-proposed noise barriers mitigate noise and pollution from trucks, and what design alternatives would better meet the needs of the community?

TRUCK-RELATED LAND USE MANAGEMENT

We identified suitable locations for industrial businesses to maintain air quality and safety for residents. Potential industrial land parcels located farther from occupied residential parcels, sensitive community facilities, and those with less tree canopy were identified as more suitable for freight-related purposes, while parcels without those characteristics were identified as candidates for protection from industrial growth. More suitable areas were located to the northeast of the POE and southwest of the Rouge River,

while less suitable lands were located in Delray immediately to the west of the POE plaza. We developed policies to help guide freight-intensive industry to suitable areas and away from less suitable areas.

Recommendations—Truck Related Land Use

The City of Detroit and its partners should establish a “No New Trucks Zone” in areas identified as unsuitable for freight business. This zone is designed to deter freight businesses from locating near where area residents live and congregate. Businesses locating within this zone would be subject to heightened regulations including:

- » Vegetative buffering
- » Street-tree planting requirements
- » Greater setbacks

The City of Detroit and its partners should create a “Southwest Detroit Freight District Zone” in areas identified as suitable for freight businesses. This zone is designed to attract freight businesses by providing access to incentives including:

- » Technical business assistance
- » Freight-oriented infrastructure improvements
- » Fee waivers

Additionally, collaborative regional-scale freight planning should be incorporated into the City of Detroit, Detroit Economic Growth Corporation, and the Southeast Michigan Council of Governments (SEMCOG) planning processes.

TRUCK-RELATED MOVEMENT

We developed a method to understand the impact of trucks on residential communities and identify truck routes that account for the impact of trucks on communities and logistic efficiency. The team tested four potential future configurations of truck routes in Southwest Detroit:

- » No-restrictions network (where trucks take the lowest travel-time route)
- » Low-sensitivity network (designed to interact with the fewest sensitive features)
- » Current truck-route network
- » “Test” route (the low-sensitivity network with small modifications to avoid sensitive features).

For each set of routes, the team measured the travel time for truckers and calculated the degree that trucks would interact with residences and other sensitive features.

Though all analyzed routes impacted Southwest Detroit communities, the Test route scenario most effectively improved logistic efficiency while reducing impact to the community.

Recommendations—Truck Movement

The team recommends the Detroit Department of Transportation (DDOT) and partnering organizations use the method presented in this report when assessing and designating truck routes to mitigate the impacts of freight traffic in Southwest Detroit. The travel time (weighted average travel time) metric should be used to measure truck movement efficiency, while the impact score metric

should be used to measure the degree that trucks traveling on potential truck routes interfere with Southwest Detroit residents. Routes that successfully reduce this interference will likely represent a compromise between travel-time minimization and sensitive location avoidance. Considering both variables jointly is an effective method to determine truck routes that minimize both trucks' travel time and their impact on surrounding communities.

To enforce designated truck routes, we recommend:

- » *Technological Enforcement* - Camera-based enforcement systems should be installed along non-truck routes with low travel times and high impact on communities in order to deter trucks from selecting these routes. This would require a policy shift at the state level. The City of Detroit should work with MDOT and State legislative partners to establish firm legal ground for camera-based truck route enforcement.
- » *Positive and Negative Signage* - Positive signage, signaling routes where truckers must drive, should be installed in addition to negative signage, signaling where trucks are prohibited, to ensure truck drivers know where to drive at all times.

TRUCK NOISE AND POLLUTION MITIGATION

We analyzed noise barrier design options, modeled MDOT's proposed noise barriers, and developed an alternative design approach. We also garnered feedback from Southwest Detroit residents on noise barrier designs. In evaluating existing MDOT design documents, we found

that the proposed wall may be effective in blocking sound from I-75 to houses north of the service drive, but would be ineffective at blocking sound from traffic on POE access ramps. Additionally, Service Drive traffic noise reflecting off the planned MDOT noise barrier may exacerbate traffic noise for residents living north of the Service Drive. This reflection risk may worsen noise and air pollution, the top priorities identified by a neighborhood focus group, which we organized to solicit feedback on alternative designs.

Recommendations—Noise and Pollution Mitigation

To reduce truck noise and address resident-indicated preferences, we recommend two alternative design approaches:

- » *Thematic Design "Green Fusion"* - Features such as berms, vegetative buffers, and a living wall should be incorporated into the planned noise barrier at strategic locations wherever public land and right-of-way space allows. Incorporating vegetation, including shrubs and trees, would meet deficiencies of the planned barrier by reducing sound reflection and mitigating air quality impacts.
- » *Specific Needs Approach* - The planned noise barrier proposal should be augmented with features offering additional protection. We recommend placing noise barriers on the POE ramps, eliminating all gaps in the planned soundwall, and constructing double walls at strategic locations. These measures would serve as a baseline for community needs.



A decorative graphic at the top of the page. It features a horizontal line that passes through a teal rectangular box on the left containing the word 'INTRODUCTION' in yellow capital letters. The line continues to the right, passing through a stylized bridge with two towers and a suspension. After the bridge, the line enters another teal rectangular box on the right, which contains a vertical yellow bar.

INTRODUCTION

The goal of maintaining and improving residential quality of life has been an integral purpose of urban planning since the field emerged in the early 20th century as a distinct function of local government. Delray and, more broadly, Southwest Detroit have borne substantial negative consequences from industrial development, including industrial growth and increased freight movement near residential homes. The Gordie Howe International Bridge (GHIB) development is likely to exacerbate the impact of trucks on residents and raises the question of how municipal policy and action can work to maintain public health and quality of life in Southwest Detroit.

To address this question, our team divided the range of impacts from the bridge into three distinct areas of concern: 1) truck-related land use; 2) truck movement; 3) truck noise and pollution. The location of new businesses that generate substantial truck traffic was one primary public health issue identified. We also identified the designation

and enforcement of local truck routes that carry this freight traffic as another key factor in determining public health. Finally, we analyzed the planned construction of noise barriers and opportunities to integrate health considerations in the noise mitigation design. We researched each of these three areas of concern and identified policies that could improve health outcomes for residents. These three areas are presented as distinct, but our team addresses them in tandem, since they are highly interwoven issues that impact one another. Our project seeks to empower the Southwest Detroit Community Benefits Coalition (SWDCBC) in its negotiations with the City, State, and Windsor-Detroit Bridge Authority (WDBA) by presenting research from freight-management experiences elsewhere and investigating how solutions can fit the built-environment and institutional context in Southwest Detroit. We propose an array of potential strategies to improve resident quality of life, safety, and health given available resources.

Our report comes at a time when many efforts that bear on the future of Southwest Detroit are taking place. The City of Detroit's Department of Transportation (DDOT) has commissioned a technical study to assess configurations of truck routes in the City. Similarly, the City has initiated a set of neighborhood plans across Detroit, with Delray being one of those neighborhoods. The recommendations from the Delray neighborhood plan will likely guide the City's policy stance in the neighborhood for the next 20 years. Additionally, the City is updating its municipal zoning code for the first time since the 1960s, which will affect how development occurs throughout Detroit. Meanwhile, the State of Michigan's Department of Transportation (MDOT) is set to engage local stakeholders on the design of noise barriers along I-75 in Southwest Detroit. Considering this complex array of initiatives, this study, which prioritizes resident quality of life, seeks to inform these aforementioned efforts.

CURRENT CHALLENGES FACING THE COMMUNITY

Land Use

The analysis area for this study is predominantly zoned residential (47.5%) and industrial (47.0%) (Figure 1).¹ For residents of the analysis area, this means living in close proximity to a variety of heavy-industrial businesses that are incompatible with residential land uses. Residents within the analysis area live near oil- and steel-refining facilities, a coal-fired power plant, a wastewater treatment and incineration

1. Detroit Open Data. (2018). Zoning. City of Detroit. Retrieved 1/30/19 at <https://data.detroitmi.gov/Property-Parcels/Zoning/62rv-kyp9>.

facility, scrap yards, and several large freight facilities. Additionally, regional, national, and international freight traffic is concentrated onto I-75, which separates the Delray and Mexicantown/Springwells Village neighborhoods, due to the international Ambassador Bridge and industrial facilities to the north. These combined factors have created health and safety hazards within the analysis area.

Current Regulations

Detroit's current zoning code does not differentiate freight from other industrial land uses, making it difficult to identify the unique impact freight businesses have on their surrounding communities.² Zones where freight activity of some type is allowed are detailed in Appendix B.

Truck Routes

MDOT and Southeast Michigan Council of Governments (SEMCOG) identified freight trucking routes across the state and within the analysis area (Figure 2) to make trade more efficient and safe.³⁴ Though these truck routes were created to enable trade, by directing freight traffic onto roads designed for heavier vehicles traveling at higher average speeds, they indirectly benefit the community by routing trucks away from residential communities. This helps to reduce the air-quality, noise, and safety impacts of freight traffic.

2. City of Detroit. (2018). CH 61 ZONING ORDINANCE (OCTOBER 14, 2018). City of Detroit. Retrieved 1/16/19 at <https://detroitmi.gov/document/ch-61-zoning-ordinance-october-14-2018>.

3. Michigan Department of Transportation. (2018). Truck Operators Map. State of Michigan. Retrieved 2/1/19 at https://www.michigan.gov/mdot/0,4616,7-151-11151_11033_32060--,00.html.

4. SEMCOG. (2018). Truck Routes. Southeast Michigan Council of Governments. Retrieved 2/1/19 at <https://maps-semcog.opendata.arcgis.com/datasets/truck-routes>.

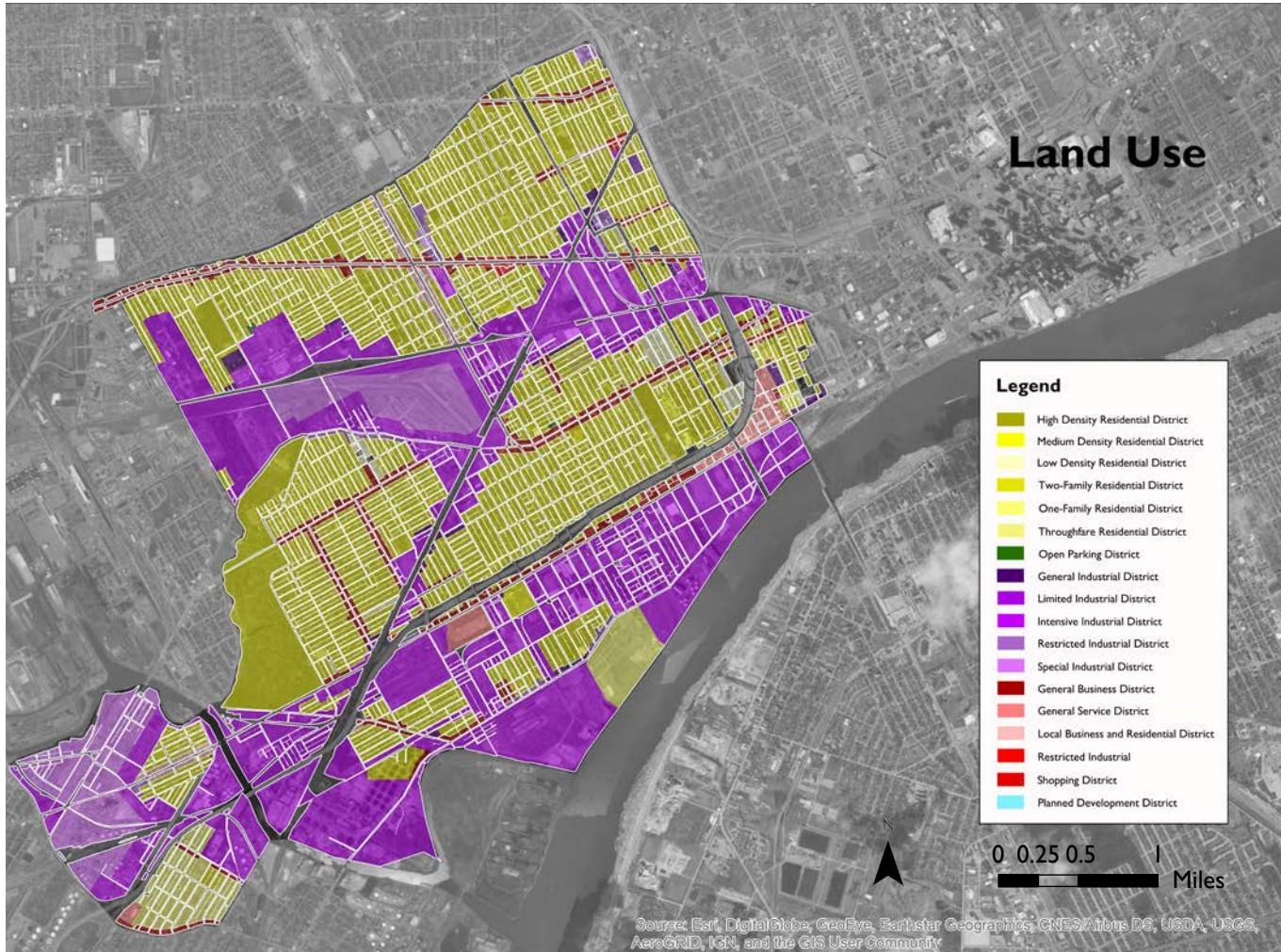


FIGURE 1. Zoning designations within the analysis area.
 All maps throughout the report use the same source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

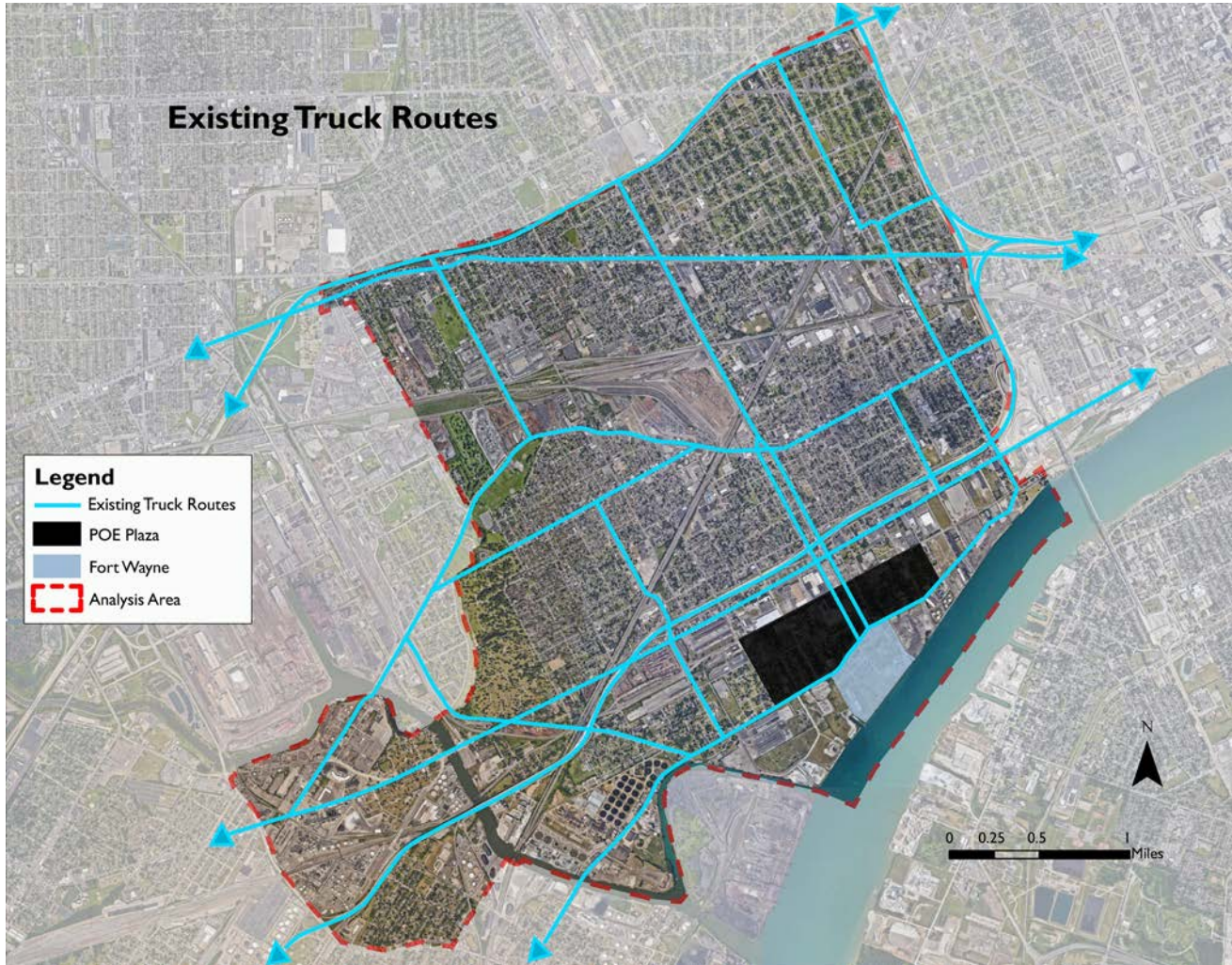


FIGURE 2. Truck routes designated by the City of Detroit and State of Michigan in Southwest Detroit.

Despite this, the analysis area does not receive the full benefit of established truck routes due to the location and weak enforcement of truck routes near industrial land uses, freight facilities, and the Detroit Intermodal Freight Terminal (DIFT). All of this incentivizes trucks to drive on local streets as they move through the analysis area en route to established truck-routes. This local truck traffic creates health, safety, and quality-of-life hazards for residents.

The State of Michigan does restrict roads that trucks are legally allowed to travel on by truck size, weight, and number of axles; however, enforcement of these rules is lax to nonexistent within the analysis area.⁵ Even if these rules were enforced, the number and location of several designated truck-routes still creates significant health, safety and quality-of-life hazards for residents, as many current routes direct trucks through populated, residential areas.

Gordie Howe International Bridge: Construction Plans

The construction of the Ghib will have a significant impact on the Southwest Detroit communities, particularly within Delray. Competing economic pressures and land use visions held by various stakeholders (community members; the freight industry; local, state, and international entities)(see Appendix A) stand to create a new balance between the economic potential of the area as an industrial, logistics hub and the needs of legacy residential communities. Meanwhile, the analysis area already experiences problems including

5. Michigan Center for Truck Safety. (2017). Truck Driver's Guidebook. Michigan Center for Truck Safety. 18th Edition. Retrieved 2/2/2019 at <https://www.truckingsafety.org/Portals/0/GuideBooks/18th%20Ed%20TDGB.pdf>.

air quality, noise, road and pedestrian safety, congestion, depopulation, lowered property values, and degraded roads from existing incompatible land uses.

THE GORDIE HOWE INTERNATIONAL BRIDGE

The international bridge construction consists of four major components:

1. **The Bridge:** Cable-stayed design, 6 lanes, 1.5 miles, no piers in the water, dedicated multi-use path for pedestrians and cyclists.
2. **US POE:** 167 acres, inbound/outbound inspection facilities, commercial exit control booths.
3. **Canadian POE:** 130 acres, inbound/outbound inspection facilities and toll collection facilities, largest Canadian port on US/Canada border.
4. **The Michigan Interchange:** Four road bridges, five pedestrian bridges, widened roads at key intersections for freight traffic, reconfiguration of I-75 interchange ramps and service drives.

FIGURE 3. The four major components of the Ghib. More and updated information on the bridge project can be found at the WDBA website, <https://www.gordiehoweinternationalbridge.com/en>.

HISTORY OF BRIDGE PLANNING

- **2001-04:** Planning/Need and Feasibility Study conducted⁶
- **2005-09:** Coordinated U.S. and Canadian environmental studies conducted, including comprehensive and peer reviewed geotechnical analysis⁷
- **2008:** SDCBC forms to advocate for community benefits for residents of Delray and other Southwest neighborhoods⁸
- **2008-12:** Canada land acquisition begins⁹
- **2012:** Canada passes Bridge to Strengthen Trade Act and Prime Minister Stephen Harper along with Michigan Gov. Rick Snyder sign crossing agreement that bridge will be jointly owned by the state of Michigan and the government of Canada; WDBA established¹⁰
- **2013:** Obama administration approves presidential permit for crossing¹¹
- **2015:** Canadian government decides to entirely fund the bridge and both customs plazas; crossing officially named Gordie Howe International Bridge¹²
- **2015:** Public-Private Partnership procurement process begins
- **2017:** City Council approves agreement for \$45M to go to community benefits, particularly the Neighborhood Improvement Fund
- **2018:** WDBA announces the selection of Bridging North America (BNA) as the Preferred Proponent to design, build, finance, operate and maintain the GHIB project
- **2018:** Prime Minister Justin Trudeau attends construction kick-off (estimated 74 months construction phase)
- **2024:** GHIB opens operations
- **Operation phase:** BNA will maintain the GHIB for a 30-year contract, while the WDBA collects tolls and fares

6. Chynoweth, Matthew J. (2016). "2016 Midwest Geotechnical Conference." Michigan Department of Transportation, www.michigan.gov/documents/mdot/18_Gordie_Howe_Intern_Brdg_540398_7.pdf.

7. Ibid.

8. Krings, A. E. (2015). Building Bridges Where There is Nothing Left to Burn: The Campaign for Environmental Justice in a Southwest Detroit Border Community (Unpublished doctoral thesis). University of Michigan.

9. Chynoweth, Matthew J. (2016). "2016 Midwest Geotechnical Conference." Michigan Department of Transportation, www.michigan.gov/documents/mdot/18_Gordie_Howe_Intern_Brdg_540398_7.pdf.

10. Ibid.

11. Ibid.

12. Ibid.

FIGURE 4. Timeline of the design, construction, and planning for the GHIB

Completion of the Ghib stands to exacerbate existing conflicts by changing land use and transportation demand patterns. Nearby logistics and freight uses are expected to increase, and the City's land use regulations do not adequately address the adverse effects that freight movement has on residential communities. Also, with an expected increase in truck traffic, existing truck-route designations and enforcement mechanisms will not adequately ensure separation of residents and trucks. The combined effects of these land-use and transportation changes will result in significant increases in emissions and noise, reducing resident quality of life at home, school, work, and during travel.

PLANS FOR MITIGATING IMPACTS OF THE GHIB

In 2019, SWDCBC negotiated with stakeholders for funds, design elements, and policy measures to mitigate impacts from the bridge. Bridging North America (BNA), the Ghib's construction contractor, has allocated community-benefits funding to mitigate the impact of construction, increased freight volumes, and land-use change likely to be spurred by the bridge.¹³ "Community benefits" frequently refers to amenities provided to compensate a neighborhood for the negative impacts from new development. By contrast, the list of investments in Figure 5 focuses largely on harm mitigation, a notably different goal than compensation. These community benefits are being distributed by BNA, the City of Detroit, and MDOT.

13. Windsor-Detroit Bridge Authority. (2018). "Gordie Howe International Bridge Community Benefits Report". Windsor-Detroit Bridge Authority [https://www.gordiehoweinternationalbridge.com/u/files/Meetings/Financial%20Close/Community%20Benefits%20Report%20\(2018-09-27\)%20VP%20App.pdf](https://www.gordiehoweinternationalbridge.com/u/files/Meetings/Financial%20Close/Community%20Benefits%20Report%20(2018-09-27)%20VP%20App.pdf)

GHIB COMMUNITY BENEFITS

- » The Bridging Neighborhoods housing swap and home retrofit programs (City of Detroit)
- » Construction site sound buffers (BNA)
- » I-75 noise barriers (MDOT)
- » Air-quality monitoring (BNA, Michigan Department of Environmental Quality [MDEQ], and City of Detroit)
- » Construction of American with Disabilities Act compliant pedestrian bridges over I-75 at Morrell Street and Junction Street (BNA)
- » Pavement, landscaping, and lighting improvements on Campbell Street for the new I-75 northbound ramp to Jefferson Avenue (BNA)
- » Noise and vibration monitoring for properties within 150 feet of bridge construction (BNA)
- » Construction emissions and noise studies (BNA)
- » Mitigation of construction traffic within Delray and Mexicantown/Springwells Village through a traffic mitigation plan and by establishing truck-routes (BNA). Designated areas for traffic mitigation include:
 - Fort St
 - Green St from Fort St to the Northern Suffolk Right of Way [ROW]
 - Livernois Ave from I-75 to the Railroad ROW
 - Dragoon St from I-75 to the Railroad ROW
 - Campbell St from Fort St to Jefferson St
 - Jefferson Ave from Campbell St to west city limits
 - All permanent and temporarily closed road segments by MDOT
- » Construction health impact assessment (City of Detroit)
- » Notification of impending disturbances of contaminated soils, lead, and asbestos (BNA)
- » Greenways connecting to Fort Wayne and maintain connectivity to Fort Wayne (BNA and MDOT)
- » Street sweeping (BNA)
- » Workforce development and job training program for southwest Detroit residents (City of Detroit)

FIGURE 5. Major plans and programs to mitigate impacts from the Ghib as of March, 2019. (body responsible in parentheses)

SOUTHWEST DETROIT

The analysis area encompasses the Delray neighborhood and the Mexicantown/Springwells Village area (north of I-75, south of I-94, and west of I-96 to the Detroit City line) where freight traffic is anticipated to grow the most after the completion of the bridge (Figure 6).

