Fort Street Transportation Equity Study

CITY OF LINCOLN PARK

FINAL DRAFT FOR ADOPTION

September 2022

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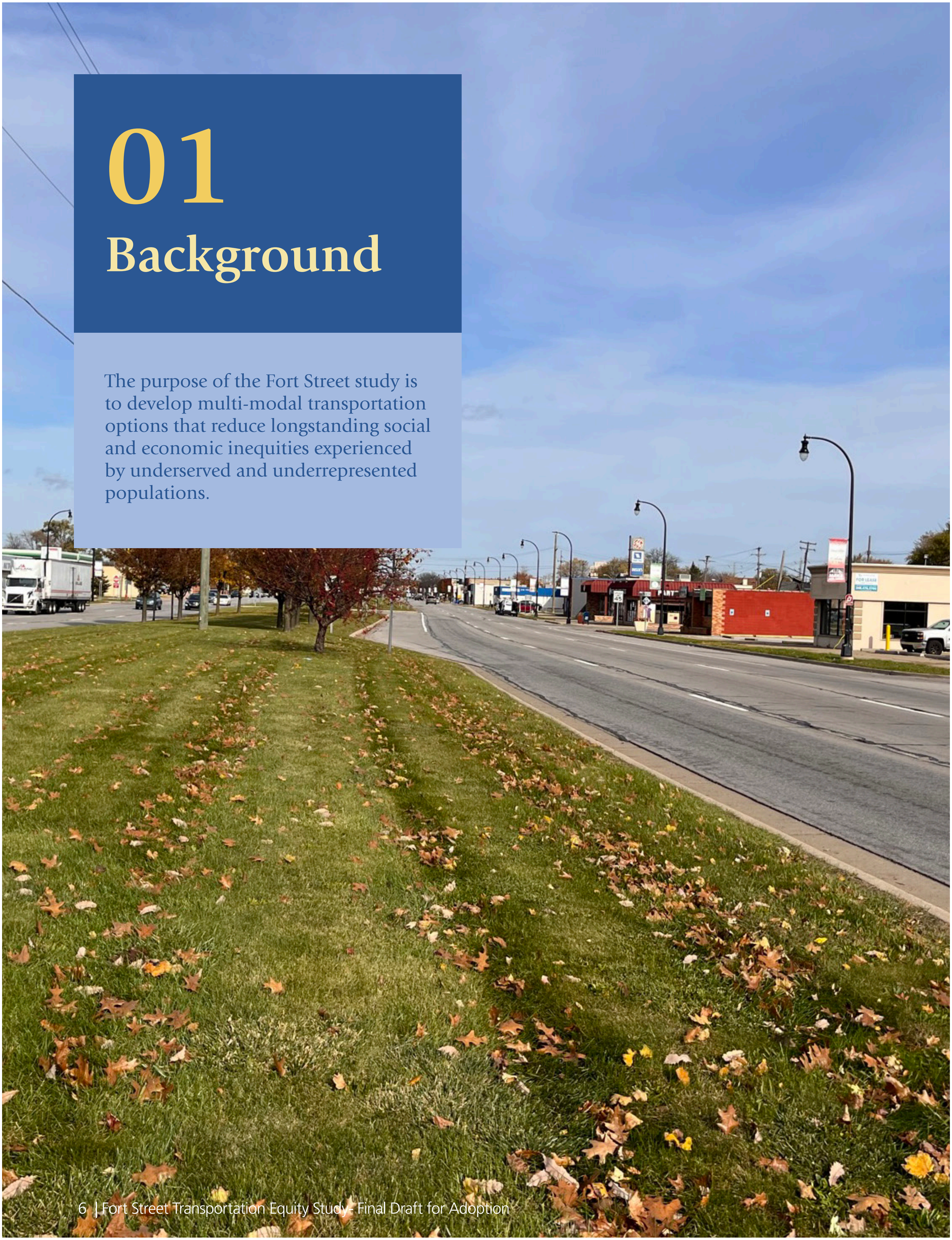


01
Background

The purpose of the Fort Street study is to develop multi-modal transportation options that reduce longstanding social and economic inequities experienced by underserved and underrepresented populations.

OVERVIEW

The Fort Street Transportation Equity Study aims to support and improve equitable transportation along Fort Street for nonmotorized and motorized travelers alike. The purpose of the Fort Street study is to develop multi-modal transportation options that reduce longstanding social and economic inequities experienced by underserved and underrepresented populations. The recommendations in the study address the following items:

1. **Location:** the study provides support for transportation planning projects in locations that have historically been underserved or underrepresented, especially communities with high concentrations of low-income and minority/ethnic populations.

2. **Social and Economic Status:** the study provides support for planning projects that address inequities affecting individuals or groups of individuals due to their race/ethnicity, income, language, education, or other social and economic factors.

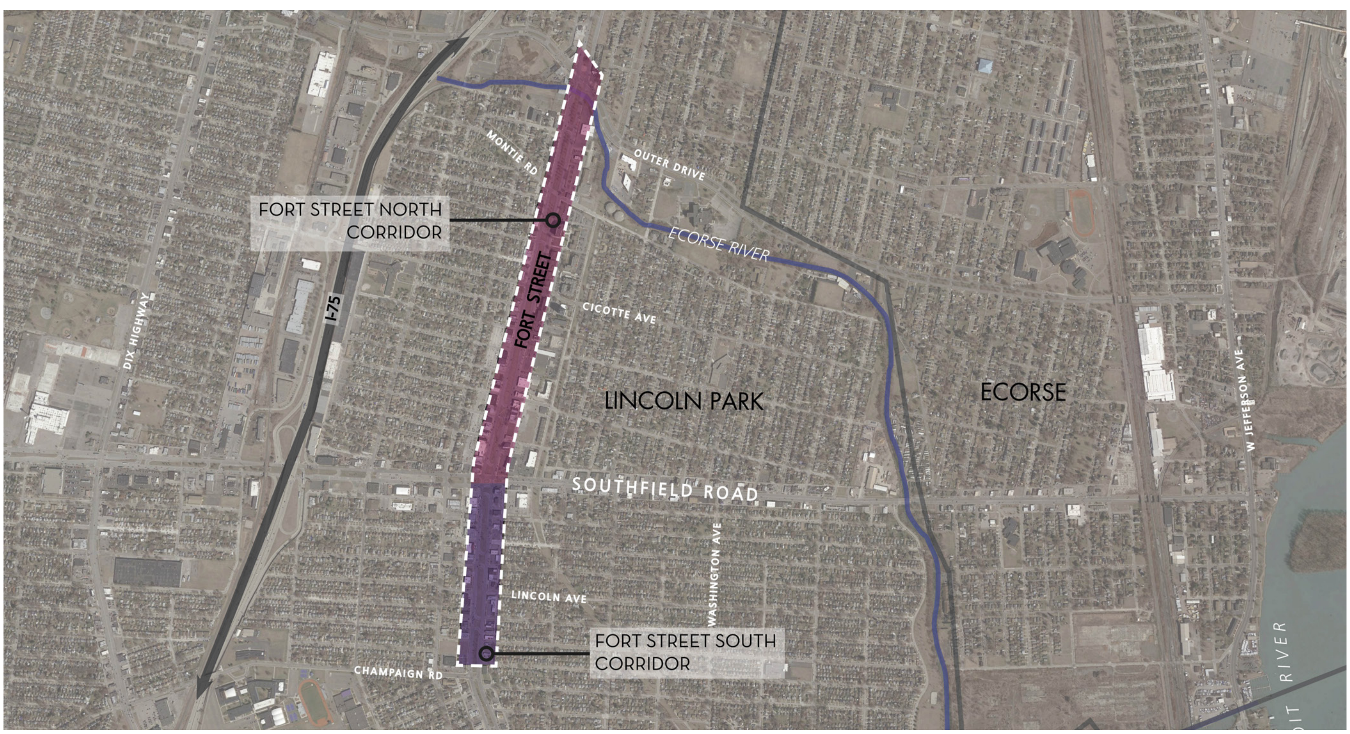
3. **Mobility Needs and Ability:** the study provides support for transportation planning projects that increase and meet the needs of people with a variety of mobility challenges or impairments. This includes people with disabilities, as well as non-drivers, children, seniors, and other groups with different mobility patterns or needs. This definition also supports universal design, which goes beyond the legal requirements of ADA to provide transportation infrastructure and services that accommodate people of all ages and abilities – from strollers to wheelchairs.

The City of Lincoln Park received a grant from the Southeast Michigan Council of Governments (SEMCOG) to conduct this study to better understand and improve transportation equity on Fort Street. Recommendations in the study were developed based on results from extensive community engagement efforts, a traffic analysis, and best practices for improving high-speed, auto-centric corridors .

STUDY AREA

The Fort Street Transportation Equity Study spans from Champaign Road to Outer Drive, encompassing approximately 1.4 miles in length (see Figure 1-1). The study occurred in conjunction with a separate, yet parallel effort of the Southfield Road Corridor Study in the Cities of Lincoln Park and Ecorse.

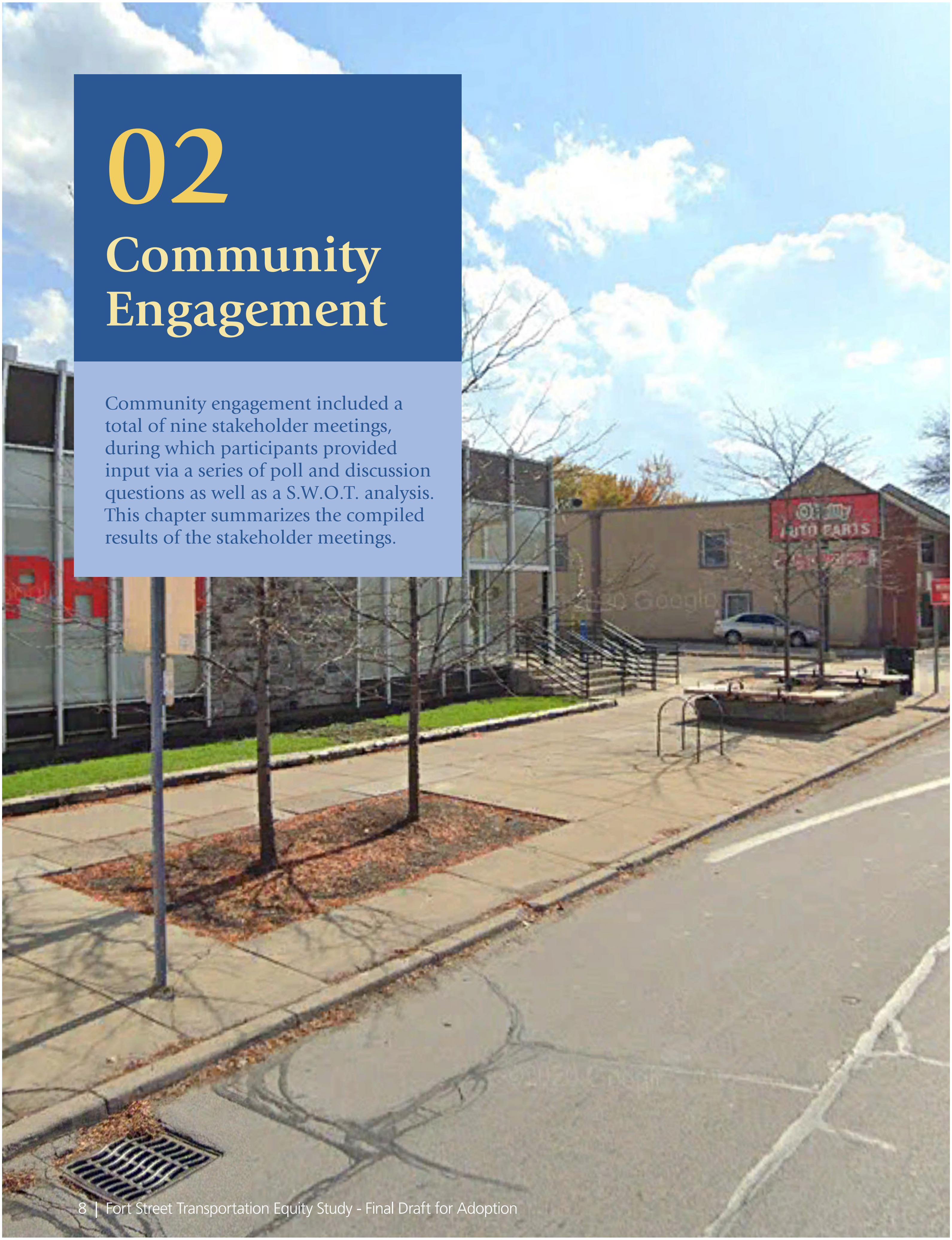
Figure 1-1. Study Area



02

Community Engagement

Community engagement included a total of nine stakeholder meetings, during which participants provided input via a series of poll and discussion questions as well as a S.W.O.T. analysis. This chapter summarizes the compiled results of the stakeholder meetings.



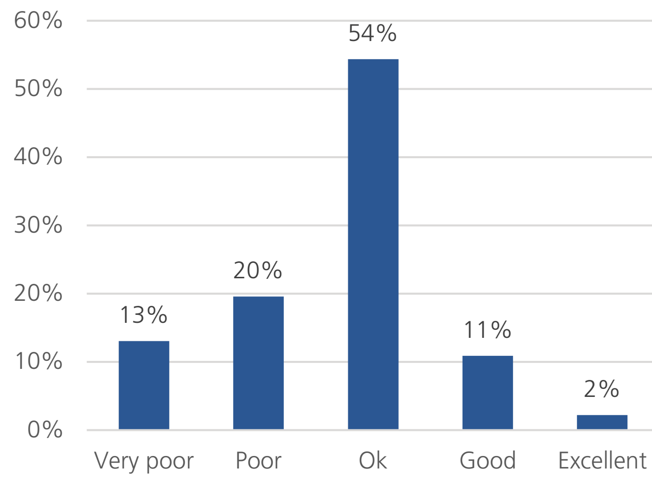
OVERVIEW

The community engagement portion of the corridor studies was quite extensive and involved a wide array of stakeholder groups. The community engagement efforts encompassed both the Fort Street Transportation Equity Study and the Southfield Road Corridor Study as both studies occurred simultaneously and are similar in nature. Therefore, many of the engagement results, unless otherwise specified, pertain to both corridors. Over the course of two months, there was a total of nine stakeholder meetings, including the following groups:

1. Transportation professionals
2. Elected officials and city staff
3. City boards and commissions
4. City of Lincoln Park Downtown Development Authority
5. City of Lincoln Park Economic Development Corporation
6. Community organizations
7. Regional organizations
8. Programs to Educate All Cyclists (PEAC)
9. General public
10. Joint City Council and Planning Commission

Each stakeholder session was roughly 1.5 hours long and occurred virtually via the online Zoom platform. For ease of compiling results, the sessions were consistent in their format and questions. Each session included a brief introduction to the studies (the Fort Street Transportation Equity Study and the Southfield Corridor Study) and and their respective purposes, followed by a series of poll and discussion questions, and finalized with a Strengths, Weaknesses, Opportunities, and Threats (S.W.O.T.) analysis. All input was recorded. The session questions were also available in an online survey format for those stakeholders who could not attend one of the scheduled meetings. A summary of the compiled results of the interactive questions and the S.W.O.T. analyses is below.

Figure 2-1: What is your experience on the corridor today? (Q1)



INTERACTIVE QUESTIONS

Question 1: What is your experience on these corridors (Southfield + Fort) today?

Most participants (54%) indicated that their overall experience on the corridors today is "ok." One-third (33%) indicated that their experience is either "very poor" or "poor," leaving a noticeably smaller percentage (13%) to report their experience as either "good" or "excellent."

Question 2: What aspects of the experience are good? (open-ended discussion)

Common responses included the following:

- » Decent traffic flow as a driver
- » Decent road conditions
- » Corner of Fort and Southfield has sense of place
- » New street lighting
- » Comfortable walking on Fort Street
- » Historic buildings

Question 3: What aspects of the experience are poor? (open-ended discussion)

Common responses included the following:

- » High traffic speeds

- Lack of crosswalks
- Short timing for pedestrians using existing crosswalks
- Intersection of Fort and Southfield is problematic and dangerous (cars do not yield to pedestrians)
- Vacant buildings
- Unattractive (lack of upkeep, trash, etc.)
- No bicycle facilities
- Traffic backups in the right-of-way from drive-thru businesses on Southfield Road
- Oversaturation of auto-related land uses

Question 4: What aspects of the corridors (Southfield + Fort) should be preserved? (open-ended discussion)

Common responses included the following:

- Medians and parking in medians
- Existing business districts (downtowns)
- Historic buildings
- Fort and Southfield intersection landmarks (i.e. flag display)
- Museum and City Hall
- Higher traffic volume capacity near I-75

Question 5: What are the top three changes you would like to see along the corridors (Southfield + Fort) in the next 10 years?

Participants were asked to select their top three priorities from a pre-determined list of options for changes to the corridors. The top three options chosen were more local shopping/restaurants (23%), improved appearance (21%), and more bicycle/walking paths and sidewalks (19%). Please note that no one wanted to preserve the corridors as they are and that even job availability and traffic flow were less important than the overall appearance of the corridors.

Question 6: For different modes of transportation along these corridors (Southfield + Fort), how would you respond to the following statement: "I feel comfortable as a..."

Figure 2-3: I feel comfortable as a... (Q6)

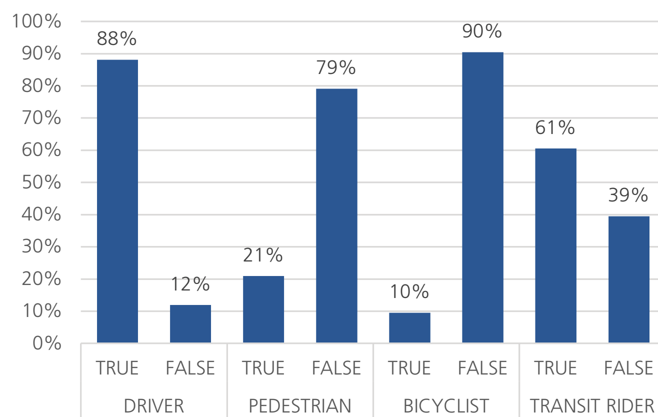
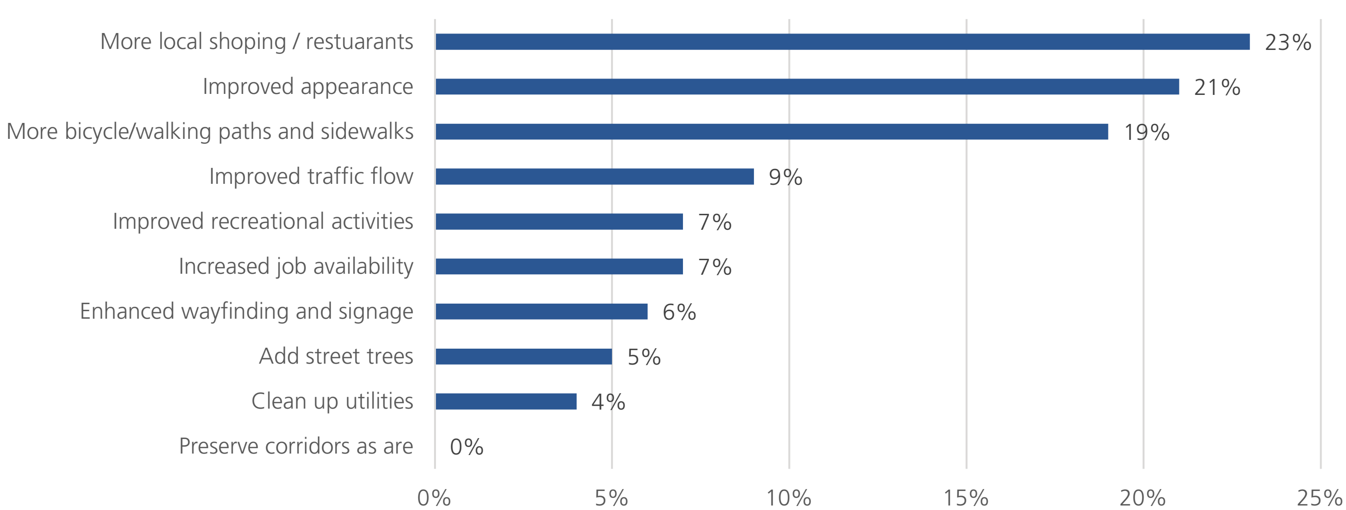


Figure 2-2: What are the top three changes you would like to see along the corridor in the next 10 years? (Q5)



Most respondents (88%) feel comfortable as a driver along these corridors but not comfortable as either a pedestrian (79%) or bicyclist (90%). The comfort level as a transit rider was somewhat more mixed with 61% indicating that they are comfortable and 39% saying there are uncomfortable (although most of the participants were not regular transit riders so their responses were guesses at their level of comfort on a bus).

Questions 7 & 8: What aspects of the corridors (Southfield + Fort) make you feel comfortable and uncomfortable? (open-ended discussion)

These open-ended discussion questions asked participants to reflect in greater detail on poll results from question 6, specifically pertaining to aspects that cause comfort and discomfort. Common responses for why participants feel comfortable as a driver included the wide road/lanes, the median in the middle, good road conditions, and lighting. Participants feel comfortable as a pedestrian due to the center median as a place of refuge, and people feel comfortable walking on Fort Street (but not crossing the street). There were no comments for aspects contributing to comfort as a bicyclist or transit rider, due to relatively little experience among the participants with those modes of transit.

Table 2-1: What aspects of the corridor affect your comfort level? (Q7 & 8)

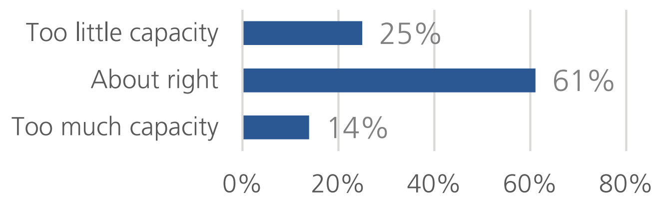
Driver	Pedestrian
» No median closer to Ecorse » People turning right on re » Traffic backups » Traffic speed	» High traffic volumes and speeds » Wide road to cross » People turning at Fort & Southfield » Loitering/panhandling » No crosswalks » Sidewalk under I-75 » No median » Not ADA accessible » Lack of lighting
Bicyclist	**Transit Rider**
» Not safe on sidewalk or street » No bicycle lanes » A lot of driveways » High traffic speeds » Aggressive motorists » Poor surface conditions	» Having to cross multiple lanes of traffic to get to a bus stop, which is often impossible » Lack of bus stops » Bus stops are not appealing (no shelter)

Table 2-1 summarizes common responses regarding discomfort for all four modes of transportation:

Question 9: As a user of the corridors (Southfield + Fort) today, what is your opinion on roadway capacity?

Most respondents (61%) indicated that the roadway capacity for Fort Street is "about right."

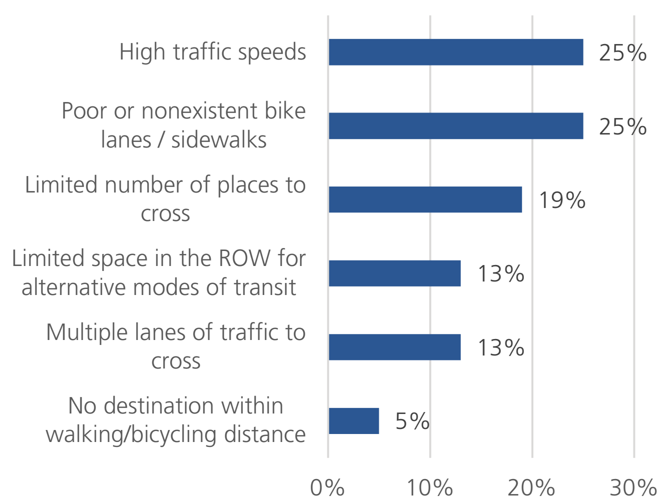
Figure 2-4: What is your opinion on roadway capacity? (Q9)



Question 10: What is the biggest obstacle standing in the way of enhancing pedestrian or bicycle mobility?

Participants were asked to select their top three obstacles standing in the way of enhancing pedestrian or bicycle mobility. The top three options chosen were high traffic speeds (25%), poor or nonexistent bike lanes/sidewalks (25%), and limited number of places to cross (19%).

Figure 2-5: What is the biggest obstacle standing in the way of enhancing pedestrian or bicycle mobility? (Q10)



Question 11: How can we improve our ROWs to equitably balance between all modes of transportation (pedestrian, bicycle, auto, bus, others)? (open-ended discussion)

Common responses included the following:

- Make ROWs multi-modal
- Provide bicycle amenities (lanes, parking, etc.)
- Provide more lighting for both visibility and safety (lack of lighting makes people feel physically unsafe)
- More signage
- Education for drivers on how to share the road with other users
- More frequent and clear crosswalks
- Slow traffic down

Question 12: What factors, under the Cities' control, do you think contribute to a business' success if it is located on one of these corridors (Southfield + Fort)?

Participants were asked to select their top three factors that could contribute to a business' success. The responses were somewhat varied, but the top three options chosen were type of establishment permitted (21%), vehicular access (14%), and façade (13%), all of which may be addressed through the Zoning Code.

Question 13: What actions could the Cities take to support businesses along the corridors (Southfield + Fort)?