History

Delray, shown as red in Figure 6, is a heavily industrial neighborhood located in Southwest Detroit. Once its own municipality, Delray was annexed by the City of Detroit in 1905. From a historically Hungarian residential enclave, Delray experienced steady industrial growth together with neighborhood-level pollution and nuisances that spurred continual resident outmigration beginning in the 1930s. From a peak of 24,000 in 1930, the neighborhood population declined to 2,104 people as of 2017 Census estimates.¹⁴ With the decision to locate the GHIB in Delray, the City has renewed efforts to relocate residents through a housing swap program funded by the bridge's project budget. Despite these efforts, many residents wish to remain in Delray.¹⁵

Bordering Delray to the north are Mexicantown and Springwells Village, shown as blue in Figure 6. Mexicantown and Springwells Village are thriving, predominantly Hispanic,

14. John Carlisle. (2017). Is this the end of Delray?. Detroit Free Press. Retrieved 1/31/19 at <https://www.freep.com/story/news/columnists/john-carlisle/2017/12/07/delray-neighborhood-detroit-michigan/676597001/>.

15. Bridging Neighborhoods. (2018a). Home Swap Program. City of Detroit. Retrieved 1/31/19 at <https://detroitmi.gov/government/mayors-office/bridging-neighborhoods-program/programs/home-swap-program>.

enclaves. Mexicantown's Mexican community began migrating to the area, originally termed "La Bagley," beginning in the 1920s.¹⁶ This concentrated community helped to draw further Hispanic migration to Mexicantown from the 1940s through the 1990s, growing into the Springwells Village neighborhood as well.^{17,18} In the 1980s, the community decided to rename La Bagley as Mexicantown as part of a public relations campaign.¹⁹ Mexicantown and Springwells Village have for years contended with freight traffic on local streets as trucks move goods from the DIFT to I-75, the nearest Interstate offering access to regional, national, and international freight networks. The GHIB's construction within Delray is expected to exacerbate the negative health, safety, and quality-of-life effects experienced by Mexicantown and Springwells Village residents due to increased truck traffic. To offset these impacts, residents in eligible areas may receive funding for home retrofits to reduce noise and air pollution within their homes.²⁰

16. Bonisteel, S. (2015). In Detroit, It's the Mexicans Welcoming Visitors to America. Fox News. Retrieved 2/1/19 at <https://www.foxnews.com/story/in-detroit-its-the-mexicans-welcoming-visitors-to-america>.

17. Ibid.

18. DeVito, L. (2015). Welcome to 'Springwells Village' — a Southwest Detroit neighborhood most of its own residents have never heard of. Detroit MetroTimes. Retrieved 4/22/19 at <https://www.metrotimes.com/detroit/welcome-to-springwells-village-a-southwest-detroit-neighborhood-most-of-its-own-residents-have-never-heard-of/Content?oid=2277537>

19. Bonisteel, In Detroit, It's the Mexicans Welcoming Visitors to America.

20. Bridging Neighborhoods. (2018b). The I-75 Environmental Mitigation Program. City of Detroit. Retrieved 1/31/19 at <https://detroitmi.gov/government/mayors-office/bridging-neighborhoods-program/programs/i-75-environmental-mitigation-program>.

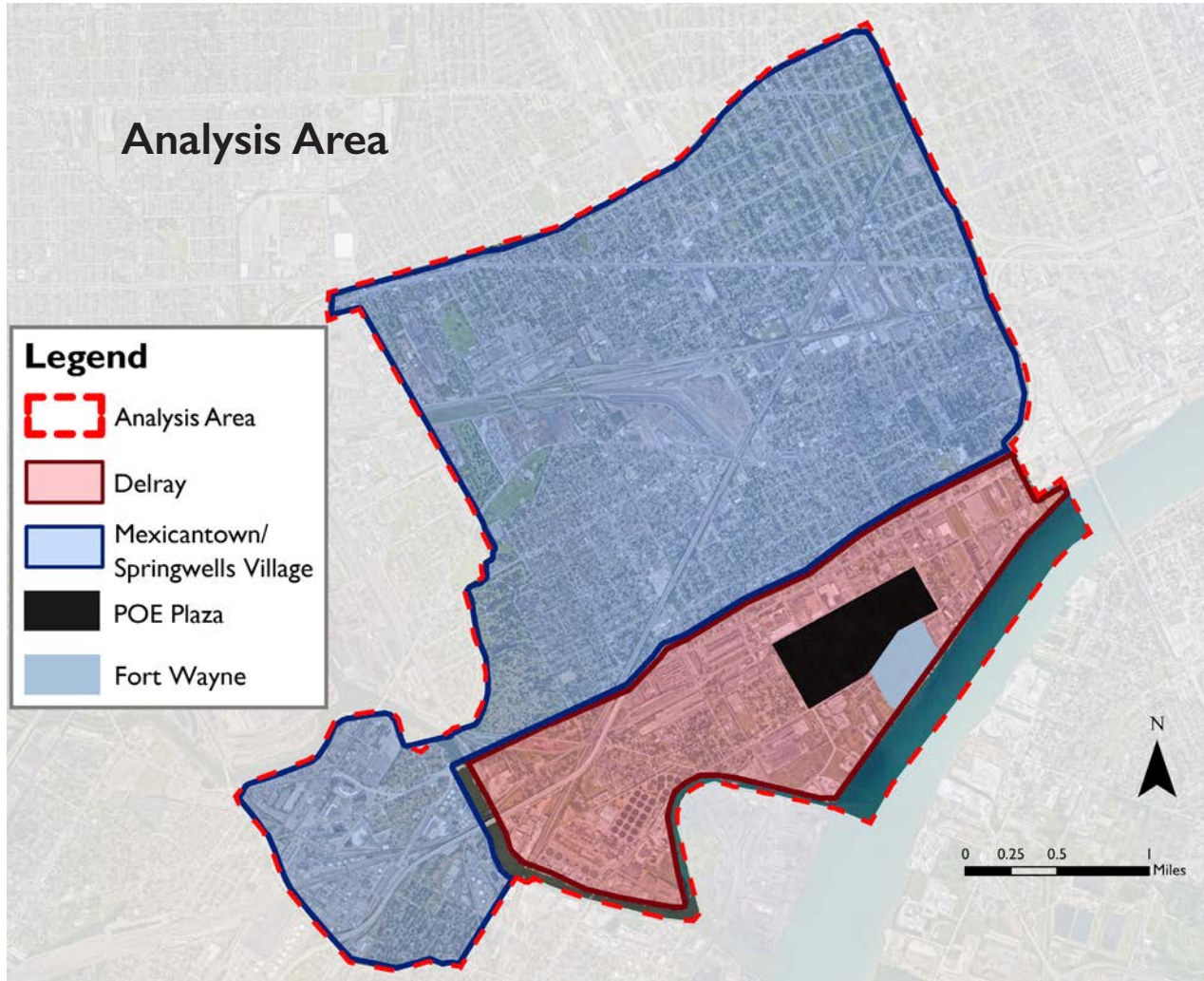


FIGURE 6. Study Analysis area and neighborhoods within Southwest Detroit.

Demographics

Overall, the analysis area has experienced population and demographic changes different from those observed in the rest of the city. For example, the analysis area's population decreased only slightly between 2010 and 2017, significantly less than the city-wide population decrease (Table 1).^{21,22} Despite this slight decrease, within age groups, the analysis area experiences a faster rate of youth-population decline, working-age population stagnation, and increasing retirement-age population.

21. American FactFinder. (2017). B01001 SEX BY AGE: 2013-2017 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

22. American FactFinder. (2010). B01001 SEX BY AGE: 2006-2010 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

TABLE 1. Demographic change within the analysis area and the City of Detroit 2010-2017.^{21,22,23}

	ANALYSIS AREA		DETROIT	
	2017	change from 2010	2017	change from 2010
Total Population	54,312	-0.3%	679,865	-11.7%
Age 0-17	17,286	-5.4%	171,070	-26.5%
Age 18-65	32,907	1.3%	419,859	-9.4%
Age 65+	4,119	7.9%	88,936	5.9%
Hispanic or Latino	34,432	2.8%	51,685	5.8%
White	10,760	2.2%	67,579	17.7%
African American	7,715	-18.7%	535,900	-9.5%

Located near the center of Detroit's Hispanic community, the study area is home to a majority-Hispanic population. In 2017, the three largest racial/ethnic groups in the analysis area were Hispanics, Whites, and African Americans (Table 1).²³ The analysis area is considerably different from the rest of the city in racial/ethnic terms, as Detroit's three largest racial/ethnic groups were African Americans, Whites, and Hispanics in 2017. Since 2010, the analysis area has experienced significant decline in its African American population, and slow growth in its Hispanic and White populations.²⁴

In 2017, household median incomes within the analysis area were higher than in the rest of the city (Table 2).²⁵ Additionally, the analysis area's housing stock had a higher occupancy rate than the city-wide housing stock.²⁶ With regard to educational attainment, analysis-area residents 25 and older were less educated in all diploma and degree categories when compared to the rest of Detroit.²⁷

23. American FactFinder. (2017). B03002 HISPANIC OR LATINO ORIGIN BY RACE: 2013-2017 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

24. American FactFinder. (2010). B03002 HISPANIC OR LATINO ORIGIN BY RACE: 2006-2010 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

25. American FactFinder. (2017). B19013 MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2017 INFLATION-ADJUSTED DOLLARS): 2013-2017 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

26. American FactFinder. (2017). B25002 OCCUPANCY STATUS: 2013-2017 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

27. American FactFinder. (2017). B15003 EDUCATIONAL ATTAINMENT FOR THE POPULATION 25 YEARS AND OVER: 2013-2017 American Community Survey 5-Year Estimates. United States Census Bureau. Retrieved 1/27/19 at <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

TABLE 2. 2017 educational and housing census data comparing the analysis area to the City of Detroit.²⁵

	ANALYSIS AREA	DETROIT	DIFFERENCE
	2017	2017	%
High School Diploma or Equivalent	30.9%	32.7%	-1.8%
Associate's Degree	3.8%	7.2%	-3.4%
Bachelor's Degree	3.9%	8.5%	-4.6%
Master's Degree	1.8%	4.4%	-2.6%
Professional Degree	0.3%	0.8%	-0.5%
Doctoral Degree	0.2%	0.6%	-0.4%
Household Median Income	29,481	27,838	5.6%
Housing Occupied	76.9%	70.8%	6.1%



Southwest Detroit is home to many murals.



OVERVIEW

A site suitability analysis identifies the suitability of an area for a specific purpose based on a defined criteria. Using Geographic Information Systems (GIS) mapping software, our suitability analysis seeks to answer the question, "What parcels are best suited for industrial land uses that generate substantial freight truck traffic in order to sustain resident quality of life?"

The analysis scores parcels based on their suitability for industrial land uses and creates an indexing system that can be used for comparing the suitability of one location to another. We identify key features that create two general indices: "The Breathe Easy Index," a health-specific evaluation related to maintaining air quality, and "The Crossing Guard Index," a pedestrian-safety-specific evaluation related to minimizing interaction between residents and trucks. These two indices were then weighted and combined into an overall site-suitability score measuring quality of life; this

supported our assessment of the parcels best suited for industrial uses in order to sustain the overall quality of life for residents within the planning area.

Assumptions

The following underlying assumptions form the basis for our analysis:

- » Residents will remain in the areas where they currently live.
- » Once completed, the bridge will attract substantial new freight-intensive business and truck activity to the area, thereby intensifying conflicts between residential and industrial uses, increasing resident exposure to air pollution and pedestrian safety risks.
- » Land use management can be used to limit the interactions between existing residential and existing and future industrial land uses.
- » All existing vacant land will be rezoned for industrial use, if it has not been already.

INDEX	VARIABLE	EXPLANATION	DATA SOURCES
BREATHE EASY	Distance from occupied residential parcels score	Scores suitability of industrially zoned parcels based on their proximity to occupied residential parcels.	- 2018 Detroit Zoning Map - 2018 Detroit Parcel Map - Residential Vacancy Map
	Distance from sensitive features score	Scores suitability of industrially zoned parcels based on their proximity to schools, parks, faith institutions, and community centers in use.	- 2016 Detroit Public School Locations - 2016 Detroit Parks - Faith Institution Map - Community Center Map - 2018 Detroit Parcel Map - 2018 Detroit Zoning Map - Vacancy/planned demolition Map
	Tree canopy coverage score	Scores suitability of industrially zoned parcels prioritizing those with fewer trees	- 2011 Land Cover - 2018 Detroit Parcel Map - 2018 Detroit Zoning Map - Vacant Parcel Map
Breathe Easy = (Distance from occupied residential score*0.35) + (Distance from sensitive features score*0.35) + (Tree canopy score*0.3)			
CROSSING GUARD	Distance from dense residential blocks score	Scores suitability of industrially zoned parcels based on their proximity to densely occupied residential blocks	- 2018 Detroit Parcel Map - 2018 Detroit Zoning Map - Residential Vacancy Map
	Distance from sensitive features score	Scores suitability of industrially zoned parcels based on their proximity to schools, parks, faith institutions, and community centers in use	- 2016 Detroit Public School Locations - 2016 Detroit Parks - Faith Institution Map - Community Center Map - 2018 Detroit Parcel Map - 2018 Detroit Zoning Map - Vacancy/planned demolition Map - Residential Vacancy Map
	Distance to dissipate freight industry noise score	Scores suitability of industrially zoned land, prioritizing occupied parcels, based on their noise disipation distance from residentially zoned parcels	- 2018 Detroit Zoning Map - Existing Freight Businesses Map
Crossing Guard Index = (Distance from dense residential blocks*0.33) + (Distance from sensitive features*0.33) + (Noise dissipation*0.33)			
QUALITY OF LIFE	Quality of Life Index = (Breathe Easy Index*0.5) + (Crossing Guard Index*0.5)		

FIGURE 7. Variables and data included in the Breathe Easy and Crossing Guard indices.

Variables

To construct the site suitability analysis, we selected variables that would illuminate the community health and pedestrian safety issues we identified.²⁸ Figure 7 shows our two indices, the variables within each index, the data contained in each variable, how the variable is measured, and the source of the data.

ANALYSIS

Preliminary Steps

- » **Identify Potential Industrial Parcels:** The team selected all properties zoned industrial from the Detroit zoning map. The team then identified all non-industrial parcels and excluded them from the analysis in Mexicantown/ Springwells Village. Due to the high risk of industrial land conversation, all parcels within Delray were analyzed for their industrial suitability.

28. Data sources for variables used in analysis:

Detroit Open Data. (2016a). Detroit Public School Locations. City of Detroit. Retrieved 2/10/19 at: <https://data.detroitmi.gov/Education/Detroit-Public-School-Locations/h8ij-tu87>.

Detroit Open Data. (2016b). Parks 2016. City of Detroit. Retrieved 2/10/19 at: <https://data.detroitmi.gov/Fun/Parks-2016/yu9n-k8rd>.

Detroit Open Data. (2018a). All Schools 2017/2018. City of Detroit. Retrieved 2/10/19 at: <https://data.detroitmi.gov/Education/All-Schools-2017-2018/wn8n-5a4d>.

Detroit Open Data. (2018b). Zoning. City of Detroit. Retrieved 1/30/19 at: <https://data.detroitmi.gov/Property-Parcels/Zoning/62rv-kyp9>.

United States Geological Survey. (2011). Download by State or Territory. United States Department of Interior. Retrieved 1/30/19 at: <https://gapanalysis.usgs.gov/gaplandcover/data/download/>.

Breathe Easy Index Steps

For the analysis that focused on maximizing health outcomes for residents, we determined those potential sites for industrial uses that would have less impact on air quality for residents in Southwest Detroit. To do this, the team identified all industrially zoned land in Southwest Detroit north of I-75 and southwest of the Rouge River, and all land located in Delray as potential parcels for industrial uses. We determined that potential sites located further from occupied residential parcels and sensitive features, and with less dense tree canopies, would have fewer negative



The presence of many industrial operations in and around the neighborhood has a significant impact on air quality.



Industrial and freight operations are already prevalent in Southwest Detroit.

health impacts for residents if occupied by an industrial use and categorized these parcels as more suitable sites for these businesses. This analysis was performed separately for all parcels in Delray and again for industrial parcels in Southwest Detroit to control for a skewing effect that the more densely occupied neighborhoods north of I-75 might have on determining suitable sites.

- » **Identifying Occupied Residential Parcels:** The team first used the Detroit zoning map and selected all parcels that are located in residential zones. From this selection, the team then geolocated a record of demolished properties and removed these parcels from the layer. The area's remaining residential parcels without structures were then located using Google Earth imagery and removed.
- » **Creating the Sensitive Features Layer:** The team located several types of important community facilities (schools, parks, community centers, faith institutions, restaurants, bars, healthcare facilities) using Google Maps and City of Detroit GIS data. These locations were then grouped into one layer of sensitive features. Each type of sensitive feature was then given a weight from 1 to 5, reflecting their use by the community and priority for protection.
- » **Determining Tree Canopy Cover by Parcel:** Using land cover data, we joined the percent tree canopy coverage with the zoning layer to show the relative canopy coverage on each parcel.
- » **Calculating Distance From Residential Parcels:** We calculated the distance of each potential industrial parcel from occupied residential parcels using ArcGIS's Near tool. Near distances were figured from the edge of each potential industrial parcel to the closest edge of a residential parcel. These distance scores were then normalized on a 1 to 100 scale, with 100 being furthest from sensitive features and 0 being closest.
- » **Calculating Distance From Sensitive Feature Parcels:** The team calculated the distance of each potential industrial from sensitive features using the Near tool.

The team then multiplied these distance scores for each type of sensitive feature category by their priority weights. The distance scores were normalized on a 0 to 100 scale, with 100 being furthest and 0 being closest.

- » **Calculating Tree Canopy Scores:** We normalized the percent canopy coverage of each parcel on a 0 to 100 scale, with 100 being the most canopy coverage and 0 being the least canopy coverage.
- » **Joining Industrial Layers:** We joined the industrial layers used to calculate distance and tree canopy scores in the three preceding steps into the industrial zoning layer. The suitability scores calculated from each of these three map layers were added in an additional column as an aggregate score and normalized on a 0 to 100 scale with 0 being the least suitable and 100 being the most suitable. The formula used to calculate the aggregate score is below:
 - *Distance from occupied residential score (45%) + Distance from sensitive features score (45%) + Tree canopy score (10%).*
- » **Rendering the Map:** These aggregate scores were classified into quintiles, with an equal number of parcels in each class.

Crossing Guard Index Steps

For the analysis that focused on maximizing pedestrian safety outcomes for residents, we determined which potential industrial parcels were farther from residents. Our team again identified potential parcels for industrial uses as all industrially zoned land in Southwest Detroit north

of I-75 and southwest of the Rouge River, and all land in Delray. We determined that potential sites located further from concentrations of residents' homes and sensitive features, and out of earshot of residents' homes would be more suitable for these uses because these locations would have fewer negative impacts for residents if occupied by an industrial business.²⁹ The team used the distance needed to dissipate noise specified in the Detroit Zoning

29. Municipal Code Corporation. (1984). Detroit City Code. Municipal Code Corporation.



Truck traffic is an existing concern.

Ordinance for commercial uses, a distance of 250 feet, to determine necessary noise dissipation distances for industrial businesses. The analysis was run separately for all parcels in Delray and again for the industrially zoned parcels in Southwest Detroit. The results from both analyses were combined to produce a final map showing suitability for industrial uses based on maximizing resident safety and comfort.

- » **Determining Occupied Housing Density:** The team overlaid the occupied residential parcels layer used in the Breathe Easy index analysis with the Detroit blocks layer. We calculated the percent occupancy by block and categorized each block into three categories; low, medium, and high density, with an equal number of blocks in each category.
- » **Calculating Distance From Each Type of Block:** We calculated the distance of each potential freight parcel from each type of block; low, medium, and high density using the Near tool. These distance scores for each category were re-calculated on a 0 to 100 scale, with 100 being furthest from blocks and 0 being closest distance to block categories.
- » **Calculating Distance From Sensitive Features:** The team then calculated the distance of each potential freight parcel from sensitive features using the Near tool. We multiplied the distance scores for each potential freight parcel by the weight from their nearest sensitive feature. The resulting distance scores were normalized on a 0 to 100 scale, with 100 being furthest and 0 being closest.

- » **Creating Noise Dissipation Buffers:** The team buffered residential blocks by 250 feet, corresponding to the City's distances required to dissipate noise emissions from industrial and commercial uses.
- » **Intersecting Potential Freight Industrial Parcels with Noise Buffer:** We overlaid potential industrial parcels with the noise buffer. Parcels located within the buffer received a "0" score while those that were located outside of the buffer received a "1". These scores were normalized on a 0 to 100 scale, with 100 being parcels located outside the noise buffer and 0 being parcels located within it.
- » **Joining Industrial Layers:** We joined the layers used to calculate distance and noise buffer scores in the previous steps into a copy of the industrial zoning layer. The suitability scores calculated in each of these five map layers were then added in an additional column as an aggregate score and normalized on a 0 to 100 scale with 0 being the least suitable and 100 being the most suitable. The formula used to calculate the aggregate score is below:
 - *Distance from residential blocks (0.33), Distance from sensitive features (0.33), Noise Dissipation (0.33).*
- » **Rendering the Map:** These aggregate scores then classified into quintiles, with an equal number of parcels in each class.

Final Industrial Suitability Index

- » **Breathe Easy and Crossing Guard Indices:** The two indices were overlaid and final suitability scores from each analysis were combined at the parcel level. The following weights used represent an even weighting:
 - *Crossing Guard aggregate score (0.5) and Breathe Easy aggregate score (0.5)*

Products

This site suitability analysis results in a total of three maps:

- » Suitable industrial zones based on the Breathe Easy approach (see page 26).
- » Suitable industrial zones based on the Crossing Guard approach (see page 27).
- » Suitable industrial zones based on weighting the Breathe Easy and Crossing Guard equally (see page 28).

For each map, the results are illustrated using a 5-step color ramp, reflecting the calculated suitability of all parcels in Delray, and existing industrially zoned parcels in Southwest Detroit for industrial use. Darker colored parcels indicate high suitability, whereas lighter colored parcels indicate low suitability. The results of this analysis serve as the basis for policy and zoning recommendations detailed in the Recommendations section of the report.



Clark Park is a local gathering place and an example of a sensitive feature.



LAND USE: RESULTS

Truck Business Suitability

3

Our method scores industrially zoned land throughout Southwest Detroit and all land within Delray to determine potential sites for industrial businesses to locate in order to maintain and enhance resident quality of life.

BREATHE EASY ANALYSIS

The goal of the Breathe Easy Index is to identify land suitable for industrial businesses that generate and attract substantial freight traffic while maintaining air quality for residents. This index, depicted in Figure 8, shows that areas most suitable for these industrial businesses are located northeast of the POE, southwest of Fort Wayne along the Detroit River; southwest of the Rouge River; along the northeast bank of the Rouge River; and north of Dix Avenue near the City of Detroit border. Areas least suitable for industrial businesses include those parcels along the railroad extending north from I-75 toward the DIFT and the areas north and south of Dearborn Street. Areas prioritized as

more suitable for industrial uses are located further from dense clusters of residential housing, further from key sensitive features, and have higher tree canopy coverage.

CROSSING GUARD ANALYSIS

The goal of the Crossing Guard Index is to identify land suitable for industrial businesses that generate substantial freight traffic while maintaining safety and comfort for residents in their homes and in public spaces. The areas most suitable for industrial business are located northeast of the POE, southwest of Fort Wayne, along the eastern banks of the Rouge River; and north of Dix Avenue near the City of Detroit's border with Dearborn (Figure 9). These areas are located further from dense clusters of residential housing, further from key sensitive features, outside of ranges needed to dissipate noise from commercial businesses to residential properties. Areas least suitable for industrial businesses are located north and south of Dearborn Street to the west of

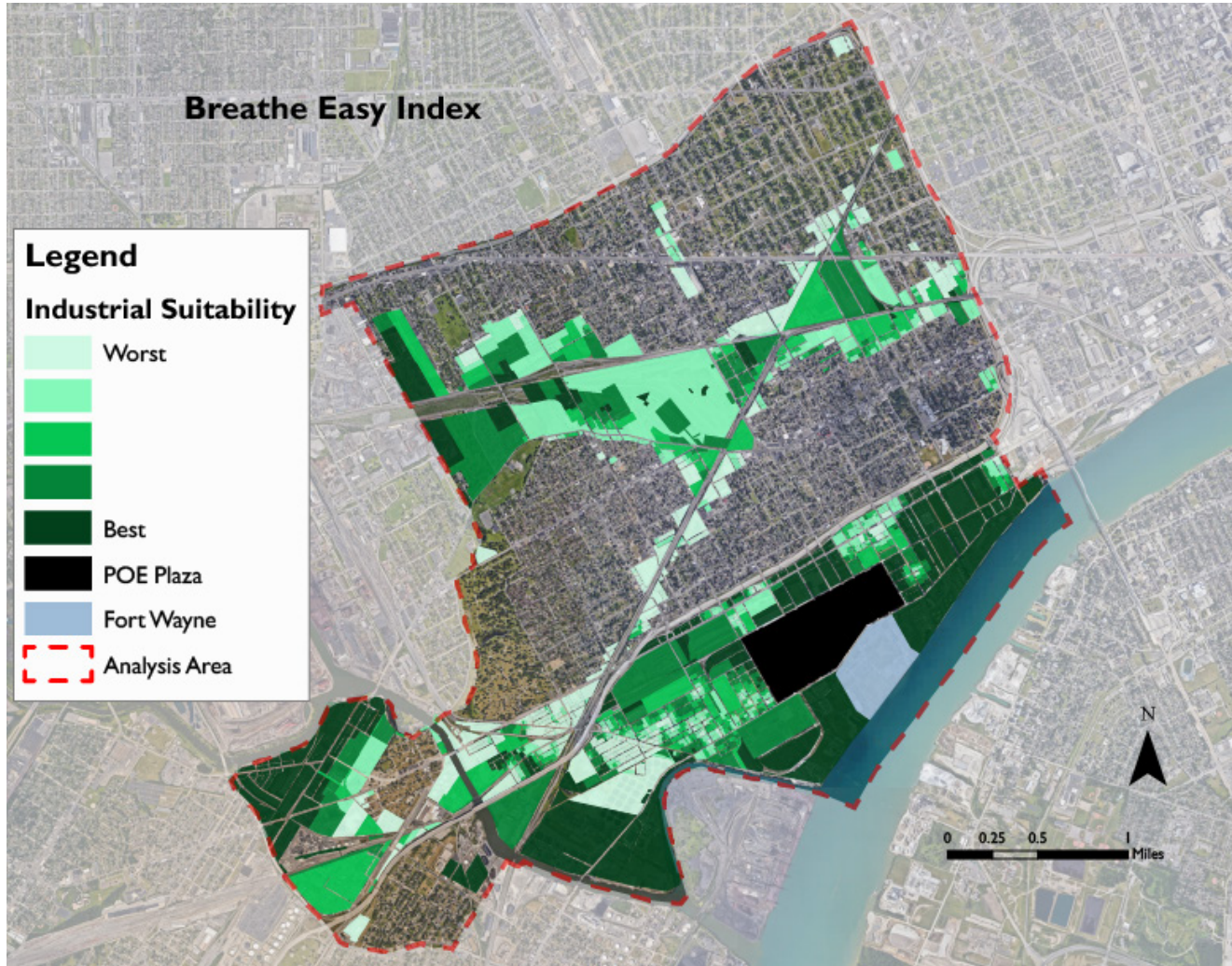


FIGURE 8. Breathe Easy Index map.

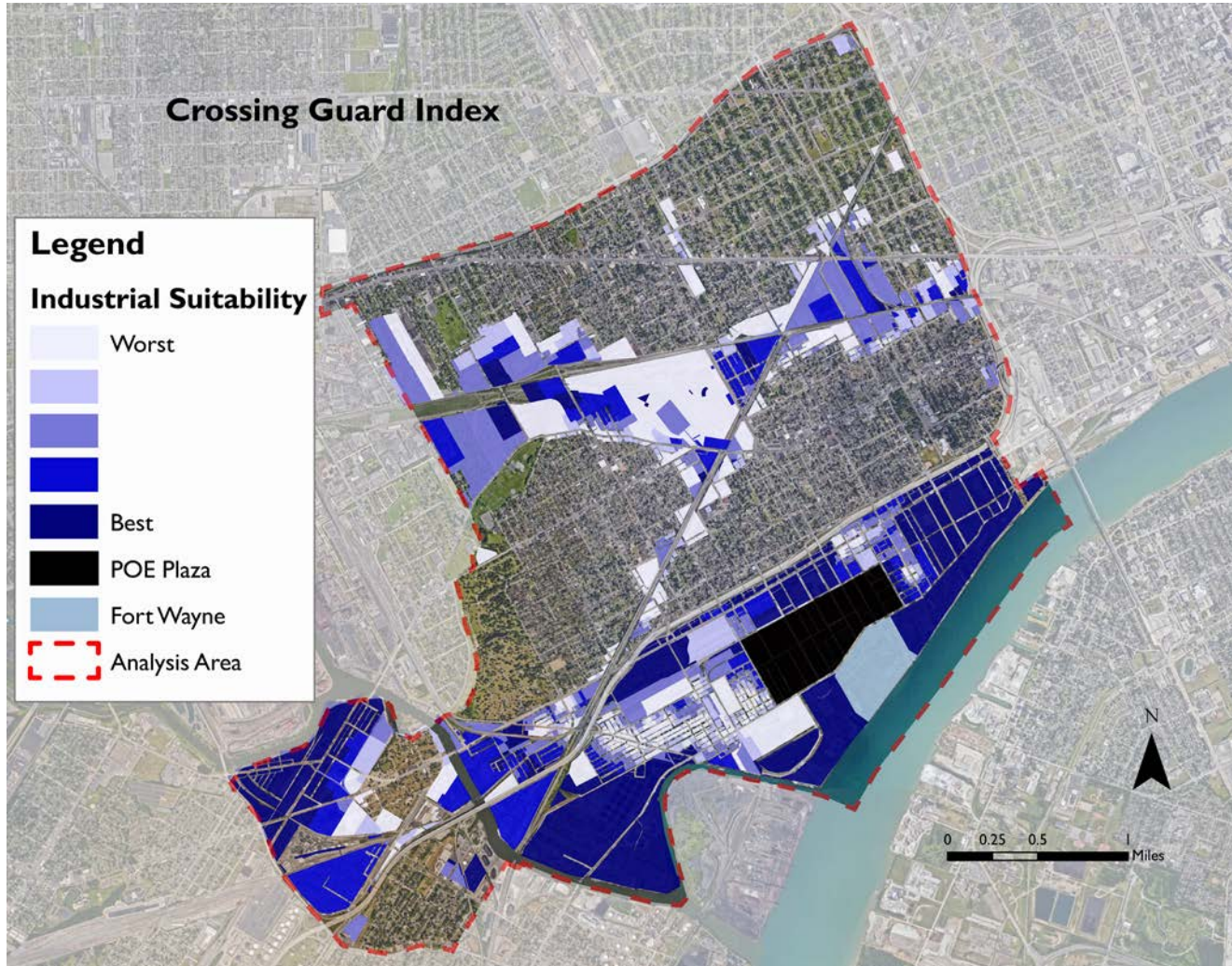


FIGURE 9. Crossing Guard Index map.

the POE Plaza, and along the railroad lines extending from the northeast to southwest of Southwest Detroit. These least-suitable areas are located nearer to areas of dense residential housing; are closer to important sensitive features such as schools, parks, and medical facilities; and are located too close to houses to avoid freight-related noises.

QUALITY OF LIFE INDEX RESULTS

The Quality of Life Index identifies land suitable for industrial businesses that generate freight traffic by considering both air quality and pedestrian safety for residents. To ensure that our analysis was not unduly influenced by our study-area boundaries thereby pushing suitable land to the edge of the analysis area, we expanded the analysis to account for residential areas and sensitive features from outside southwest Detroit (see Appendix C). The areas most suitable for industrial business (see Figure 10) are located northeast of the bridge plaza, southwest of Fort Wayne, along the eastern banks of the Rouge River, to the west of the Rouge River, and north of Dix Avenue near the City of Detroit's border with Dearborn. These areas are generally located further from dense clusters of residential housing, are further from key sensitive features such as schools and parks, and fall outside of ranges needed to dissipate noise from commercial businesses to residences. Areas least suitable for industrial uses are located immediately to the west of the bridge plaza, further to the west of the bridge plaza along Dearborn Street, and along the railroad tracks extending from northeast to southwest of Southwest Detroit in the center of the analysis area.

CONCLUSION

Despite our intent to prioritize resident quality of life, the resulting maps show isolated pockets of occupied residential land in Delray northeast of the POE and southwest of Dearborn Street north of I-75 as suitable for industrial businesses. This is because our analyses prioritized protecting more densely populated residential areas across Southwest Detroit over these pockets of occupied residential land. If land use regulations based on these findings are pursued, further residential displacement by incoming industrial businesses could occur within these isolated residential areas. We urge the City of Detroit to work especially closely with the residents northeast of the POE and southwest of Dearborn Street in order to find them homes in established residential neighborhoods that are less dominated by industrial businesses.



Pockets of dense residential areas remain in Delray.

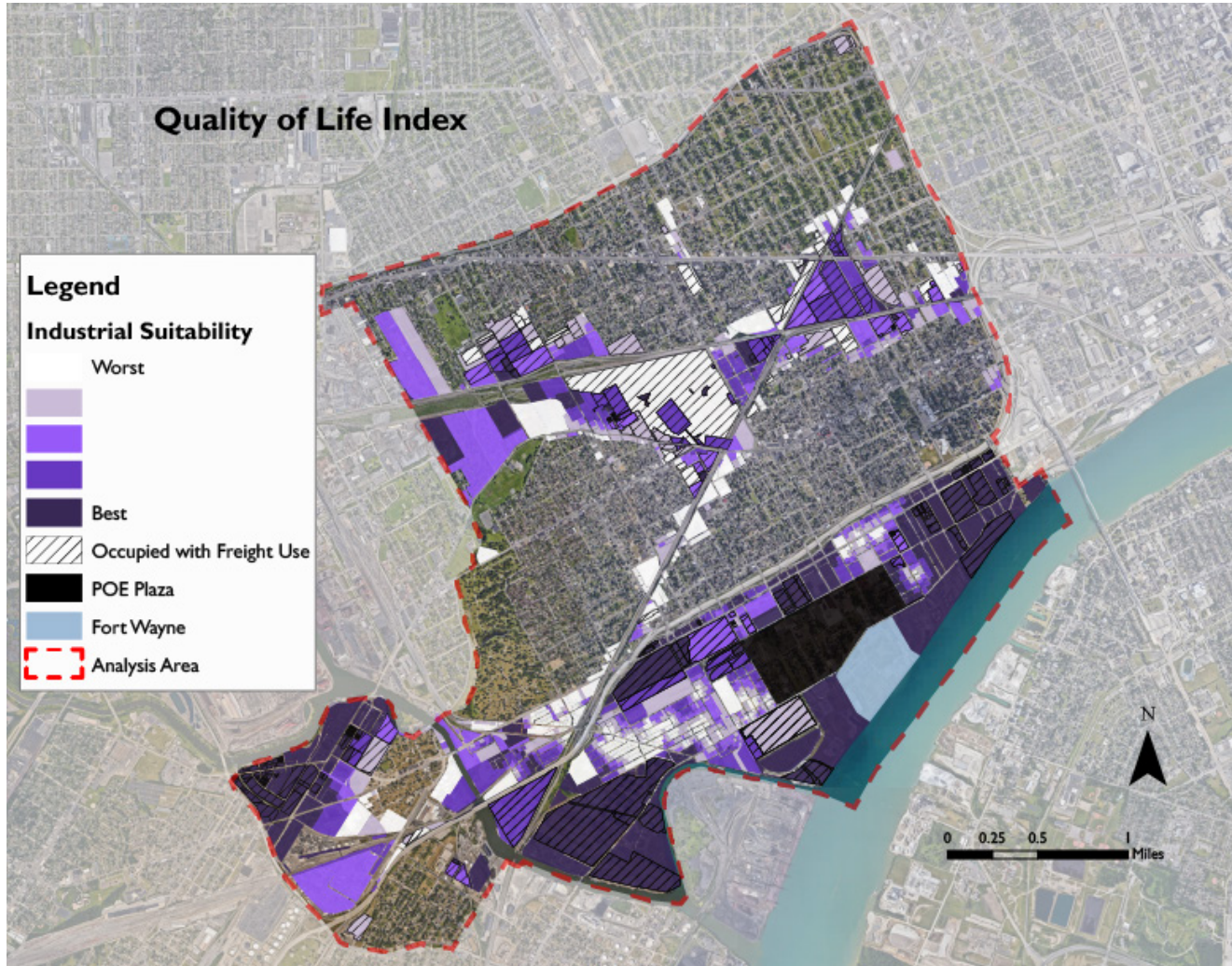


FIGURE 10. Quality of Life Index map.



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OVERVIEW

To test potential truck routes, we developed a model to simulate truck movement under different potential truck-route networks. This method assesses truck travel time and the relative impact on the communities through which they travel. In this analysis, we used existing Southwest Detroit trucking company sites as origins and major business hubs as destinations. We then aggregated travel time between origins and destinations using the number of employees in the U.S. Census Bureau's North American Industrial Classification (NAICS) code for each business hub. This resulted in a time-cost metric, expressed as weighted average travel time (travel time), and impact of trucks on sensitive features metric, expressed as "impact score," for each truck-route network.

To compare potential future truck routes against existing conditions, we created four potential truck-route network configurations in Southwest Detroit: the No Restriction

Network, where trucks can travel on any roads in Southwest Detroit; the Current Network, the currently designated 2019 truck-route network; the Low Sensitivity Network, the maximum sensitive feature avoidance network; and the Test Network, which modifies the Low Sensitivity Network to better avoid sensitive features. For each network, travel time and impact score reveal those routes with maximum time-cost efficiency and least community impact.

DATASET AND VARIABLES

- » **Sensitive Features:** We selected sensitive feature categories to indicate places where residents gather (Table 3). To identify these locations, the research team used the Google Maps Places Application Programming Interface. To ensure data accuracy, we also visited a sample of sensitive features to verify that they were currently in use, and removed those sensitive features from the analysis that were no longer used by the community. To account for the importance of

TABLE 3. Sensitive feature categories and their priority weights.

SENSITIVE AREA VARIABLES	PRIORITIZING CHILDREN <i>Yes=1 No=0</i>	PRIORITIZING OUTSIDE USE VS. INSIDE USE <i>Outside=1 Inside=0</i>	MODE OF ACCESS <i>Walk=1 Other=0</i>	NUMBER OF PEOPLE GATHERING AT ONCE <i><50=1 >50=2 >100=3</i>	TOTAL
School	1	1	1	2	5
Park	1	1	1	1	4
Library	1	0	1	2	4
Bus Stops	0	1	1	1	3
Church	0	0	0	2	2
Grocery Store	0	0	0	2	2
Beauty Salon	0	0	1	1	2
Convenience Store	0	0	1	1	2
Liquor Store	0	0	1	1	2
Small Retail	0	0	1	1	2
Doctor	0	0	0	1	1
Restaurant	0	0	0	1	1
Bar	0	0	0	1	1
Health	0	0	0	1	1
Pharmacy	0	0	0	1	1
Hair Care	0	0	0	1	1
Clothing Store	0	0	0	1	1
Bank	0	0	0	1	1
Bakery	0	0	0	1	1
Laundry	0	0	0	1	1

these sensitive features, we assigned priority weights, protecting them from truck traffic, based on features that primarily serve children, those that cater to outdoor activities, those that users would walk to, and those that serve activities that attract large numbers of people. Protection priority by sensitive feature category is reflected in Table 3.

- » **Origins:** Origins were identified in partnership with the SWDCBC and are defined as major logistics sites within the analysis area that generate a large amount of freight traffic.³⁰
- » **Destinations:** Business hubs, identified using census data, served as destinations within the analysis. Longitudinal Employer-Household Dynamics data was used to identify freight-intensive businesses and the relative size of those businesses based on the number of employees.³¹ Industries included in the analysis are shown in Table 4.

30. Major logistic sites include:

- ContainerPort Group Detroit, 8501 W Fort St, Detroit, MI 48209
- Detroit Produce Terminal, 7201 W Fort St # 1, Detroit, MI 48209
- Boasso Global, 7650 Melville St, Detroit, MI 48209
- Central Transport, 7701 W Jefferson Ave, Detroit, MI 48209
- Renaissance Global Logistics, 4333 W Fort St, Detroit, MI 48209
- Norfolk Southern, 2725 Livernois Ave, Detroit, MI 48209
- Universal Trucking, 2860 Clark Ave, Detroit, MI 48210
- Logistics Insights Inc, 3685 Central Ave, Detroit, MI 48210

31. The North American Industry Classification System (NAICS, pronounced Nakes) was developed under the direction and guidance of the Office of Management and Budget as the standard for use by Federal statistical agencies in classifying business establishments for the collection, tabulation, presentation, and analysis of statistical data describing the U.S. economy.

TABLE 4. Freight-intensive businesses in the study area and their respective NAICS codes.

NAICS CODE	NAICS INDUSTRY TITLE	TOTAL NUMBER OF EMPLOYEES
11	Agriculture, Forestry, Fishing and Hunting	11
21	Mining	95
23	Construction	1,127
31-33	Manufacturing	4,531
42	Wholesale Trade	1,364
44-45	Retail Trade	1,046

TABLE 5. Roads in Southwest Detroit delineated as truck routes in each of the four truck-route configurations.

TRUCK-ROUTE NETWORKS	SOUTHWEST DETROIT ROADS INCLUDED
No Restriction Network	All
Current Network	Wyoming, Jefferson, Dearborn, Vernor, Lonyo, Springwells, Livernois, Dragoon, Clark, Grand, Michigan, Fort, Westend
Low Sensitivity Network	Michigan, Dix, Southern, John Kronk, Miller; Wyoming, Dearborn, Jefferson, Livernois (North Section), Fort, Lonyo, I -75, I-96
Test Network	Michigan, Dix, Southern, John Kronk, Miller; Wyoming, Dearborn, Jefferson, Livernois (North Section), Fort, Lonyo, I -75, I-96, Junction

» **Truck-Route Networks:** Networks were created and analyzed using GIS road data from SEMCOG. Each network contained a unique set of truck routes in the analysis area. During the simulation, we used GIS software to model truck movement along the truck routes listed in Table 5.

» **Travel Time:** Travel time was calculated using average travel time of all trips within the origin-destination matrix analysis between one origin and all destination points. Average travel time was calculated using street lengths divided by the street’s corresponding speed limit. Destinations within the analysis were weighted by the number of employees working at each destination point. Using analysis results from all origins within the model, we derived the average number of trip travel-times as the travel time using the formula:

$$\text{Weighted Average Travel Time} = \frac{\sum_{i=1}^N \text{Time}_i \times \text{Employees}_i}{\text{Total Number of Employees}}$$

Where N is the total number of employment cluster points, *Total Number of Employees* is the quantity of employees in each destination point. *Time* is the estimated travel time from origin to destination predicted by the road network model.

» **Impact Score:** Impact is defined as each time a truck passes within 300-ft of a sensitive feature. Impact score was quantified as the sum of the impact for each truck-route configuration on sensitive features using the following formula:

$$\text{Impact Score} = \sum_{i=1}^N \frac{\text{Number of Sensitive Features in Segment Buffer}_i}{\text{Number of Trips on the Segment}_i}$$

Where i is the total number of road segments in a truck-route network.

ANALYSIS

Network Building

We used existing SEMCOG road networks as base data and modified them to create four truck-route network scenarios. Each truck-route scenario includes a different set of rules used to create the truck-route network:

- » **No Restriction:** All Southwest Detroit roads included.
- » **Current:** Current state with existing, local truck-routes.
- » **Low Sensitivity Feature:** A new network developed by creating a 300-ft buffer around schools. The network includes arterials that do not touch the buffer.
- » **Test:** Add Junction Ave to the Low Sensitivity Feature network.

After designating the networks, we estimated the time cost of each based on speed (speed limit based on Census Feature Class Codes) and road length (function: length/speed)

$$\text{Travel Time for Road Segment}_i = \frac{\text{Length of Road Segment}_i}{\text{Allowed Speed of Road Segment}_i}$$

Origins were then geo-coded by business address, and destinations were imported using the “On The Map” tool with employment cluster data.

Travel Time Evaluation

Our model was then used to simulate truck movement, creating a travel-time table for all potential trips that was aggregated by trip origins and then applied to the formula above to calculate the travel time, which was defined as the average travel time of the truck-route network.

Sensitive Feature Impact Evaluation

To calculate the impact score, weighted sensitive features were added to the GIS analysis. Using the Line Density feature, the three most frequently traveled routes from the previous analysis were identified in each scenario. The three most traveled routes were weighted and buffered by 300-ft. The total weighted score was multiplied by the line density figure to get the final impact score for each route. The last two scenarios were compared by normalizing their impact score on a 0 to 100 scale, with 0 being no impact and 100 being the most impact.

Truck Traffic Camera Enforcement and Signage Locations

To determine priority locations for camera-based truck route enforcement, the team separated designated truck routes from regular streets in GIS based on predicted truck-traffic volumes from the origin-destination analysis in the Low Sensitivity Feature Network. Predicted truck volumes on non-designated truck routes were then ranked in quintile groups from high to low, with higher scores indicating greater predicted truck volumes and lower scores indicating lower predicted truck volumes. Finally, these predicted truck volumes on non-truck routes were classified into prioritized

camera-enforcement categories. Scores with higher predicted truck volumes corresponded to higher priority roads for camera enforcement while lower predicted truck volumes corresponded to lower priority roads for camera enforcement.

To determine priority locations for signage on roads, indicating designated truck routes, we isolated designated 2019 truck routes in Southwest Detroit from all roads in the area. We then projected truck traffic on these truck routes based on traffic volumes from the origin-destination analysis within the Low Sensitivity Network. These predicted truck-route traffic volumes were classified into three categories for signage installation, with higher predicted truck volumes corresponding to higher priority locations for truck-route signage and lower predicted truck volumes corresponding to lower priority locations for truck-route signage.

PRODUCTS

This truck-routes analysis resulted in a total of three distinct products:

- » A table showing travel times for each of the four truck-route configurations (see page 37).
- » A graph displaying impact score and vehicle miles traveled in the Test and Low Sensitivity Networks (see page 38).
- » Two maps illustrating the locations of impact scores under the Test and Low Sensitivity Networks (see page 39).
- » Two maps showing priority locations for camera-based truck route enforcement and positive signage (see pages 42-43).



TRUCK ROUTES: RESULTS

5

OVERVIEW

Our method assesses existing and potential future truck routes in Southwest Detroit and provides an evaluation process for designating specific streets as truck routes to minimize travel time and avoid sensitive features within the analysis area. We used two variables to evaluate and designate truck routes: travel time and impact score. Showing freight efficiency and public health impacts to residents, these metrics account for the needs of freight-intensive businesses and area residents.