This was an open-ended discussion question that went into more detail from question 12. Common responses included the following:

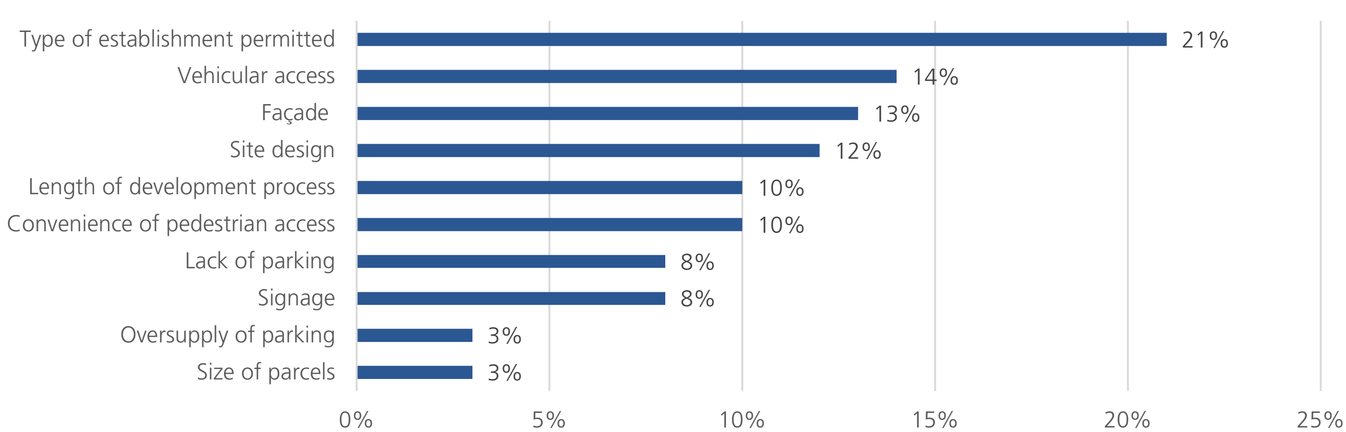
- Provide better pedestrian access
- People-friendly, customer-facing businesses
- Update zoning
- Make crossing roads easier
- Add signage, especially directing to rear parking on Fort Street
- Improve lighting
- Increase financial incentives
- Engage with businesses regularly

Question 14: Placemaking is one economic development strategy. Placemaking is the approach to planning and designing active and interesting community spaces. Examples include splash pads, outdoor fitness centers, and amphitheaters. What placemaking efforts would you like to see along the corridors (Southfield + Fort)?

Common responses included the following:

- Outdoor seating areas

Figure 2-6: What factors, under the Cities' control, do you think contribute to a business' success if it is located on the corridor? (Q12)



» Public art

» Lending library

» Pop-up activities

» Ways to encourage people to spend time outdoors

» Dog park

» Open-air market

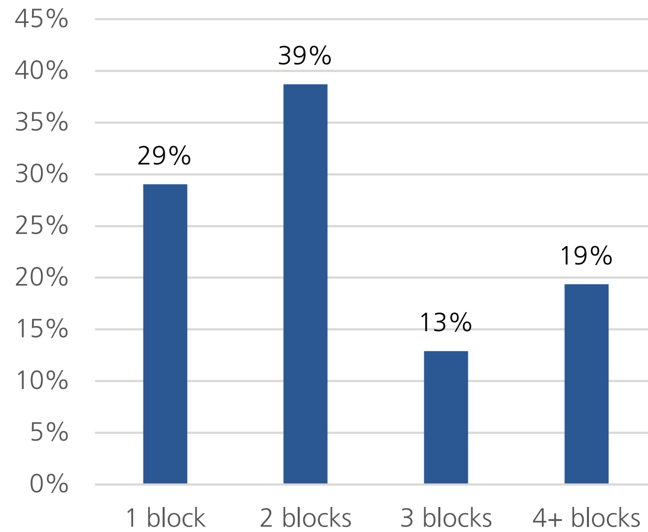
Question 15: What type of improvements to the streetscape would make you want to frequent these corridors (Southfield + Fort) more often?

Participants were asked to select their top three improvements to the streetscape. The top three responses chosen were pedestrian-scale enhancements (lighting, benches, trash/recycling bins) (21%), beautiful facades (16%), and landscaping / street trees (12%). These results indicate a preference for pedestrian-scale streetscape elements, rather than auto-related elements.

Question 16: How far would you be willing to walk from available parking to your destination?

The responses to this question were quite varied, but the most common response was two blocks at 39% of participants. This finding indicates an understanding that parking cannot be guaranteed directly in front of each establishment and that a culture of walking to destinations may be cultivated.

Figure 2-8: How far would you be willing to walk from available parking to your destination? (Q16)



S.W.O.T. ANALYSIS:

The compiled results of each S.W.O.T. analysis are summarized in Table 2-2 on the following page.

Figure 2-7: What type of improvements to the streetscape would make you want to frequent the corridor more often?? (Q15)

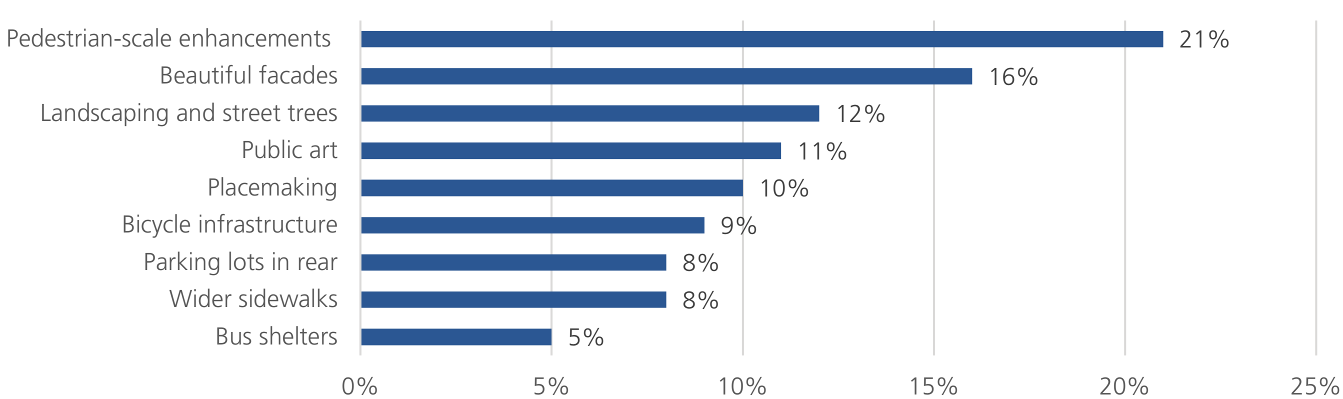


Table 2-2: S.W.O.T. Analysis

Strengths	Weaknesses
» Central location and proximity to major roads (I-94 and I-75) (4) » Multiple transit routes / bus access (4) » Detroit River / Refuge access (3) » Good road conditions for drivers (surface, lighting, lane width) (3) » Prime areas for businesses (3) » Good bones to work with (setbacks, buildings, human scale) (2) » Residential population (2) » City leadership in both cities (2) » Traffic capacity (1) » Lower property values and cost contribute to a lower cost for redevelopment (1) » Mix of big box stores and mom and pop stores (1) » Grassy median (1) » From PEAC office, there are amenities and destinations (bike racks, pizza place) (1) » Existing processes for redevelopment (1) » A lot of people who come through these corridors (1)	» Lack of pedestrian access and safety (7) » Neglected and deteriorating conditions of buildings and infrastructure (5) » Excessive automotive businesses (3) » Lack of bicycle access and safety (2) » Lack of trees/flowers/amenities (benches, signs) (2) » Loitering/panhandling with no enforcement (2) » Speed limit is too high (2) » No programs or aid for local businesses (i.e. Motor City Match) (2) » Lack of ADA-compliant infrastructure (2) » Lack of public engagement and involvement (2) » Lack of connectivity between areas – always have to drive around (1) » Missing adjacent and complementary uses (1) » Antiquated lots (1) » Loud/noisy corridor (1) » Traffic (1) » No bus shelters/crosswalks that connect bus stops (1) » Timed crossings are too short to cross the entire corridor (1)

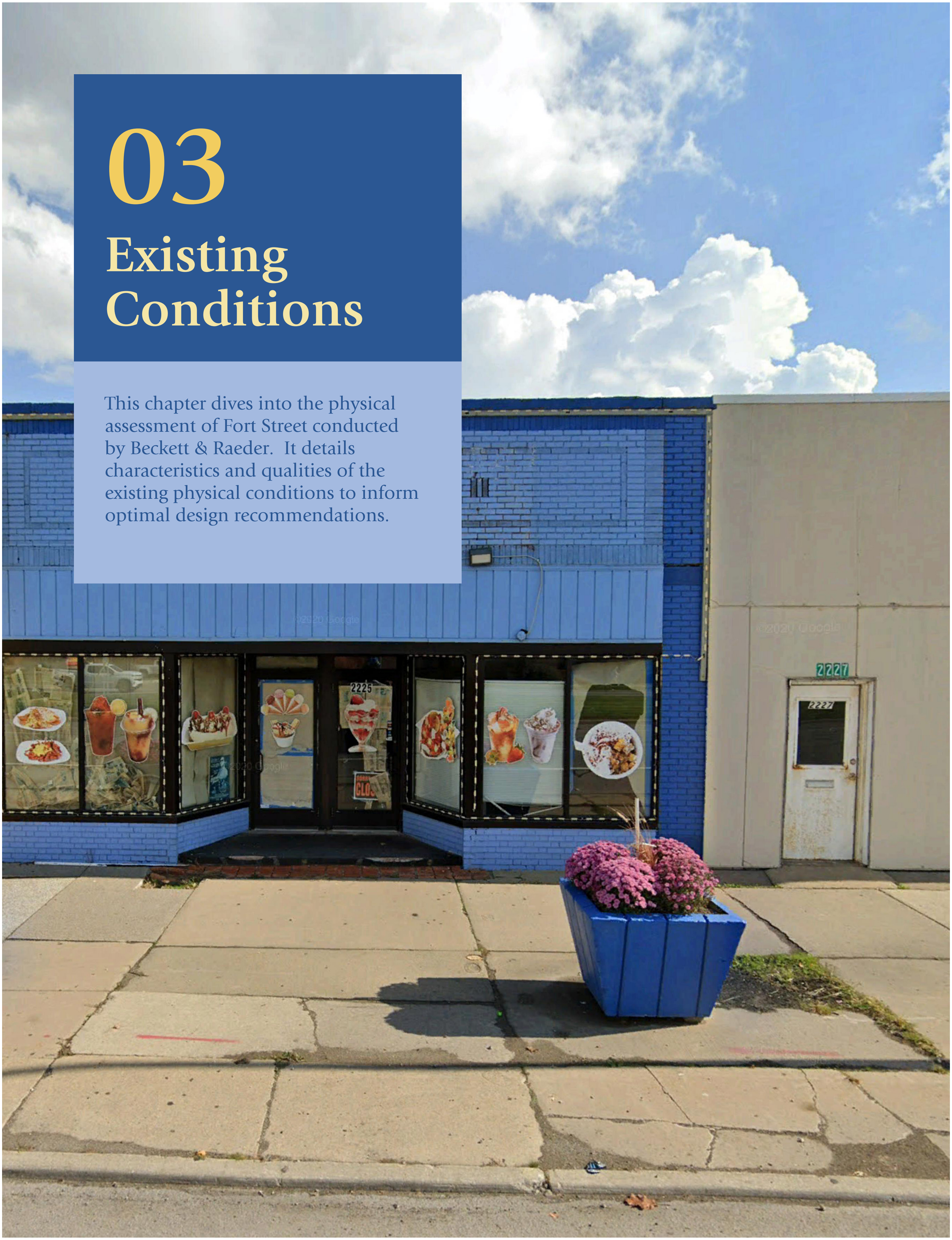
Opportunities	Threats
» Placemaking in vacant lots (5) » Downtown beautification & business development (4) » Events (i.e. Downriver Cruise, food truck rally on river, Farmer's Market in median, DIA project) (4) » Link to bicycle facilities/businesses on Jefferson (3) » Pedestrian amenities (wayfinding, streetlights, sidewalk connections) (3) » Available real estate & vacant buildings (3) » Protected bike lanes and routes (2) » More frequent crosswalks and extended time to cross (use crosswalk from Fort & Miami as model) (2) » Smaller lots (combination or small businesses) (2) » Local funding opportunities (Façade grant, EDC small business loan program) (2) » Outside funding opportunities (Brownfield, Act 51 dollars to maintain sidewalks) (2) » Community & PEAC engagement (2) » Wide roads provide room for improvements (1) » Use of the multi-modal tool MDOT/SEMCOG (1) » Pursuing RRC certification (1) » Updated zoning for commercial uses (1) » Design interventions to slow down traffic (1)	» High traffic speeds & aggressive motorists (5) » Pedestrian and bicyclist safety (4) » Negative attitudes & perception of cities (3) » Lack of crossings/signals (2) » Number of jurisdictions that need to coordinate (County, MDOT, 2 cities, SEMCOG, SMART) (2) » This project is too large in scope to accomplish (2) » Property maintenance and litter (2) » Quality of roads / infrastructure (2) » Youth leaving the cities (1) » Increasing automotive businesses (1) » Rush hour congestion (1) » Incompatible mix of land uses » Parking taken away from the median (1) » Changing shopping patterns (1) » Flooding (1) » Crime – location dependent (1) » Budget constraints (1)

The theatre along Fort Street in Downtown Lincoln Park is a prime example of an existing creative mixed-use development along the Fort Street Corridor. This concept could be replicated in other locations along the corridor.

03

Existing Conditions

This chapter dives into the physical assessment of Fort Street conducted by Beckett & Raeder. It details characteristics and qualities of the existing physical conditions to inform optimal design recommendations.

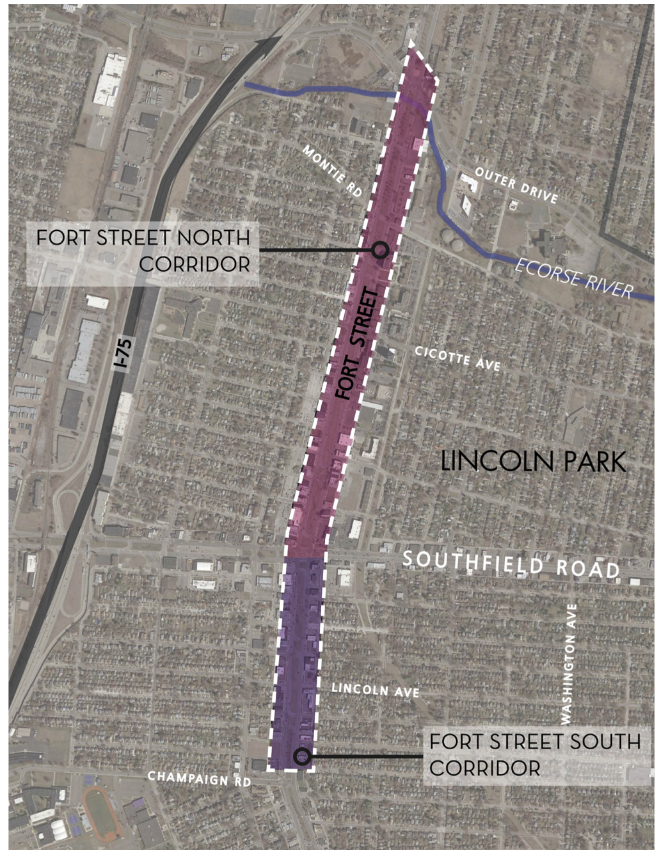


PHYSICAL ASSESSMENT

Fort Street Equity Study's physical assessment is divided into segments determined by its bisection with Southfield Road. These sections described in this report, Fort Street South, and Fort Street North, have differing physical characteristics that will be further explored in this section. Fort Street South begins at Champaign Road and ends at Southfield Road. Fort Street North begins at Southfield Road and ends at Outer Drive.

The following sections describe the character of the Fort Street South and Fort Street North areas of study. The quality and physical form is detailed in this section and is centered around existing character, vegetation, lighting, overhead electric, bus stops, pedestrian access, and bicycle access.

Figure 3-1: Division of Fort Street into the Fort Street North & Fort Street South Study Areas



Landscape & street trees on Fort Street south of Southfield Road

Figure 3-2: Character Shift Along the Fort Street Corridor

LEGEND

DISTINCT SHIFT IN CHARACTER

AREAS OF INTEREST

Figure 3-3: Vegetation Types and Patterns Along the Fort Street Corridor

LEGEND

MID-ESTABLISHED OVERSTORY VEGETATION

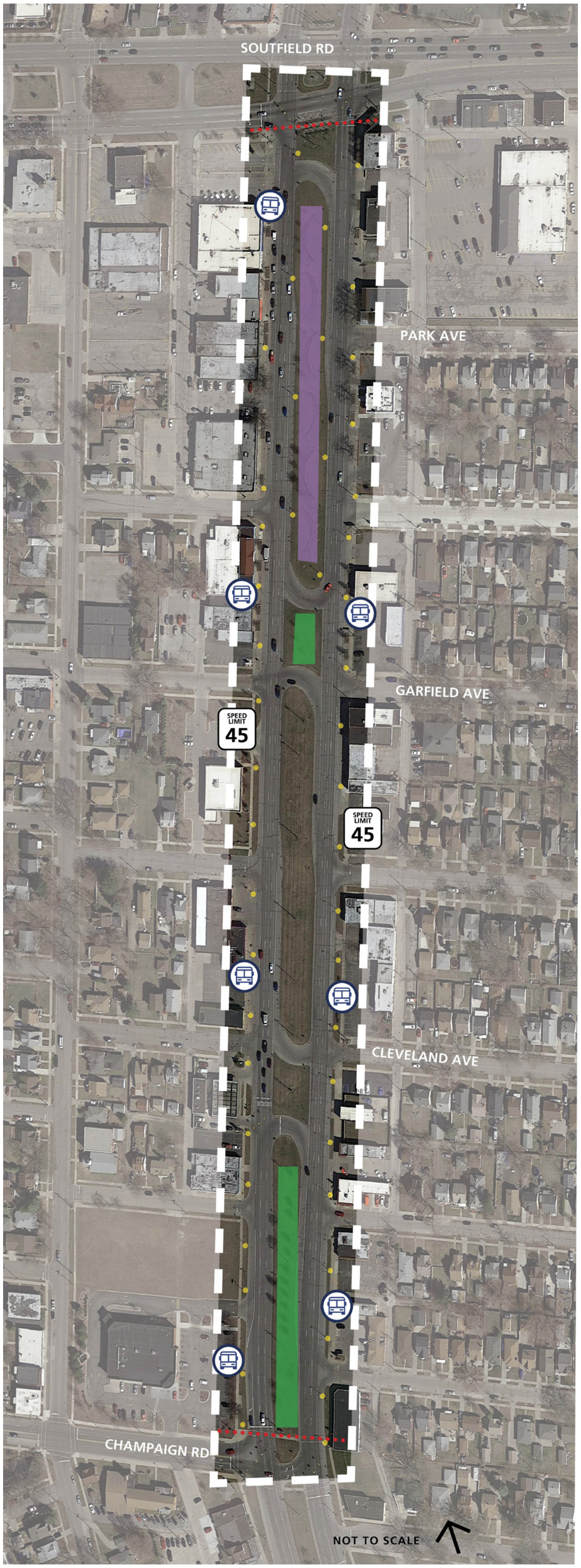
ESTABLISHED HERBACIOUS VEGETATION

TURF

Figure 3-4: Bus Stops and Pedestrian Crosswalks Along the Fort Street Corridor

Figure 3-5: Lighting and Overhead Electrical Lines Along the Fort Street Corridor

Figure 3-6: Fort Street South Analysis



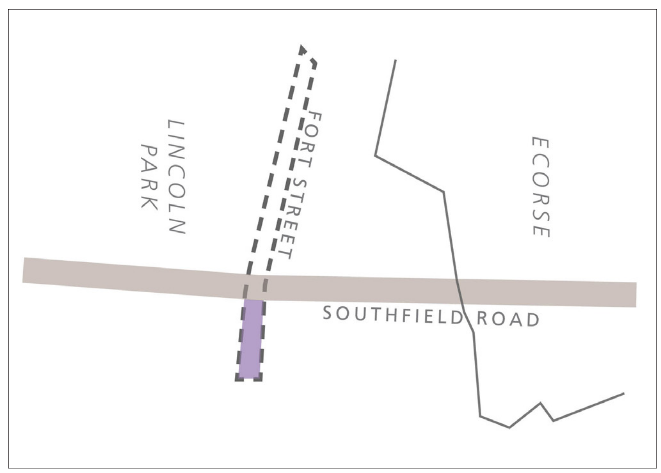
Fort Street South

Character

South Fort Street is a six-lane roadway with three southbound lanes, three northbound lanes, Michigan-left turn lanes and a large grass median with existing street trees. The eastern side of the roadway has walkways that range from 5' with a grass median to 15' at storefronts. There are existing raised tree planters between Garfield Avenue and Southfield Road with mature street trees and benches. There is intermittent on-street parking in this section of Fort Street. The speed limit on Fort Street South is 45 miles per hour.

Vegetation

The center median from White Avenue to Southfield Road has existing landscaping and decorative retaining walls with street trees. The existing retaining wall installation in the center median is primarily perennial, low-growing vegetation.



LEGEND

- EXISTING MID-ESTABLISHED OVERSTORY VEGETATION
- EXISTING ESTABLISHED HERBACIOUS VEGETATION
- EXISTING LIGHT POLE
- EXISTING BUS STOP
- EXISTING POOR CROSSWALK

Mature honey locust trees are located in the raised planter beds on the eastern side of Fort Street past White Avenue to the intersection with Southfield Road. The western side of the street has the same raised planters with mature honey locust trees in some of the planters and young honey locust trees in some of the planters.

Overhead Electric & Lighting

The overhead electric lines of the southern section of Fort Street assessed for this study run through the center median. Overhead electric lines intersect Fort Street at Cleveland Avenue and White Street.

Pedestrian-scale lighting along Fort Street South is consistent along the sidewalks on the outer edges of the roadway and in the center media. There is an existing system of banners attached to these lighting fixtures.

Bus Stops, Pedestrian Access, Existing Bicycle Access

There are existing pedestrian amenities in this section of Fort Street closest to its intersection with Southfield Road. These amenities include benches on the ends of the existing raised planters, bike hoops, and trash receptacles.

All the existing bus stops on Fort Street South have pavements to the roadway, improving their accessibility for all users, except for the bus stop located just north of Farnham Avenue. There are benches and trash receptacles located at the two bus stops (both north- and south-bound) at the northern end of this section of the corridor where Fort intersects There is a bus shelter at the Fort Street southbound bus stop, but no bus shelter at the Fort Street northbound bus stop. There are no existing bike lanes in this area. Existing crosswalks are located at signalized intersections. It has been identified that the current signal timing at the crosswalk at Champaign Road is not long enough for pedestrians to cross the full length of the roadway.

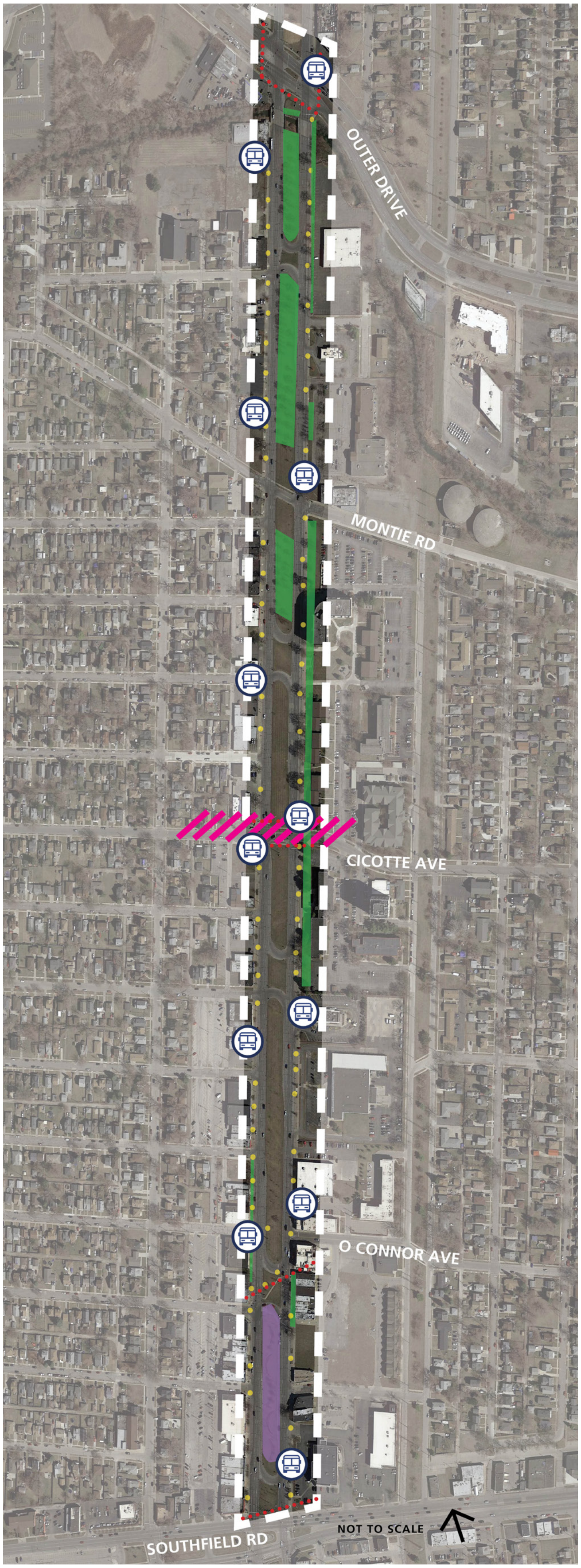
Across the Fort Street South section of the corridor, there exist furnishings in poor condition, one mid-block pedestrian crossing at Warwick Avenue, and a no additional midblock crossings north to Outer Drive.