PROPOSED TRUCK-ROUTE NETWORK DESIGN PROCESS

Using major logistic sites in Southwest Detroit as origins and freight-intensive business facilities as destinations, our origin-destination analysis simulated four truck-route scenarios. Table 6 shows the travel time and impact score for each scenario.

TABLE 6. Travel time and impact score in each truck-route configuration between an example origin and destination.

SCENARIO	TRAVEL TIME (min:sec)	IMPACT SCORE
No Restriction Network	3:21	N/A
Current Network	3:36	N/A
Low Sensitivity Features Network	5:15	100
Test Network	3:52	68

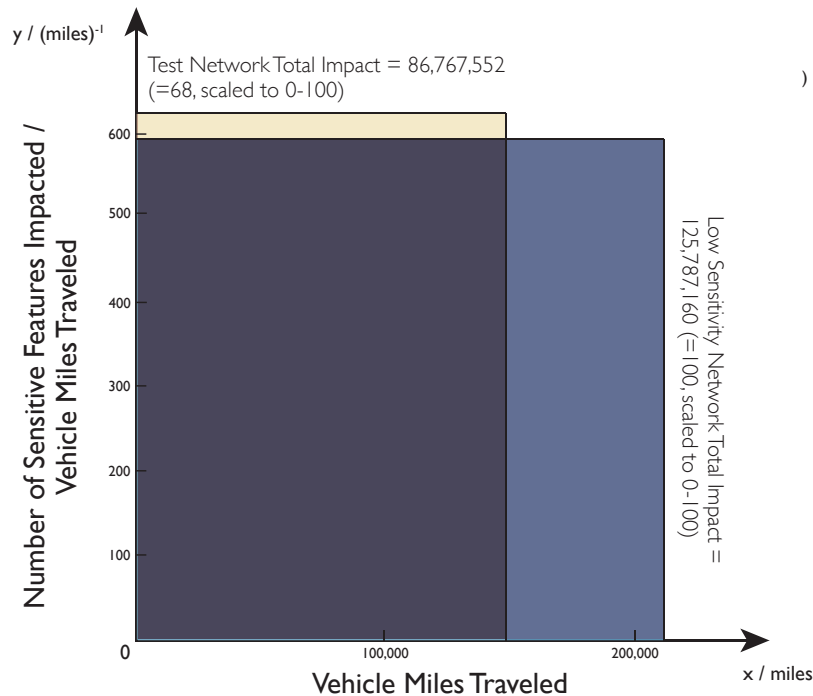


FIGURE 11. Number of sensitive features impacted and vehicle miles traveled in the Test Network and Low Sensitivity truck-route configurations.

Our No Restriction Network had the lowest travel time and is the most time-efficient route network for truck drivers, however it touches a significant number of sensitive features within the study area. The Current Network was the second most time-efficient route network, with a 15-second travel time increase compared to the No Restriction Network; however, the current network design still leads trucks to drive near sensitive features. Some truck routes within the Current Network, such as the routes along Clark Street, have high impact scores because they pass by areas where kids play and attend school, something residents are especially concerned with.

The Low Sensitivity Network resulted in a 1:39 travel time increase over the Current Network, making it the least time-efficient truck-route network. Finally, the Test Network results in greater freight-movement efficiency through a lower travel time and impact score than the Low Sensitivity Network; travel time decreased by 1:23 over the Low Sensitivity Network and the impact score is also lower. This is because of the long detour trucks must take in the Low Sensitivity Network, which eventually leads to a longer travel distance and a higher chance that truck traffic will pass near to more sensitive features in total. The Test Network induces large volumes of trucks traveling on Junction Avenue because of its shorter travel time, thus increasing the number of interactions with sensitive features along Junction Avenue. However, the reduced overall travel distance results in fewer negative interactions between truck traffic and sensitive features (Figure 11).

To further verify the above findings, we calculated the total Vehicle-Miles Traveled (VMT) and the density of sensitive features for these two networks. In Figure 11, the horizontal axis of the graph shows the VMT for the Low Sensitivity and Test Network scenarios, while the vertical axis shows the density of sensitive features impacted by each scenario. The total impact in each scenario equals its VMT multiplied by the number of sensitive features passed per vehicle-mile traveled. The area of the two resulting rectangles represents the total impact scores. Although the Low Sensitivity Scenario has a relatively low density of sensitive features, the scenario's higher VMT causes the trucks to take long detours, and thus still makes its final impact score higher.

Maps depicting the impact score on each road segment in the Low Sensitivity and Test scenarios are shown below in Figures 12 and 13. The road segments with low impact scores, 0-20, were left blank in order to highlight road segments with higher scores. With Junction Avenue added to the network, many of the red road segments in the low sensitivity scenario were downgraded to yellow, orange or green, indicating lower impact, while Junction Avenue was upgraded to red in Figure 13, indicating traffic was diverted onto Junction Avenue.

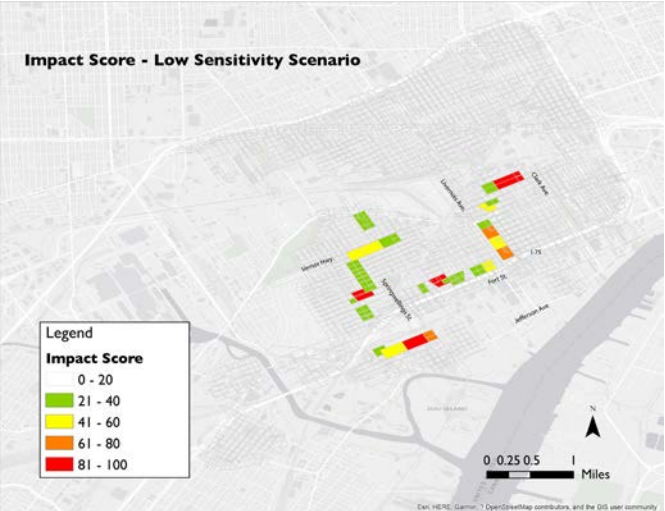


FIGURE 12. Total impact on sensitive features in the Low Sensitivity truck-route configuration.

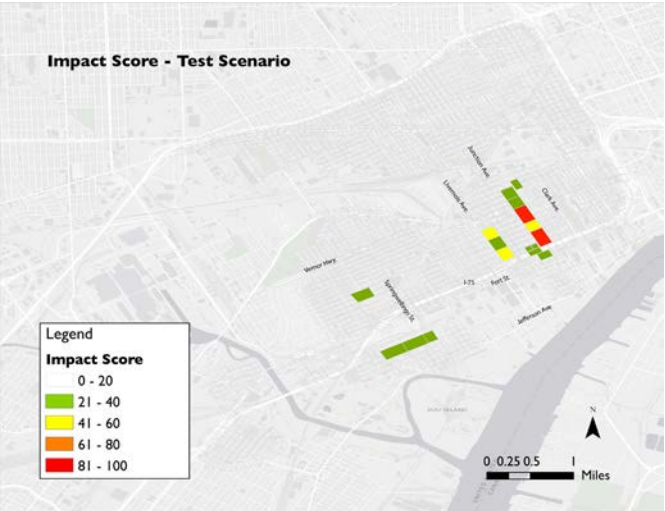


FIGURE 13. Total impact on sensitive features in the Test truck-route configuration.

CASE STUDY: CAMERA-BASED TRUCK-ROUTE ENFORCEMENT (PORT OF BALTIMORE, MD)

Challenges

- » Freight trucks traveling on restricted residential streets.
- » Limited police enforcement resources.
- » Driver awareness of designated routes.
- » Permitting local delivery drivers.
- » Consistency with state law.

Notable Practices

New cameras were integrated in 2018 as part of the City's updated speeding and red-light camera system, the Automated Traffic Violation Enforcement System. For truck-route enforcement, cameras snap pictures of vehicles taller than twelve feet. Once detected, transportation officials check the images before issuing a ticket. Punitive measures are progressive: violators get a warning for a first offense, a \$125 fine for a second offense, and \$250 for subsequent offenses.³² Similar practices have also been used in Washington, DC, where three oversized safety cameras are used for identifying large commercial vehicles, and New York City, where closed circuit television cameras are trained on major arterials. This allows operations staff to monitor traffic conditions at key locations in the city and activate variable message signs for the temporary rerouting of traffic such as in response to over-height trucks striking a bridge, and also to identify trucks traveling in non-designated truck routes.³³

Cooperation with local stakeholders was necessary to implement these policies. Louis Campion, president of the Maryland Motor Truck Association, said that a carrier came to the association with concerns about deliveries to John Hopkins Hospital.³⁴ The hospital receiving area was within a zone that included an enforcement camera. The City worked with Maryland Motor Truck Association and the camera was moved two blocks east, allowing commercial vehicles to deliver to the hospital without concerns for tickets.

Relevance to Southwest Detroit

Truck-route enforcement has long been seen as part of the job for the local police force in municipalities. The cities of Baltimore and Detroit both host a significant volume of trucks due to high levels of freight traffic between both of these cities and other places, yet both cities have limited resources to monitor trucking activity. Using cameras near the residential neighborhoods where truck traffic problems occur presents a technological solution that has been proven effective.

32. Travis Overton. (2018). "Baltimore DOT is installing numerous cameras to monitor trucks 24/7". CDLLife. <https://cdllife.com/2018/big-brother-increasing-its-reach-in-baltimore/>

33. New York City Department of Transportation. (2015). "Urban Freight Initiatives". New York City Department of Transportation. <https://www1.nyc.gov/html/dot/downloads/pdf/2015-09-14-urban-freight-initiatives.pdf>

34. FreightWaves Staff. (2018). "Baltimore deploys cameras to crack down on trucks traveling on local roads". FreightWaves <https://www.freightwaves.com/news/cash-flow-corner/baltimore-deploys-cameras-for-wayward-trucks>

ENFORCEMENT RESULTS - PROPOSED CAMERA AND SIGNAGE LOCATIONS

To help keep trucks on their designated routes, our analyses also assessed the deployment of enforcement measures on these potential truck routes. We suggest that enforcement focus on non-truck routes that have projected high truck volumes. Considering truck traffic volumes on each road, we ranked roads into quintiles within the truck-route network from highest to lowest. We recommend that the City prioritize enforcement on roads starting with the highest projected truck volumes and implement them in stages based on available budget. Figure 15 shows the ranking of non-truck-route roads for camera-based enforcement under the Low Sensitivity Network scenario. In this map, we divided all non-truck routes into three categories to highlight the enforcement priority for different roads. Based on the truck volumes shown in this map, we recommend the City implement enforcement on the “low budget” streets first as they have high simulated truck-traffic volumes.

Figure 15 shows high-priority roads (red orange) with large numbers of sensitive features necessitating higher enforcement levels. Blue roads are low-priority truck routes with small numbers of sensitive features and low projected truck traffic.

- » Low Budget - The non-truck-route roads ranked as the top 33% in truck volume.
- » Medium Budget - The non-truck route roads ranked as the 33% - 66% in truck volume.
- » High Budget - All the non-truck-route roads ranked from the highest truck volume.

We also propose installing positive signage on designated truck routes signaling to truck drivers that they are on an approved truck route. Similar to camera installation, positive signage should be installed according to truck-traffic volumes on each road. We categorized all truck routes into three groups from the ranging from highest to the lowest priority for positive signage. A potential design for positive truck-route signage is shown in Figure 14. The City could install the positive sign on the truck routes with relatively high projected truck volumes and then gradually install the signs on lower-volume routes, as shown in Figure 16.

- » Low Budget - top 33% truck-route roads ranking from the highest truck volume
- » Medium - 33% to 66% truck-route roads ranking from the highest truck volume
- » High Budget - All truck-route roads ranking from the highest truck volume

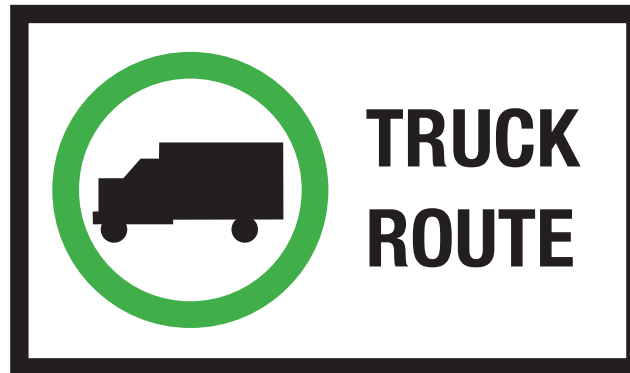


FIGURE 14. Example of signage indicating an approved truck route.

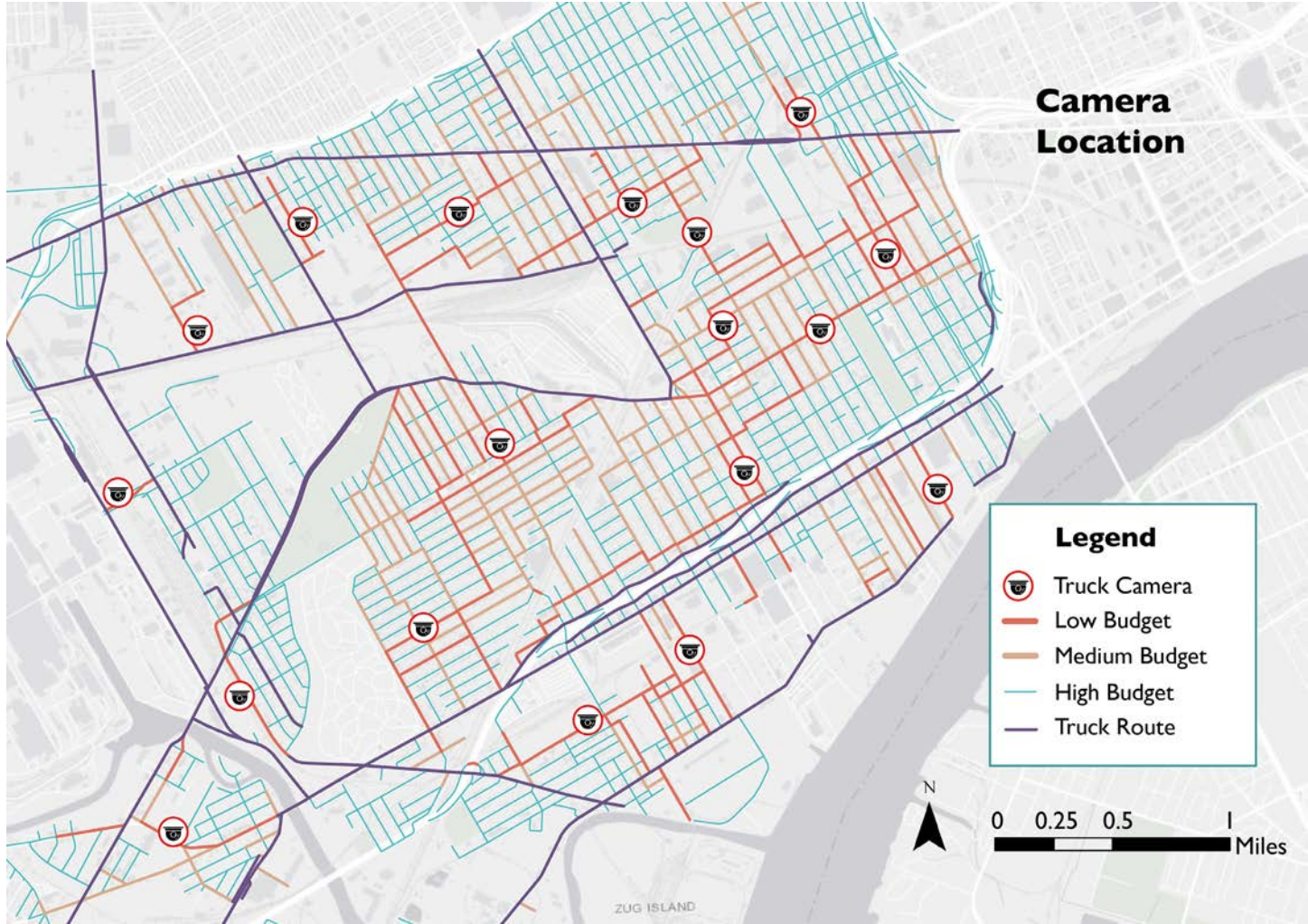


FIGURE 15. Priority locations for truck-route camera enforcement.

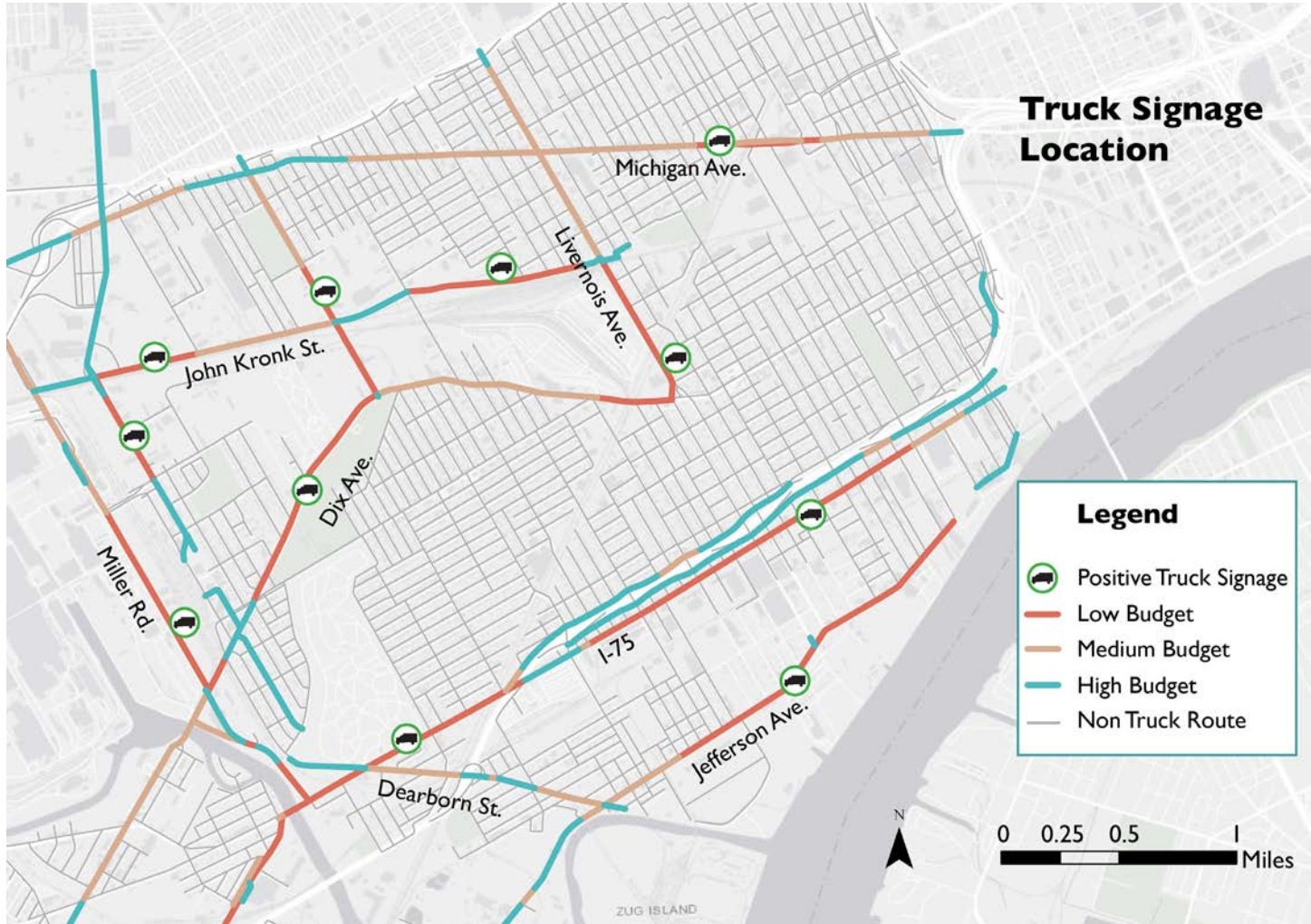


FIGURE 16. Locations for truck approved-route signage based on budget availability.




Bridge to Canada
EXIT 47B
NO RE-ENTRY TO USA

HOTEL YORBA

OVERVIEW

The Gordie Howe International Bridge project will drastically impact noise levels and air pollution emissions not only in Delray, but also in neighborhoods adjacent to the I-75 POE interchanges. MDOT explored noise barriers in this area as a mitigation strategy for both of these effects; however, not all of the MDOT barriers analyzed were recommended for build-out.³⁵ MDOT's 2018 recommendation evaluation criteria included cost, effectiveness, and number of households benefiting from noise mitigation attributable to a barrier. Although technical principles of noise management may guide planning for barrier height and location, other design considerations will impact the long-term experience of nearby residents. As part of the planning process, MDOT and BNA have stated intentions to engage community members during the design phase of the noise barriers. We piloted one type of outreach in a neighborhood focus group.

35. Michigan Department of Transportation. 2018 "Noise Technical Report Build Year 2040" Michigan Department of Transportation

METHODS

Our method for assessing noise barrier proposals and creating alternative approaches integrated three main steps to identify physical and community concerns, identify opportunities, and guide design approaches for noise reduction. The methods assume the importance of protecting all residents, and focus on households located immediately north of I-75 between Clark Street to the east and Mullane Street to the west. Our primary methods include:

- » **Site Modeling** - including a virtual tour
- » **Defining Site Characteristics** - including MDOT proposal evaluation
- » **Community Input** - including a community focus group

The products of each method build upon one another and guide our final recommendations. In this section, we describe our three methods.

Site Modeling

Virtual Tour

We constructed a virtual tour video with 3-D modeling software that served two main purposes:

1. To accurately depict future build-out plans according to available MDOT development specifications, geography, topography, and land use conditions, which allowed an assessment of sound barrier efficacy;
2. To provide community members with a visual depiction of MDOT's sound wall proposals through a 2 ½ minute video tour which flies through the north side of I-75 along the Service Drive. This tour included locations of new POE ramps, alterations to I-75 on/off ramps, pedestrian footbridges, service drive shifts or expansions, and noise barrier segments reflecting height and location. The tour only showed these barriers as simple, gray concrete. As of this study, detailed material design plans have not been made available to the public at this stage.

The video, created using InfraWorks, highlights noise barrier points of interest, and provides views of existing conditions versus MDOT proposed conditions. The model incorporates satellite imagery from Microsoft Bing Maps, topography from United States Geological Survey, 10-m digital elevation models from the National Elevation Dataset, building footprints from OpenStreetMaps, and roadways from OpenStreetMaps. We manually adjusted building heights for blocks adjacent to the Service Drive. Google

StreetView provided updated data about tree location and demolished buildings. We estimated the height of POE ramps using sectional height data provided in a 2017 public presentation by the WDBA, and then projected reasonable heights for the entire ramp interchange.³⁶

Defining Site Characteristics - Including MDOT Proposal Evaluation

After constructing a 3D-site model, we identified primary noise concerns and opportunities for noise mitigation based upon best practices for noise barrier design from the Federal Highway Administration and multiple state departments of transportation. Best practices combine functionality with creativity to reach context-specific goals. We then used these best practices to delineate five segments of the impact site along the north side of I-75 that had different needs and opportunities, such as land characteristics and directional angles from traffic noise. Our segments were shorter than MDOT's proposed barrier segments, which allowed for more attention to nuanced details and concerns. We then evaluated the MDOT noise barrier proposal to determine the efficacy of each proposed barrier section.