Landscaping in the center median of Fort St.

Overhead electrical lines in the center median on Fort St.

Bus stop on Fort Street with no pedestrian amenities

Figure 3-7: Fort Street North Analysis



Fort Street North

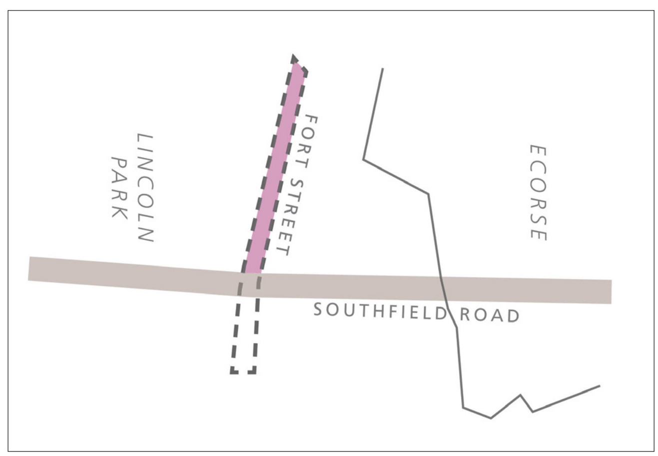
Character

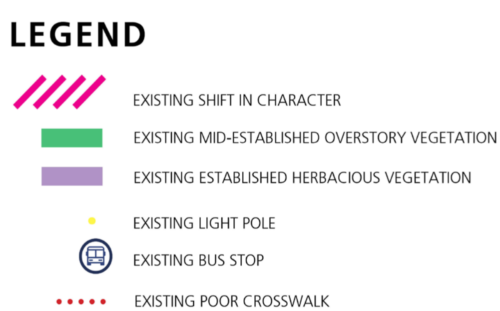
North Fort Street is a six-lane roadway with three southbound lanes, three northbound lanes, Michigan-left turn lanes and a large grass median with existing street trees. The walkways along Fort Street North are paved to the roadway edge and range from 18-20' in width There are existing raised tree planters between Southfield Road and Keppen Boulevard. There is intermittent on-street parking in this section of Fort Street. The speed limit on Fort Street North is 40 miles per hour.

Vegetation

The center median from Southfield Road to Warwick Avenue has existing landscaping and decorative retaining walls with street trees. The existing retaining wall installation in the center median is primarily perennial, low-growing vegetation.

Honey locust trees are in the raised planter beds on the sides of Fort Street to O Connor Avenue. The western side of the street has the same raised





planters with mature honey locust trees in some of the planters and young honey locust trees in some of the planters.

Overhead Electric & Lighting

The overhead electric lines of the northern section of Fort Street assessed for this study intersect the corridor at O Connor Avenue and in the center median starting at Council Avenue north to Outer Drive and beyond the study area.

Overhead cobra and post top lighting along Fort Street North is consistent along the sidewalks on the outer edges of the roadway and in the center median. There is an existing system of banners attached to these lighting fixtures.

Bus Stops, Pedestrian Access, Existing Bicycle Access

There are existing pedestrian amenities in this section of Fort Street closest to its intersection with Southfield Road. These amenities include benches on the ends of the existing raised planters, bike hoops, and trash receptacles.

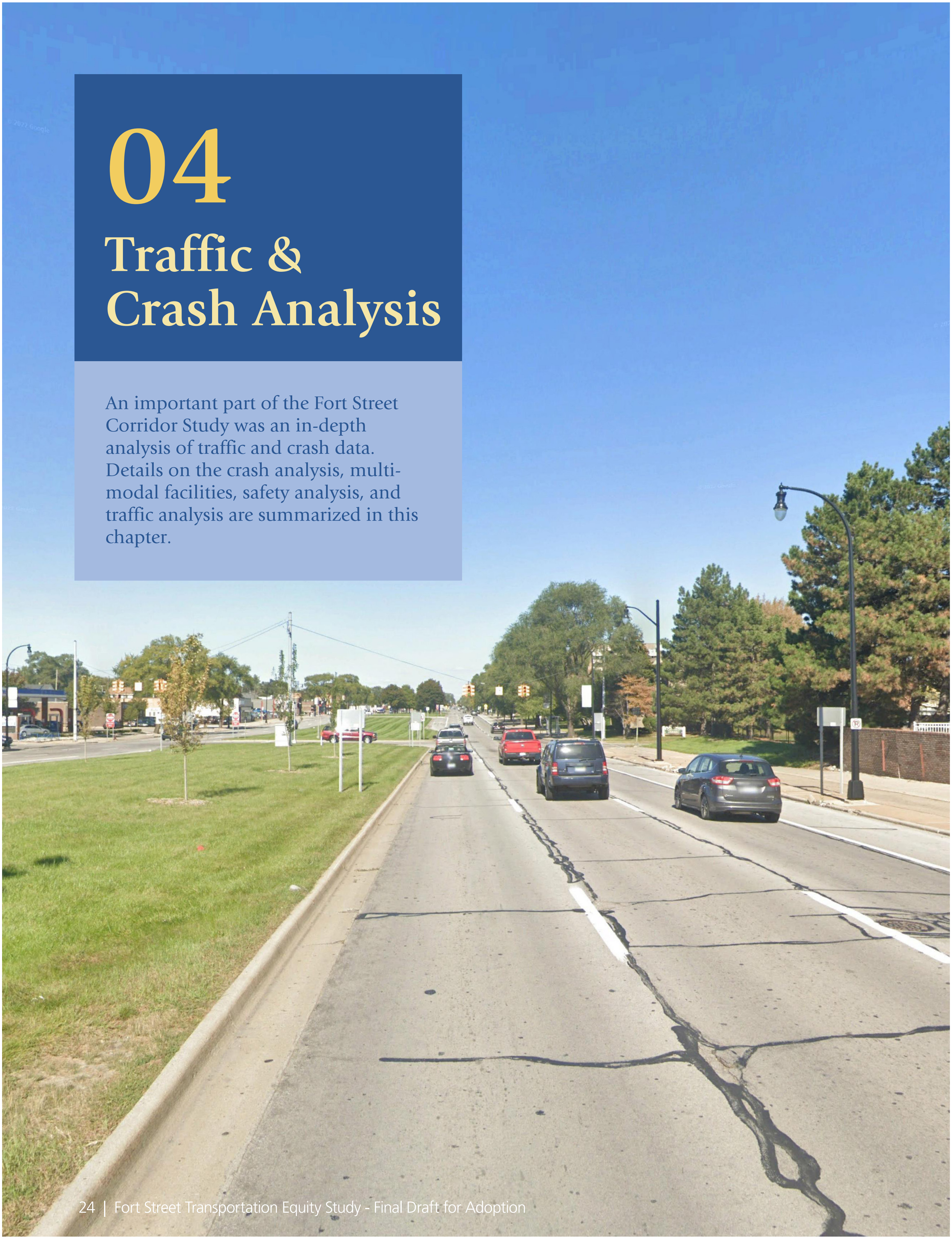
Many of the bus stops on Fort Street North have pavements to the roadway, improving their accessibility for all users. There are benches and trash receptacles located at the two bus stops (both north- and south-bound) at the northern end of this section of the corridor where Fort intersects Outer Drive. There is a bus shelter at the Fort Street southbound bus stop, but no bus shelter at the Fort Street northbound bus stop. There are no existing bike lanes in this area. Existing crosswalks are located at signalized intersections.

Across the Fort Street North corridor, there exist furnishings in poor condition and a lack of mid-block pedestrian crossings.

Landscaping in the center median of Fort St.

Lighting in the center median of north Fort St.

Bus Stop located on the north Fort Street study area



04

Traffic & Crash Analysis

An important part of the Fort Street Corridor Study was an in-depth analysis of traffic and crash data. Details on the crash analysis, multi-modal facilities, safety analysis, and traffic analysis are summarized in this chapter.

CRASH ANALYSIS

Background

As part of the Fort Street Corridor Study, crash analysis was evaluated for the corridor. The crash review period ranged from January 1, 2016 to December 31, 2020. 541 crashes were found over the five-year period for the entire length of the corridor. 48 of these crashes occurred at Southfield Road on Fort Street.

With the hope of making the Fort Street Corridor more pedestrian and bicycle friendly, redevelopment is expected to occur in the upcoming years. The objective is to make the corridor safer and more user friendly for all modes of transportation. By implementing alternatives, it is the goal to prevent crashes between vehicles, pedestrians, and/or bicycles while creating a facility that non-motorized users feel safe using. One of the largest comments from the stakeholders' groups was that the Fort Street facility did not feel comfortable as a non-motorized user.

Analysis

The most frequently occurring crash along the Southfield Road corridor was rear-end type. Angle crashes were the second most frequent crash for the corridor followed by Sideswipe. See Table 4-1 for a summary of crash data by type.

A large number of rear end crashes can be attributed to congestion and higher traffic volumes along a corridor, as well as a result of poor signal timing.

Three fatalities occurred on the Fort Street corridor, two in 2019 and one in 2020. All of these crashes were vehicle related, no pedestrian or bicycle fatalities occurred.

A heat map depicting the number of crashes by location along the Fort Street corridor as well as a map of the entire Lincoln Park Corridor Study area can be found in the Appendix A.

Table 4-1: Crash Data by Type

Type	# of Crashes	Type %
Rear End	194	35.9%
Angle	138	25.5%
Sideswipe	136	25.1%
Single Motor Vehicle	61	11.3%
Other/Unknown	7	1.3%
Backing	4	0.7%
Head On	1	0.2%
Grand Total	**541**	**100%**

Table 4-2: Crash Severity

Severity Level	# of Crashes	Severity %
Fatal Crash	3	0.6%
Injury Crash	112	20.7%
Property Damage Only Crash	426	78.7%
Grand Total	**541**	**100%**

MULTI-MODAL FACILITIES

Existing Multi-Modal Facilities

The locations and distribution of existing pedestrian facilities can be found in Appendix A while the location and number of pedestrians can be found in Appendix B. After reviewing the videos used for the traffic and pedestrian counts, during the PM Peak Hours, a majority of the pedestrian's noted were children walking home from school. The PM Peak hour was earlier than expected, occurring at 3:00 – 4:00 PM, most likely due to the school dismissal. The number of children crossing suggests special considerations should be made to make these areas as safe as possible to support safe travel through the corridor.

MDOT / SEMCOG Multi-Modal Tool

The MDOT / SEMCOG Multi-Modal Tool was used to analyze the roadway's ability to facilitate various modes of transportation for the existing and proposed conditions. The tool creates a score based on various conditions that are pertinent to the travel mode being graded. The scores range from one to four, with one being the best grade and four being the worst. To meet the objective of providing proper design and infrastructure that will adequately support the specific travel mode, a minimum score of two is required for the land use context of the study area. The results are summarized in Table 4-3.

Table 4-3: SEMCOG Multi-Modal Tool Results Summary

Fort Street (Warwick to Cicotte)					
Existing Conditions					
Mode	Priority	Tier	Score	Average Score	Objective Met?
Pedestrian	1	1	3	1.79	Not Met
Bike	5	3	4	3.60	Not Met
Transit	4	2	4	4.00	Not Met
Auto	2	1	1	1.00	Met
Freight	3	1	3	2.50	Not Met
Proposed Conditions					
Mode	Priority	Tier	Score	Average Score	Objective Met?
Pedestrian	1	1	3	1.43	Not Met
Bike	5	3	2	4.38	Met
Transit	4	2	2	2.00	Met
Auto	2	1	1	1.00	Met
Freight	3	1	3	2.00	Not Met
Fort Street (Cicotte to Outer)					
Existing Conditions					
Mode	Priority	Tier	Score	Average Score	Objective Met?
Pedestrian	1	1	3	1.71	Not Met
Bike	5	3	4	3.40	Not Met
Transit	4	2	4	4.00	Not Met
Auto	2	1	1	1.00	Met
Freight	3	1	2	1.50	Met
Proposed Conditions					
Mode	Priority	Tier	Score	Average Score	Objective Met?
Pedestrian	1	1	3	1.36	Not Met
Bike	5	3	2	1.25	Met
Transit	4	2	2	2.00	Met
Auto	2	1	1	1.00	Met
Freight	3	1	3	1.50	Not Met

*It should be noted that the tool requires spacing between corridor crosswalks to be 400 feet or less to meet pedestrian objections. While this study recommends additional crossings, contextual and regulatory environment of Southfield Road corridor do not permit spacing of 400 feet or less. Due to the spacing not meeting the 400’ requirement, the pedestrian objectives are not met.

SAFETY ANALYSIS

Countermeasures

From a Traffic and Safety perspective, various Michigan Department of Transportation (MDOT), Southeast Michigan Council of Governments (SEMCOG) and Federal Highway Administration (FHWA) resources were used to determine viable countermeasures to improve safety for all types of users. The analyses considered low cost easy to implement solutions and then moved to more complicated solutions that will require funding sources and a longer term implementation plan.

The initial traffic models looked at refining the existing traffic signals along the corridor. There are several identified countermeasures that could improve corridor operations without making any significant geometric changes. The corridor’s signals, maintained by Wayne County, have not been updated for many years. DGL conducted analyses of the Yellow Change Intervals and Pedestrian Crossing Intervals. The Yellow

Change Interval is the length of time that the yellow indication stays lit. This in turn with the Red Change Interval, allows a clearing of the intersection prior to green indications for the other street. The Safety benefits include 36-50% reduction in red light running, an 8-14% reduction in total crashes and a 12% reduction in injury crashes. A review of Pedestrian Crossing Intervals also revealed that some of the crossing times were not long enough, which could leave a pedestrian in a crosswalk unexpectedly. The countermeasure is especially helpful for children and older adults. Updates to these items alone increase vehicle and pedestrian safety.

Another countermeasure to consider is a Leading Pedestrian Interval (LPI). Leading Pedestrian Intervals gives pedestrians the opportunity to enter the crosswalks 3-7 seconds before any vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have a priority to turn right or left. This is especially important at Southfield Road and Fort Street where heavy right turn movements are seen as vehicles travel to and from I-75. Although pedestrian crashes are not significant, many students are seen throughout the corridor before and after school. The safety benefit of LPI is a 13% reduction in vehicle-pedestrian crashes.

Other signal related countermeasures include adding Backplates with Retroreflective Borders. This added measure of visibility offers a controlled-contrast background which makes them more conspicuous in day and night conditions. Due to the extra weight of the backplates, all signal poles, arms and span wires should be reviewed for the ability to support the added wind load. 15% of all crashes are reduced with the addition of backplates.

Signage and Pavement Marking Upgrades should be considered as soon as funding can be obtained. Overhead signage can help direct all users to the correct lanes. Removal of conflicting or confusing signage is key. Repainting lane lines, arrows and blocked out areas will also help, especially in the large intersections that no longer permit left turns.

Additional pedestrian crossings in key locations and to connect to known paths were considered. These crossings should have enhanced crosswalks and additional traffic control to help pedestrians and bicycles cross. As implementation plans move forward, Rectangular Rapid Flashing Beacons (RRFB) or Pedestrian Hybrid Beacons (PHB) should be considered.

Fort Street already employs the Michigan Left turn between Champaign Street and Outer Drive. The Michigan Left lines up with Reduced Left-Turn Conflict Intersections Safety Countermeasure. If these were new to the corridor significant crash reductions could be seen. Reviewing the MDOT Design Guides indicates that the U-turns located closest to the Southfield intersection do not meet design standards and should be removed. Traffic volumes and the number of pedestrians should be monitored along Fort Street. If in a future condition warrants are met for traffic signals at the existing unsignalized Michigan Left turns along the corridor, traffic signals coordinated with the corridor should be considered for installation.

The City of Lincoln Park wants to offer better non-motorized options for travel along Fort Street. A Road Diet was studied as a way to provide more opportunity for bike lanes, parking, and other complete streets amenities. Traffic models were developed to look at a road diet along Fort Street. It was determined that the traffic volumes from Champaign to Southfield Road were too high to offer lane reductions. It is possible to road diet north of Southfield Road to Outer Drive. The six lane section can be reduced to four lanes. The Road Diet allows for a bike lane and possible on-street parking. Transmodeler was used to determine the ability to implement a road diet.

MDOT Safety countermeasure information can be found in Appendix C.

Speed Limits

Speed limits for all road users was also considered. Fort Street was designed to move traffic to and from I-75, provide a second north-south route for I-75 traffic and provide access to the neighborhoods in the area. The total reconstruction of I-75 required closures and Fort Street (along with other north-south streets) was used as a bypass. This led to a higher speed limit than pedestrians and bicyclists are comfortable with. Currently Fort Street is 45 MPH south of Southfield Road and 40 MPH north of Southfield Road. Slower speeds could help increase the number of non-motorized users along the corridor. The method of determining speed on MDOT Truck Lines requires the Michigan State Police to conduct a Speed

Study. As the corridor implementation plans move forward, consideration of speed should be reviewed. A speed study is not recommended at this time, it is possible that since the observed speed is suspected to be higher than the currently posted limit a speed study could result in increasing the legal speed. It is suggested that a speed study be conducted after traffic calming improvements are made to the corridor.

Access Management

Corridor Access Management, i.e. combining or eliminating access points, would offer additional safety benefits. Specific crash hot spots locations can be identified for drive consolidation. The best way to accomplish Corridor Access Management is with a sidewalk or roadway project or roadway project is implemented, or with a land redevelopment project. It is important to consider this throughout the project development process.

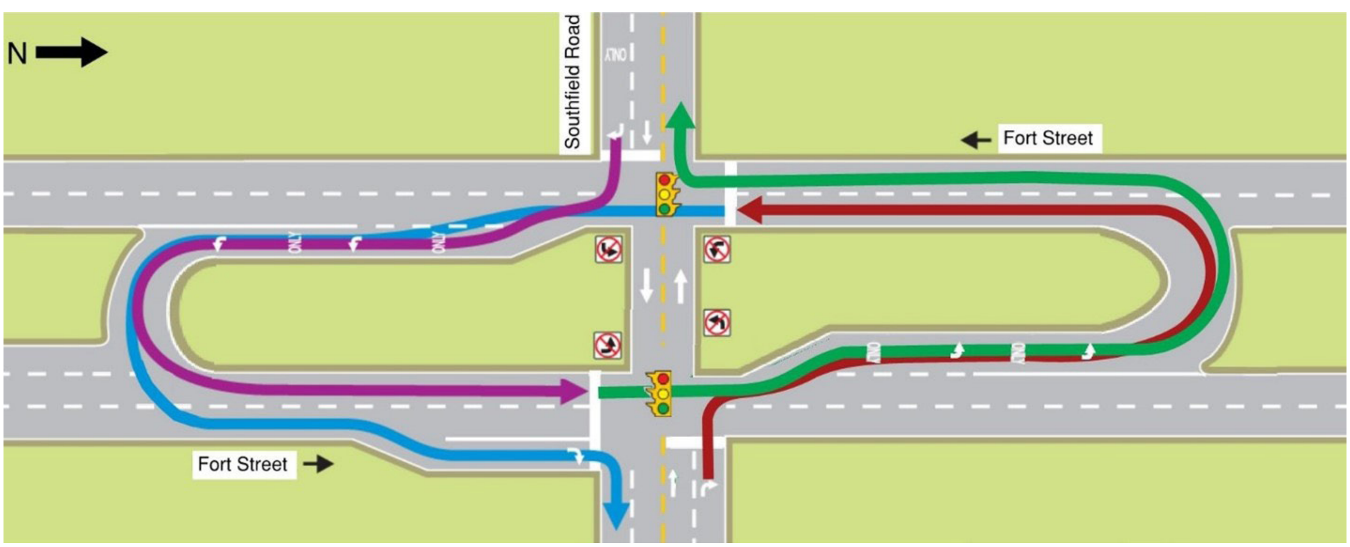
Michigan Left Turns

The key intersection in the corridor is Southfield Road and Fort Street. Both streets have the wide median which make the intersection very large. No left turns are permitted within the intersection itself. As part of a concurrent study of the Southfield Road corridor, analyses were conducted to improve operations. There are several significant movements that use this intersection in non-traditional ways. Eastbound Southfield at Fort Street has a heavy right turn to Southbound. Much of the right turning traffic uses a Michigan left south of Southfield Road to then travel northbound. Traffic queues are significant during the PM Peak Hour.

To mitigate this, a second right turn lane was considered. Changing the right most thru lane to a thru-right lane and retaining the dedicated right turn lane offers better operations. Northbound Fort Street travels through the intersection to use a Michigan left to then travel southbound back to Southfield and then turn right only Southfield to I-75. The southbound right turn lane should be extended to accommodate peak hour queues. This study has identified that a Road Diet can be implemented on Fort Street north of Southfield Road. This will permit the reduction of one thru lane on the southbound Fort approach.

The Fort Street Michigan Left turns immediately north and south of Southfield Road are located in close proximity to the intersection. This necessitates multiple lane changes within a very short distance for motorists making the turnaround movements described above. Project stakeholders have identified this as cause for many near misses, both vehicular and pedestrian. MDOT has changed design guidance since the time of Fort Street construction and this study recommends removal of the Michigan Left turns directly adjacent to Southfield Road. This will shift turning movements

Figure 4-1: Southfield Road & Fort Street Intersection



to the next set of Michigan Lefts and increase distance available for drivers to safely make necessary lane changes.

TRAFFIC ANALYSIS

ADT

Average daily traffic is the bidirectional sum of the amount of traffic on a corridor over the course of specific time period. On the Fort Street corridor, the amount of traffic ranged from 21,630 vehicles at the north end of the corridor to 47,600 vehicles to the south. A figure of the calculated Average Daily Traffic for the Lincoln Park Corridor studies can be found in Appendix B.

Distribution

According to the collected traffic counts, the average distribution of traffic from Champaign Road to Outer Drive is 53% northbound and 47% southbound. Due to Fort Street paralleling I-75, the distribution mimics that of the major north-south freeway, functioning as a surface street option to get to the same locations.

Count Information

The peak hours of the Fort Street corridor varied slightly from intersection to intersection. For analysis purposes, an average was determined to keep a uniform output. The peak hours used were 7:15 AM to 8:15 AM for the AM Peak and 3:00 PM to 4:00 PM for the PM Peak. It was determined based on the date that the counts were collected, that school arrival and dismissal did have an impact on the peak hours of the corridor. All counts included the breakdown of pedestrians, bicycles, and heavy vehicles.

Figures depicting the peak hours, traffic volume data, pedestrian and bicycle volumes, as well as heavy vehicle percentages can be found in Appendix B.

Pedestrian Clearance Intervals

Along the Fort Street corridor, many of the intersections have insufficient time for pedestrians to make it all the way across the roadway. Pedestrian clearance intervals were calculated to determine how much time is needed to cross, and then compared to the existing timing.

The comparison revealed that all intersections with the exception of Fort Street and Warwick Avenue have a timing deficit for pedestrian attempting to cross the entire width of the roadway.

To retain the existing pedestrian timing, it is suggested that only half the width of the roadway be included in the clearance intervals and pedestrian pushbuttons be provided in the median island in to cross the remainder of the roadway in the next cycle. With only half the width included in the calculations, all existing timing is sufficient. See Appendix A for a comparison table and figure.

Capacity Analysis

The level of service (LOS) is a way to classify the intersection on a scale of A to F, from a functional standpoint. Intersections and approaches are assigned an overall grade based on traffic volumes, capacity, and overall delay experienced by drivers.

Capacity Analysis was conducted for existing, the Fort Street Corridor Study Alternative, and a Combined Lincoln Park Corridor Studies Alternative. Transmodeler was used to determine the LOS for all intersections. LOS C is considered acceptable in all conditions, while LOS D is considered acceptable in congested urban areas, such as interchanges and commuter corridors.

The Fort Street Alternative consists of a road diet to the north of Southfield Road. With just this piece of the project, all intersections are expected to function at acceptable levels of service with the exception of Montie Road & Cicotte Avenue intersections. With additional analysis, as signal at Montie may alleviate the poor LOS & Delay, while adjustments to signal timing can improve the Cicotte Avenue LOS & Delay.

Table 4-4: LOS & Delay Information for Intersections

Intersection Level of Service and Delay *(In Seconds)*					
Signalized Intersection			Unsignalized Intersection		
A	<=	10s	A	<=	10s
B	>	10-20s	B	>	10-15s
C	>	20-35s	C	>	15-25s
D	>	35-55s	D	>	25-35s
E	>	55-80s	E	>	35-50s
F	>	80s	F	>	50s

Table 4-5: Capacity Analysis – Fort Street Corridor

Location/ Direction		Existing Conditions				Built Condition							
		AM Peak		PM Peak		Fort Street AM Peak		Fort Street PM Peak		Combined AM Peak		Combined PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Outer Drive & Fort Street													
Eastbound		C	22.0	C	30.8	C	20.7	C	23.2	B	19.2	C	20.2
Westbound		C	20.5	C	20.4	B	19.2	B	18.7	C	20.3	B	18.8
Northbound		B	20.0	B	10.0	B	17.2	B	17.3	B	15.7	B	19.7
Southbound		A	8.7	B	16.0	B	10.5	B	19.6	A	9.1	B	19.7
Overall		B	17.8	B	19.3	B	16.9	B	19.7	B	12.8	B	12.8
Montie Road & Fort Street													
Eastbound						A	3.9	C	17.5	B	10.7	C	24.4
Westbound	TR					F	1,060.9	F	750.2	A	0.0	B	13.5
Northbound						A	0.3	A	0.0	A	0.0	A	0.0
Southbound						A	0.0	A	0.0	A	0.1	A	0.6
Overall						F	266.3	F	191.9	C	21.4	C	22.5
Cicotte Avenue & Fort Street													
Eastbound	TR	B	17.5	D	52.2	B	19.6	F	107.0	C	20.3	E	65.4
Westbound	TR	C	21.2	E	71.1	C	27.0	E	55.8	C	28.5	D	44.8
Northbound		B	14.5	B	14.8	B	17.1	B	17.8	B	16.8	A	9.2
Southbound		A	6.8	A	9.1	A	7.1	A	8.3	A	6.7	A	7.8
Overall		B	15.0	D	36.8	B	17.5	D	47.2	B	17.5	B	16.6
Warwick Avenue/NB U-Turn & Fort Street													
Eastbound		C	20.7	B	11.3	B	18.7	B	10.5	B	10.3	B	10.1
Northbound		B	12.3	B	12.0	B	11.2	B	11.8	C	23.0	B	15.8
Southbound		B	19.7	B	17.4	C	20.5	C	21.1	C	20.4	B	20.0
Overall		B	16.0	B	15.6	B	15.8	B	17.9	C	21.6	B	18.5
Southfield Road & Fort Street													
Eastbound	T	E	71.9	F	154.7	C	24.8	D	37.7	C	20.2	B	16.6
	TR	-	-	-	-	-	-	-	-	C	20.7	B	12.6
	R	C	20.8	F	175.5	B	11.6	D	48.2	A	5.9	A	5.5
	App.	D	47.5	F	163.0	B	18.7	D	41.8	B	15.2	B	11.8
Westbound		B	19.0	C	20.9	C	20.2	C	20.4	C	21.9	A	5.8
Northbound		C	29.2	B	10.8	C	25.5	B	11.4	C	23.0	C	25.3
Southbound		B	19.0	C	27.5	B	19.2	C	30.1	B	19.2	C	23.6
Overall		C	28.7	E	55.6	C	20.9	C	25.9	B	17.6	B	16.5
Champaign Road & Fort Street													
Eastbound		C	29.6	C	26.9	C	28.5	C	27.2	C	28.6	C	29.5
Northbound		A	9.8	A	9.0	A	9.8	A	9.1	A	8.8	A	8.6
Southbound		A	7.6	A	8.8	A	8.7	A	8.3	B	10.33	B	12.0
Overall		B	15.7	B	14.9	B	15.7	B	14.9	B	13.7	B	14.8

*L- Left, T-Thru, R-Right, TR-Thru/Right

Table 4-6: Queue Length Analysis: Fort Street Corridor (FEET)

	Existing Conditions		Built Condition			
Location	AM Peak	PM Peak	Fort Street AM Peak	Fort Street PM Peak	Combined AM Peak	Combined PM Peak
Outer Drive & Fort Street						
Eastbound	112.0	241.0	126.2	205.3	69.9	133.0
Westbound	104.6	172.4	103.6	134.0	54.5	100.8
Northbound	457.8	647.2	300.2	200.8	208.9	184.9
Southbound	123.7	160.9	90.3	240.8	82.5	189.9
Montie Road & Fort Street						
Eastbound	20.1	17.9	0.0	18.7	44.8	47.1
Westbound	19.2	61.2	555.9	564.5	519.1	516.8
Northbound	0.0	0.0	0.0	0.0	0.0	0.0
Southbound	0.0	0.0	0.0	0.0	0.0	17.0
Cicotte Avenue & Fort Street						
Eastbound	73.6	203.7	75.2	398.2	72.2	272.5
Westbound	100.5	290.5	127.2	180.1	84.9	134.5
Northbound	328.6	263.7	321.2	331.4	229.0	161.2
Southbound	113.2	194.5	85.8	223.8	75.2	127.8
Warwick Avenue/NB U-Turn & Fort Street						
Eastbound	17.7	17.4	20.0	17.2	0.0	0.0
Westbound	702.2	529.1	623.4	488.6	140.3	138.5
Southbound	238.8	373.6	236.1	452.6	168.7	188.2
Southfield Road & Fort Street						
Eastbound	682.5	1,307.3	328.7	1,308.4	185.4	138.9
Westbound	239.3	259.4	246.9	253.6	201.8	49.7
Northbound	685.2	227.1	343.3	257.8	235.9	291.7
Southbound	296.3	462.0	272.6	536.9	163.1	304.5
Champaign Road & Fort Street						
Eastbound					93.8	110.3
Northbound					138.0	138.5
Southbound					122.7	206.9

When both the proposed Southfield Road Alternative (road diet east of Fort Street) and the Fort Street Alternative described above, most of the intersections function at acceptable LOS with the exception of Cicotte Avenue with Eastbound functioning at LOS E in the PM peak hour. It should be noted that the LOS and Delay at the Southfield Road and Fort Street intersection is tremendously improved with the proposed alternatives.

Queue Length Analysis

Both existing and proposed alternative vehicular queue lengths were reviewed for the Fort Street Corridor. Figures depicting the queue lengths for the corridor can be found in Appendix A. Just like with the capacity analysis, long queues for the corridor could be reduced with adjustments to signal timing.

External Corridor Impacts

Impact of the Gordie Howe Bridge

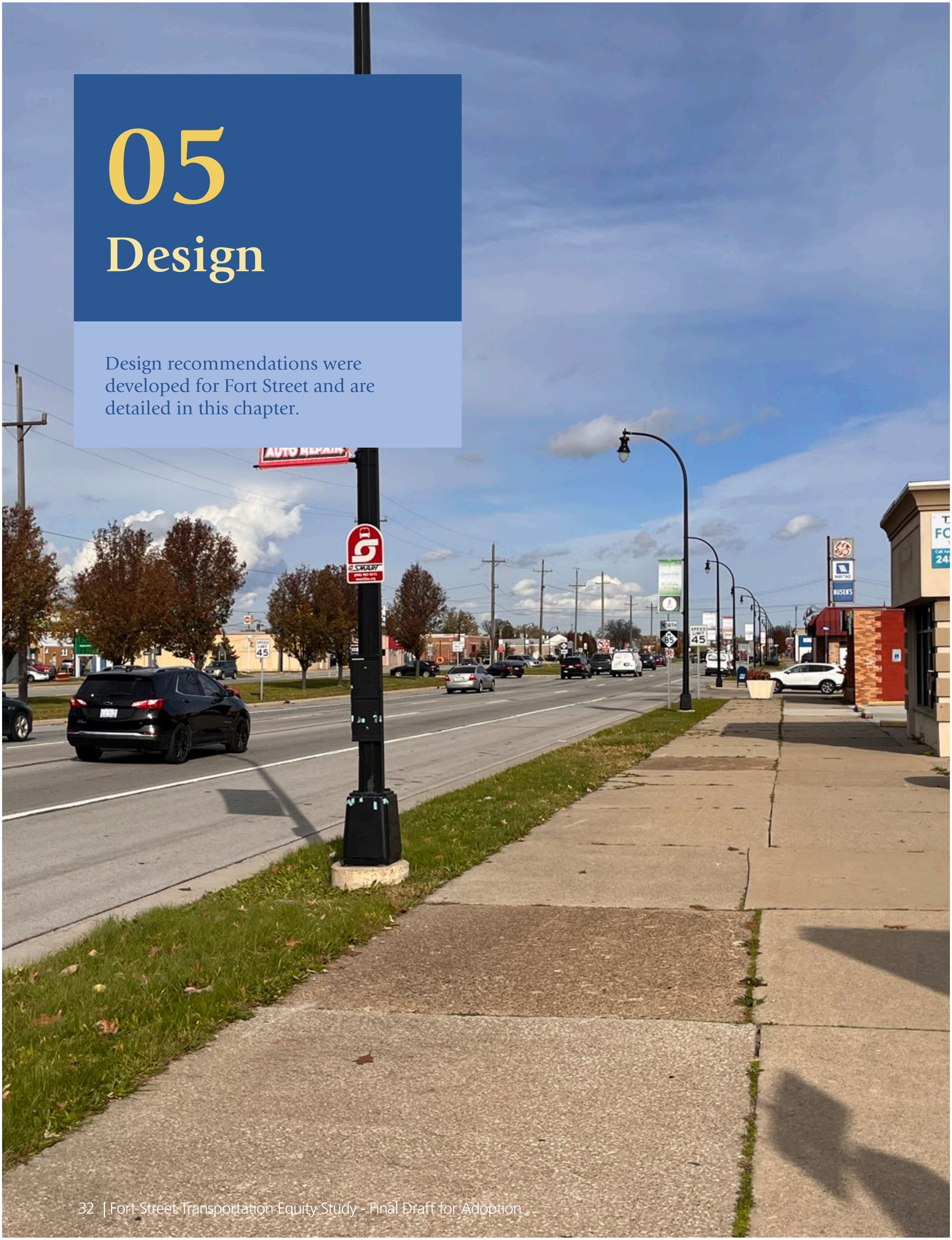
A review of the Level 3 Traffic Analyses Technical Report (TAR) was conducted. The bridge is located north of Lincoln Park and while it expects to attract new traffic to the crossing into Canada, it will also relieve congestion on the existing Ambassador Bridge by providing a second crossing between the United State and Canada. Traffic volumes on I-75 and adjacent streets was expected to rise by 7-15% over the next 20 years. The completion of the Gordie Howe Bridge should not significantly impact Lincoln Park or Ecorse Street networks.

Impact of I-75

When a crash or construction impacts I-75, Fort Street is noted as a detour route. This increases congestion at the Southfield and Fort intersection. Depending on the location of the incident or construction, various cross streets also receive more traffic. When this occurs, all routes become more congested with very poor operations. MDOT noted that modifications to Fort Street can be accomplished. This would require a traffic study review and further plan development.

05 Design

Design recommendations were developed for Fort Street and are detailed in this chapter.



DESIGN

Fort Street (M-85) traversing north-south through Lincoln Park and is a major arterial roadway connecting to Southgate and Detroit. Fort Street intersects Southfield Road in Downtown Lincoln Park and provides regional connection to I-75 and the M-39 Southfield Freeway. Additionally, Fort Street is one of only 4 crossings of the Rouge River into downtown Detroit and functions as an MDOT Emergency Route.

Fort Street within Lincoln Park is a divided roadway with center median, consisting of three travel lanes and a non-continuous curb use lane (4-lanes total) in each direction. "Michigan left" turns are located at regular intervals along the corridor and add their associated left turn lane pockets to create 5-lane total width in each direction at those locations.

Function as an MDOT Emergency Route currently prevents opportunity to reduce lane quantity or capacity from that of the existing 3-lanes in each direction. However, other corridor enhancement opportunities exist to improve transportation equity in Lincoln Park and the surrounding communities.

Suggested improvements seek to better reflect the character of Lincoln Park and facilitate a safer and more welcoming streetscape environment that supports local residents and corridor businesses, ultimately providing a more appropriate balance between all transportation users, motorized and non-motorized. To this end, key design objectives of the suggested improvements include:

1. Improve access, safety, and comfort for non-motorized users (including transit riders)
2. Reduce the physical and perceived scale of vehicular uses
3. Reduce perceived speed appropriateness and increase driver awareness of non-motorized users
4. Increase non-motorized permeability along the corridor with frequently spaced, improved crosswalks
5. Physically separate motorized and non-motorized users
6. Facilitate connections to local and regional non-motorized pathways
7. Provide safe and convenient on-street parking
8. Enhance non-motorized users' experience with improved character and amenities
9. Provide canopy street trees and land-use buffer plantings to improve non-motorized user comfort and environmental sustainability

Fort Street south of Southfield Road.

Table 5-1: Summary of Design Recommendations

Fort Street Design Recommendations
» Remove Michigan-left turns and deceleration lanes immediately north and south of Southfield
» Protection islands
» Enhanced median tree plantings
» Parallel parking
» Mid-block pedestrian crossings with RRFB signals
» Bus stops and pedestrian amenities
» Street tree plantings
» Nonmotorized trail connection
» Pedestrian lighting and amenities
» Alternative suggestions for MDOT reconstruction of southbound bridge over Ecorse Creek

TYPOLOGIES

This report details two typologies for design recommendations and improvements along the Fort Street corridor. The typologies are largely defined by differences in the proposed vehicular traffic lanes and bicycle facilities.

Typology 1 – 'Fort Street South'

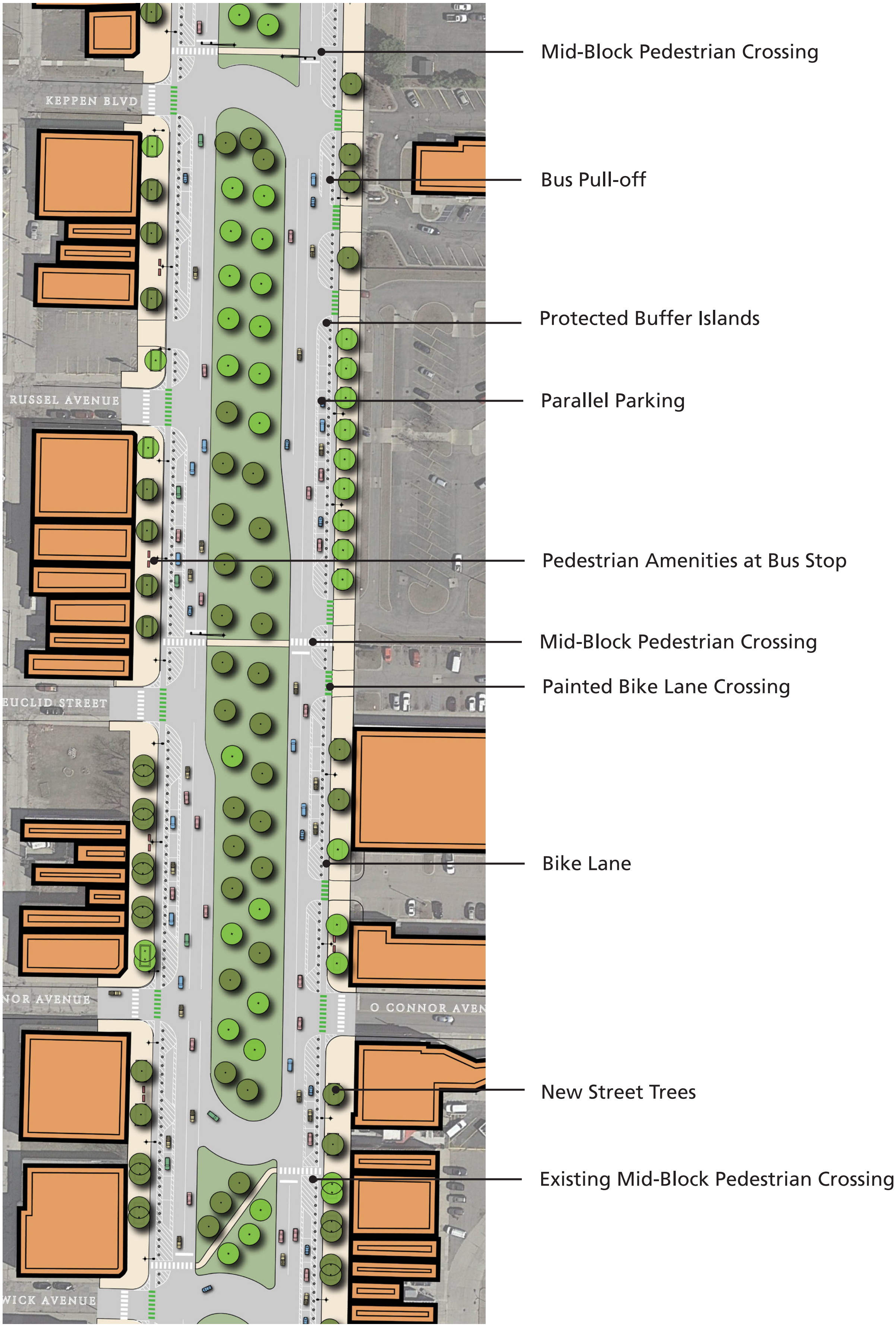
- » Remove "Michigan left" turn and associated left turn lane pockets immediately north and south of Southfield Road (1 immediately south of Southfield Road)
- » Widen and enhance sidewalks to serve as non-motorized paths.
- » Bump-out protection islands for curb use lanes
- » On-street parking with striped entry/exit buffer zone
- » Dedicated pull-off transit stop bays with striped entry/exit buffer zone
- » Formalized pedestrian crosswalks at signalized intersections and signalized midblock crossings with Rectangular Rapid Flashing Beacons (RRFB)
- » Roadway and pedestrian scale lighting
- » Pedestrian and transit stop amenities
- » Street tree and landscape buffer enhancements

Typology 2 – 'Fort Street North'

- » Remove "Michigan left" turn and associated left turn lane pockets immediately north of Southfield Road (1 immediately north of Southfield Road)
- » Reduction of 6 vehicular travel lanes to 4 vehicular travel lanes
    - 2 northbound
    - 2 southbound
    - Turn lanes
- » Protected bike lanes adjacent to existing curb lines (eastbound and westbound) with greenway striping at roadway and driveway intersections
- » On-street parking with striped entry/exit buffer zone
- » Dedicated pull-off transit stop bays with striped entry/exit buffer zone
- » Formalized pedestrian crosswalks at signalized intersections and signalized midblock crossings with Rectangular Rapid Flashing Beacons (RRFB)
- » Roadway and pedestrian scale lighting
- » Pedestrian and transit stop amenities
- » Street tree and landscape buffer enhancements

Protected bike lane with parallel parking and pylons

Figure 5-1: Fort Street Design



SUMMARY OF PHYSICAL IMPROVEMENTS

The following are more detailed descriptions of the Typology 1 and 2 design recommendations:

On-Street Parking

On-street parallel parking is proposed as a component the design recommendations for Typologies 1 and 2 on Fort Street. While parking demand may not be high in some portions of the corridor, presence of defined parking still provides visual clarity of the curb use lane and perceived narrowing of the vehicular roadway. In addition to supporting needs of corridor businesses, the on-street parking serves as a physical and spatial barrier between non-motorized facilities (sidewalks and protected bike lanes where present) and moving traffic lanes. A 2’ width striped buffer zone is provided between the parallel parking spaces and moving traffic lanes to increase vehicle entry/exit space and visual awareness of passing drivers.

Based on the current preference for bike lane protection north of Southfield Road (pavement striping and vertical pylons), parking regulatory signage will be located curbside, along with metering or pay stations if desired in the future. If bike lane protection preferences were to migrate toward raised curb islands/planters, all regulatory signage, meters, pay stations, etc. could be located in the raised islands. The raised islands would also support adequate protections for installation of EV charging stations and parking metering or pay stations if desired in the future, adjacent to on-street parking.

Curb Use Lane Protection Islands

Protection islands, commonly referred to as curb bump-outs, are proposed to be added to the curb use lane to reduce physical and perceived roadway width in both Typologies 1 and 2. The islands also serve to better define and increase safety for on-street parallel parking and pull-off transit stop bays. The study explored 3 options for the protection islands:

» Pavement striping to serve as visual buffer from vehicles (lowest cost, lowest impact)

» Pavement striping and vertical pylons

» Raised curb islands/planters (highest cost, highest impact) Preference by the study steering committee is to create the most impact through use of raised curb island planters adjacent the proposed bike lanes to maximize beautification and user safety. It should also be noted that use of raised curb islands/planters could provide stormwater

Planter curb barrier land separating driving/parking lane from cyclists

management functions, increased landscape presence, and space for additional pedestrian amenities. If necessary, this decision could be revisited during a future project implementation phase based upon current priorities and available budgets. Pavement striping and vertical pylons could be considered as an alternative or incrementally phased approach to bicycle lane protection.

Preference by the study steering committee is to balance impact and project budget through use of pavement striping and vertical pylons. However, this decision should be revisited during a future project implementation phase based upon current priorities and budget at that time. It should be noted that use of raised curb islands/planters could also provide stormwater management functions, increased landscape presence, and provide space for additional pedestrian amenities.

Protected Bike Lanes

Protected bike lanes are located as the outside lanes of the roadway, adjacent to the existing curbline in Typology 2, north of Southfield Road. Greenway pavement markings are proposed at intersecting roadways and driveways to serve as visual awareness for both bicyclists and drivers. The study explored 3 options for bike lane configuration and methods of protection:

- 6′ width bike lane with pavement striping to serve as buffer from vehicles (lowest cost, lowest impact)
- 6′ width bike lane with pavement striping and vertical pylons, minimum 8′ clear width between curb and pylons for snow removal
- 8′ width bike lane with raised curb islands/ planters (highest cost, highest impact)

Preference by the study steering committee is to balance impact and project budget through the use of a 6′ bike lane with pavement striping and vertical pylons. However, this decision should be revisited during a future project implementation phase based upon current priorities and budget at that time. It should be noted that use of raised curb islands/planters could also provide stormwater management functions and facilitate the installation of EV charging stations for on-street parking. Refer to additional considerations described in the On-Street Parking section of this report.

Example of on-street parking with protection islands

Green painted intersections to enhance visibility of cyclists

Example of sidewalk improvements in Grandville, MI

Sidewalks & Crosswalks

Existing sidewalks within the corridor range in condition from like new to very poor. The very poor sections exhibiting cracking, settlement, heaving, or other degradations that create tripping hazards. All sidewalks should be subject of a detailed condition review and be replaced as needed. Pedestrian curb ramps should be reviewed and brought up to current accessibility standards.

Fort Street sidewalks are proposed to also serve as non-motorized pathways outside of the downtown core in Typology 1 (only South of Southfield). In most locations, existing sidewalks already have 8-10 feet clear width. However, removal of clear width impediments and/or widening of sidewalks will be required in some locations. Curb ramps at intersections and driveways will need to be modified accordingly, and appropriate signage added. Greenway pavement markings are proposed at intersecting roadways and driveways to serve as visual awareness for both bicyclists and drivers. A "walk your bike" policy and signage should be implemented within the downtown core to reduce bicycle/pedestrian conflicts in areas of higher pedestrian use.

Through the full length of the corridor, formalized pedestrian crosswalks are proposed at signalized intersections and signalized midblock crossings. The proposed condition includes a total of six signalized intersection crosswalks and six signalized midblock crossings. On average, formalized crosswalks occur at approximate two block intervals along the corridor. Crosswalks would include pavement markings, pedestrian curb ramps and appropriate signage. Pedestrian phase signal timing should be programmed to allow adequate crossing time for the specific roadway with and condition at each crosswalk. At mid-block crossings, push button activated Rectangular Rapid Flashing Beacons (RRFB) are recommended on overhead mast arms to increase driver awareness of pedestrian presence. Lincoln Park may want to consider enacting "yield for pedestrians" laws and related signage to codify the communities' transportation equity priorities.

Non-Motorized Network Connections

To achieve an effective non-motorized transportation system that provides resident access to and from essential goods and services, it is critical that non-motorized improvements within

Recangular Rapid Flashing Beacon and pedestrian crosswalks support the safety of pedestrians at crossings

the Fort Street corridor connect to regional non-motorized pathway networks and destinations.

Proposed Fort Street improvements will directly connect with non-motorized improvements (protected bike lanes & and shared-use non-motorized pathways) proposed for Southfield Road.

Via Southfield Road, Fort Street will have connectivity to a regional pathway existing on Jefferson Avenue (Ecorse) and ultimately to the Detroit River Greenway. Additionally, Southfield Road will provide connectivity to SEMCOG's planned Electric Avenue corridor regional bikeway, and Lincoln Park's local recreational pathway following Ecorse Creek at River Drive. Short, 1-block cross connections between Fort Street and the Electric Avenue corridor are also possible via sidewalks and shared-use roadways on low volume neighborhood streets.

Pedestrian and Non-Motorized Amenities

Pedestrian and non-motorized amenities are proposed at strategic locations along the corridor based upon non-motorized transportation needs and land-use influences. These improvements can be seen in both Typology 1 and Typology 2 for Fort Street. Improvements include benches, litter receptacles, bike hoops, historical/interpretive signage, wayfinding, and other such accoutrements. Benches should be placed at regularly spaced intervals (approximately every neighborhood block) throughout the corridor to provide frequent resting places for mobility challenged individuals. Additional benches and bike hoops should be located based on land use and resulting demand. Opportunities for historical/interpretive signage exist within the Lincoln Park downtown, at Ecorse Creek, and at other significant points along the corridor.

Transit Stop Amenities

Improvements are proposed at transit stops to better support transportation equity and the comfort and safety of users. Occurring in both Typologies 1 and 2, all bus stops should provide, at a minimum, accessible paved surfaces, benches, and curb ramps for pedestrian access to/from a stopped bus. At bus stops with significant ridership or those located near key destinations, improvements should be enhanced to also include shelters, litter receptacles, transit maps/schedules, community information, and other user amenities.

Proposed non-motorized routes in Lincoln Park.

Existing bus shelter at Fort Street & Southfield Road

Lighting

The Fort Street corridor is currently lit by decorative roadway scale fixtures. Supplemental pedestrian scale lighting is recommended for the pedestrian streetscape environment to reinforce character of a walkable business corridor. New pedestrian scale fixtures should be of the same design vocabulary as existing roadway fixtures. These recommendations occur in both Typology 1 and 2.

Street Trees & Landscape

Street trees are proposed throughout the corridor to improve user comfort, visual character, and environmental sustainability. Healthy and vibrant urban street trees have proven positive impacts on commercial/retail environments, user enjoyment, community health, and environmental quality. Existing raised planters provide additional physical and perceptual barriers from moving traffic, as well as providing informal seating opportunities. Existing planters should be repaired or replaced where necessary, and additional tree plantings within the pedestrian streetscape environment should continue this existing design vocabulary.

Portions of the Fort Street median currently support significant mature tree canopy, particularly between Montie Road and Outer Drive. Supplemental tree plantings should be added elsewhere in the corridor to increase tree canopy to similar density.