We considered the following best practice principles to evaluate MDOT's proposed barrier:

36. Windsor-Detroit Bridge Authority. (2017). Informational Meeting Powerpoint. Windsor-Detroit Bridge Authority [https://www.gordiehoweinternationalbridge.com/u/files/Meetings/2017-07-05%20-%20Public%20Information%20Meeting/PPA%203%20Panels%20for%20web%20\(2017-07-20\)%20Reduced.pdf](https://www.gordiehoweinternationalbridge.com/u/files/Meetings/2017-07-05%20-%20Public%20Information%20Meeting/PPA%203%20Panels%20for%20web%20(2017-07-20)%20Reduced.pdf)

- » *Line of Sight (direct noise)*: To achieve recognizable noise reduction, the height of a sound barrier should completely block the line of sight to the noise source from the receiver, i.e., the person or object affected by the noise.³⁷
- » *Reflection*: Sound waves can either absorb, reflect, transmit, or diffract when they encounter a sound wall. Reflection becomes an issue when sound bounces off of a wall and travels back in the opposite, unintended direction.³⁸
- » *Flank Noise (diffracted noise)*: Flank noise is sound wrapping around the side or top of a barrier. An optimal noise barrier has no or minimum gap.
- » *Green Berms*: Earthen mounds, berms, or a combination of earthen berms and walls, can form an effective noise barrier by intercepting and scattering noise. Earthen berms have a natural appearance and are often visually pleasing. They also reduce noise more effectively than walls of the same height and are least expensive.^{39,40}

37. Federal Highway Administration. (2017). "Noise Barrier Design - Visual Quality". U.S. Department of Transportation https://www.fhwa.dot.gov/Environment/noise/noise_barriers/design_construction/keepdown.cfm

38. California Department of Transportation. (2014). "Noise Barrier Design Considerations." California Department of Transportation https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rtcreff/ch2.6/2014-12-19_Caltrans_TrafficNoiseAnalysisProtocol_Part3.pdf

39. California Department of Transportation. (2014). "Noise Barrier Design Considerations." California Department of Transportation https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rtcreff/ch2.6/2014-12-19_Caltrans_TrafficNoiseAnalysisProtocol_Part3.pdf, Federal Highway Administration. (2017). "Noise Barrier Design - Visual Quality". U.S. Department of Transportation https://www.fhwa.dot.gov/Environment/noise/noise_barriers/design_construction/keepdown.cfm

40. Washington State Department of Transportation. (2019). "Road noise and noise walls." Washington State Department of Transportation. <https://www.wsdot.wa.gov/environment/protecting/>



Fisher Service Drive that runs parallel to I-75.

Earthen berms typically require 2:1 to 4:1 base-width to height ratio.⁴¹ Noise berms generally require more space than a wall.

- » *Vegetative Buffers*: Shrubs and trees are useful elements for scattering noise. Vegetation intercepts sound waves and scatters them, thereby mitigating reflection. Additionally, the placement of vegetation near air pollution sources, such as traffic, can aid in air pollution absorption.⁴²

noise-walls

41. Federal Highway Administration. (2017). "Noise Barrier Design Handbook". U.S. Department of Transportation https://www.fhwa.dot.gov/ENVIRONMENT/noise/noise_barriers/design_construction/design/design04.cfm; https://www.fhwa.dot.gov/ENVIRONMENT/noise/noise_barriers/design_construction/design/design03.cfm

42. Sara Janhall. (2015). "Review on urban vegetation and particle air pollution" Atmospheric Environment. Vol. 105. <https://www.sciencedirect.com/science/article/pii/S1352231015000758>

Evaluation of the MDOT proposal focused on the basic parameter of intercepting direct noise from the main sources identified (POE ramps, I-75, Service Drive). We used our virtual model to observe receiver (resident) perspective at the height of a two-story window (20-ft tall) and evaluated direct line-of-sight to noise sources located on Service Drive, I-75 and the POE ramps.

Community Focus Group

In cooperation with the SWDCBC, the team organized a focus group to begin gathering community input on the design and locations of noise barriers along I-75 near the POE. Participants in the focus group were residents living within the impact zone north of the I-75 service drive. Focus groups are particularly beneficial for facilitating participant interaction and idea sharing. The focus group had three main goals: education, inspiration, and prioritization.

Goal 1: Educate and Inform

- » *Action:* Introduce noise barrier basics:
 - How noise travels from highways
 - How sound walls work
 - Standard types of sound walls, materials and designs

- » *Action:* Illustrate current plans for noise mitigation:
 - We created a comprehensive 2 ½ minute virtual tour for residents to explore the current site development plans. Focus group participants viewed the tour and were able to ask questions and share their responses.

Goal 2: Inspire

- » *Action:* Inspire participants to conceive of designs that improve their community through effective noise barrier design. We provided examples of advanced noise barrier designs from around the world, exemplifying noise barrier:
 - Types (i.e. post and panel)
 - Features (green elements)
 - Materials (i.e. concrete, acrylite, steel, etc.)
 - Designs (various)

Goal 3: Prioritize

- » *Action:* Gather insight to community preferences on noise barrier design. We engaged participants in exercises, including:
 - Interpersonal discussion of traffic and noise concerns
 - Sticker voting on noise barrier design preferences and outcome values
 - Sticker voting on most important barrier features, such as wall material and style, wall vegetation, and vegetative berms. Voting results served as a basis for our recommendations for community preferences.

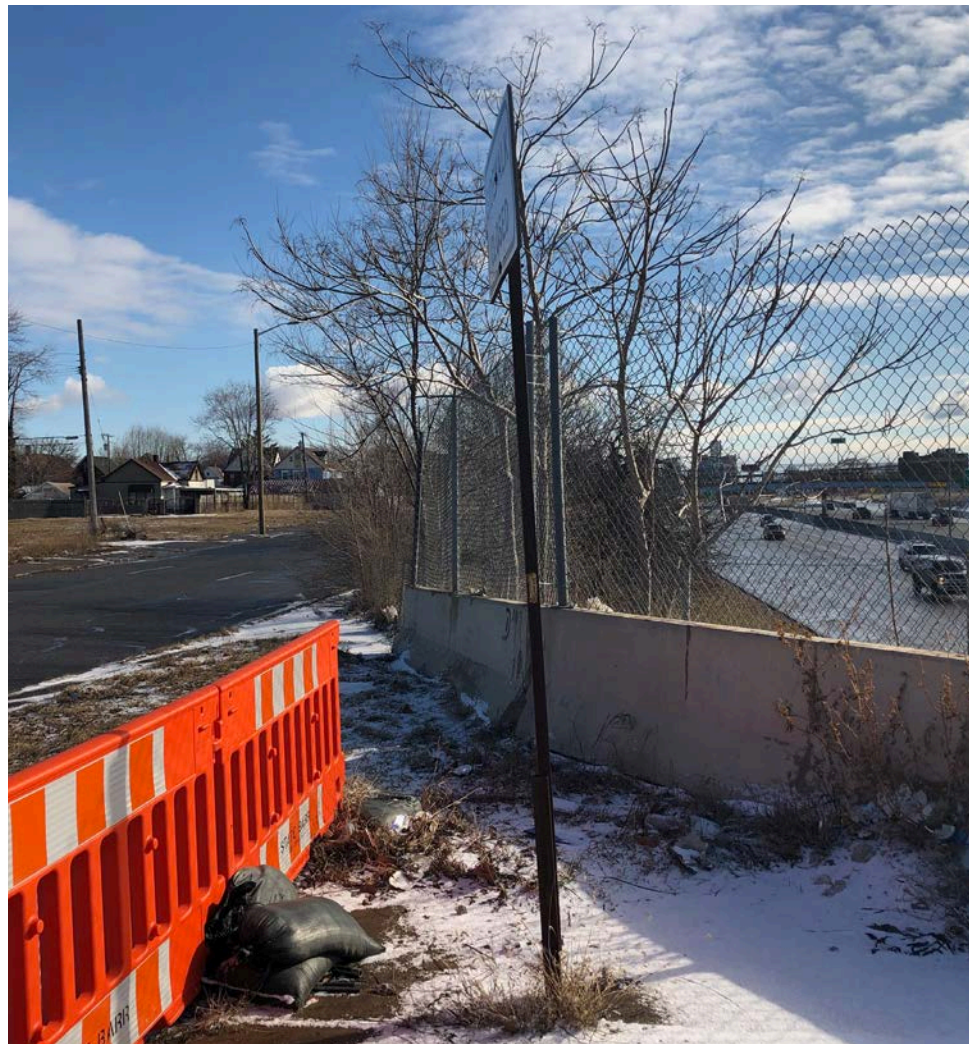
PRODUCTS

Visual Aids

Preparation of descriptive materials about current MDOT sound wall plans and potential design alternatives played an important role in the success of the noise emissions focus group. While community members are experts in their nuanced experiences about the neighborhood and the impact of existing trucks throughout the impact zone, education on noise and noise barriers was necessary to spur discussion and formulate input on barrier design. In order to successfully introduce noise barrier basics, explain current MDOT plans for noise mitigation, and visualize design features, we created a series of visual aids to illustrate concepts and examples of noise barriers.

Visual aids included:

- » Map of Bridging Neighborhoods Home Swap and I-75 Environmental Mitigation Program boundaries.
- » Noise barrier design images, exemplifying various materials and wall types.
- » Virtual video tour with full build out and barriers identified their MDOT-recommended or non-recommended status.



Potential location for noise barrier between Fisher Service Drive and I-75.



NOISE BARRIERS: RESULTS

7

SITE MODELING & VIRTUAL TOUR

We rendered a 2 ½ minute virtual tour of the impact zone along Fisher Service Drive North, using AutoDesk Infracore software. The virtual tour illustrates the MDOT design plan of the POE/I-75 interchange ramps, Service Drive shifts, footbridges, and added and removed automotive bridges.⁴³ It also includes the noise barriers proposed by MDOT. The virtual tour demonstrates a complete build-out of the MDOT proposal (Figure 17).

DEFINING SITE CHARACTERISTICS

In building a 3D-model of the site, we identified five distinct segments of the Fisher (I-75) Service Drive between Clark Avenue and Mullane Street based upon physical conditions, noise concerns, and mitigation opportunities (Figure 18).

Conditions and concerns that characterized these segments included the new alignment of the Service Drive, pushing the drive into previously residential parcels, new elevated ramps to the POE, and the potential for noise reflection from a new noise wall between I-75 and the Service Drive. Some areas also present opportunities where vacant parcels allow for alternative noise and air quality mitigation strategies. These segments did not correspond to the noise barrier segments detailed in the MDOT proposal, but instead provided a framework for evaluating the efficacy of the proposal and potential alternatives.

We used the 3D-model to evaluate the effectiveness of the MDOT-proposed barriers at intercepting direct noise from primary sources (raised ramps and I-75) (Table 7). We also identified areas where the MDOT-proposed noise barrier introduced new concerns to the study area, including where the noise from trucks traveling on the Service Drive posed a risk of reflection, which would amplify noise

⁴³ Michigan Department of Transportation. 2018 "Noise Technical Report Build Year 2040" Michigan Department of Transportation

reaching adjacent households. Currently, trucks traveling on the Service Drive pose a daily challenge for residents. Some residents reported their houses shaking when trucks passed, particularly moving on and off ramps to I-75. Strategies for addressing the risk of noise reflection as well as noise emanating from elevated ramps is described in the recommendations section.

We found that the MDOT-proposed barrier heights would intercept I-75 direct traffic noise, but would ineffectively block noise from the elevated POE interchange ramps. In addition, MDOT-proposed barriers, referred to as

“New Barrier 4A/4B,” “New Barrier 1A/1B,” and “New Northbound,” were not recommended in MDOT’s 2018 Noise Technical Report. Therefore, we anticipate significant gaps in noise mitigation if implementation is limited to current MDOT recommendations. Residents between Livernois and Waterman could experience particularly severe risks from elevated POE ramp noise and I-75 noise. The noise of trucks merging onto S I-75 from the southbound POE ramps may be especially loud here, as tires-on-pavement and gear-shifting noise from truck exhaust stacks will magnify sound impacts.

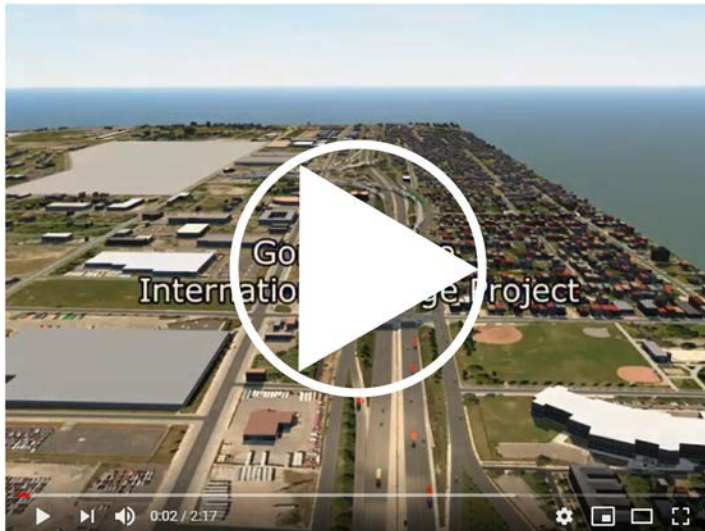


Figure 17. Virtual model (tinyurl.com/y6lsw3my) of the noise impact site with complete build-out of MDOT proposed noise barriers (left) and an example of a residential view from a second story window (right).

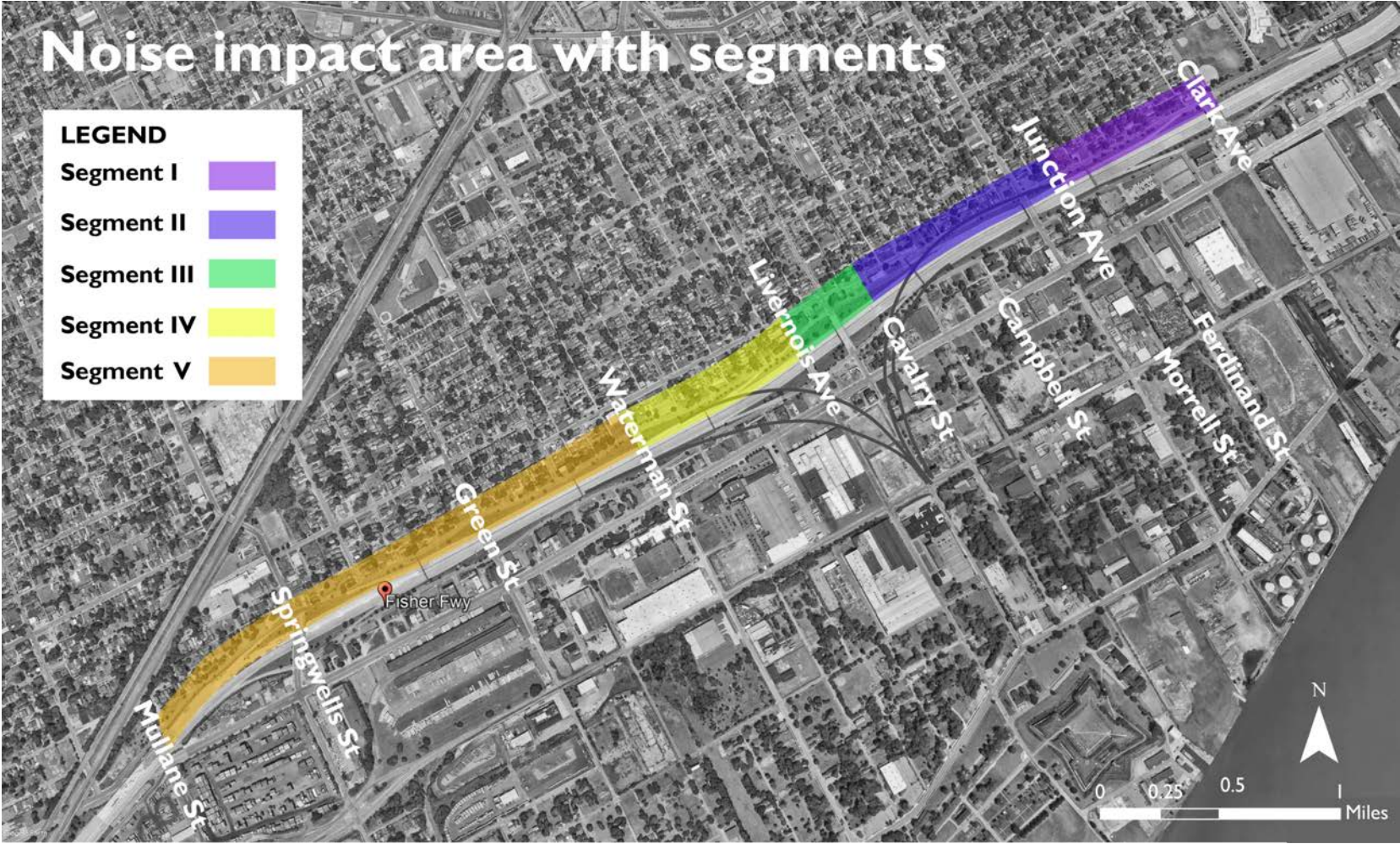


FIGURE 18. Noise impact area with segments characterized by physical conditions, noise concerns, and mitigation opportunities.

TABLE 7. MDOT Noise Barrier Proposal Evaluation

SEGMENT	MDOT NOISE BARRIER	END POINTS	BARRIER HEIGHT (FT.)	EFFECTIVE AT MITIGATING I-75 NOISE?	EFFECTIVE AT MITIGATING POE RAMP NOISE?
I	Original Barrier #3	Clark St. Junction Ave.	15'	Yes	N/A
II, III, IV	Original Barrier #2	Junction Ave. Livernois Ave.	15'	Yes	No
IV	New Barrier 4A/4B*	Livernois Ave. Waterman St.	20'	Yes	No
V	Original Barrier #1	Waterman St. Green St.	14'	Yes	N/A
V	New Barrier 1A/1B*	Green St. Springwells St.	13.2'	Yes	N/A
II	New Northbound*	(South of I-75)	11'	Yes	No

* not recommended by MDOT

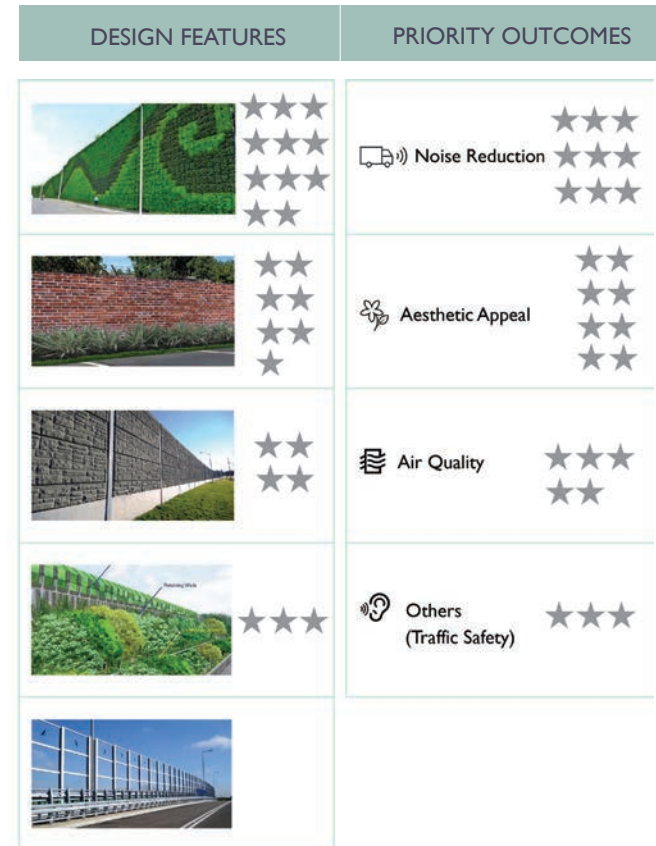


FIGURE 19. Community members' votes for noise barrier design features and priority outcomes (stars indicate votes).

COMMUNITY FOCUS GROUP

We held a focus group and presented information on noise barrier basics, the MDOT sound wall proposal, and alternative design options. We then solicited community input on priorities for noise barrier design and values in the overall outcomes. Feedback from the community focus group (described above in the Methods section) provided insights in two critical areas: concerns about future conditions and priorities for noise barrier values and designs. Along the entire extent of the north Service Drive, residents expressed concerns about traffic in the following order of priority: air quality, noise, and traffic safety. Overall, residents' analysis of our segments resulted in the identification of five general concerns that require attention and mitigation. These concerns were:

- » Lack of data: baseline information on noise and noise barriers, as well as barrier plans;
- » Direct noise and shaking from trucks on Service Drive;
- » Air pollution, including fugitive dust, particulate matter, and lead poisoning;
- » Aesthetic appeal, impact on community feeling; and
- » Safety from increased traffic.

Sticker Voting Results

The focus group was asked to sticker vote at two different times, first to prioritize their values in the desired outcomes of the noise barrier and second to prioritize their design feature preferences. Participants voting preferences are shown in Figure 19.

Community members expressed their priorities and preferences for future noise barriers by sharing stories of their experiences in the study area and by voting. Focus group participants cited air quality improvement and noise reduction as top priorities (Figure 19). They also wrote in traffic safety as a priority, referencing a need for traffic calming measures or protection from Service Drive traffic. Focus group participants also indicated their design preferences for sound barriers (Figure 19). A wall with integrated vegetation, such as a living wall, received the most votes. Brick wall material received more votes than concrete. Notably, the transparent wall design received zero votes. Community members stated that a transparent wall looks more appropriate for a “newer” neighborhood but not their neighborhood. Our team understood this to mean that the transparent barriers did not fit the character of Southwest Detroit, while the green wall (top choice) and brick wall (2nd choice) did.



Sticker voting at the focus group.



RECOMMENDATIONS

8

LAND USE

Overview

We found three common types of policy approaches to managing industrial land uses that generate freight traffic: zoning, incentives, and long-term planning. We reviewed the freight-intensive land-use policies of the following cities: Baltimore, Maryland; Chicago, Illinois; Long Beach, California; Miami, Florida; New York City, New York; Orlando, Florida; Portland, Oregon; San Francisco, California; and Vancouver, British Columbia. We examined relevant documents for municipal policies or programs related to freight planning, including each city's zoning ordinances, incentive programs that pertain to freight location, and comprehensive plans. The team then synthesized this language to develop policy recommendations specific to Southwest Detroit for our three main approaches: zoning, incentives, and long-term planning.

Zoning

Zoning is a regulatory approach to land management that determines what land uses may locate within defined geographic areas of a city, in part as a mechanism for protecting residential land uses. In Southwest Detroit, the principal goal is to locate future incoming industrial businesses away from residents. Residents remaining in the neighborhood could benefit from zoning regulations that mitigate the impacts of incoming industrial land uses. We propose a regulatory approach that offers two general zoning schemes: 1) a negative overlay zone, titled the "No New Trucks Zone," which includes more stringent zoning requirements in existing core residential areas, and 2) an industrial district, the "Southwest Detroit Freight District Zone," which includes minimum zoning requirements coupled with the provision of business incentives and would exist in current industrial areas or areas facing pressure for conversion to industrial use.

We derived the geographic extent of both overlay zones from the team's suitability analysis (see Land Use Results section). A No New Trucks Zone was delineated by isolating the two least suitable categories from the suitability map, 40% of the total land parcels we considered as potential sites for industrial businesses in the analysis. Similarly, we delineated a Southwest Detroit Freight District Zone by isolating the most suitable category of parcels from the suitability map, 20% of the total land parcels we considered as potential sites for industrial businesses in the analysis. Both of these zones are shown in Figure 20.

The No New Trucks Zone's primary purpose is to provide additional protection to existing residential areas from industrial uses. The zone encompasses existing core residential areas and adjoining parcels and would discourage new industrial development through stricter zoning requirements. Our proposed zoning requirements for industrial land uses, outlined below, prioritize air quality and resident safety and are based on an analysis of best practices throughout the country.

- » **Buffering:** Zoning in these areas would include a 20-ft buffering requirement when the parcel is adjacent to a residential use. Vegetative buffers aid in enhancing aesthetics and mitigating pollution. Native plants would also be required because they are hardier, require less maintenance, and do not disrupt natural systems. All plant species would be required to be effective in reducing pollution. For details on this strategy, see our case study on the City of Long Beach's use of vegetative buffers (page 61).

- » **Street Trees:** Requiring street tree planting and maintenance for new industrial businesses would further advance aesthetics and pollution mitigation in residential neighborhoods.
- » **Setbacks:** Large front, side, and rear yard setbacks would be a requirement for incoming industrial businesses when the parcel is located adjacent to a residential use. This would provide additional separation between conflicting land uses.
- » **Development Review:** A development review study, prior to development approval, would be required for incoming businesses in order to determine the impact the business would have on air quality and public health in the community. This would serve to increase residents' awareness and to help prepare the community for changes. Such studies could also inform the City about the freight needs incoming businesses may have.
- » **Public Notice:** Greater public notice requirements (e.g. direct mail notice) would be mandated to ensure that residents have more knowledge and voice in the development process.