Increased ordinance compliance is recommended for screening and buffering of some private development land uses, particularly vehicular use areas (parking/drives) and material storage yards. In many instances along the corridor, these uses directly abut the public right-of-way and sidewalks without physical separation or screening. Pedestrian comfort and aesthetic quality of the corridor could be greatly increased by screening/buffering of these land uses per ordinance standards. Opportunities should be sought to bring non-conforming existing conditions into compliance, and screening/buffering should be made a high priority in site plan reviews for new development or redevelopment.

Ecorse Creek Bridges

During the process of this study, MDOT contacted the City of Lincoln Park for coordination of Ecorse Creek Bridge replacements scheduled for 2023. No dimensional changes are proposed for the

Example of transit stop amenities

Example of pedestrian-scale lighting

Figure 5-2: MDOT Preliminary Design

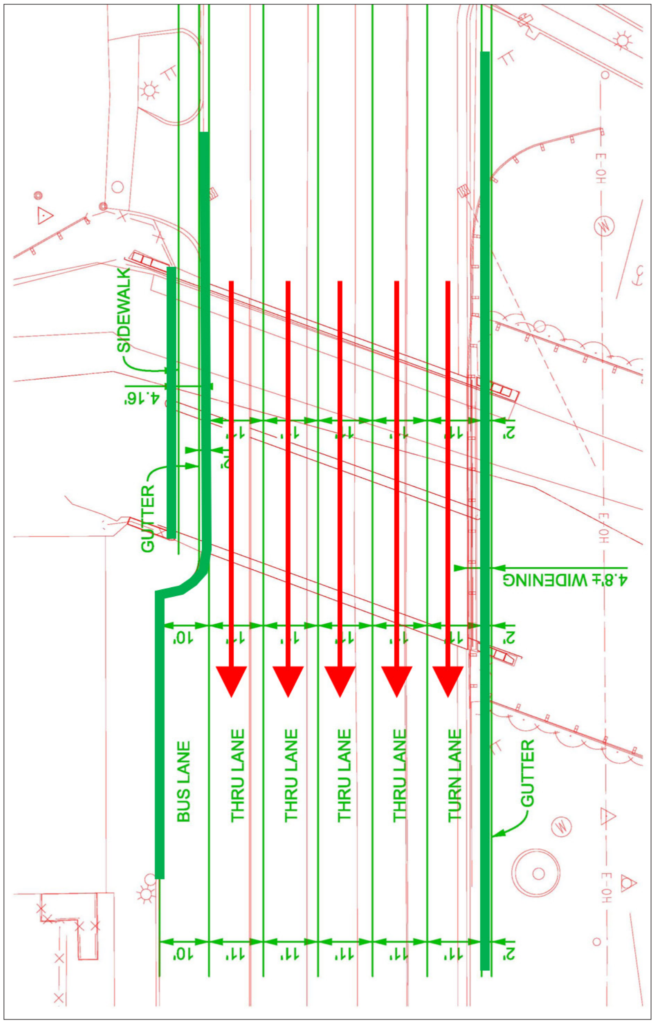
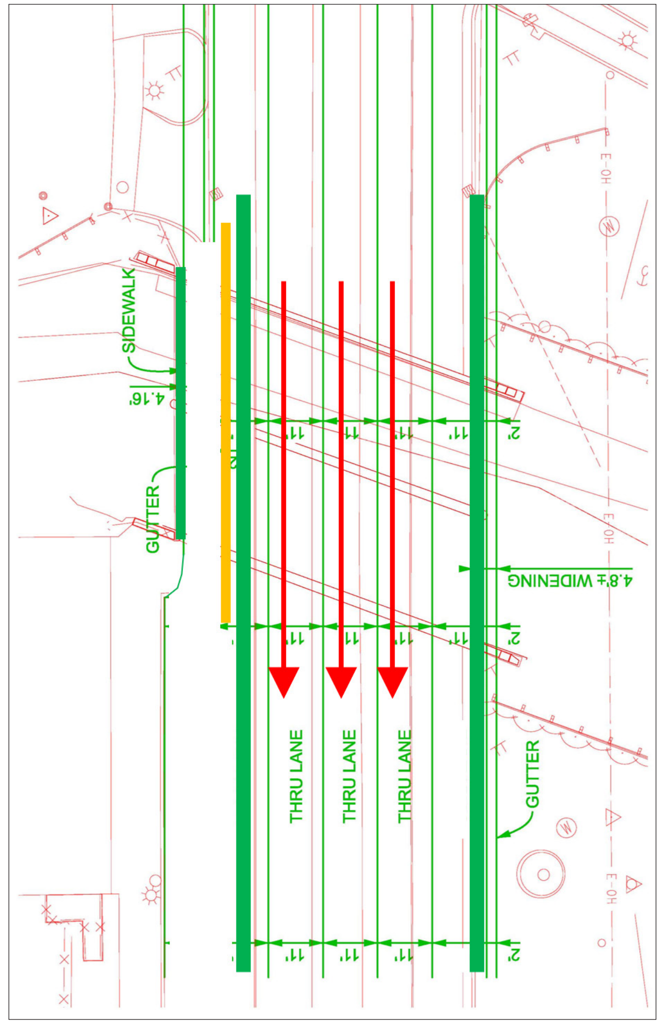


Figure 5-3: Alternative Suggestion

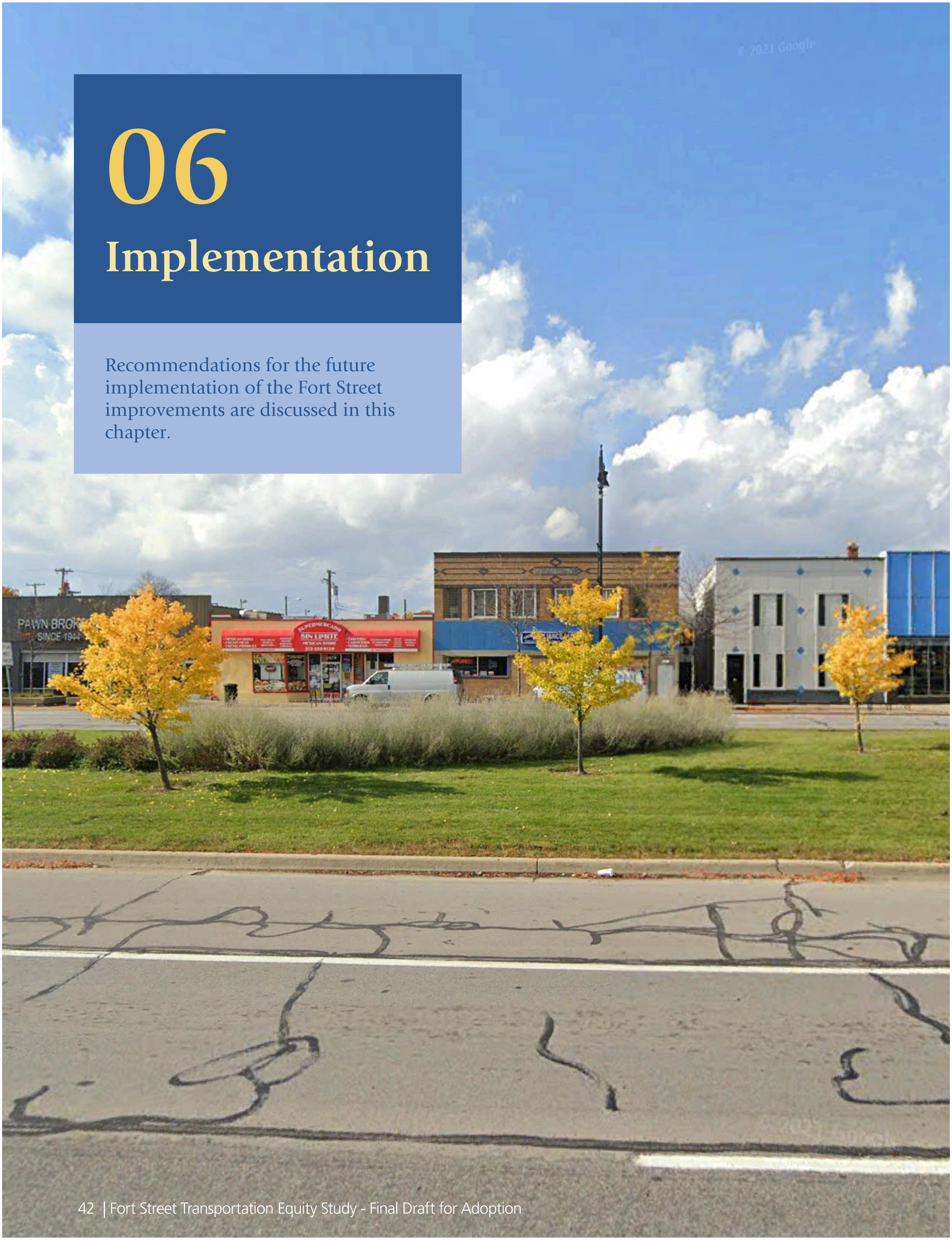


northbound bridge. However, MDOT proposes widening the southbound bridge to accommodate 5-lanes of thru traffic. The current bridge supports 3-lanes of thru traffic, plus a "Michigan left" turn lane (4 lanes total). The MDOT proposal is counter to the Lincoln Park's transportation goals and the study recommends continued dialog with MDOT to preserve dimensions of the current bridge, or further reduce width by eliminating the existing left turn lane over the bridge. The left turn lane could begin south of the bridge and still easily maintain sufficient stacking distance.

Aerial view of Ecorse Creek bridge.

06
Implementation

Recommendations for the future implementation of the Fort Street improvements are discussed in this chapter.



IMPLEMENTATION

Implementing the design recommendations identified in this report will create a more equitable, safe, and aesthetically appealing transportation corridor along Fort Street. An undertaking like this will require various partner entities and funding mechanisms. Focus areas, timeline, possible partners, and possible funding mechanisms are outlined in this section.

The scale of the proposed enhancements warrants a strategic, phased approach that can be adjusted to the needs and budgetary limits of the City of Lincoln Park. Below is a table that identifies phasing possibilities for the implementation of the improvements including Traffic and Transportation (T) focused projects and Pedestrian Amenities and Beautification (P) centered work. The table also breaks down a conceptual budget for the options presented for road diet implementation (from painted buffer islands to raised curb planter islands).

IMPLEMENTATION FOCUS AREAS

- **Traffic & Transportation (T)** – Implementation areas focused on the physical improvements within the roadway.
- **Pedestrian Amenities & Beautification (P)** – Implementation areas that improve the pedestrian zone and beautify the streetscape

IMPLEMENTATION TIMELINE

- **Short Term (3-4 Years)** – Projects that require local capital improvement funding, and the procurement of private or state and federal funding
- **Long Term (Greater than 7 Years)** – Projects that require a higher degree of coordination and the procurement of several funding sources

FUNDING

Table 6-1: Design Implementation Action Plan

T1 Fort - Champaign to Outer (Approx. 1.4 miles)			
Proposed Work	**Estimated Cost**	**Responsible Parties**	**Timeline**
Remove Michigan-left turns and deceleration lanes immediately north and south of Southfield.	$0.9 million project ($0.7 million construction cost)	City of Lincoln Park, DDA, EDC, MDOT	Long Term
» Redefine curb-use lanes with protected parking (striping). Add 6 mid-block crossings with RRFB signals.	**Curb Lane – Striping Only** $1.1 million project ($0.9 million construction cost)		
» Redefine curb-use lanes with protected parking (striping & pylons). Add 6 mid-block crossings with RRFB signals.	**Curb Lane – Striping & Pylons** $1.75 million project ($1.4 million construction cost)		
» Redefine curb-use lanes with protected parking (raised/curbed islands). Add 6 mid-block crossings with RRFB signals.	**Curb Lane – Raised/Curbed Islands** $3.8 million project ($3 million construction cost)		
P1 Fort - Champaign to Outer Drive (Approx. 1.4 miles)			
Proposed Work	**Estimated Cost**	**Responsible Parties**	**Timeline**
» Replace approximately 50% of concrete sidewalks based on condition/need. » Add bus stop amenities (concrete pads, benches, trash receptacles, shelters, etc.) » Add pedestrian amenities (benches, trash receptacles, etc.) » Add street trees in new planters, lawn extensions, and medians	**Pedestrian Streetscape** $2.25 million project ($1.8 million construction cost)	City of Lincoln Park, DDA, EDC, MDOT, Wayne County	Short Term

Funding for Fort Street enhancements will come from a variety of sources, including local capital improvement funds, general fund allocations, tax increment financing through the DDA, and state and federal funding programs.

Implementation projects of the scale and magnitude of the Fort Street Corridor often require multiple project partners and funding sources. Often, funding programs are focused on priorities and goals that may only fund portions or specific elements within the overall Fort Street Corridor projects. All funding sources and programs should be reviewed for complimentary requirements and opportunities to leverage local match dollars for multiple funding sources. Below is a select list of potential funding programs that may be applicable to the Fort Street projects:

» American Rescue Plan Act Funding (various sources)

» DTE Foundation Grants (Community Transformation, Economic Progress, Environment)

» FHWA & MDOT Congestion Mitigation and Air Quality Improvement Program

» MDNR Natural Resources Trust Fund Grant

» MDNR Recreation Passport Grant

» MDNR Urban and Community Forestry Grants

» MDOT & SEMCOG Transportation Alternatives Program

» MEDC Michigan Main Street Community Program

» MEDC Public Spaces Community Places Program

» Michigan Community Development Block Grant Programs

» Michigan State Infrastructure Bank Loan Program

» Michigan State Revolving Fund

» Michigan Transportation Economic Development Fund

» NPS & MDNR Land and Water Conservation Fund Grant

» Public/Private Partnership Opportunities

» Safe Routes to School Program

» TMA Surface Transportation Block Grant Program

» USDOT Reconnecting Communities Pilot Program

» Wayne County Partnership (collaboration with Wayne County for multiple grant opportunities)

» Wayne County Community Foundation

» Wayne County New Economy Initiative

Appendix

Appendix A Fort Street Exhibits

Appendix B Fort Street Traffic Counts

Appendix C Fort Street Safety Countermeasures

Appendix D MDOT Complete Streets Process Guide for Southeast Michigan

Appendix E Traffic & Crash Analyses Resources

LINCOLN PARK CORRIDOR PLAN

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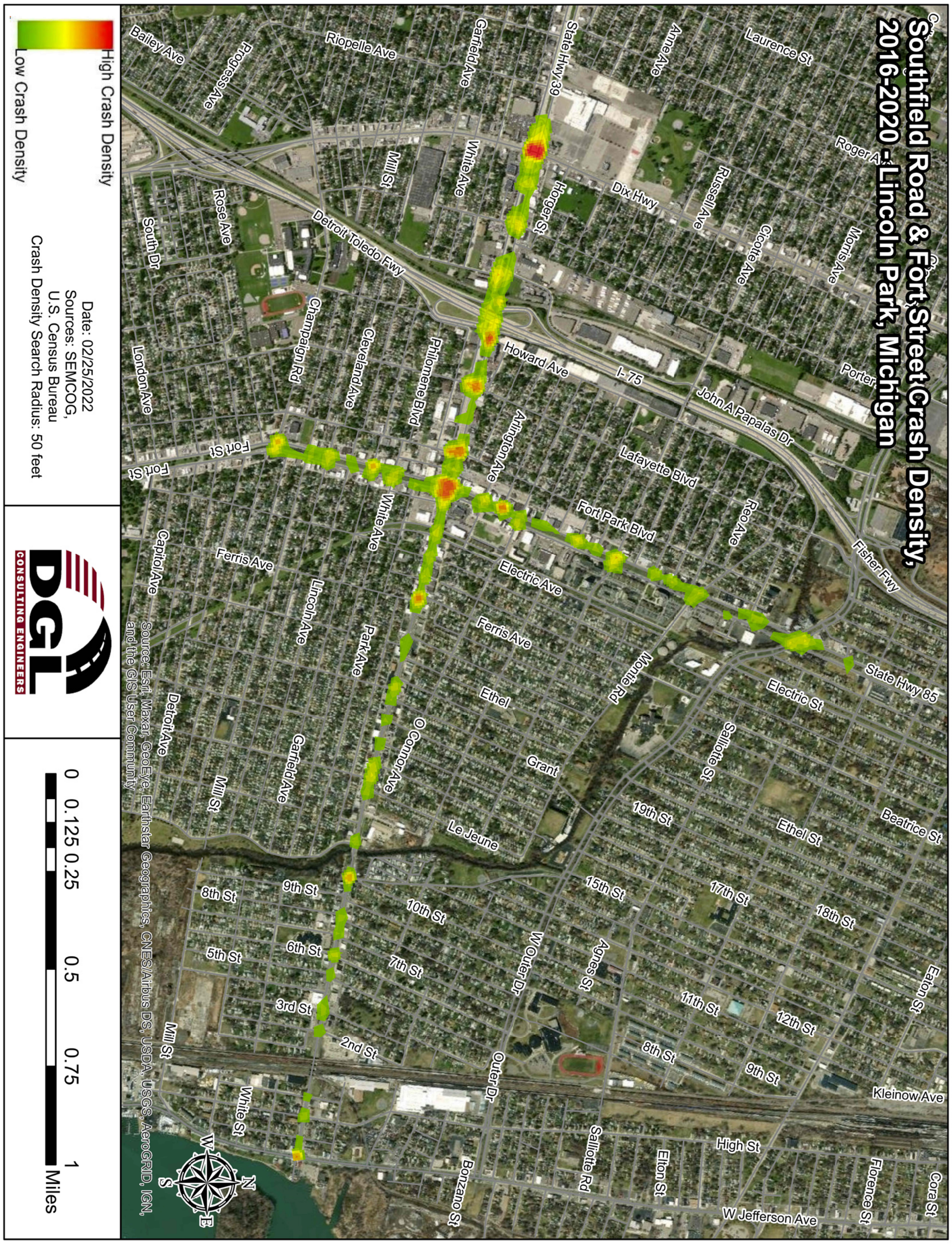

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DGL CONSULTING ENGINEERS

LINCOLN PARK CORRIDOR STUDIES
CRASH HEAT MAP

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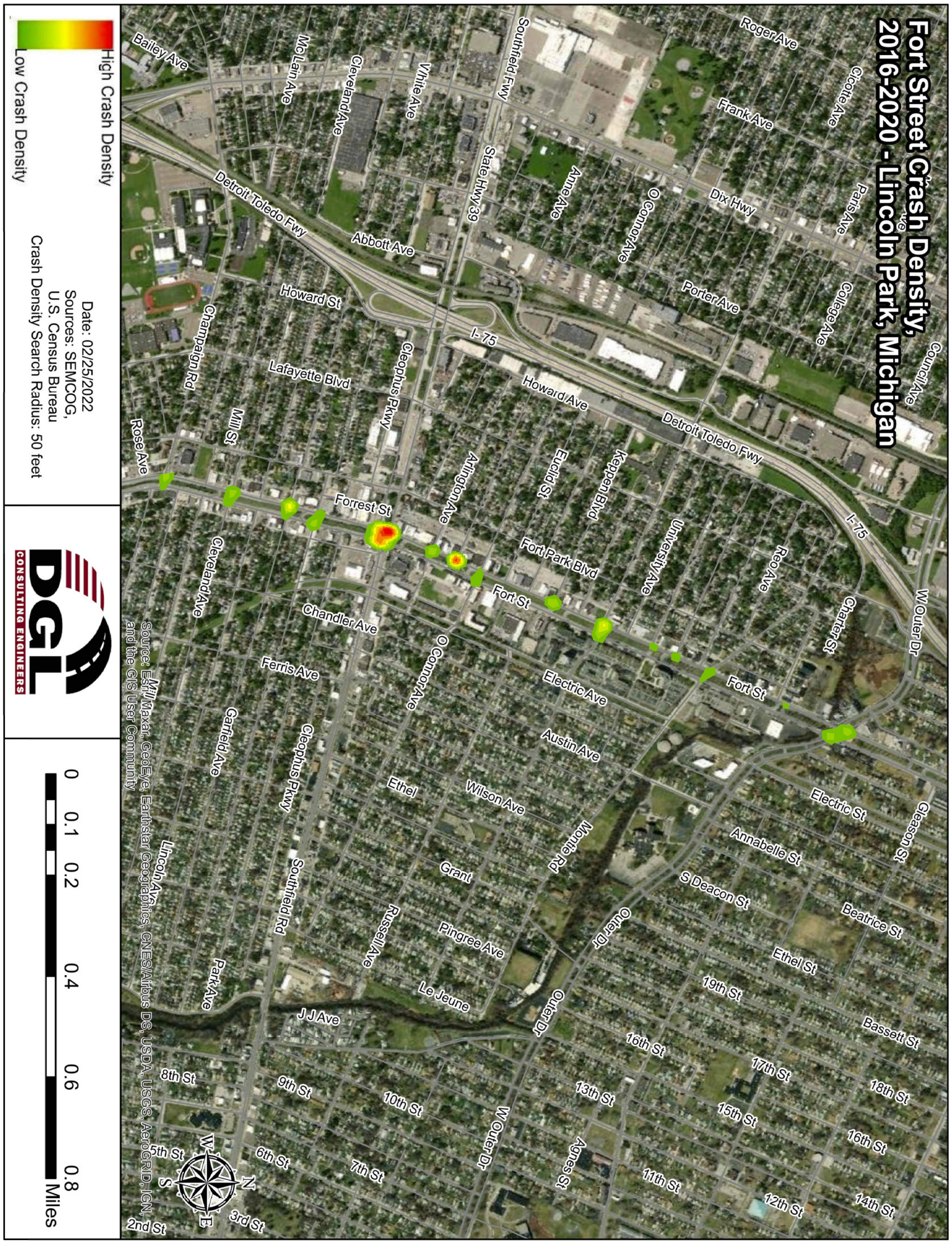

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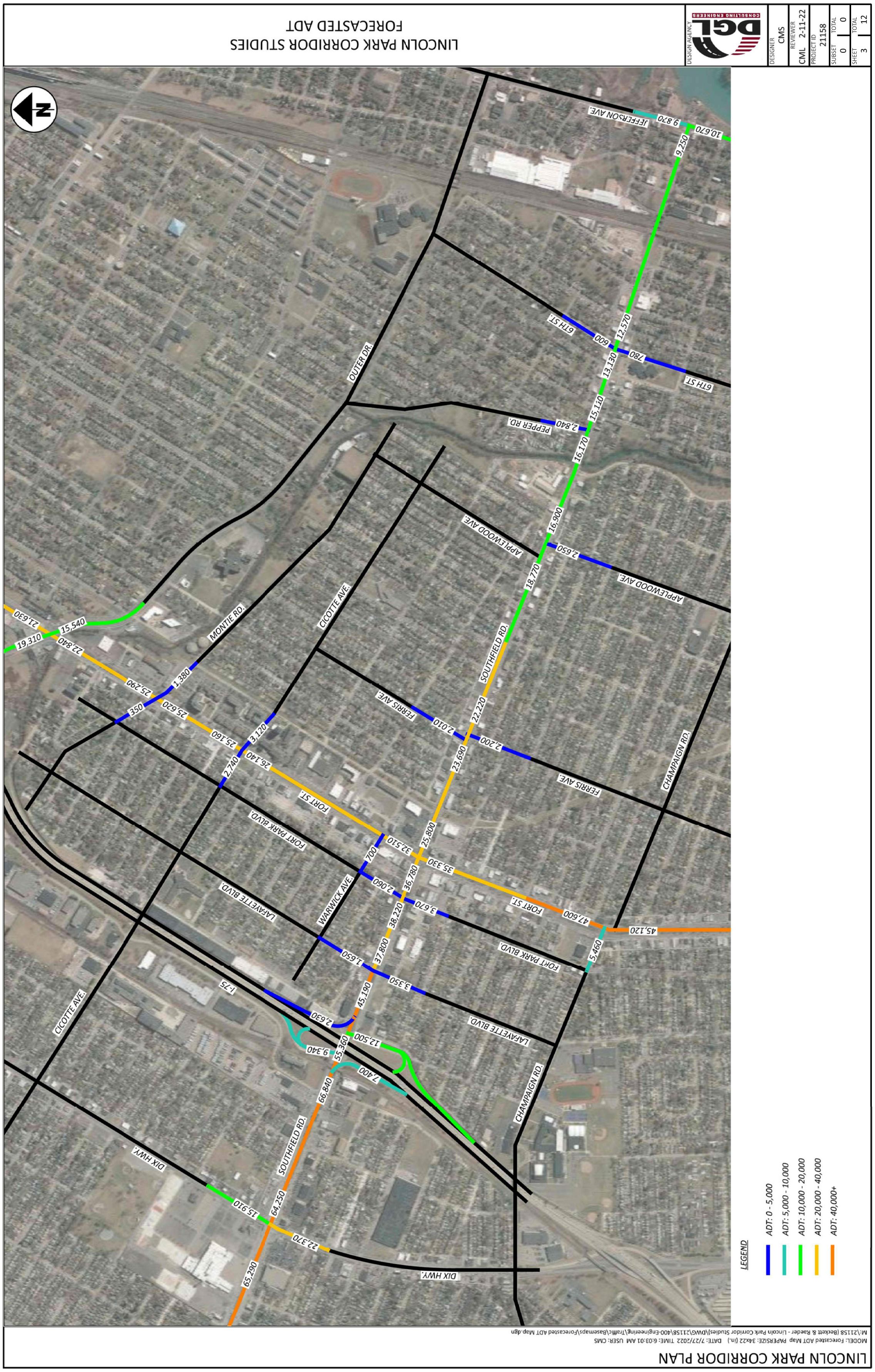
DESIGN AGENCY: DGL CONSULTING ENGINEERS