By contrast, the Southwest Detroit Freight Districts Zone's primary purpose is to provide industrial businesses with a less stringent development process, thus indirectly incentivizing incoming freight-intensive businesses to locate in these areas. This Southwest Detroit Freight Districts Zone would apply to clusters of exclusively industrial uses. There would be no requirements for street trees, larger setbacks, a development review study, or special public

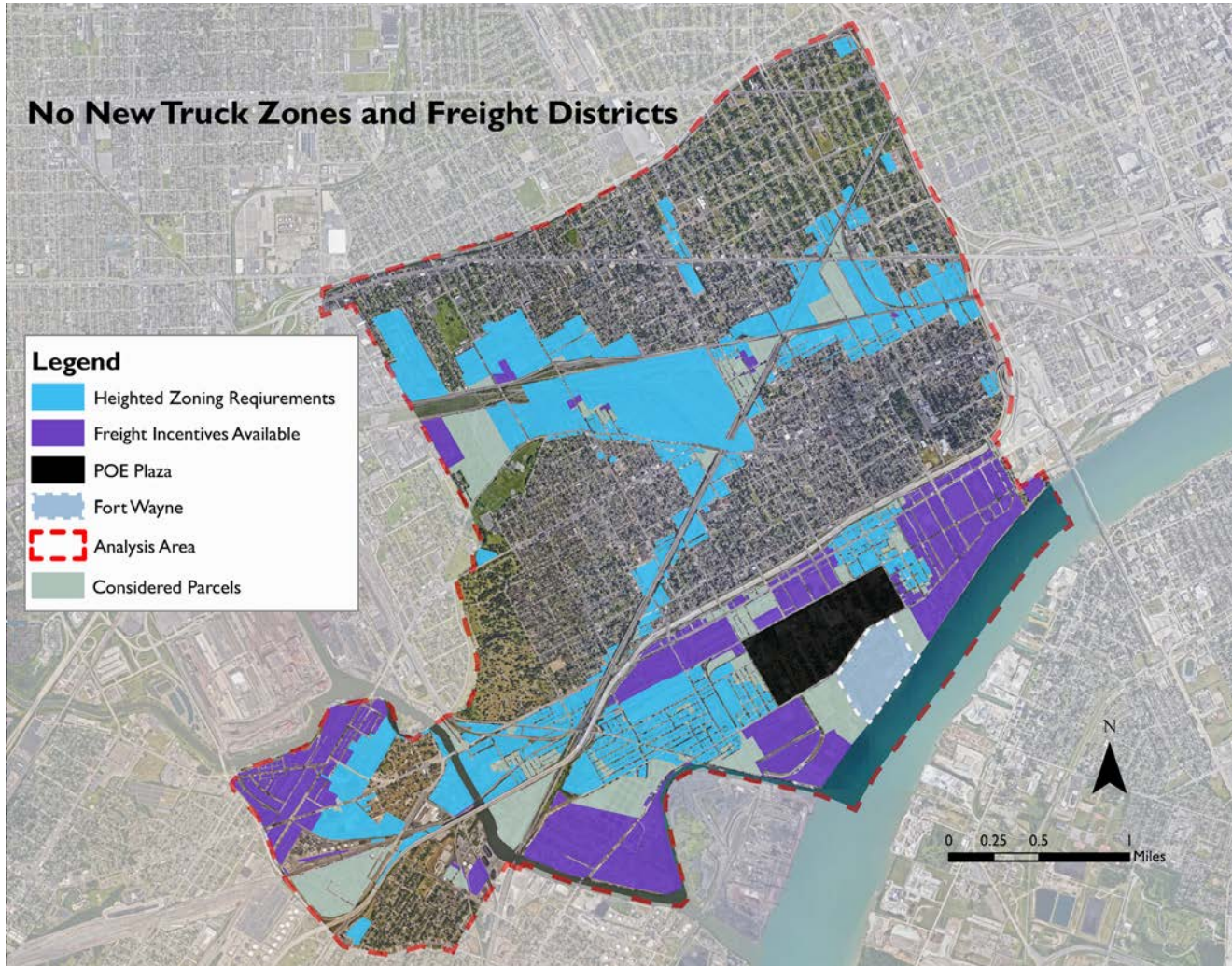


FIGURE 20. No New Trucks Zones show areas with heightened zoning requirements to discourage new freight businesses and Freight Districts show areas with available incentives to attract freight businesses.

notices. There would, however, be a 5-foot vegetative buffering requirement for industrial business when they adjoin a residential parcel, a space requirement suggested for vegetative buffers in order to maintain air quality along collector roads.⁴⁴ The Southwest Detroit Freight Districts Zone would therefore be more appealing for incoming industrial businesses due to fewer regulations and additional incentive opportunities, which are outlined in the following section.

Incentives

Incentives are a strategy that some cities use to encourage industrial land uses that generate freight traffic to locate in specific areas of investment. Cities can embed incentives in their zoning code or enact incentives as city ordinances or programs as a way to shape business owners' locational decisions. Several of the cities we researched use incentives to encourage industrial businesses to locate in their desired areas, including:

- » **Tax abatements or credits:** The City of Portland offers a property tax exemption for up to five years to industrial businesses that locate within designated freight districts (page 63).
- » **Low-interest loans:** Some cities set aside funds to be able to offer high-value credit for economic development initiatives.
- » **Fee waivers:** The process of relocating businesses to a new city or a new area is often expensive, with many

44. Community Action to Promote Healthy Environments. (2018). Vegetative Buffer Toolkit. Community Action to Promote Healthy Environments.

required steps involving processing or other fees that add to the cost of relocation. Fee waivers can help reduce the cost of relocating a business.

- » **Technical assistance:** Siting a business can be a complicated procedure with approvals required from many different offices and jurisdictions, including city, county, and state governments. Offering program-based technical assistance for navigating the required approvals lowers time, risk, and other costs for businesses to locate.
- » **Capital improvement programs:** Freight traffic requires infrastructure that is distinct from regular traffic, including reinforced road beds, wider turn lanes, etc. Cities can attract industrial businesses to areas by specifically preparing infrastructure to bear heavy load-carrying trucks and other necessary equipment.

Incentives often seek to attract businesses to a concentrated and consolidated area. Such geographic concentration makes the freight system more efficient, makes it easier for cities to provide required services and infrastructure, and helps contain the harmful emissions and other quality-of-life concerns that industrial businesses bring, such as noise, odors, vibrations, and glare.

Tax credits are the most common form of incentive for locating industrial businesses. However, we think that Delray can strategically attract industry without the use of tax abatements which would further constrain City resources. Commercial tax revenue is an important resource for the City to provide crucial services that both support new industrial businesses and mitigate the harms from these businesses to residents in the area. The City of Detroit and the neighborhoods of Delray and Southwest Detroit can

CASE STUDY: REGULATION FOR MITIGATION OF TRUCK IMPACTS (LONG BEACH, CA)

Place Description

The City of Long Beach is located in the greater Los Angeles metropolitan region and is home to one of the largest ports in the country. The Ports of Long Beach and Los Angeles are the busiest ports in North America.⁴⁵ As the location of one of the most important ports on the continent for freight trade, the City contends with a significant volume of truck movement through its boundaries. The City's lowest-income neighborhoods are located nearest the port, which results in a disproportionate impact of the negative health consequences associated with port and freight activities, including degraded air quality.

Notable Practices

The Port of Long Beach instituted a Clean Truck program in 2008, which bans older heavy polluting diesel drayage trucks from operating in the terminals.⁴⁶ In addition, the City requires a conditional use permit for transportation-related uses in industrially zoned properties, which allows for an extra layer of scrutiny by city officials to consider whether the business brings harm to the surrounding community. The zoning code also requires that industrial properties incorporate landscaping buffers in their site design.

Relevance to Southwest Detroit

By adopting a requirement that any industrial business intending to locate near the new port of entry be required to obtain a special use permit, the City of Detroit could use additional layers of scrutiny to ensure the appropriateness of the incoming business to the surrounding neighborhood. In addition, a regulation could address environmental health concerns by requiring that such businesses create landscape buffers on their properties that absorb emissions from truck activities. The regulation could specify that the buffer be composed of plants that are known for absorbing harmful emissions and/or are native to the area.

45. Lisa Baertlein, (2019) "Busiest U.S. port sets all-time cargo record in 2018", Reuters <https://www.reuters.com/article/us-usa-trade-ports/busiest-u-s-port-sets-all-time-cargo-record-in-2018-idUSKCN1PA2XA>

46. Port of Long Beach. (2018). "Port of Long Beach Clean Trucks Program Factsheet". Port of Long Beach <http://www.polb.com/civica/filebank/blobload.asp?BlobID=3759>

therefore benefit immensely from the tax revenue that such businesses can bring and should continue to collect taxes on commercial and industrial properties.

Instead, we recommend that the City offer other non-tax incentives. One example is designating “Freight Districts;” defined zones wherein new businesses qualify for technical assistance and are supported by public infrastructure planning, like the City of Portland offers (see Portland case study on page 63). These are areas where the City brings special expertise and planning to bear, including preparing road beds for heavy load-carrying trucks, designating site and regional truck maps to make mobility more efficient, identifying signage improvements that are specific to truckers, implementing a freight-user communication system, and creating a freight data program. Another recommended non-tax incentive is offering technical assistance in working with the City and linking developers to other economic development initiatives, which the City of Chicago does effectively (see Chicago case study on page 65). For example, the City of Detroit could connect developers and businesses to technical assistance programs including low-interest loans and tax increment financing (TIF) for brownfield development, which are already provided by the Detroit Economic Growth Corporation (DEGC). The DEGC can also help businesses see what other kinds of grants and aid the business might qualify for.

Long-term Planning

Long-term planning aids in establishing policies and intentional choices that help guide future development. There are city-, regional-, and state-level approaches for long-term planning in Southwest Detroit. Based on our

review of long-term planning best practices, we propose the following approaches for these three jurisdictional levels:

City-level

- » Freight planning would be included in the City of Detroit’s master planning process. The City should designate “freight districts” that would cluster industrial land uses.
- » A special area plan for the GHIB, which would be consistent with any relevant neighborhood plans, would be created.
- » The DEGC would be required to abide by City and regional freight plans.
- » A freight planning and advisory body would be established as part of DDOT.
- » Road network classifications would be designated to better connect land uses with necessary road infrastructure and facilities.
- » The City would coordinate with the WDBA and with the provincial government of Ontario to advocate for more environmentally friendly trucks (clean truck program).

Regional-level

- » A regional road network classification and connection system would be established.
- » Funding from outside sources would be located and coordinated at the regional scale.
- » A regional organization would be designated to incorporate environmental justice and land use planning into freight system planning to protect vulnerable and historically marginalized populations. Regional and/or

CASE STUDY: PLAN-BASED TRUCK LAND USE (PORTLAND, OR)

Place Description

The City of Portland is a major freight hub in the Pacific Northwest; thus, the local economy is highly dependent on freight movement. To plan for freight efficiency and to mitigate the negative impacts of freight movement, the city adopted a “Freight Master Plan” as part of its comprehensive plan.

Notable Practices

Establishment of Freight Districts

The City’s “Freight Master Plan” established freight districts, which are strategically located near major transportation corridors and near the Columbia and Willamette Rivers. Proximity to these features provides easy access from transportation districts to road and maritime transportation networks. While many commercial and industrial zoning designations are present within these freight districts, a variety of City policies incentivize industrial businesses to locate there. For example, public amenities provided in the districts (i.e. freight infrastructure) encourage future freight-intensive businesses to locate in these areas. Additionally, these districts coincide with zones previously established through other plans and ordinances. For instance, both the “Prime Industrial Overlay Zone,” which is established in the zoning ordinance, and the “Enterprise Zones,” which are created for economic development, encompass the same areas as the freight districts.

Impacts

The Freight Master Plan has been effective in completing neighborhood improvement projects and minimizing some of the conflict between residential and industrial uses that generate freight traffic uses. The Plan has also given industrial businesses a sense of predictability; truck-designated routes are designed for trucks, and freight districts are designated for industrial uses that generate the truck traffic.⁴⁷

Relevance to Southwest Detroit

The City of Detroit could identify areas as “Freight Districts” that would serve incoming freight and logistics businesses. This could help the city to designate districts with minimal quality-of-life impacts for residents and to efficiently plan for the appropriate infrastructure to serve those districts.

47. Robert Hillier (Transportation Planning / Freight Coordinator). Interviewed by Liz Gunden. (2019).

state organizations that could spearhead efforts include SEMCOG or Michigan Department of Environmental Quality (MDEQ).

State-level

- » A new primary access point for the DIFT would be created to allow for more efficient freight mobility on routes intersecting with fewer residential areas.

Land uses along Miller Road and Southern Road in Dearborn between the western edge of the DIFT and Interstates 75 and 94 are more industrial and less residential compared to Southwest Detroit. Relocating the DIFT's primary entrance to the facility's western boundary would therefore lessen impact on residents in Detroit and likely would not impose major harms on neighborhoods in Dearborn.

- » The State would coordinate with local and regional entities to designate I-75 access points.

Coordinating Regulation, Incentives, and Long-Term Planning

Zoning, incentives, and long-term planning are important land management tools that can work in concert rather than as separate strategies. While zoning designates site-specific regulations that protect residents and other occupants within the planning area from the negative impacts of truck-related businesses, incentives can simultaneously guide these businesses to locate in specific areas that reduce the harm and nuisance residents experience, as policies in New York City illustrate (see case study on page 67). Long-term planning is crucial to ensure the success of the goals for zoning and incentives, though it is not designed for immediate relief from acute problems. Incorporating the tools of zoning and incentives into long-term planning strategies can help align actions of multiple public bodies with common priorities. Finally, incorporating planning at regional and state levels helps ensure that resources from other areas that receive the benefits from the freight infrastructure (e.g. the efficient movement of goods from and to their area) come into the planning area.



The Container Port Group business is an existing logistics operation near a residential area.

CASE STUDY: INCENTIVE-BASED TRUCK LAND USE (CHICAGO, IL)

Challenges

The presence of inter-regional competition among localities for economic development related to industrial land use management.

Notable Practices

The City of Chicago layers incentives to promote industrial businesses to locate in desired areas. The City launched its Industrial Corridor System Fund Ordinance to generate funds for investing in new corridors to ensure a stable future for manufacturing and industrial employment in Chicago and to address the loss of industrial land.⁴⁸

- » Chicago launched the Industrial Corridor System Fund Ordinance to create funding for investment in designated corridors to ensure sufficient land availability for industrial uses in these areas.
- » The City also actively makes use of federal and state Enterprise Zone programs, which offer benefits and tax or regulatory relief to industrial businesses located in the zones. Such businesses are given preference for industrial revenue bond loans, which are tax-exempt bonds issued by the City whose proceeds are lent to manufacturing companies to finance qualified development projects.
- » Chicago also uses a streamlined Tax Increment Financing (TIF), which provides expedited access to grants for the improvement of industrial properties in TIF districts. Similarly,
- » Cook County offers reduced property tax incentives to industrial businesses that are retaining and adding jobs for community residents.⁴⁹

Relevance to Southwest Detroit

The region recognizes and appreciates the crucial role of freight in its future economy. As such, various local public organizations offer multiple and layered incentives for attracting and retaining freight-related businesses to the region. Chicago's incentives for freight-intensive land uses are primarily oriented toward industrial development and retention, as opposed to the mitigation of impacts on residents. While the Southwest Detroit project focuses on impact mitigation, a well-structured incentive plan could simultaneously foster industrial development while keeping it an appropriate distance from sensitive areas.

48. Chicago Industrial Corridor System Fund Ordinance. §16-B-050

49. Cook County Economic Development Division. (2018). Programs and Incentives. Cook County <https://www.cookcountyl.gov/file/8188/download/token=MpwoSEy6>

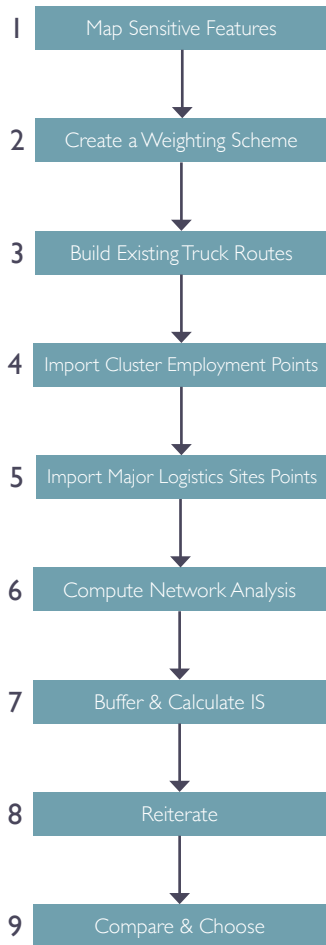


FIGURE 21. Process for using travel time and impact score (IS) to evaluate potential truck-routes.

TRUCK ROUTES RECOMMENDATIONS

Overview

An effective truck-route policy depends on both designation and enforcement. For truck-route designation, we tested four truck-route network scenarios using an origin-destination analysis and evaluated the results using travel time and impact score. These metrics are designed to assess the impact a potential truck-route network would have on freight movement and local residents. We recommend this process and our metrics, weighted average travel time and impact score, be used by the City of Detroit and its partners as a means to evaluate and designate truck routes. Regardless of truck-route evaluation and designation process efficacy, effective enforcement is critical to ensure truckers abide by designated routes. To support the following enforcement recommendations, we identified three US cities that have experience enforcing truck-routes: Baltimore, Maryland; New York City, New York; and Washington, DC. Each of these cities implemented camera and signage programs to enforce designated truck routes.

Truck-Route Designation

We recommend that policymakers employ an origin-destination analysis in conjunction with travel time and impact score variables as an evaluation method when designating future truck-route networks. The process to evaluate and designate potential truck-routes is as follows (Figure 21):

- » Map and categorize sensitive features such as schools, parks, and residential units, based on research and community feedback.
- » Create a weighting scheme to account for differences in which residents sensitive features serve and how they are used.
- » Model existing truck-route networks in GIS.
- » Map freight destinations using NAICS code and business cluster data.
- » Map freight origins using major logistic businesses and sites.
- » Run an origin-destination analysis in GIS to simulate truck movement and generate travel-time data.
- » Buffer simulated truck routes and calculate the impact score on residences from trucks traveling on the routes.
- » Iterate alternative truck-route networks based on research and community feedback.
- » Compare results and designate truck routes based on the weighted average travel time and impact score metrics.

Our evaluation method can help identify truck routes that are time-efficient for truck drivers and maintain community quality of life. Travel time and impact score are two direct and effective indicators for assessing the impact of truck routes. By comparing these two variables between potential truck-route configurations, as we did in the “Low Sensitivity” and “Test” scenarios, street- and community-level truck impact can be assessed. Though travel time and impact score are useful evaluation metrics, it should be noted that they are in tension and necessitate trade-offs when designating truck routes. As a measure of time

CASE STUDY: INDUSTRIAL BUSINESS ZONES (NEW YORK CITY, NY)

Challenges

The City of New York faced limited availability of industrial real estate for expansion and high real estate costs. This was due in part to growing real estate speculation and conversion of industrial land to other uses. Meanwhile, industrial activity in these manufacturing zones create hazardous conditions for surrounding residents.

Notable Practices

Industrial Business Zones

The cornerstone of the City's policies to cluster industrial firms in geographic districts is the establishment of Industrial Business Zones (IBZs). A variety of incentives and programs are available to industrial businesses within these zones. IBZ boundaries were established in 2006 by a workgroup that included representatives from key municipal departments including the City's economic development office, and the office of small businesses.

Per Employee Tax Credit

The City offers a one-time tax credit of \$1,000 per employee up to \$100,000 per firm for manufacturing, industrial, and logistics businesses that locate into defined IBZs from outside the zones.⁵⁰ The purpose is for these uses to cluster in the area, thereby increasing industrial efficiency, consolidating the need for services, and reducing impact on surrounding residences.

Zoning Solutions to Environmental Health Concerns

The City also requires commercial establishments to mitigate pollution through zoning requirements. The City's zoning code establishes that businesses converting over 20% of a parcel from manufacturing to commercial use must plant one street tree for every 25-ft. of street frontage.

Relevance to Southwest Detroit

The New York case illustrates that incentives for industrial and logistics businesses can be leveraged to increase the chances that these uses cluster into defined geographic districts. The City's practices also show how zoning provisions can be enacted to make commercial businesses add vegetation in public rights of way to reduce public health impacts. Although New York City represents markedly different circumstances than Delray, similar motivations prompted the City's action, including the consolidation of industrial uses and prevention of negative quality-of-life outcomes for residents. Establishment of a commission similar to New York's in Detroit, including community representatives and city departments, could provide an integrative process for consensus building necessary for such a zoning scheme in Detroit.

50. City of New York City. (2013). Industrial Business Zone Boundary Commission Staff Recommendations.

efficiency, travel time does not take into account sensitive community features. Similarly, as a measure of community impact, impact score does not take into account time-efficiency. Therefore, considering these two variables together is paramount to designate truck routes that reduce community impact while maintaining a logistically efficient truck-route network that truckers will abide by.

Enforcement

Cameras

We recommend using cameras to enforce newly designated truck routes. As an enforcement tool, cameras penalize truck drivers who stray from designated routes. Currently, Michigan has no state law enabling camera-based roadway enforcement, and a 2007 opinion by the Michigan Attorney General concluded that under State Motor Vehicle Code, the use of “red light” cameras is not permitted.⁵¹ Laws that “allow [a] city to issue citations for civil infractions for disobeying a traffic control signal (red light) based on the photograph or video produced by an unmanned traffic monitoring device” are “invalid.”⁵² Therefore, the City would need to work with MDOT and legislative partners at the state level to establish firm legal ground for camera-based truck-route enforcement in order to use cameras as an enforcement measure.

51. Steven M. Gursten. (2015). “Should Michigan use speed cameras to monitor drivers?”. Michigan Auto Law. <https://www.michiganautolaw.com/blog/2015/04/06/speed-cameras/>.

52. Ibid.

Many cities locate cameras near residential neighborhoods where there are more frequent truck-route violations; however, we used truck-traffic volumes as the main indicator to determine where to locate cameras. We recommend that, once authorized, DDOT implement the new cameras as their departmental budget allows. Additionally, we recommend that City decision makers decide which truck routes to prioritize based on truck-traffic volumes.

Signage

We recommend using positive signage to signal truckers to the designated truck-routes. Effective sign design can help drivers identify the established routes and make informed route decisions. New York City was an early user of positive truck-route signage and it proved important to enforcing commercial vehicle movement. Currently, Southwest Detroit has many “No Truck” signs indicating to truckers where not to travel, but few signs indicating where they should travel.

TABLE 8. Availability of funding for truck-route enforcement and projected volumes of trucks on non-truck-route roads.

ENFORCEMENT FUNDING AVAILABILITY	TYPE OF NON-TRUCK ROUTE
\$	Non-truck routes with the top one-third of projected truck volume
\$\$	Non-truck routes with the top two-thirds of projected truck volume
\$\$\$	All other non-truck routes

CASE STUDY: TRUCK-ROUTE COMMUNICATIONS (NEW YORK CITY, NY)

Challenges

In 2007, changing land use patterns, regulations, and the nature of goods movement in New York City necessitated improvements to the truck-route network. Rezoning of many of the City's historically commercial and industrial districts resulted in an influx of residential development and a loss of industrial land. These changes generated quality-of-life concerns for new residents regarding truck movement through their neighborhoods.

Notable Practices

The City undertook a "Truck-Route Management and Community Impact Reduction Study" in order to better understand residents' concerns and to create potential solutions. Following the study, the New York City Department of Transportation initiated an improved signage program that provides easily identifiable signage to commercial vehicle operators indicating which roads are designated truck routes. The City's truck-route signs picture a truck silhouette, as shown in Figure 15, which indicates that drivers are on approved routes. This type of design is used throughout the United States to indicate approved truck routes. The City introduced color to the black and white truck-route sign and used a new font in order to improve recognition and legibility. These signs have a green circle around the truck. Conversely, the City kept their non truck route signage coloring in black and white to match recognized standards used elsewhere in the United States that indicate which roads are not for trucks. The New York City Department of Transportation estimated that signage program would cost \$4.13 million, which would include the fabrication and installation of over 11,000 signs throughout the City's five boroughs.⁵³

Relevance to Southwest Detroit

The New York City Department of Transportation's policies show that signage that indicates the presence of approved truck routes can be used as an enforcement mechanism to keep trucks off non-designated roads. These types of relatively low-cost enforcement strategies for truck routes can be coupled with existing negative signage to clearly indicate where approved route alternatives are located.