FORT STREET CORRIDOR STUDY
CRASH HEAT MAP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PEPPER RD.
OUTER DR.
APPLEWOOD AVE.
SOUTHFIELD RD.
FERRIS AVE.
CHAMPAIGN RD.
FORT ST.
FORT PARK BLVD.
LAFAYETTE BLVD.
WARWICK AVE.
CICOTTE AVE.
MONTIE RD.
I-75
DIX HWY.
LEGEND
ADT: 0 - 5,000
ADT: 5,000 - 10,000
ADT: 10,000 - 20,000
ADT: 20,000 - 40,000
ADT: 40,000+
LINCOLN PARK CORRIDOR PLAN

LINCOLN PARK CORRIDOR PLAN

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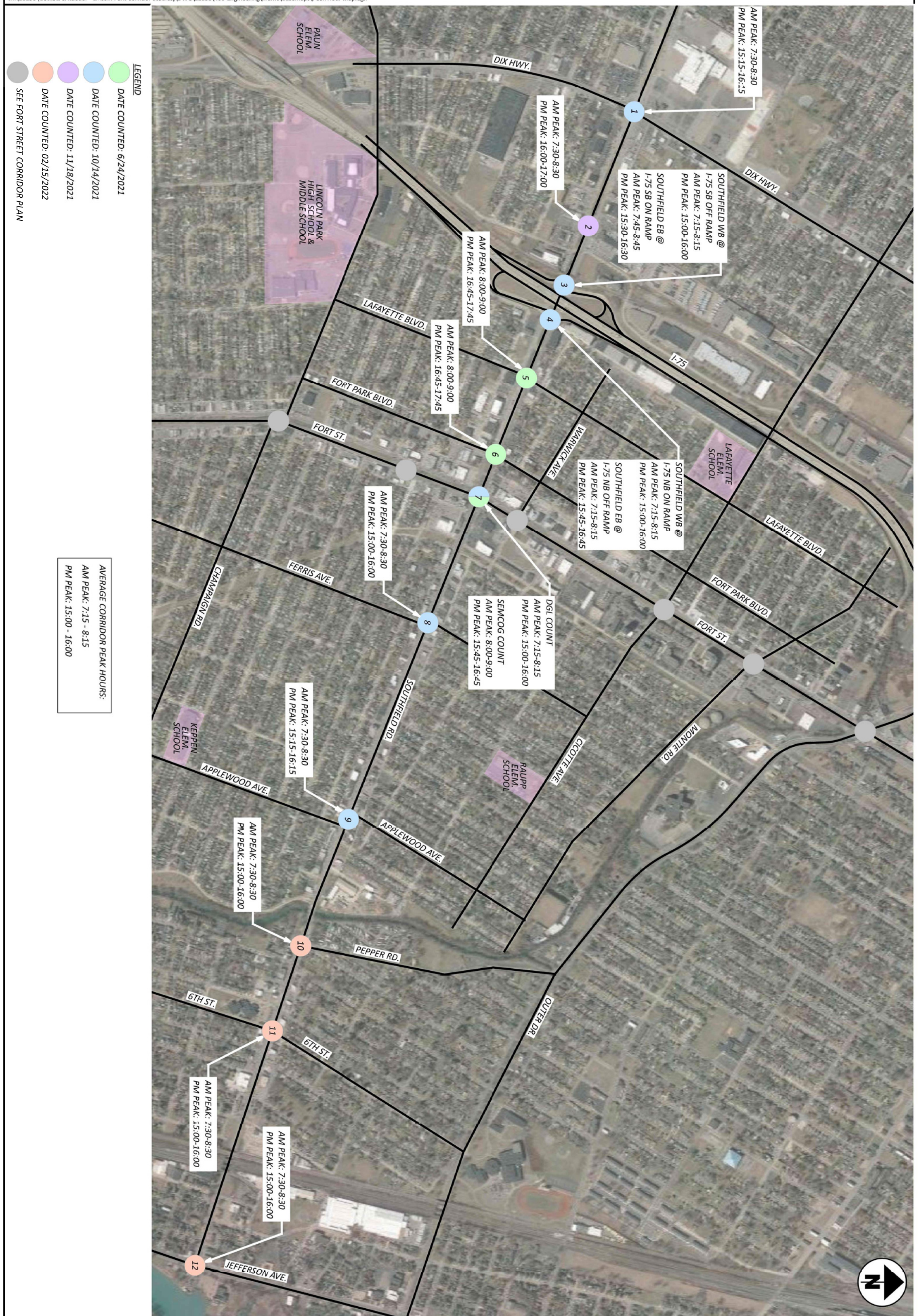

LINCOLN PARK CORRIDOR STUDIES
PEAK HOURS

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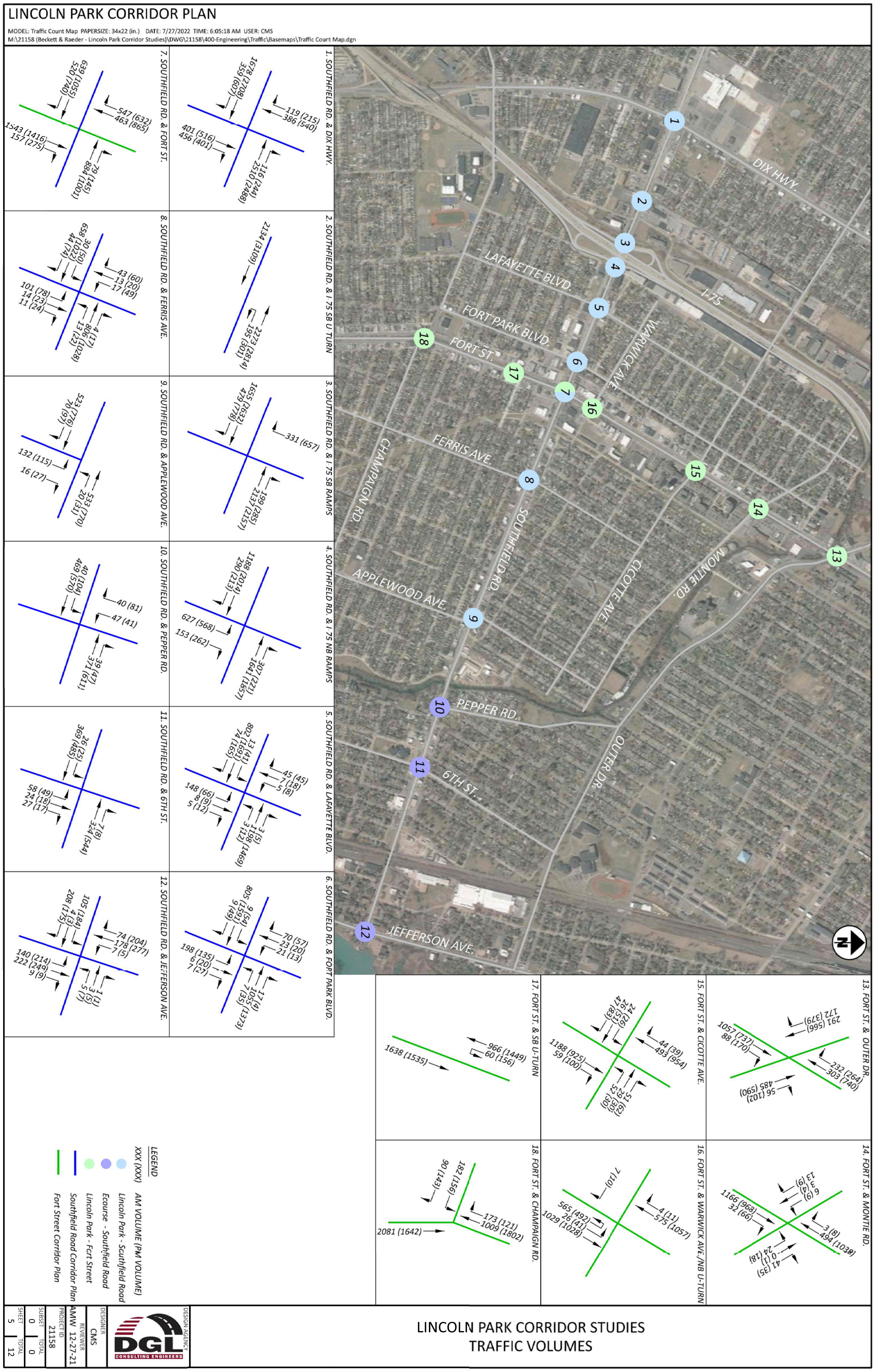
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3. SOUTHFIELD RD. & I 75 SB RAMPS
4. SOUTHFIELD RD. & I 75 NB RAMPS
5. SOUTHFIELD RD. & LAFAYETTE BLVD.
6. SOUTHFIELD RD. & FORT PARK BLVD.
7. SOUTHFIELD RD. & FORT ST.
8. SOUTHFIELD RD. & FERRIS AVE.
9. SOUTHFIELD RD. & APPLEWOOD AVE.
10. SOUTHFIELD RD. & PEPPER RD.
11. SOUTHFIELD RD. & 6TH ST.
12. SOUTHFIELD RD. & JEFFERSON AVE.
13. FORT ST. & OUTER DR.
14. FORT ST. & MONTIE RD.
15. FORT ST. & CICOTTE AVE.
16. FORT ST. & WARWICK AVE./NB U-TURN
17. FORT ST. & SB U-TURN
18. FORT ST. & CHAMPAIGN RD.
DIX HWY.
I-75
LAFAYETTE BLVD.
FORT PARK BLVD.
FORT ST.
WARWICK AVE.
FERRIS AVE.
CHAMPAIGN RD.
SOUTHFIELD RD.
CICOTTE AVE.
MONTIE RD.
APPLEWOOD AVE.
PEPPER RD.
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Ecourse - Southfield Road
Lincoln Park - Fort Street
Southfield Road Corridor Plan
Fort Street Corridor Plan
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LINCOLN PARK CORRIDOR STUDIES
TRAFFIC VOLUMES

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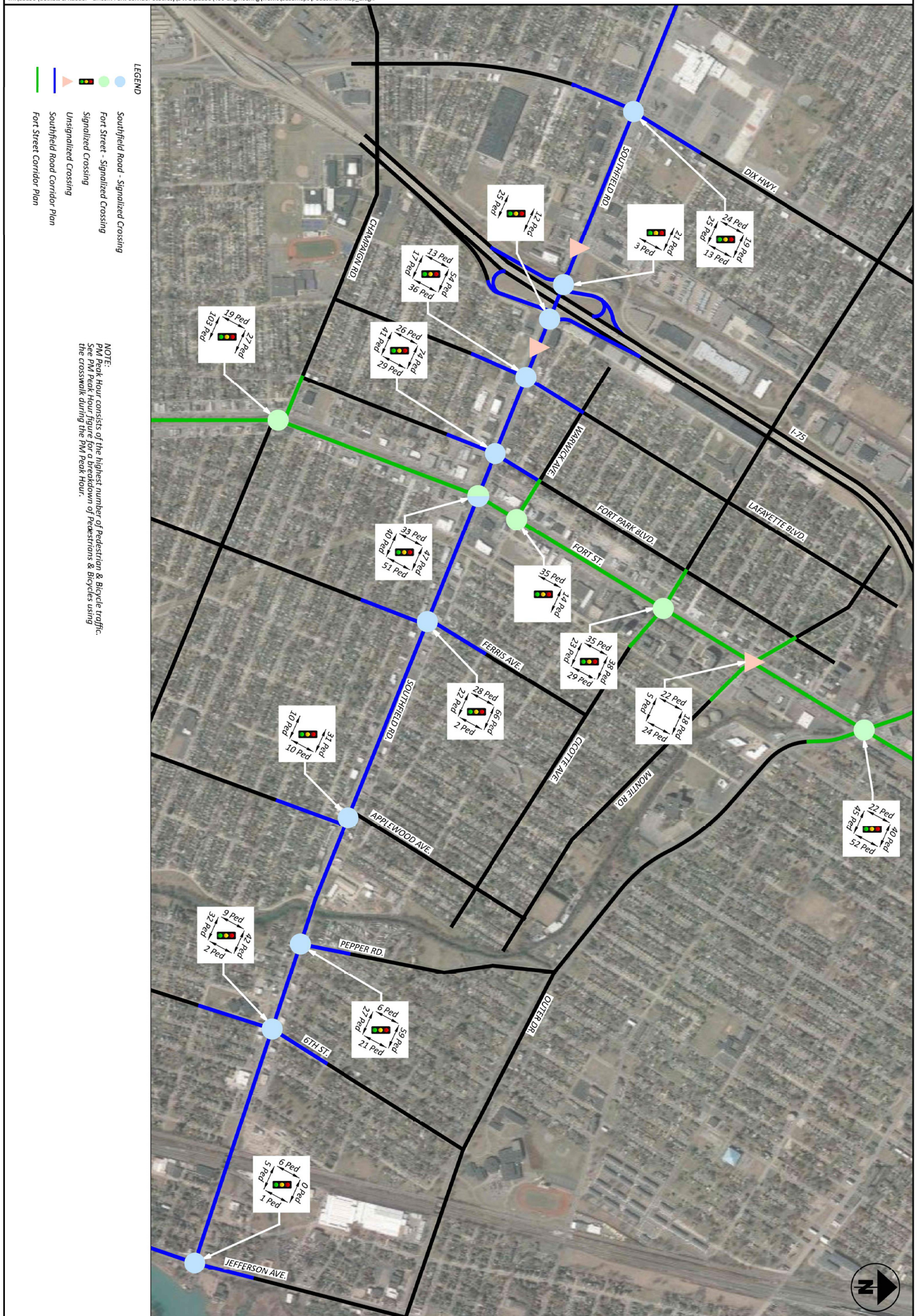

LINCOLN PARK CORRIDOR STUDIES
PEDESTRIAN AND BICYCLE VOLUMES

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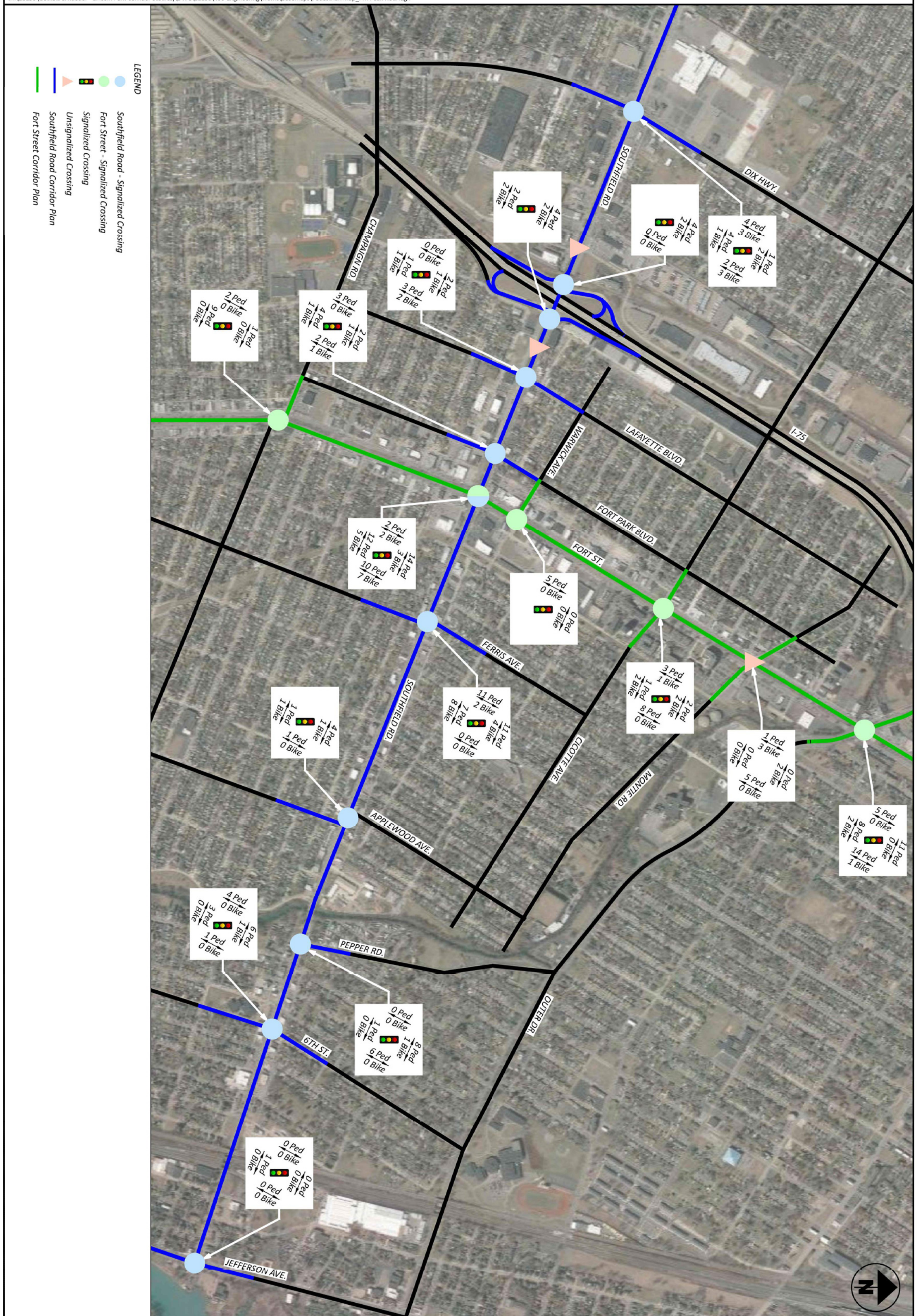

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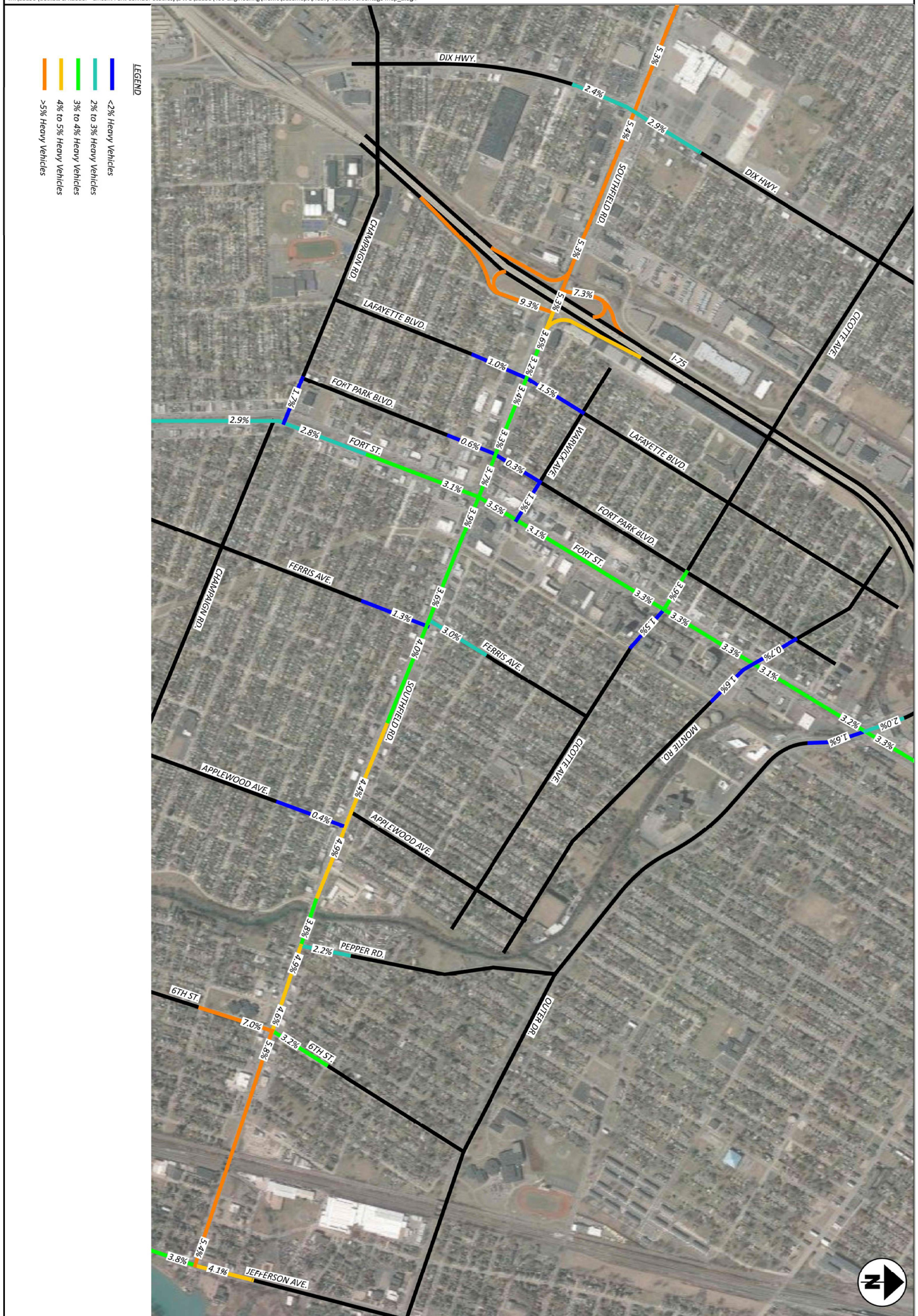

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HEAVY VEHICLE PERCENTAGE

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LINCOLN PARK CORRIDOR PLAN

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Fort Street Timing

Current Ped Timing vs Calculated Ped Timing

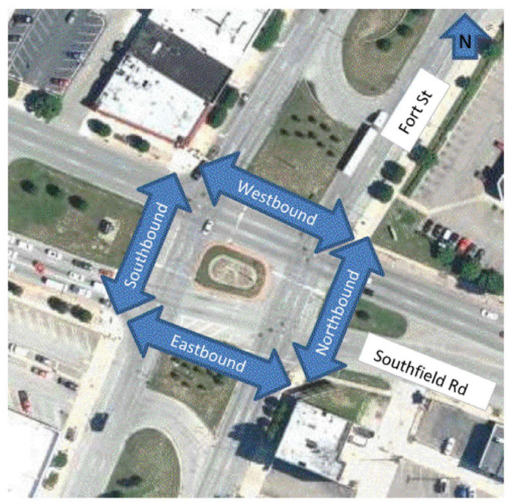
Full Crossing

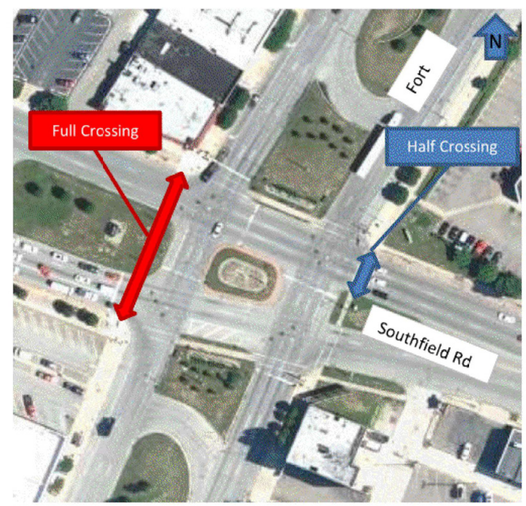
	Northbound	Southbound	Eastbound	Westbound
Fort & Champaign				
Current Timing	-	54.0	27.0	27.0
Calculated Timing	-	19.0	54.0	56.0
Difference	**0.0**	**-35.0**	**27.0**	**29.0**
Fort & Warwick				
Current Timing	-	39.3	-	42.0
Calculated Timing	-	13.0	-	19.0
Difference	**0.0**	**-26.3**	**0.0**	**-23.0**
Fort & Cicotte				
Current Timing	58.4	58.4	23.0	23.0
Calculated Timing	18.0	15.0	61.0	61.0
Difference	**-40.4**	**-43.4**	**38.0**	**38.0**
Fort & Outer				
Current Timing	42.5	42.5	43.0	43.0
Calculated Timing	48.0	55.0	77.0	75.0
Difference	**5.5**	**12.5**	**34.0**	**32.0**

Half Crossing

	Northbound	Southbound	Eastbound	Westbound
Fort & Champaign				
Current Timing	-	54.0	27.0	27.0
Calculated Timing	-	19.0	22.0	21.0
Difference	**0.0**	**-35.0**	**-5.0**	**-6.0**
Fort & Cicotte				
Current Timing	58.4	58.4	23.0	23.0
Calculated Timing	18.0	15.0	21.0	19.0
Difference	**-40.4**	**-43.4**	**-2.0**	**-4.0**
Fort & Outer				
Current Timing	42.5	42.5	43.0	43.0
Calculated Timing	28.0	55.0	30.0	25.0
Difference	**-14.5**	**12.5**	**-13.0**	**-18.0**

- Green: Fits within Existing Timing
- Yellow: Equal to Existing Timing
- Red: More Time Needed