53. Federal Highway Administration. (2009). "Urban Freight Case Studies - New York City", Federal Highway Administration, 2009, <https://ops.fhwa.dot.gov/publications/fhwahop10019/truckrtmgmt.htm>

We recommend using new, positive truck-route signs that direct truckers to designated truck-routes and encourage their use. Similar to the camera placement, we recommend Detroit's Department of Public Works install this positive signage incrementally.

Effective truck-route design and enforcement can help reduce health impacts on local neighborhoods while

maintaining logistic efficiency; however, tension exists between logistic efficiency and the elimination of truck impact on communities. Therefore, we recommend two enforcement approaches to ease this tension: 1) proactively encouraging drivers to use designated truck routes with positive signage, and 2) seeking authorization and using cameras to enforce truck routes, issuing tickets to truckers who stray from designated truck routes.



Noise barriers should protect existing residences in the Fisher Servie Drive impact zone.

NOISE BARRIERS RECOMMENDATIONS

Themes from our virtual model, best practice research, and community focus group show that effective noise barriers should include adequately located and designed barriers that address the air and noise pollution, traffic safety, and provide aesthetic appeal. To meet these needs, we provide two sets of noise barrier design recommendations:

- » Thematic Design
- » Specific Needs

Thematic Design - Green Fusion

Integrating community input with site concerns and best practices, we developed a recommended theme approach called, "Green Fusion." This approach prioritizes air quality in conjunction with noise mitigation. We provide here (Figure 22), a hierarchy of design choices to guide design by segment, or even by block, for best results. We recommend applying the Green Fusion design hierarchy along the entire impact zone, from Clark Street westward to Mullane Street. Depending upon constraints in each segment, the first-choice design option may not be feasible, meaning the second option in the design hierarchy should be implemented and so forth.





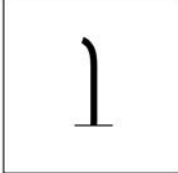


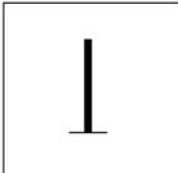
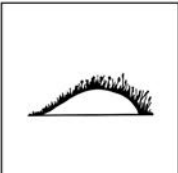
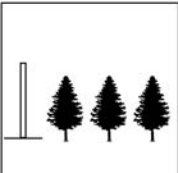

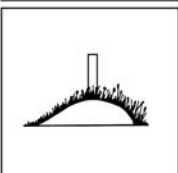

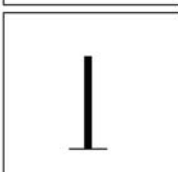
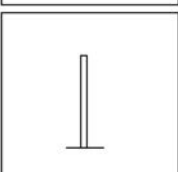
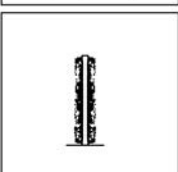
 Guiding Design Principles			
Area	Ramp	I-75	Residential
First Choice  Last Choice			
			
			
			

FIGURE 22. Green Fusion (left) and the hierarchy of design elements to maximize the approach (right).







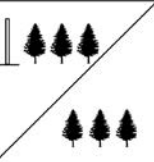




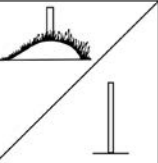




 Recommended Designs			
Segment	Ramp	I-75	Residential
I			
II			
III			
IV			
V			

FIGURE 23. Green Fusion applied to impact site segments (I-V).

After applying the Green Fusion hierarchy to each segment, we recommend that the combination of designs shown in Figure 23 be applied to the impact zone segments.

Design choices are prioritized to include vegetative buffers (trees and shrubs oriented in a specific manner) and earthen berms as the most preferred means to mitigate noise improve local air quality. The hierarchy addresses barrier design choices on both the I-75 and the residential side of the Service Drive. Where land permits on both sides of the Service Drive, berms with all-season, coniferous trees and low shrubs are our first choice. On the I-75 side, berms would absorb Service Drive reflection noise while avoiding reflection issues caused by traditional concrete barriers.

In order to implement berms, sufficient land width is required. Conservatively, a 4:1 width-to-height ratio should be used to determine the maximum height of a berm (Appendix E). Where berms are not able to achieve the necessary height, we recommend building berms to the maximum height possible, with an additional wall on top to meet the minimum height requirements for noise mitigation.

On the north side of the Service Drive, trees and vegetation remain important for air pollution mitigation. Where land width is available, we recommend a wall along the Service Drive and a multiple-row tree and shrub buffer on the residential side. Where land width only allows a wall, we recommend a living wall, which is an innovative, vertically vegetated wall with vegetation covering the entire wall surface. Such a wall is aesthetically pleasing for residents and can capture pollutants on the motorist side of the wall. For

LIVING WALLS

Living walls are commonly applied to the exterior walls of buildings, affording heat, pollution, and noise protection for beneficiaries.⁵⁴ Their successful application has gained attention in Michigan cities, such as Grand Rapids.⁵⁵ If designed using careful choice and installation of the wall's plant system, the vegetation can endure harsh winters.⁵⁶ While using living walls specifically as traffic noise barriers is an innovative idea, its success would be just as symbolic and it would be effective for reducing noise and improving local air quality. It would represent forward-thinking solutions to interrelated problems faced by communities. We recommend a vertical wall that incorporates vegetation into its design over solid, plain wall material, for overall effectiveness. Wall vegetation can reduce high-frequency sounds while the physical wall structure can reduce low-frequency sounds.⁵⁷

54. Ambius. (2019). "The ultimate guide to living green walls." Ambius. <https://www.ambius.com/green-walls/ultimate-guide-to-living-green-walls/#how-do-they-help-to-reduce-noise-levels>

55. Live Wall. (2013). "Living Wall at Downtown Market Turns Heads." Live Wall. <https://livewall.com/living-wall-at-downtown-market-turns-heads/>

56. Semper Green. (2017). "Surviving the Cold." Semper Green. <https://www.sempergreen.com/us/about-us/news/outdoor-green-walls-can-thrive-even-in-climates-like-chicago-or-toronto-or-montreal>

57. Lerner, Joel. (2005). "A Good Wall, Even if It's Made of Plants, Can Reduce Highway Noise." The Washington Post. https://www.washingtonpost.com/archive/realestate/2005/03/12/a-good-wall-even-if-its-made-of-plants-can-reduce-highway-noise/07eaf1fe-3397-4d26-a959-1f3d15029b7a/?hpid=hp_hp-top-table-main-noise:homepage&utm_term=.0372f318313a; Ambius. (2019). "The ultimate guide to living green walls." Ambius. <https://www.ambius.com/green-walls/ultimate-guide-to-living-green-walls/#how-do-they-help-to-reduce-noise-levels>

CASE STUDY: EARTHEN BERMS (WASHINGTON D.C. / MD)⁵⁸

Place Description

Along the John Hanson Highway in Maryland (suburban Washington D.C.), there are five sections of noise barriers that include both earthen berms and trees. The adjacent community of Heritage Harbour is a retirement community near two major highways (US-50 and I-97) that connect Washington D.C. to Baltimore and Annapolis. Maryland State Highway Administration was one of the participants responsible for the barrier design and build in 1998.

Notable Practices

- » Combining earthen berms and trees to make an improvement in landscaping.
- » Encouraging local residents to participate in the public involvement for barrier design.
- » Accurately predicting post-barrier noise levels based upon pre-barrier conditions including vehicle mix, speed, and volume.

Impacts

- » Reducing the noise level from the highway by integrating berms and trees.
- » Increasing local residents' satisfaction of effectiveness of sound barriers.

Relevance to Planning Area

Residents of the community were facing increasing truck volumes, widening roads, and construction of new highway ramps. The Maryland State Highway Administration decided to not only keep the original trees, but plant more trees on the open space, in order to mitigate the environmental impact. The Administration sponsored community involvement to elicit diverse perspectives from residents.

58. Polcak, Kenneth, and Andy Smith. (1998) "Case study in public perception of noise barrier effectiveness." Transportation Research Record: Journal of the Transportation Research Board. 1626: 67-70.

areas where walls are placed along the north side of the Service Drive, sidewalks should be constructed on the residential side.

The Green Fusion design hierarchy should be applied to effectively meet the community's noise reduction needs. While we have made recommendations by segment, it will be useful to apply this hierarchy on a finer scale within segments as necessary (i.e. block by block). The hierarchy is effective because it addresses design opportunities that respond to the multiple impacts of the freight traffic.

Applying Green Fusion - Site examples

Between Morrell and Cavalry Streets, Green Fusion calls for a berm on the north side of the Service Drive. At this location, publicly owned land offers the area needed for berm construction. Additionally, at this particularly noisy location, the berm will further reduce noise, from the elevated POE ramps being constructed nearby. Land width constraints south of the Service Drive restrict the design options to a wall, which may introduce noise reflection concerns to the neighborhood.



FIGURE 24. Green Fusion berm and tree plantings on the south side of the Service Drive at Segment I (left), and Segment II (right). (Segment I is at the Corner of Clark Street and Segment II is between Campbell and Calvary).

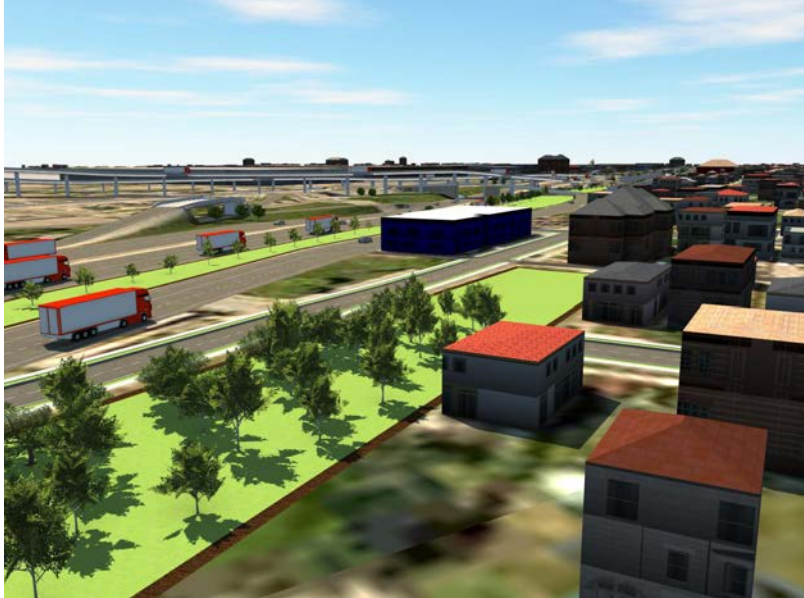


FIGURE 25. Green Fusion vegetative buffer at Lafayette, north of Service Drive located at Segment III/III (road closure at Cavalry).

The Green Fusion approach calls for a vegetative buffer on the north side of the Service Drive on the blocks both east and west of Cavalry Street, which would be connected to a currently existing outdoor recreation area by Ministry Avenue Church. This would require consolidating a series of publicly owned parcels into the buffer by adding rows of conifer trees and low native shrubs to block and absorb truck dust and particulate matter emissions. Additionally, implementation would require a road closure as well, which residents in the focus group supported.



FIGURE 26. Green Fusion double-vertical living wall and street closure at Segment IV (closing Crawford Street and Casgrain Street at Service Drive).

We recommend a living wall and road closure at Crawford and Casgrain Streets, between Livernois Avenue and Rademacher Street on the north side of the Service Drive. Due to available land width, no berm or buffer could be located along this segment portion north of the Service Drive; however, a living wall could occupy the small land width, providing protection from I-75 traffic and Service Drive traffic. Vegetation on the wall could help absorb dust. Because this wall would be placed so close to occupied homes, vegetation would help improve the wall's aesthetic,



FIGURE 27. Living Walls at Segment I (left), and Segment II (right).
(Segment I is at the Corner of Clark Street and Segment II is between Campbell and Calvary).

making it appear less intrusive. Segment IV's close proximity to the Service Drive and to the southbound POE ramps made the wall imperative.

Specific Needs

While the Green Fusion approach pursues community goals through an interactive design hierarchy, the Specific Needs approach identifies elements essential to all effective sound barriers. In this section, we introduce and re-emphasize these specific elements. Minimizing noise diffraction, blocking all direct noise, and realizing safer vehicular travel between the Service Drive and the neighborhood necessitate the following:

Continuous Barriers: There should be no gaps in the 15-foot barriers along the service drive from the Clark Street I-75 overpass to Mullane Street (beyond Springwells Street), aside from pedestrian bridge access points and Service Drive ramp openings. Continuous barriers reduce diffracted noise entering the community. Using a combination of designs, there should always be a barrier contributing to noise reduction at every location along the impact zone. This concern is specific to the MDOT-proposed plan, because gaps would result from any section where MDOT has recommended against building a noise barrier. Additionally, no barriers were proposed or evaluated between Springwells Street and Mullane Street, leaving this area unprotected from increased truck traffic volumes.

POE Ramp Barriers: We recommend that barriers be placed upon all elevated POE ramps. Due to the combination of POE ramp height and increased truck noise from on- and off-ramps, the POE ramps should include

noise barriers. 18-foot-tall barriers have been used on bridges elsewhere in the nation (see Dallas Case Study on page 79). Residents living along the Morrell-Cavalry (Segment II) and Livernois-Waterman (Segment IV) segments, are particularly susceptible to the sound of trucks shifting gears from elevated POE and I-75 ramps. Walls on the ground would have to reach beyond practical heights to



Available land between residences and the Service Drive allows for more creative sound barrier opportunities.



Existing noise barrier south of the impact zone along the Service Drive.

block the residents' line of sight of the ramps. An alternative solution is wall placement on the ramps themselves, which would put barriers closer to the source, block noise at a steeper angle and minimize diffraction, thus greatly reducing noise impact on the neighborhood. Safe wall materials are those that strip upon vehicular impact, such as metal, rather than crumble, such as concrete.

Selected Residential Street Closure: Community members shared concern about an unsafe relationship between Service Drive traffic and residential streets. To avoid gaps in protection from increased noise and pollution, residents at the focus group voiced unanimous support for closing streets intersecting the Service Drive; however, we recommend against closing streets that access I-75 pedestrian bridges. We also recommend against closing streets that connect businesses or other frequented destinations within a block of the Service Drive. Traffic leaving these destinations should have easy access to the Service Drive for their departure to avoid rerouting deeper into residential streets. Closed streets would have to incorporate a form of turnaround, e.g. a cul-de-sac, for residents. Identified street closure opportunities are shown in Appendix F.

CASE STUDY: NOISE BARRIERS ON BRIDGES (DALLAS, TX)⁵⁹

Place Description

A noise barrier was placed upon a bridge located on I-30 near downtown Dallas, Texas. The adjacent neighborhoods had experienced noise problems since the expansion of the highway in the early 2000's, where the original 8-foot concrete barrier had proven inadequate. TDOT intended to place a lightweight barrier upon the bridge to resolve the issue.

Notable Practices

- » Noise emanating from elevated high traffic areas was abated.
- » Barrier design combined both highly reflective concrete (8-feet tall), as well as highly absorptive and reflective acrylic (additional 10-feet).
- » Transparent acrylic benefitted both motorists and residents, avoiding the sense of feeling "trapped," and was visually appealing.

Impacts

- » Installation only required one month, taking place in the evening from 10pm-6am.
- » Cost: \$35.89 per square foot, for 23,950 square feet (length - 2,395-feet).
- » Addition of the 10-foot acrylic wall, further reduced noise by 1.6 decibels.
- » Noise modeling over-predicted noise abatement achieved by an average of 5.1 decibels.

Relevance to Planning Area

The proposed ramps for the POE/I-75 exchange reach heights of 45-feet, presenting challenges to intercepting direct soundwaves through noise barriers located at ground level. Barriers on the raised ramps themselves appear to be a realistic solution.

59. Trevino, Manuel (2015) Evaluation of Lightweight Noise Barrier on IH-30 Bridge Structure in Dallas, Texas. Center for Transportation Research at the University of Texas Austin. Technical Report 0-6804-1.



52

IMPLEMENTATION

9

■ LAND USE ■ TRUCK ROUTES ■ NOISE BARRIER

SHORT-TERM (0-1 years)

ACTION ITEM	DESCRIPTION	LEAD PARTNERS
<p>Create the “No New Trucks” overlay zone with the following standards for industrial uses (see pages 58-59):</p> <ul style="list-style-type: none"> » Buffer: A 20-ft. native-vegetation buffering requirement when adjacent to a residential use. » Street Trees: Street tree planting and maintenance requirement. » Setbacks: A greater front, side, and rear yard setback requirement. » Development Review: Prior to development permit approval, require a development review study. » Public Notice: Direct mail public notice requirement. 	<p>Requires formal review and adoption by the Planning Commission and City Council to make text amendments to the zoning code. This effort may be coordinated with Councilwoman Raquel Castañeda-López’s office, which is currently considering a vegetative buffer ordinance.</p>	<p>City Planning Commission (CPC); City Council (especially Councilmember Raquel Castañeda-López)</p>
<p>Create the “Southwest Detroit Freight Districts” overlay zone with the following standards (see pages 58-60):</p> <ul style="list-style-type: none"> » No zoning requirements added to existing industrial zoning categories aside from a 5-ft. vegetative buffer. » 5-ft. vegetative buffer requirement. 	<p>(Same as above)</p>	<p>CPC; City Council (especially Councilmember Raquel Castañeda-López)</p>

SHORT-TERM (0-1 years)		
ACTION ITEM	DESCRIPTION	LEAD PARTNERS
Establish a new primary access point for the Detroit Intermodal Freight Terminal (DIFT) to allow for more efficient freight mobility intersecting with fewer residential areas (see page 64).	Establish the DIFT's western entryways in Dearborn as primary access points; close the facility's eastern entryway on Livernois Street. Benefits would include greater connectivity between the freight terminal and industrial uses in Dearborn as well as reduced truck traffic on sensitive residential streets in Southwest Detroit.	MDOT and DDOT
Apply the truck route designation method in this report and designate a new set of roads to form a truck route network that results in less impact on residential and sensitive areas (see page 66).	The new truck route network will be primarily arterials and major roads that connect Delray and the industrial/commercial sites north to I-75 while avoiding residential communities.	MDOT and DDOT
Work with state legislature to authorize camera enforcement of traffic laws (see page 68).	Currently, Michigan has no state law specifically allowing red-light and speed cameras.	MDOT and DDOT
Information, education, communication (see page 48): <ul style="list-style-type: none"> » Workshop series on noise barrier design, following the focus group pilot modeled as part of this study. » Define and prioritize community concerns. » Develop community 'asks' for noise barrier design to finalize preliminary recommendations included with this report. 	Prepare community members to participate in the BNA noise barrier design phase to ensure barriers meet community needs and address design concerns that may otherwise harm residents.	Local non-profits: UNI, SDEV, District 6 Councilmember Raquel Castañeda-López
Collaborate with BNA to determine how the community participation will be integrated into the design phase (see page 48): <ul style="list-style-type: none"> » When will this take place? How many interactions? In what form will the participation occur? Etc. 	Thus far, community participation in the design phase of the noise barrier has been promised by BNA and MDOT, however, the extent, form, and results of participation have yet to be formulated. This opportunity should be structured to maximize long-term outcomes for residents, both those directly impacted.	Bridging North America (BNA); MDOT

MID-TERM (1-6 years)		
ACTION ITEM	DESCRIPTION	LEAD PARTNERS
Establish a technical assistance incentive program for the "Southwest Detroit Freight Districts" (see page 60).	Technical assistance for navigating the required development process will lower the time, risk, and costs for businesses to locate in the designated "Southwest Detroit Freight Districts." We propose that DEGC, rather than an agency of the City, provide the technical assistance to prevent the issue of City Council being required to approve another line item in the City Budget.	DEGC
Establish a capital improvements incentive program for the "Southwest Detroit Freight Districts" (see page 60).	Freight-intensive traffic requires infrastructure that is distinct from regular traffic, such as reinforced road beds, wider turn lanes, etc; cities can attract freight activity to areas by specifically preparing the infrastructure to bear heavy load-carrying trucks and other necessary equipment. A city-wide task force consisting of representatives from City agencies and truck-related businesses could provide guidance on which capital improvements to prioritize.	DDOT and DEGC
Designate freight zones through the City of Detroit's Master Plan to cluster freight-intensive land uses (see pages 62-63).	In order to further guide future development, freight zones should be established through the City's master plan.	Detroit Department of Planning & Development (P&DD); CPC
Establish road network classifications, based on the type of land use served by roads (see page 63).	Ensures that neighborhood-serving roads receive infrastructure improvements that discourage heavy trucks	DDOT; SEMCOG; MDOT
Install commercial truck cameras and new truck route signage and monitor freight movement violations (see pages 68-69). <ul style="list-style-type: none"> » Provide locations for camera and signage installation according to the method developed in this report. » Start the installation process. 	Major enforcement method to better regulate freight movement and make sure trucks stay on the designated route.	DDOT and MDOT

MID-TERM (1-6 years)		
ACTION ITEM	DESCRIPTION	LEAD PARTNERS
Design Phase with BNA (see pages 70-72): <ul style="list-style-type: none"> » Provide well-supported community input: <ul style="list-style-type: none"> • Noise concerns by area (block to block) • Prioritized list of barrier features • Comprehensive design preferences 	A critical opportunity for the community to integrate their concerns and steer the design of the noise barriers, which will have substantial impact on not only the noise, but also on air quality and sense of community value for decades to come.	MDOT

LONG-TERM (post-bridge construction)		
ACTION ITEM	DESCRIPTION	LEAD PARTNERS
Create a new section of the Delray neighborhood plan focusing on mitigation strategies for negative quality of life impacts from freight businesses (see page 62).		P&DD
Coordinate Detroit Economic Growth Corporation (DEGC) plans with freight plans (see page 62).	As the primary economic development agency for the city, DEGC will have a significant impact on which businesses locate to the planning area and where they hope to locate. It is therefore important that the agency coordinate with long-term plans to ensure consistency.	DEGC
Create a freight planning and advisory body to be part of the Detroit Department of Transportation (see page 62).	Create a planning body that particularly focuses on and advocates for freight as a user of infrastructure.	CPC and DDOT
Designate a body within DDOT to incorporate environmental justice and land use planning into freight system planning to protect vulnerable and historically marginalized populations (see page 62).	Designate a planning body that focuses particularly on and advocates for environmental justice as a consideration in land use and transportation decisions.	SEMCOG; MDOT; DDOT

LONG-TERM (post-bridge construction)		
ACTION ITEM	DESCRIPTION	LEAD PARTNERS
Coordinate with local and regional entities for I-75 access points to Southwest Detroit (see page 64).		MDOT; SEMCOG; DDOT
Coordinate with the Windsor Detroit Bridge Authority and the provincial government of Ontario to advocate for more environmentally friendly trucks (Clean Truck Program) (see page 62).	The current political environment in Michigan and the United States as a whole means that stricter environmental regulations on vehicle emissions are unlikely at the American federal or state level in the next few years. Such policies might be more palatable, however, on the Canadian side and could have a significant and positive impact on the amount of harmful pollutants circulating in the planning area.	WDBA; MDOT; provincial government of Ontario
Initiate an education program that informs truck drivers where the new truck routes are, the existence of newly established traffic cameras, and the fine policies for violation at the POE (see pages 68-69).	The education and outreach program can take multiple forms, such as a website page, which contains the links to truck route map files, fine policy documents, and accesses to report a problem, or showing the truck route map on a screen at the POE.	WDBA and DDOT
Noise study/evaluation (see pages 46-47)	A study should be prescribed to evaluate the noise impacts following the opening of the bridge to evaluate the efficacy of the noise barrier system.	MDOT
Maintenance (see page 73)	Maintain sound barriers to ensure proper long term operation.	MDOT



A decorative header featuring a horizontal line with a bridge graphic in the center. To the left of the bridge is a teal rectangular box containing the word "CONCLUSIONS" in white, uppercase letters. To the right of the bridge is a larger teal square box containing the number "10" in white, uppercase letters.