FORT STREET CORRIDOR STUDY
PEDESTRIAN TIMING COMPARISON

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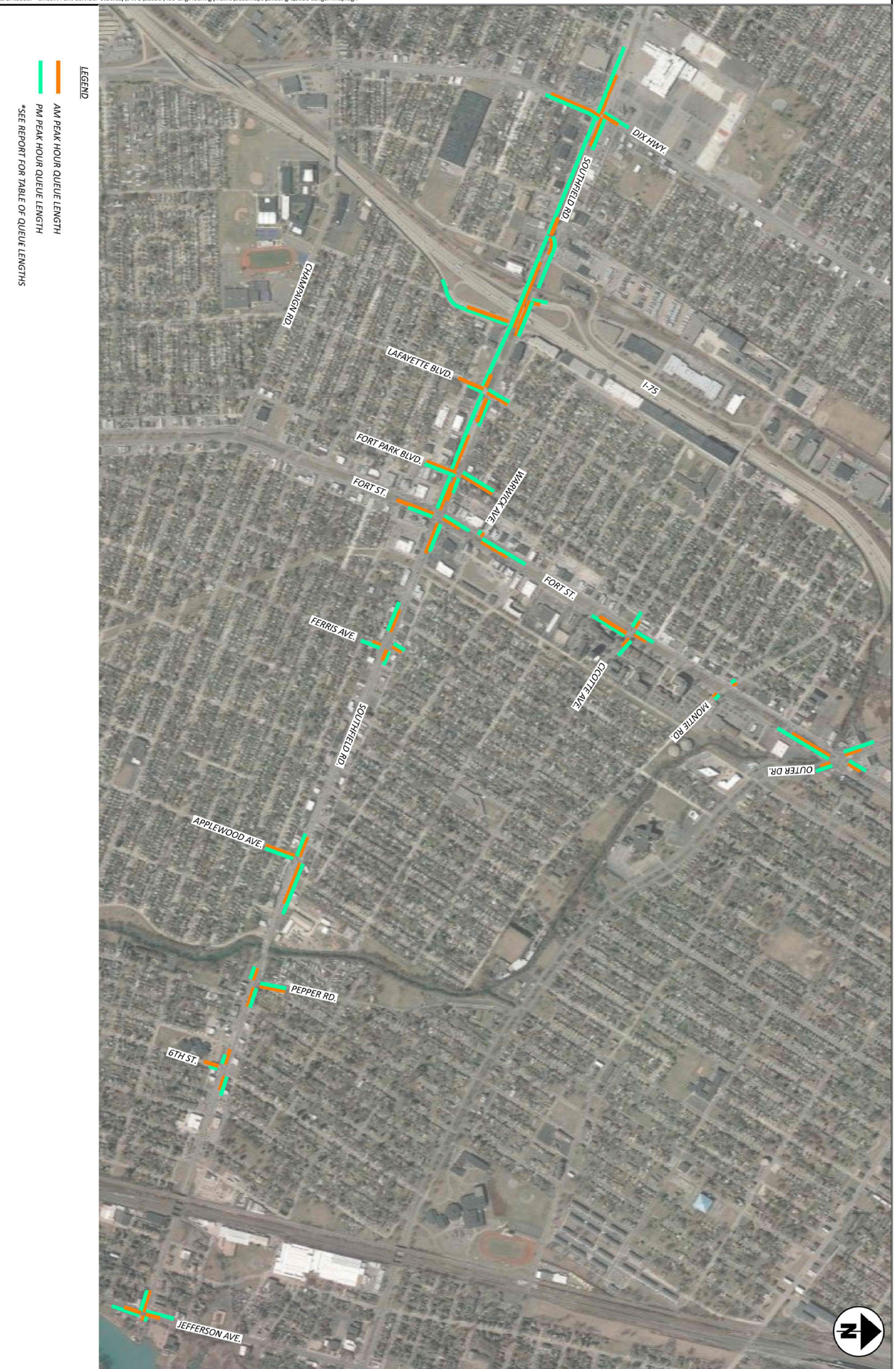

LINCOLN PARK CORRIDOR STUDIES
EXISTING CONDITIONS QUEUE LENGTHS

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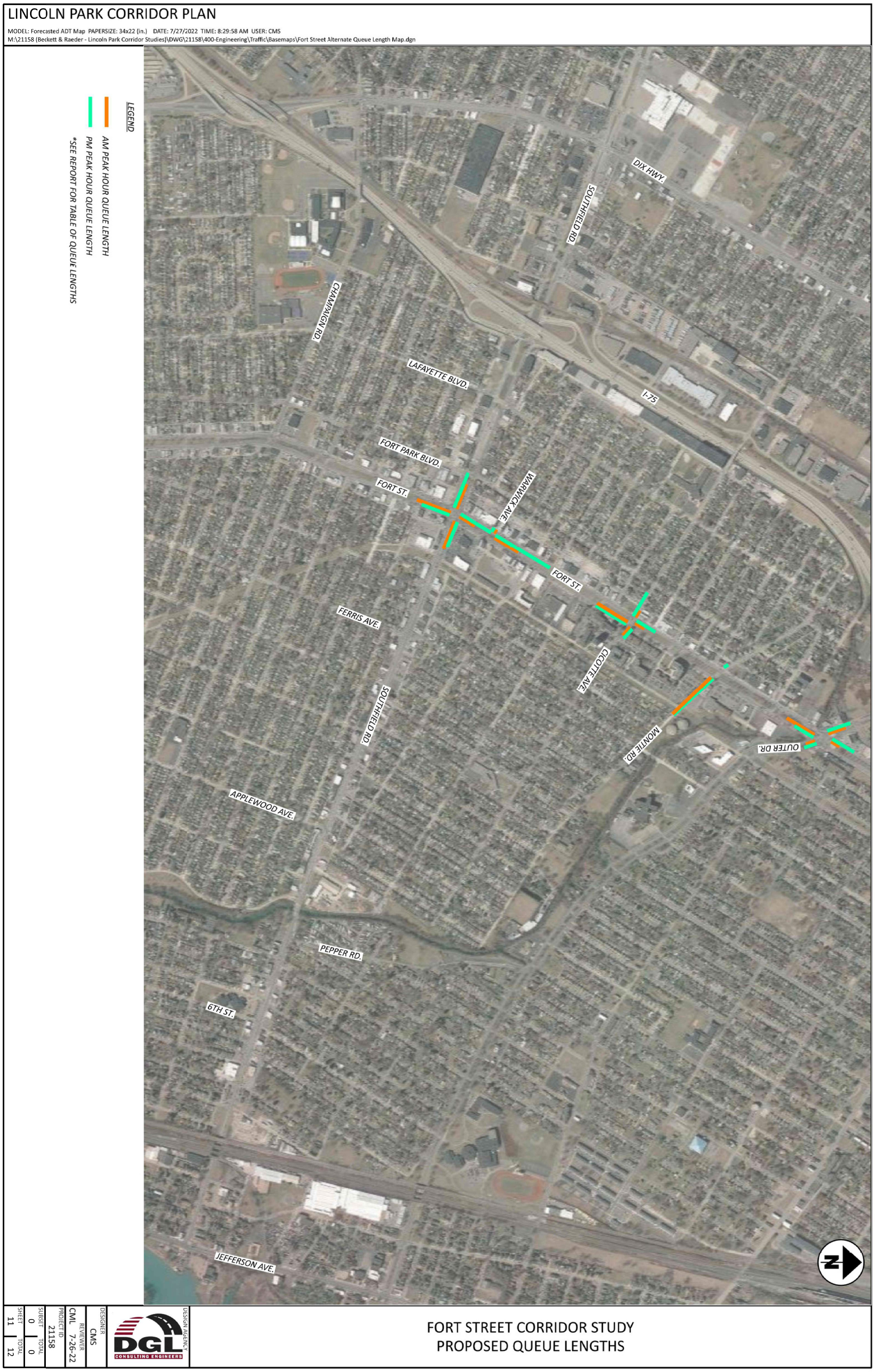
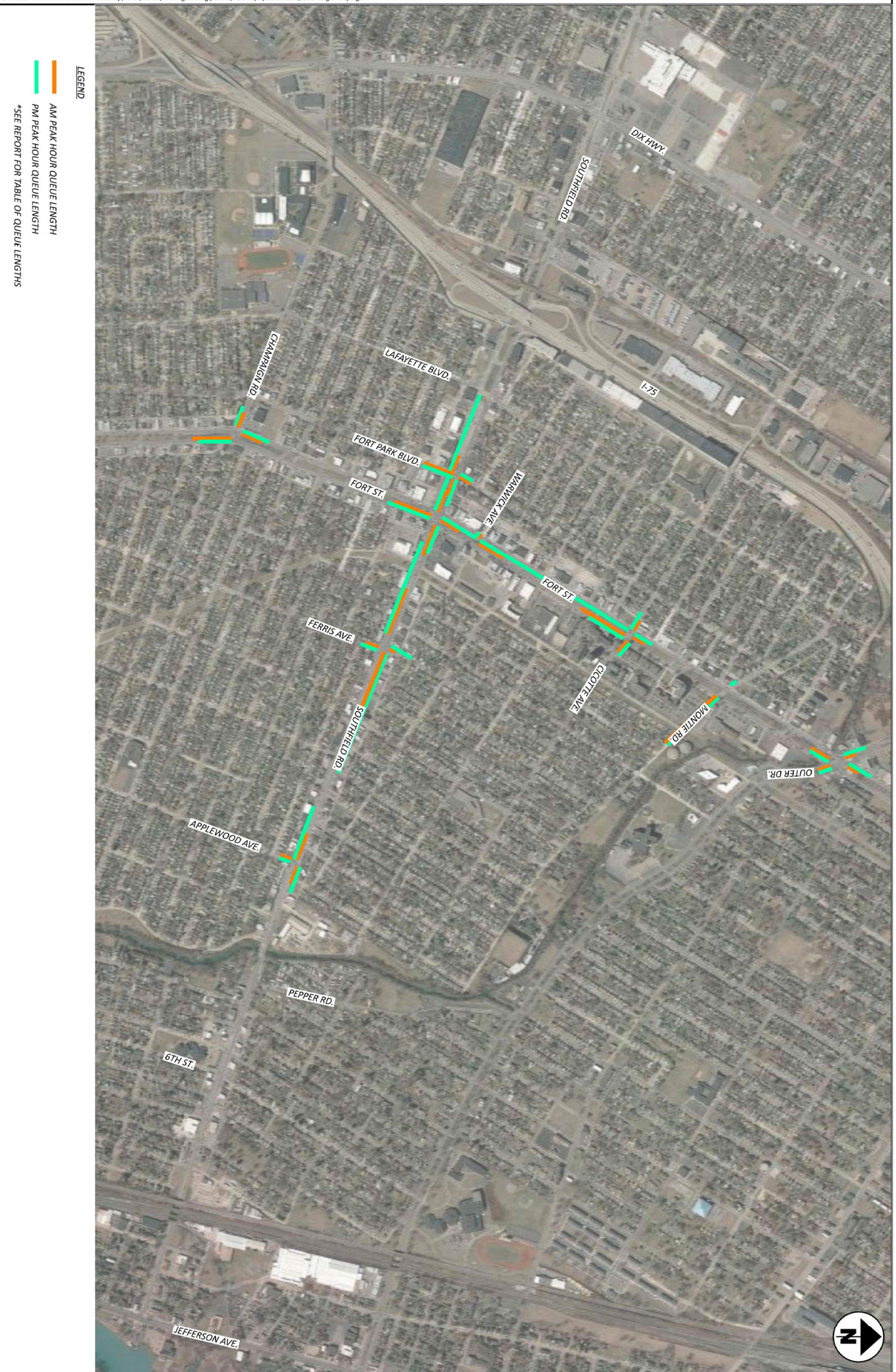

LINCOLN PARK CORRIDOR PLAN
MODEL: Forecasted ADT Map PAPERSIZE: 34x22 (in.) DATE: 7/27/2022 TIME: 8:29:58 AM USER: CMS
M:\21158 (Beckett & Raeder - Lincoln Park Corridor Studies)\DWG\21158\400-Engineering\Traffic\Basemaps\Fort Street Alternate Queue Length Map.dgn
LEGEND
AM PEAK HOUR QUEUE LENGTH
PM PEAK HOUR QUEUE LENGTH
*SEE REPORT FOR TABLE OF QUEUE LENGTHS
DIX HWY.
SOUTHFIELD RD.
CHAMPAIGN RD.
LAFAYETTE BLVD.
I-75
FORT PARK BLVD.
FORT ST.
WARWICK AVE.
FORT ST.
FERRIS AVE.
CICOTTE AVE.
SOUTHFIELD RD.
MONTIE RD.
OUTER DR.
APPLEWOOD AVE.
PEPPER RD.
6TH ST.
JEFFERSON AVE.
N
FORT STREET CORRIDOR STUDY
PROPOSED QUEUE LENGTHS
DESIGN AGENCY
DGL
CONSULTING ENGINEERS
DESIGNER CMS
REVIEWER CML 7-26-22
PROJECT ID 21158
SUBSET 0 TOTAL 0
SHEET 11 TOTAL 12

LINCOLN PARK CORRIDOR PLAN

MODEL: Forecasted ADT Map PAPERSIZE: 34x22 (in.) DATE: 7/27/2022 TIME: 9:30:42 AM USER: CMS
M:\21158 (Beckett & Raeder - Lincoln Park Corridor Studies)\DWG\21158\400-Engineering\Traffic\Basemaps\Combined Queue Length Map.dgn



DESIGNER CMS, REVIEWER CML 7-26-22, PROJECT ID 21158, SUBSET 0 TOTAL 0, SHEET 12 TOTAL 12	DESIGN AGENCY: DGL CONSULTING ENGINEERS

LINCOLN PARK CORRIDOR STUDIES
COMBINED ALTERNATIVES QUEUE LENGTHS

Lincoln Park Fort St Corridor Plan
Fort Street and Outer Drive

Leg	Outer Dr						Outer Dr						Fort St						Fort St						
Direction	Southeastbound						Northwestbound						Northeastbound						Southwestbound						
Start Time	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Int Total
2022-02-15 07:00:00	0	55	20	0	**75**	0	0	86	21	0	**107**	0	0	185	13	0	**198**	0	0	45	48	0	**93**	0	**473**
2022-02-15 07:15:00	0	48	43	0	**91**	2	0	111	11	0	**122**	0	0	265	11	0	**276**	0	0	55	57	0	**112**	2	**601**
2022-02-15 07:30:00	0	66	33	0	**99**	0	0	135	16	0	**151**	1	0	277	25	0	**302**	0	0	84	56	0	**140**	3	**692**
2022-02-15 07:45:00	0	78	48	1	**127**	0	0	120	18	0	**138**	0	0	294	24	0	**318**	0	0	85	68	0	**153**	3	**736**
2022-02-15 08:00:00	0	99	48	0	**147**	0	0	119	11	0	**130**	0	0	221	28	0	**249**	0	0	79	51	0	**130**	0	**656**
AM Peak Hour Totals	**0**	**291**	**172**	**1**	**464**	**2**	**0**	**485**	**56**	**0**	**541**	**1**	**0**	**1057**	**88**	**0**	**1145**	**0**	**0**	**303**	**232**	**0**	**535**	**8**	**2685**
AM PHF		**0.73**	**0.90**		**0.79**			**0.90**	**0.78**		**0.90**			**0.90**	**0.79**		**0.90**			**0.89**	**0.85**		**0.87**	**0.67**	**0.91**
2022-02-15 08:15:00	0	89	38	1	**128**	0	0	108	20	0	**128**	3	0	239	31	0	**270**	0	0	65	56	0	**121**	0	**647**
2022-02-15 08:30:00	0	95	44	0	**139**	0	0	109	15	0	**124**	1	0	204	31	0	**235**	0	0	57	45	0	**102**	1	**600**
2022-02-15 08:45:00	0	83	47	0	**130**	2	0	98	11	0	**109**	1	0	179	21	0	**200**	0	0	73	44	0	**117**	2	**556**
2022-02-15 11:00:00	0	71	43	1	**115**	0	0	82	16	0	**98**	0	0	131	24	0	**155**	0	0	83	52	0	**135**	1	**503**
2022-02-15 11:15:00	0	63	46	0	**109**	2	0	67	19	0	**86**	1	0	117	27	0	**144**	1	0	84	38	0	**122**	1	**461**
2022-02-15 11:30:00	0	54	43	0	**97**	1	0	96	13	0	**109**	3	0	113	25	0	**138**	2	0	72	39	0	**111**	0	**455**
2022-02-15 11:45:00	0	86	46	1	**133**	1	0	86	24	0	**110**	0	0	127	29	0	**156**	1	0	112	31	0	**143**	0	**542**
2022-02-15 12:00:00	0	73	47	1	**121**	2	0	90	15	0	**105**	0	0	142	25	0	**167**	0	0	91	44	0	**135**	1	**528**
2022-02-15 12:15:00	0	75	56	1	**132**	0	0	91	11	0	**102**	1	0	128	28	0	**156**	0	0	91	57	0	**148**	0	**538**
2022-02-15 12:30:00	0	69	60	1	**130**	2	0	111	15	0	**126**	1	0	127	32	0	**159**	1	0	87	36	0	**123**	0	**538**
2022-02-15 12:45:00	0	81	52	0	**133**	0	0	110	22	0	**132**	2	0	141	27	0	**168**	0	0	103	60	0	**163**	5	**596**
Mid-Day Peak Hour Totals	**0**	**298**	**215**	**3**	**516**	**4**	**0**	**402**	**63**	**0**	**465**	**4**	**0**	**538**	**112**	**0**	**650**	**1**	**0**	**372**	**197**	**0**	**569**	**6**	**2200**
Mid-Day PHF		**0.92**	**0.90**		**0.97**			**0.91**	**0.72**		**0.88**			**0.95**	**0.88**		**0.97**			**0.90**	**0.82**		**0.87**	**0.30**	**0.92**
2022-02-15 14:00:00	0	87	55	1	**143**	1	0	124	18	0	**142**	0	0	162	41	0	**203**	1	0	136	44	0	**180**	1	**668**
2022-02-15 14:15:00	0	117	56	0	**173**	0	0	132	22	0	**154**	6	0	185	26	0	**211**	7	0	137	69	0	**206**	1	**744**
2022-02-15 14:30:00	0	100	68	1	**169**	2	0	131	19	0	**150**	2	0	171	32	0	**203**	3	0	140	60	0	**200**	1	**722**
2022-02-15 14:45:00	0	116	71	1	**188**	1	0	137	28	0	**165**	1	0	172	41	0	**213**	3	0	140	64	0	**204**	3	**770**
2022-02-15 15:00:00	0	100	79	0	**179**	0	0	133	22	0	**155**	2	0	189	39	0	**228**	3	0	140	63	0	**203**	0	**765**
2022-02-15 15:15:00	0	117	73	0	**190**	1	0	140	28	0	**168**	3	0	183	33	0	**216**	2	0	158	59	0	**217**	5	**791**
2022-02-15 15:30:00	0	126	92	1	**219**	2	0	171	26	0	**197**	3	0	195	33	0	**228**	0	0	192	70	0	**262**	1	**906**
2022-02-15 15:45:00	0	175	108	2	**285**	1	0	139	25	0	**164**	3	0	175	56	0	**231**	3	0	190	67	0	**257**	3	**937**
2022-02-15 16:00:00	0	148	106	1	**255**	1	0	140	23	0	**163**	6	0	184	48	0	**232**	5	0	200	68	0	**268**	2	**918**
PM Peak Hour Totals	**0**	**566**	**379**	**4**	**949**	**5**	**0**	**590**	**102**	**0**	**692**	**15**	**0**	**737**	**170**	**0**	**907**	**10**	**0**	**740**	**264**	**0**	**1004**	**11**	**3552**
PM PHF		**0.81**	**0.88**		**0.83**			**0.86**	**0.91**		**0.88**			**0.94**	**0.76**		**0.98**			**0.93**	**0.94**		**0.94**	**0.55**	**0.95**
2022-02-15 16:15:00	0	166	86	0	**252**	1	0	137	20	0	**157**	3	0	155	50	0	**205**	3	0	197	58	0	**255**	2	**869**
2022-02-15 16:30:00	0	146	95	0	**241**	0	0	126	29	0	**155**	2	1	176	43	0	**220**	1	0	191	60	0	**251**	2	**867**
2022-02-15 16:45:00	0	141	86	0	**227**	0	0	132	19	0	**151**	2	0	181	34	0	**215**	0	0	185	56	0	**241**	0	**834**
2022-02-15 17:00:00	0	134	85	2	**221**	0	0	137	23	0	**160**	0	0	184	29	0	**213**	2	0	187	56	0	**243**	0	**837**
2022-02-15 17:15:00	0	132	80	1	**213**	0	0	117	19	0	**136**	3	0	185	37	0	**222**	1	0	186	53	0	**239**	0	**810**
2022-02-15 17:30:00	0	141	82	1	**224**	0	0	143	24	0	**167**	0	0	177	26	0	**203**	2	0	191	44	0	**235**	0	**829**
2022-02-15 17:45:00	0	130	67	1	**198**	0	0	110	14	0	**124**	2	0	150	39	0	**189**	4	0	137	33	0	**170**	0	**681**
Grand Total	**0**	**3828**	**2383**	**23**	**6233**	**27**	**0**	**4359**	**719.9**	**0**	**5078**	**67**	**1**	**6451.9**	**1179**	**0**	**7631**	**55**	**0**	**4714**	**1971**	**0**	**6684**	**51.55**	**25622.9**
% Approach	**0.0%**	**61.4%**	**38.2%**	**0.4%**			**0.0%**	**69.9%**	**11.6%**	**0.0%**			**0.0%**	**103.5%**	**18.9%**	**0.0%**			**0.0%**	**75.6%**	**31.6%**	**0.0%**			
% Total	**0.0%**	**14.9%**	**9.3%**	**0.1%**	**24.3%**		**0.0%**	**17.0%**	**2.8%**	**0.0%**	**19.8%**		**0.0%**	**25.2%**	**4.6%**	**0.0%**	**29.8%**		**0.0%**	**18.4%**	**7.7%**	**0.0%**	**26.1%**		
Lights	**0**	**3195**	**1968**	**19**	**3196**		**0**	**3721**	**593**	**0**	**4314**		**1**	**5527**	**977**	**0**	**6505**		**0**	**3818**	**1674**	**0**	**5492**		**14015**
% Lights	**0.0%**	**98.0%**	**98.3%**	**100.0%**	**98.0%**		**0.0%**	**98.8%**	**96.1%**	**0.0%**	**98.4%**		**100.0%**	**96.7%**	**96.9%**	**0.0%**	**96.8%**		**0.0%**	**96.1%**	**98.1%**	**0.0%**	**96.7%**		**97.5%**
Heavy	**0**	**66**	**35**	**0**	**66**		**0**	**47**	**24**	**0**	**71**		**0**	**187**	**31**	**0**	**218**		**0**	**155**	**32**	**0**	**187**		**355**
% Heavy	**0.0%**	**2.0%**	**1.7%**	**0.0%**	**2.0%**		**0.0%**	**1.2%**	**3.9%**	**0.0%**	**1.6%**		**0.0%**	**3.3%**	**3.1%**	**0.0%**	**320.0%**		**0.0%**	**3.9%**	**1.9%**	**0.0%**	**3.3%**		**2.5%**
Pedestrians						**22**						**51**						**43**						**40**	
% Pedestrians						**100.0%**						**98.1%**						**95.6%**						**100.0%**	
Bicycles on Crosswalk						**0**						**1**						**2**						**0**	
% Bicycles on Crosswalk						**0.0%**						**1.9%**						**4.4%**						**0.0%**	