CONCLUSIONS

Our research and recommendations seek to prioritize the community's quality of life in light of the impact of the planned GHB on Southwest Detroit, particularly in Delray. We have provided urban planning research, design, and policy solutions that SWDCBC and other community stakeholders can pursue to safeguard the interests of the residents living in this area, including:

- » A public-health-based method for identifying land parcels most suitable for freight-intensive development,
- » A strategy for managing land use,
- » A method for identifying and evaluating improved truck routes that reduce impact on residences and other sensitive locations,
- » Strategies for enforcing revised truck routes,
- » An assessment of the current noise barrier plans, and
- » Design recommendations for noise barriers that incorporate community preferences.

With the development of the bridge, Southwest Detroit will experience big changes to its infrastructure, land, and traffic patterns over a short period of time. The next few years will be crucial for determining community character and outcomes. New and innovative approaches are needed that incorporate and prioritize community interests. For example, we hope that the City of Detroit's upcoming planning initiatives within this area, including the Delray Neighborhood Plan and the Truck Routes Study, will consider our proposals for prioritizing public health and community safety concerns. Eliciting and addressing the concerns of neighbors who could benefit from the area's regional economy should also be central to any process. We sought to address this need through a pilot focus group discussion.

While urban planning approaches can have positive effects for the community, there are limitations to what such interventions can address. Air quality is perhaps the most urgent public health concern in this area, as Detroit has been

named as the epicenter of asthma in Michigan, with rates of asthma in Southwest Detroit even higher than those in other parts of the city.⁶⁰ Although our recommendations seek to mitigate air quality concerns stemming from increased truck traffic, these approaches cannot significantly improve health outcomes given the many air quality hazards that already exist in the planning area. State and federal

60. Wasilevich EA, Lyon-Callo S, Rafferty A, Dombkowski K. (2008). "Detroit - The Epicenter of Asthma Burden". Epidemiology of Asthma in Michigan. Bureau of Epidemiology, Michigan Department of Community Health. 2008.

policies, which are most equipped and empowered to regulate emissions from industry and transportation, should attend to the significant public health issues that Southwest Detroiters face every day. Policymakers at all levels should incorporate environmental justice considerations into freight-system planning to protect vulnerable and historically marginalized populations. Such planning would acknowledge that we are deeply interdependent at the regional and state level, and bring attention to the people who have disproportionately borne the public health consequences of the region's economic infrastructure.



Many residents will remain in Southwest Detroit and continue to face significant impacts from freight traffic.



Many people will continue to call Southwest Detroit home.

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APPENDICES

APPENDIX A Stakeholders Involved in Planning

LOCAL	Southwest Detroit Community Benefits Coalition (SWDCBC)	The SWDCBC is a community-based organization that was formed in the face of the GHIB project. It represents the Delray community and includes faith-based organizations (First Latin American Baptist Church, Hungarian Catholic Church), People's Community Services, Southwest Detroit Business Association, and active involvement from many residents. The organization chose to conditionally endorse the placement of the GHIB in their neighborhood and to advocate for community benefits to assure quality-of-life improvements for residents such as pollution mitigation and control, access to jobs for local residents, and improved parks and city services.
STATE & REGIONAL	Southeast Michigan Council of Governments (SEMCOG) ⁶¹	SEMCOG is the regional metropolitan planning organization for the Southeast Michigan region. It provides intergovernmental support through data collection, technical guidance, and regional visioning for various planning efforts. Its 2040 Regional Transportation Plan (RTP), 2014-2017 Transportation Improvements Program (TIP), and 2017-2020 TIP establish regional bridge and transportation performance goals and dedicate resources to the GHIB project. One important SEMCOG resource is its regional travel demand model, which the Michigan Department of Transportation (MDOT) uses to project travel impacts that will result from the new bridge.
	Michigan Department of Transportation (MDOT) ⁶²	MDOT is responsible for acquiring needed property in the project area, providing Environmental Impact Statements (EIS), complying with federal regulations and procedures for project construction (Code of Federal Regulations Title 23 (23 CFR 772), constructing the Michigan Interchange, and performing critical analyses to meet requirements and support decision-making. MDOT produced the following relevant reports, from which it makes recommendations for the project's strategy and construction: the 2040 Noise Technical Report, the Highway Noise Analysis and Abatement Handbook, and the 2040 Travel Demand Report.
	Michigan Department of Environmental Quality (MDEQ) Air Quality Division ⁶³	The Air Quality Division , in partnership with the City of Detroit Health Department and SWDCDC, conducts ambient air quality monitoring in Delray. Three additional air monitoring technologies are installed in the Delray neighborhood to determine baseline and ongoing levels of air pollution throughout bridge construction and post-construction. The study is important not only for the affected community, but also for improved institutional understanding of how traffic influences air quality. Results are analyzed according to the Environmental Protection Agency's (EPA) National Ambient Air Quality Standards (NAAQS), among other indicators.
CITY OF DETROIT	City Council ⁶⁴	The City of Detroit Mayor and City Council respectively proposed and approved a series of community benefits for residents in and around the bridge project site. With the \$48 million in revenue the City received from selling land to the State of Michigan for project construction, the Mayor wants the City of Detroit to invest in the following community benefit programs: \$33 million for the neighborhood improvement fund; \$10 million for skilled trade training for Detroit residents; \$3 million for utilities and lighting in the project footprint; and \$2.4 million for air and health evaluation in the project area. The City Planning Commission is a division of City Council.

61. Southeast Michigan Council of Governments. (2019). <https://semcog.org>

62. Michigan Department of Transportation. (2019). <https://www.michigan.gov/mdot/>

63. Michigan Department of Environment, Great Lakes, and Energy. (2019). <https://www.michigan.gov/egle/0,9429,,00.html>

64. City of Detroit. (2019). "City Council." <https://detroitmi.gov/government/city-council>

CITY OF DETROIT	Department of Health ⁶⁵	The City of Detroit Department of Health partners with the MDEQ to conduct air quality studies in the bridge project area. With MDEQ, the Department of Health will evaluate air quality findings, determine any public health needs, and respond with appropriate action.
	Bridging Neighborhoods ⁶⁶	The City of Detroit's Bridging Neighborhoods oversees the I-75 Environmental Mitigation program (as well as the Home Swap Delray resident relocation program). The I-75 Environmental Mitigation program offers qualifying recipients north of I-75 "updated windows, updated HVAC systems, air filters, and insulation" to mitigate the noise and pollution impacts of increased traffic during and after construction of the bridge project. Eligible recipients must live in designated program zones within 300 feet of the service drive; be a landlord or owner-occupant resident before June 23, 2017; not have their property acquired by MDOT for project construction; and be up-to-date with property tax payments.
	Planning & Development Department ⁶⁷	In 2018, the City of Detroit Planning & Development Department identified the Delray neighborhood as an area to create a comprehensive planning study. The Department is reviewing applications to identify the consultant team and plans to begin the study in April 2019. It will manage the study process and include a significant community engagement component. Key objectives of the study include identification of vegetative buffering to be implemented around the area, stabilizing areas with residential dwellings, determining the character, form and location of future industrial development, and developing improved connectivity and recreation options.
DEVELOPER	Bridging North America (BNA) ⁶⁸	Based in Toronto Canada, BNA is a consortium of firms that will finance, build, and maintain the GHIB. BNA-associated firms specialize in transportation infrastructure design, construction, wealth management services, architecture, and urban design. Although information on BNA is limited at this stage, Fluor and ACS Infrastructure, two firms within the BNA consortium, will lead the development. "Fluor and ACS Infrastructure Canada led the development phase of the project and will hold the prime contract... Fluor and ACS will operate and maintain the facility for thirty years according to performance standards that will be established by WDBA following completion."
	Windsor-Detroit Bridge Authority (WDBA) ⁶⁹	Based in Windsor, Canada, WDBA is a "not-for-profit Crown corporation which reports to Parliament through the Minister of Infrastructure and Communities. As such, WDBA is wholly owned by the Government of Canada and the powers necessary to carry out the Crown corporation's mandate are vested in the board that directs it. WDBA is responsible for the delivery of the Gordie Howe International Bridge... through a public-private partnership. It is also responsible for project oversight of the construction and the operation of the new crossing. As the operator of the new bridge, WDBA will set and collect all tolls." The WDBA Communications and Outreach Committee is responsible for communications strategies and stakeholder relations efforts.

65. City of Detroit. (2019). "Detroit Health Department." <https://detroitmi.gov/departments/detroit-health-department>

66. City of Detroit. (2019). "Bridging Neighborhoods Program." <https://detroitmi.gov/government/mayors-office/bridging-neighborhoods-program>

67. City of Detroit. (2019). "Planning and Development Department." <https://detroitmi.gov/departments/planning-and-development-department>

68. Port International Gordie Howe International Bridge. (2019). "Bridging North America - Preferred Proponent." <https://www.gordiehoweinternationalbridge.com/en/bridging-north-america-preferred-proponent>

69. Port International Gordie Howe International Bridge. (2019). <https://www.gordiehoweinternationalbridge.com/en>

APPENDIX B Freight-Related Zoning in Detroit

ZONING IN SOUTHWEST DETROIT	FREIGHT ACTIVITY ALLOWED ⁷⁰
B5, B6, M1, M2, M3, M4, M5, PUD, TM, WI	By-Right
B4, SD4	Conditional Use

LEGEND:

B: Business Uses

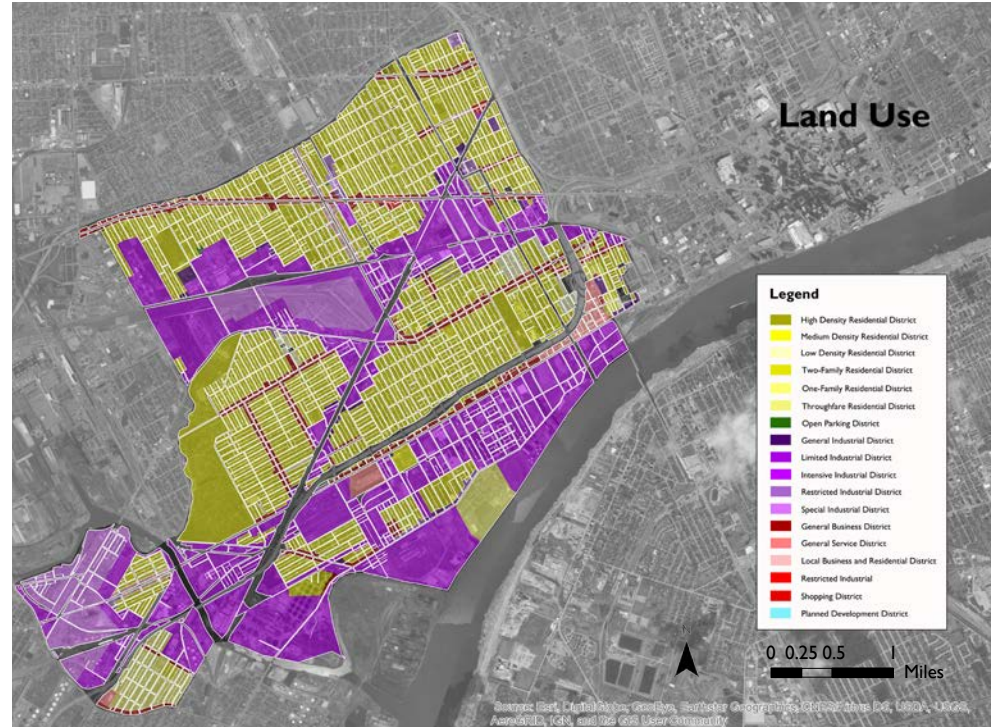
M: Industrial Uses

PUD: Planned Unit Developments

SD: Special Development District

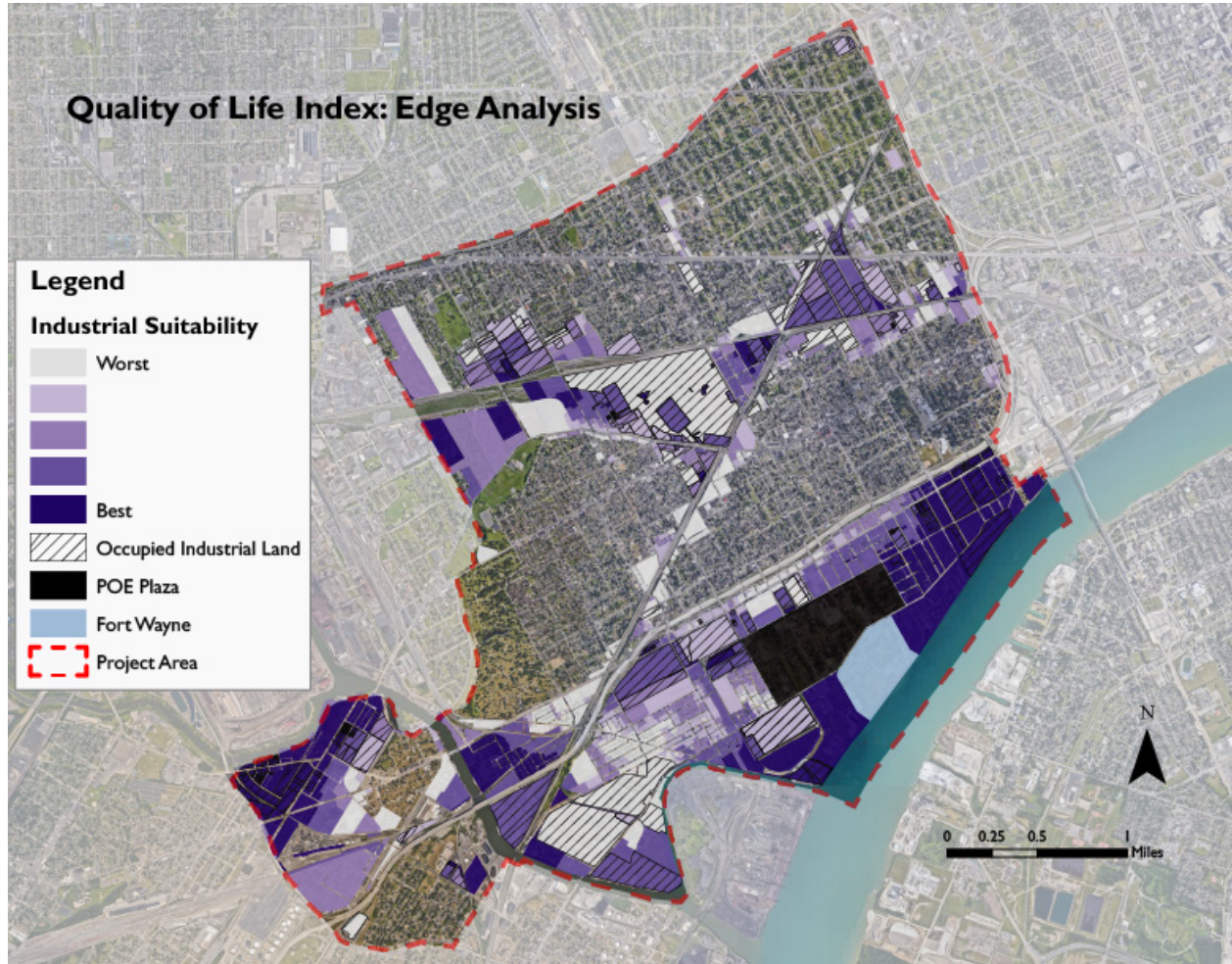
TM: Transitional Industrial Districts

W: Waterfront Industrial Districts



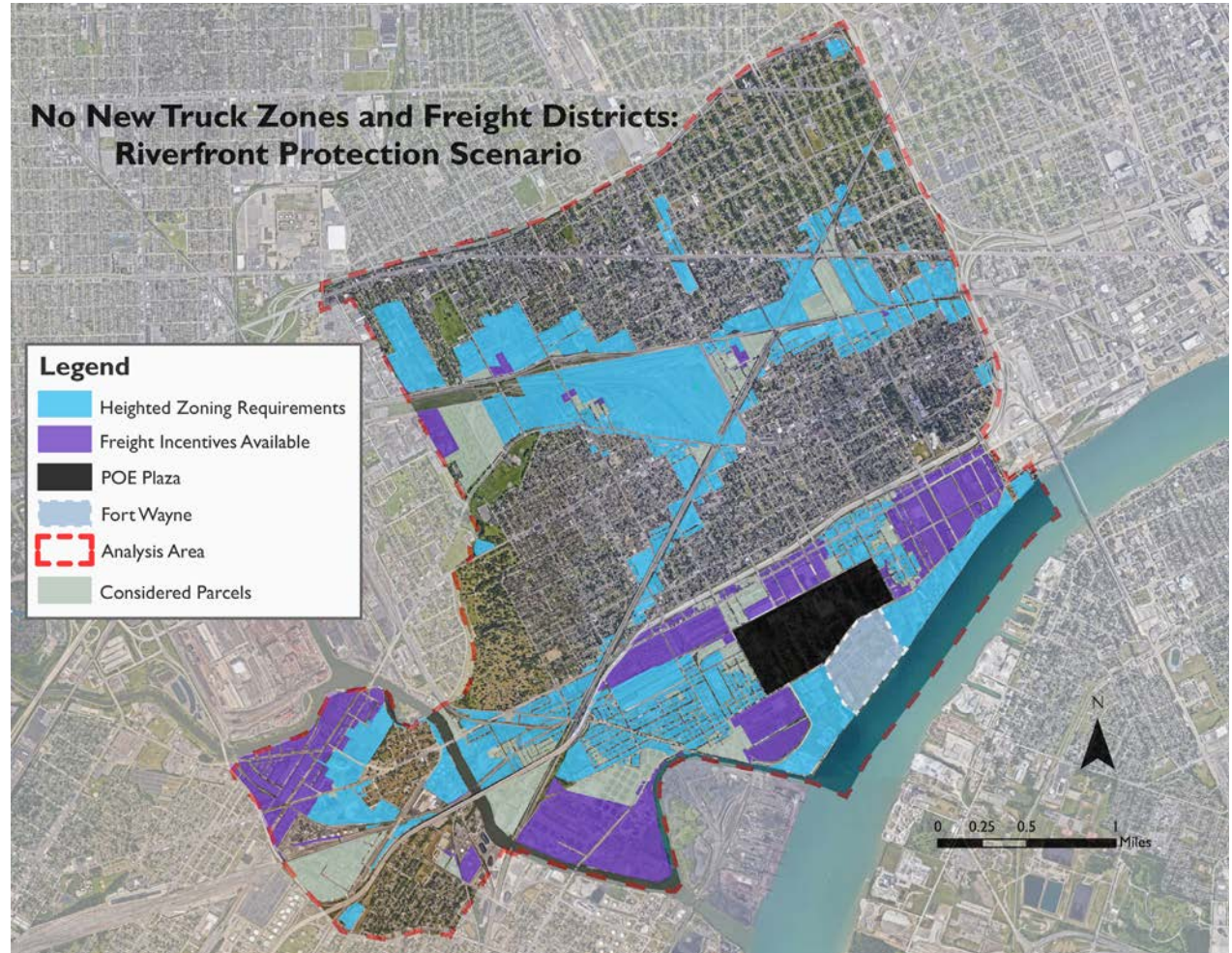
70. City of Detroit. (2018). CH 61 ZONING ORDINANCE (OCTOBER 14, 2018). City of Detroit. Retrieved 1/16/19 at <https://detroitmi.gov/document/ch-61-zoning-ordinance-october-14-2018>.

APPENDIX C Edge Analysis Quality of Life Map



APPENDIX D Land Use Riverfront Protection Recommendation Option

Because locating industrial uses along city waterfronts are now widely discouraged for environmental and resident-use reasons, we felt it important to provide a No New Truck Zone regulation and Freight District incentive map that protects Detroit's waterfront. The previous No New Trucks Zone regulation and Freight District incentive map (Figure 18) recommends many of parcels along the Detroit River be incentivized as Freight Districts because the land was deemed well-suited to industrial use in our quality-of-life industrial suitability analysis. This is at odds with current nationwide trends in waterfront zoning and should be examined to determine Detroit's southwest waterfront zoning priorities.



APPENDIX E Effective Wall/Berm Height Requirements to Block I-75 Noise

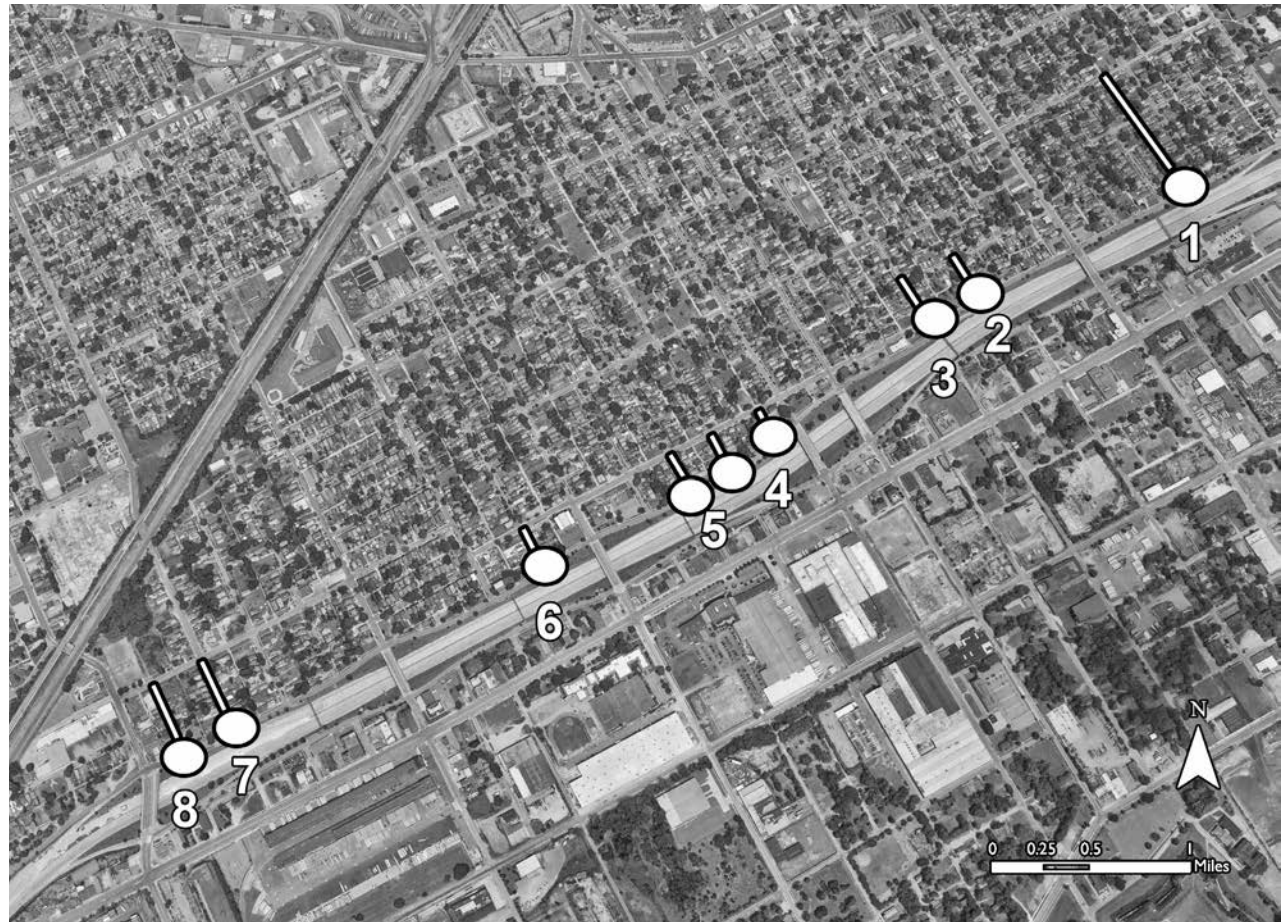


APPENDIX F

Potential Street Closures Off Service Drive

POTENTIAL STREET CLOSURES:

1. Lansing Street
2. Campbell Street
3. Cavalry Street
4. Crawford Street
5. Casgrain Street
6. Lewerenz Street
7. Central Street
8. Glinnan Street



BRIDGING THE GAP