Lincoln Park Fort St Corridor Plan
Fort Street and Montie Road

Leg	Montie Rd.						Montie Rd.						Fort St.						Fort St.						
Direction	Eastbound						Westbound						Northbound						Southbound						
Start Time	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Int Total
2021-11-18 07:00:00	1	0	1	0	**2**	2	4	0	9	0	**13**	0	0	196	5	0	**201**	0	0	89	2	0	**91**	0	**307**
2021-11-18 07:15:00	0	0	1	0	**1**	0	9	0	12	0	**21**	0	0	282	4	0	**286**	0	0	124	0	0	**124**	0	**432**
2021-11-18 07:30:00	3	1	4	0	**8**	0	4	0	9	0	**13**	1	0	317	9	0	**326**	0	0	120	1	0	**121**	0	**468**
2021-11-18 07:45:00	2	1	3	0	**6**	1	2	0	8	0	**10**	1	0	296	7	0	**303**	0	0	120	0	0	**120**	0	**439**
2021-11-18 08:00:00	1	1	5	0	**7**	0	9	0	12	0	**21**	1	0	271	12	0	**283**	0	0	130	2	0	**132**	0	**443**
AM Peak Hour Totals	**6**	**3**	**13**	**0**	**22**	**1**	**24**	**0**	**41**	**0**	**65**	**3**	**0**	**1166**	**32**	**0**	**1198**	**0**	**0**	**494**	**3**	**0**	**497**	**0**	**1782**
AM PHF	**0.50**	**0.75**	**0.65**		**0.69**		**0.67**		**0.85**		**0.77**			**0.92**	**0.67**		**0.92**			**0.95**	**0.38**		**0.94**		**0.95**
2021-11-18 08:15:00	1	1	0	0	**2**	0	3	1	10	0	**14**	0	0	294	10	0	**304**	0	0	107	1	0	**108**	0	**428**
2021-11-18 08:30:00	3	0	1	0	**4**	0	2	0	8	0	**10**	1	0	224	10	0	**234**	0	0	98	0	0	**98**	0	**346**
2021-11-18 08:45:00	1	0	1	0	**2**	0	1	0	5	0	**6**	1	0	207	8	0	**215**	0	0	120	1	1	**122**	0	**345**
2021-11-18 11:00:00	0	0	1	0	**1**	1	2	0	7	0	**9**	0	0	142	9	0	**151**	0	1	147	1	1	**150**	0	**311**
2021-11-18 11:15:00	2	0	3	0	**5**	1	4	0	9	0	**13**	1	0	160	10	0	**170**	0	0	139	0	0	**139**	0	**327**
2021-11-18 11:30:00	1	0	1	0	**2**	1	2	0	4	0	**6**	0	0	158	5	0	**163**	0	0	122	2	0	**124**	0	**295**
2021-11-18 11:45:00	5	0	2	0	**7**	2	6	0	5	0	**11**	0	0	163	9	0	**172**	0	0	140	0	3	**143**	0	**333**
2021-11-18 12:00:00	2	0	1	0	**3**	0	2	0	4	0	**6**	1	0	181	8	0	**189**	1	0	79	3	0	**82**	2	**280**
2021-11-18 12:15:00	3	0	1	0	**4**	0	3	0	8	0	**11**	2	0	178	12	0	**190**	2	0	99	1	1	**101**	3	**306**
2021-11-18 12:30:00	1	1	2	0	**4**	1	4	0	8	0	**12**	3	0	185	4	5	**194**	0	0	166	0	0	**166**	3	**376**
2021-11-18 12:45:00	4	0	0	0	**4**	0	0	0	11	0	**11**	0	0	155	9	1	**165**	0	0	162	1	1	**164**	0	**344**
Mid-Day Peak Hour Totals	**10**	**1**	**4**	**0**	**15**	**1**	**9**	**0**	**31**	**0**	**40**	**6**	**0**	**699**	**33**	**6**	**738**	**3**	**0**	**506**	**5**	**2**	**513**	**8**	**1306**
Mid-Day PHF	**0.63**	**0.25**	**0.50**		**0.94**		**0.56**		**0.70**		**0.83**			**0.94**	**0.69**	**0.30**	**0.95**			**0.76**	**0.42**	**0.50**	**0.77**		**0.87**
2021-11-18 14:00:00	0	2	1	0	**3**	0	4	0	6	0	**10**	1	0	166	7	0	**173**	0	0	173	0	1	**174**	0	**360**
2021-11-18 14:15:00	2	0	3	0	**5**	1	5	1	8	0	**14**	1	0	204	8	1	**213**	0	0	216	1	1	**218**	0	**450**
2021-11-18 14:30:00	1	1	0	0	**2**	0	2	0	7	0	**9**	1	0	213	14	0	**227**	0	0	205	0	0	**205**	0	**443**
2021-11-18 14:45:00	1	2	3	0	**6**	0	6	1	7	0	**14**	0	0	224	8	0	**232**	1	1	234	0	0	**235**	0	**487**
2021-11-18 15:00:00	2	0	4	0	**6**	1	3	1	12	0	**16**	0	0	251	17	1	**269**	1	0	241	0	1	**242**	2	**533**
2021-11-18 15:15:00	0	1	5	0	**6**	1	3	0	9	0	**12**	0	0	250	16	0	**266**	0	0	227	2	1	**230**	1	**514**
2021-11-18 15:30:00	2	1	3	0	**6**	1	5	0	10	0	**15**	4	0	250	13	1	**264**	0	0	263	1	0	**264**	1	**549**
2021-11-18 15:45:00	1	1	0	0	**2**	2	4	0	6	0	**10**	0	0	249	21	0	**270**	0	0	290	3	0	**293**	0	**575**
2021-11-18 16:00:00	6	1	1	0	**8**	0	6	1	10	0	**17**	1	0	219	16	0	**235**	0	0	258	2	2	**262**	0	**522**
PM Peak Hour Totals	**9**	**4**	**9**	**0**	**22**	**4**	**18**	**1**	**35**	**0**	**54**	**5**	**0**	**968**	**66**	**1**	**1035**	**0**	**0**	**1038**	**8**	**3**	**1049**	**2**	**2160**
PM PHF	**0.38**	**1.00**	**0.45**		**0.69**		**0.75**		**0.88**		**0.79**			**0.97**	**0.79**		**0.96**			**0.89**	**0.67**		**0.90**		**0.94**
2021-11-18 16:15:00	0	1	1	0	**2**	2	5	0	1	0	**6**	0	0	206	14	0	**220**	0	0	260	1	1	**262**	1	**490**
2021-11-18 16:30:00	3	3	1	0	**7**	3	1	0	8	0	**9**	3	0	213	17	0	**230**	0	0	290	2	0	**292**	5	**538**
2021-11-18 16:45:00	1	2	0	0	**3**	1	6	0	10	0	**16**	0	0	215	14	0	**229**	0	0	307	2	0	**309**	0	**557**
2021-11-18 17:00:00	3	0	3	0	**6**	0	10	0	3	0	**13**	1	0	218	13	0	**231**	0	0	280	1	0	**281**	0	**531**
2021-11-18 17:15:00	0	3	4	0	**7**	0	3	0	8	0	**11**	0	0	236	12	0	**248**	0	1	292	0	0	**293**	0	**559**
2021-11-18 17:30:00	2	1	0	0	**3**	0	3	0	8	0	**11**	0	0	216	15	0	**231**	0	0	258	3	0	**261**	0	**506**
2021-11-18 17:45:00	3	1	0	0	**4**	1	1	1	5	0	**7**	0	0	214	9	0	**223**	0	0	220	3	1	**224**	0	**458**
Grand Total	**57**	**25**	**56**	**0**	**138**	**22**	**124**	**6**	**247**	**0**	**377**	**24**	**0**	**6953**	**345**	**9**	**7307**	**5**	**3**	**5976**	**36**	**15**	**6030**	**18**	**13852**
% Approach	**41.3%**	**18.1%**	**40.6%**	**0.0%**			**32.9%**	**1.6%**	**65.5%**	**0.0%**			**0.0%**	**95.2%**	**4.7%**	**0.1%**			**0.0%**	**99.1%**	**0.6%**	**0.2%**			
% Total	**0.4%**	**0.2%**	**0.4%**	**0.0%**	**1.0%**		**0.9%**	**0.0%**	**1.8%**	**0.0%**	**2.7%**		**0.0%**	**50.2%**	**2.5%**	**0.1%**	**52.8%**		**0.0%**	**43.1%**	**0.3%**	**0.1%**	**43.5%**		
Lights	**57**	**24**	**56**	**0**	**137**		**124**	**5**	**242**	**0**	**371**		**0**	**6721**	**337**	**9**	**7067**		**3**	**5795**	**32**	**15**	**5845**		**13420**
% Lights	**100.0%**	**96.0%**	**100.0%**	**0.0%**	**99.3%**		**100.0%**	**83.3%**	**98.0%**	**0.0%**	**98.4%**		**0.0%**	**96.7%**	**97.7%**	**100.0%**	**96.7%**		**100.0%**	**97.0%**	**88.9%**	**100.0%**	**96.9%**		**96.9%**
Heavy	**0**	**1**	**0**	**0**	**1**		**0**	**1**	**5**	**0**	**6**		**0**	**232**	**8**	**0**	**240**		**0**	**181**	**4**	**0**	**185**		**432**
% Heavy	**0.0%**	**4.0%**	**0.0%**	**0.0%**	**0.7%**		**0.0%**	**16.7%**	**2.0%**	**0.0%**	**1.6%**		**0.0%**	**3.3%**	**2.3%**	**0.0%**	**3.3%**		**0.0%**	**3.0%**	**11.1%**	**0.0%**	**3.1%**		**3.1%**
Pedestrians						**22**						**24**						**5**						**18**	
% Pedestrians						**100.0%**						**100.0%**						**100.0%**						**100.0%**	

Lincoln Park Fort St Corridor Plan
Fort Street and Cicotte Avenue

Leg	Cicotte Ave.						Cicotte Ave.						Fort St.						Fort St.						
Direction	Eastbound						Westbound						Northbound						Southbound						
Start Time	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Int Total
2021-11-18 07:00:00	3	4	9	0	**16**	2	4	5	10	0	**19**	1	0	188	5	0	**193**	2	0	87	4	0	**91**	0	**319**
2021-11-18 07:15:00	8	8	8	0	**24**	2	18	8	16	0	**42**	1	0	275	10	0	**285**	1	0	134	2	0	**136**	1	**487**
2021-11-18 07:30:00	5	4	11	0	**20**	2	15	5	14	0	**34**	0	0	326	9	0	**335**	0	0	120	6	0	**126**	1	**515**
2021-11-18 07:45:00	5	8	16	0	**29**	1	8	6	9	0	**23**	0	0	330	17	0	**347**	1	0	113	16	0	**129**	1	**528**
2021-11-18 08:00:00	6	6	12	0	**24**	1	11	10	12	0	**33**	1	0	257	23	0	**280**	0	0	126	20	0	**146**	1	**483**
AM Peak Hour Totals	**24**	**26**	**47**	**0**	**97**	**6**	**52**	**29**	**51**	**0**	**132**	**2**	**0**	**1188**	**59**	**0**	**1247**	**2**	**0**	**493**	**44**	**0**	**537**	**4**	**2013**
AM PHF	**0.75**	**0.81**	**0.73**		**0.84**		**0.72**	**0.73**	**0.80**		**0.79**			**0.90**	**0.64**		**0.90**			**0.92**	**0.55**		**0.92**		**0.95**
2021-11-18 08:15:00	15	10	10	0	**35**	1	12	10	13	0	**35**	0	1	285	9	0	**295**	1	0	100	11	0	**111**	1	**476**
2021-11-18 08:30:00	6	6	11	0	**23**	0	6	5	10	0	**21**	0	0	214	5	0	**219**	0	0	87	6	0	**93**	4	**356**
2021-11-18 08:45:00	6	3	18	0	**27**	3	7	5	8	0	**20**	2	0	212	6	0	**218**	0	0	105	8	0	**113**	2	**378**
2021-11-18 11:00:00	3	6	8	0	**17**	3	6	7	8	0	**21**	0	0	132	18	0	**150**	0	0	135	8	0	**143**	2	**331**
2021-11-18 11:15:00	7	5	13	0	**25**	1	12	6	10	0	**28**	3	0	142	9	0	**151**	1	0	131	1	0	**132**	1	**336**
2021-11-18 11:30:00	4	4	19	0	**27**	0	8	2	6	0	**16**	1	0	157	16	0	**173**	1	0	119	2	0	**121**	0	**337**
2021-11-18 11:45:00	5	9	16	0	**30**	1	3	6	3	0	**12**	1	0	164	20	0	**184**	2	0	133	7	0	**140**	0	**366**
2021-11-18 12:00:00	15	7	9	0	**31**	1	5	5	8	0	**18**	0	0	181	12	0	**193**	0	0	114	6	0	**120**	1	**362**
2021-11-18 12:15:00	10	7	9	0	**26**	1	7	6	8	0	**21**	1	0	177	15	0	**192**	0	0	136	6	0	**142**	3	**381**
2021-11-18 12:30:00	4	12	15	0	**31**	2	5	4	15	0	**24**	2	0	182	15	0	**197**	0	0	158	6	0	**164**	2	**416**
2021-11-18 12:45:00	5	5	12	0	**22**	0	6	6	10	0	**22**	0	0	165	12	0	**177**	1	0	147	9	0	**156**	1	**377**
Mid-Day Peak Hour Totals	**34**	**31**	**45**	**0**	**110**	**4**	**23**	**21**	**41**	**0**	**85**	**3**	**0**	**705**	**54**	**0**	**759**	**1**	**0**	**555**	**27**	**0**	**582**	**7**	**1536**
Mid-Day PHF	**0.57**	**0.65**	**0.75**		**0.89**		**0.82**	**0.88**	**0.68**		**0.89**			**0.97**	**0.90**		**0.96**			**0.88**	**0.75**		**0.89**		**0.92**
2021-11-18 14:00:00	7	13	10	0	**30**	2	10	15	7	0	**32**	4	0	159	16	0	**175**	2	0	163	9	0	**172**	1	**409**
2021-11-18 14:15:00	2	7	20	0	**29**	1	15	11	11	0	**37**	0	0	180	17	0	**197**	0	0	207	4	0	**211**	1	**474**
2021-11-18 14:30:00	7	10	18	0	**35**	0	9	12	8	0	**29**	0	0	195	20	0	**215**	0	0	181	7	0	**188**	2	**467**
2021-11-18 14:45:00	6	16	19	0	**41**	0	12	4	10	0	**26**	1	0	207	23	0	**230**	2	1	222	17	0	**240**	0	**537**
2021-11-18 15:00:00	14	10	12	0	**36**	1	12	13	17	0	**42**	2	0	225	33	0	**258**	0	0	226	11	0	**237**	1	**573**
2021-11-18 15:15:00	4	9	18	0	**31**	0	10	13	15	0	**38**	4	0	250	24	0	**274**	2	0	207	14	0	**221**	3	**564**
2021-11-18 15:30:00	8	7	23	0	**38**	4	9	7	16	0	**32**	1	0	233	26	0	**259**	0	0	247	12	0	**259**	0	**588**
2021-11-18 15:45:00	8	20	27	0	**55**	0	5	5	12	0	**22**	1	0	241	25	0	**266**	0	0	262	6	0	**268**	0	**611**
2021-11-18 16:00:00	6	15	15	0	**36**	0	6	5	19	0	**30**	2	0	201	25	0	**226**	1	0	238	7	0	**245**	1	**537**
PM Peak Hour Totals	**26**	**51**	**83**	**0**	**160**	**4**	**30**	**30**	**62**	**0**	**122**	**8**	**0**	**925**	**100**	**0**	**1025**	**3**	**0**	**954**	**39**	**0**	**993**	**4**	**2300**
PM PHF	**0.81**	**0.64**	**0.77**		**0.73**		**0.75**	**0.58**	**0.82**		**0.80**	**0.50**		**0.93**	**0.96**		**0.94**			**0.91**	**0.70**		**0.93**		**0.94**
2021-11-18 16:15:00	17	5	21	0	**43**	4	7	7	7	0	**21**	0	0	193	16	0	**209**	2	0	257	8	0	**265**	1	**538**
2021-11-18 16:30:00	9	10	24	0	**43**	1	10	7	8	0	**25**	0	0	209	22	0	**231**	0	0	269	6	0	**275**	2	**574**
2021-11-18 16:45:00	12	13	13	0	**38**	0	11	9	7	0	**27**	1	0	193	29	0	**222**	2	1	301	10	0	**312**	3	**599**
2021-11-18 17:00:00	7	9	25	0	**41**	0	10	13	10	0	**33**	0	0	202	21	0	**223**	1	0	278	6	0	**284**	1	**581**
2021-11-18 17:15:00	9	10	17	0	**36**	0	11	9	6	0	**26**	0	0	216	31	0	**247**	0	0	263	10	0	**273**	0	**582**
2021-11-18 17:30:00	10	12	23	0	**45**	0	12	7	13	0	**32**	0	0	206	22	0	**228**	1	0	249	7	0	**256**	1	**561**
2021-11-18 17:45:00	5	9	18	0	**32**	1	6	7	5	0	**18**	0	0	200	17	0	**217**	0	0	195	7	0	**202**	0	**469**
Grand Total	**238**	**279**	**499**	**0**	**1016**	**35**	**288**	**240**	**331**	**0**	**859**	**29**	**1**	**6697**	**568**	**0**	**7266**	**23**	**2**	**5710**	**259**	**0**	**5971**	**38**	**15112**
% Approach	**23.4%**	**27.5%**	**49.1%**	**0.0%**			**33.5%**	**27.9%**	**38.5%**	**0.0%**			**0.0%**	**92.2%**	**7.8%**	**0.0%**			**0.0%**	**95.6%**	**4.3%**	**0.0%**			
% Total	**1.6%**	**1.8%**	**3.3%**	**0.0%**	**6.7%**		**1.9%**	**1.6%**	**2.2%**	**0.0%**	**5.7%**		**0.0%**	**44.3%**	**3.8%**	**0.0%**	**48.1%**		**0.0%**	**37.8%**	**1.7%**	**0.0%**	**39.5%**		
Lights	**228**	**270**	**478**	**0**	**976**		**283**	**234**	**329**	**0**	**846**		**0**	**6462**	**562**	**0**	**7024**		**2**	**5522**	**252**	**0**	**5776**		**14622**
% Lights	**95.8%**	**96.8%**	**95.8%**	**0.0%**	**96.1%**		**98.3%**	**97.5%**	**99.4%**	**0.0%**	**98.5%**		**0.0%**	**96.5%**	**98.9%**	**0.0%**	**96.7%**		**100.0%**	**96.7%**	**97.3%**	**0.0%**	**96.7%**		**96.8%**
Heavy	**10**	**9**	**21**	**0**	**40**		**5**	**6**	**2**	**0**	**13**		**1**	**235**	**6**	**0**	**242**		**0**	**188**	**7**	**0**	**195**		**490**
% Heavy	**4.2%**	**3.2%**	**4.2%**	**0.0%**	**3.9%**		**1.7%**	**2.5%**	**0.6%**	**0.0%**	**1.5%**		**100.0%**	**3.5%**	**1.1%**	**0.0%**	**3.3%**		**0.0%**	**3.3%**	**2.7%**	**0.0%**	**3.3%**		**3.2%**
Pedestrians						**35**						**29**						**23**						**38**	
% Pedestrians						**100.0%**						**100.0%**						**100.0%**						**100.0%**	

Lincoln Park Fort St Corridor Plan
Fort Street and U-Turn North of Outer Dr

Leg	NB Fort St. U-Turn at Outer Rd		
Direction	Northbound		
Start Time	Direction	**Total**	**Int Total**
2022-02-15 07:00:00	44	**44**	**44**
2022-02-15 07:15:00	45	**45**	**45**
2022-02-15 07:30:00	48	**48**	**48**
2022-02-15 07:45:00	52	**52**	**52**
2022-02-15 08:00:00	39	**39**	**39**
AM Peak Hour Totals	**184**	**184**	**184**
AM PHF	**0.88**	**0.88**	**0.88**
2022-02-15 08:15:00	51	**51**	**51**
2022-02-15 08:30:00	31	**31**	**31**
2022-02-15 08:45:00	27	**27**	**27**
2022-02-15 11:00:00	42	**42**	**42**
2022-02-15 11:15:00	30	**30**	**30**
2022-02-15 11:30:00	24	**24**	**24**
2022-02-15 11:45:00	35	**35**	**35**
2022-02-15 12:00:00	25	**25**	**25**
2022-02-15 12:15:00	33	**33**	**33**
2022-02-15 12:30:00	37	**37**	**37**
2022-02-15 12:45:00	38	**38**	**38**
Mid-Day Peak Hour Totals	**133**	**133**	**133**
Mid-Day PHF	**0.88**	**0.88**	**0.88**
2022-02-15 14:00:00	38	**38**	**38**
2022-02-15 14:15:00	44	**44**	**44**
2022-02-15 14:30:00	43	**43**	**43**
2022-02-15 14:45:00	46	**46**	**46**
2022-02-15 15:00:00	39	**39**	**39**
2022-02-15 15:15:00	46	**46**	**46**
2022-02-15 15:30:00	39	**39**	**39**
2022-02-15 15:45:00	51	**51**	**51**
2022-02-15 16:00:00	44	**44**	**44**
PM Peak Hour Totals	**180**	**180**	**180**
PM PHF	**0.88**	**0.88**	**0.88**
2022-02-15 16:15:00	38	**38**	**38**
2022-02-15 16:30:00	52	**52**	**52**
2022-02-15 16:45:00	38	**38**	**38**
2022-02-15 17:00:00	40	**40**	**40**
2022-02-15 17:15:00	42	**42**	**42**
2022-02-15 17:30:00	34	**34**	**34**
2022-02-15 17:45:00	33	**33**	**33**
Grand Total	**1268**	**1268**	**1268**
% Approach	**100.0%**		
% Total	**100.0%**	**100.0%**	
Lights	**1228**	**1228**	**1228**
% Lights	**96.8%**	**96.8%**	**96.8%**
Heavy	**40**	**40**	**40**
% Heavy	**3.2%**	**3.2%**	**3.2%**

Lincoln Park Southfield Rd Corridor Plan
Southfield Road and Fort Street

Leg	Southfield Rd.				Southfield Rd.				Fort St.				Fort St.				
Direction	Eastbound				Westbound				Northbound				Southbound				
Start Time	Thru	Right	**Total**	Peds	Thru	Right	**Total**	Peds	Thru	Right	**Total**	Peds	Thru	Right	**Total**	Peds	**Int Total**
2021-10-14 07:00:00	105	92	**197**	2	172	16	**188**	3	317	23	**340**	3	83	112	**195**	1	**920**
2021-10-14 07:15:00	133	138	**271**	1	261	15	**276**	4	351	32	**383**	2	146	119	**265**	0	**1195**
2021-10-14 07:30:00	155	145	**300**	1	239	26	**265**	0	430	47	**477**	1	144	138	**282**	1	**1324**
2021-10-14 07:45:00	177	125	**302**	0	212	17	**229**	1	400	41	**441**	0	116	135	**251**	0	**1223**
2021-10-14 08:00:00	159	118	**277**	1	218	12	**230**	0	369	28	**397**	0	94	139	**233**	1	**1137**
2021-10-14 08:15:00	148	132	**280**	0	215	24	**239**	0	344	41	**385**	0	109	135	**244**	0	**1148**
AM Peak Hour Totals	**639**	**520**	**1159**	**2**	**884**	**79**	**963**	**1**	**1543**	**157**	**1700**	**1**	**463**	**547**	**1010**	**2**	**4832**
AM PHF	**0.90**	**0.90**	**0.96**	**0.50**	**0.92**	**0.76**	**0.91**	**0.25**	**0.90**	**0.84**	**0.89**	**0.25**	**0.80**	**0.98**	**0.90**	**0.50**	**0.91**
2021-10-14 08:30:00	144	138	**282**	0	162	16	**178**	2	290	31	**321**	0	106	135	**241**	1	**1022**
2021-10-14 08:45:00	135	122	**257**	1	173	26	**199**	0	246	29	**275**	0	88	114	**202**	0	**933**
2021-10-14 11:00:00	156	132	**288**	2	157	27	**184**	2	202	37	**239**	1	109	90	**199**	2	**910**
2021-10-14 11:15:00	135	118	**253**	4	141	24	**165**	0	230	40	**270**	2	140	113	**253**	0	**941**
2021-10-14 11:30:00	155	140	**295**	1	180	17	**197**	0	212	51	**263**	2	127	103	**230**	1	**985**
2021-10-14 11:45:00	150	140	**290**	0	162	34	**196**	2	233	62	**295**	0	152	117	**269**	2	**1050**
2021-10-14 12:00:00	173	130	**303**	2	166	34	**200**	4	216	41	**257**	0	156	98	**254**	1	**1014**
2021-10-14 12:15:00	174	141	**315**	2	175	29	**204**	0	234	50	**284**	1	146	116	**262**	1	**1065**
2021-10-14 12:30:00	153	152	**305**	0	149	32	**181**	1	232	43	**275**	0	146	113	**259**	1	**1020**
2021-10-14 12:45:00	166	155	**321**	0	156	30	**186**	0	227	39	**266**	2	146	113	**259**	0	**1032**
Mid-Day Peak Hour Totals	**666**	**578**	**1244**	**4**	**646**	**125**	**771**	**5**	**909**	**173**	**1082**	**3**	**594**	**440**	**1034**	**3**	**4131**
Mid-Day PHF	**0.96**	**0.93**	**0.97**	**0.50**	**0.92**	**0.92**	**0.94**	**0.31**	**0.97**	**0.87**	**0.95**	**0.38**	**0.95**	**0.95**	**0.99**	**0.75**	**0.97**
2021-10-14 14:00:00	194	166	**360**	2	211	34	**245**	0	194	44	**238**	0	173	84	**257**	3	**1100**
2021-10-14 14:15:00	205	172	**377**	0	249	39	**288**	2	253	47	**300**	2	193	126	**319**	0	**1284**
2021-10-14 14:30:00	255	197	**452**	0	247	31	**278**	0	261	74	**335**	1	220	130	**350**	0	**1415**
2021-10-14 14:45:00	281	182	**463**	6	214	34	**248**	3	277	74	**351**	3	198	124	**322**	4	**1384**
2021-10-14 15:00:00	273	184	**457**	0	253	41	**294**	8	360	83	**443**	11	229	153	**382**	4	**1576**
2021-10-14 15:15:00	249	188	**437**	2	250	34	**284**	4	369	67	**436**	4	211	159	**370**	3	**1527**
2021-10-14 15:30:00	251	181	**432**	1	264	34	**298**	2	357	66	**423**	1	228	173	**401**	4	**1554**
2021-10-14 15:45:00	282	187	**469**	1	234	36	**270**	3	330	59	**389**	1	197	147	**344**	6	**1472**
PM Peak Hour Totals	**1055**	**740**	**1795**	**4**	**1001**	**145**	**1146**	**17**	**1416**	**275**	**1691**	**17**	**865**	**632**	**1497**	**17**	**6129**
PM PHF	**0.94**	**0.98**	**0.96**	**0.50**	**0.95**	**0.88**	**0.96**	**0.53**	**0.96**	**0.83**	**0.95**	**0.39**	**0.94**	**0.91**	**0.93**	**0.71**	**0.97**
2021-10-14 16:00:00	300	192	**492**	1	238	37	**275**	2	318	56	**374**	1	239	137	**376**	1	**1517**
2021-10-14 16:15:00	249	193	**442**	0	228	30	**258**	0	334	72	**406**	0	227	146	**373**	3	**1479**
2021-10-14 16:30:00	263	206	**469**	0	219	34	**253**	3	298	60	**358**	1	207	141	**348**	1	**1428**
2021-10-14 16:45:00	290	197	**487**	1	220	21	**241**	0	331	67	**398**	0	193	126	**319**	0	**1445**
2021-10-14 17:00:00	271	188	**459**	1	226	45	**271**	1	304	61	**365**	1	238	144	**382**	0	**1477**
2021-10-14 17:15:00	238	204	**442**	0	229	27	**256**	2	292	60	**352**	0	236	136	**372**	3	**1422**
2021-10-14 17:30:00	236	179	**415**	0	217	33	**250**	2	300	57	**357**	0	248	166	**414**	3	**1436**
2021-10-14 17:45:00	257	197	**454**	1	247	27	**274**	0	247	53	**300**	0	206	134	**340**	0	**1368**
Grand Total	**6512**	**5131**	**11643**	**33**	**6684**	**916**	**7600**	**51**	**9358**	**1635**	**10993**	**40**	**5451**	**4116**	**9567**	**47**	**39803**
% Approach	**55.9%**	**44.1%**			**87.9%**	**12.1%**			**85.1%**	**14.9%**			**57.0%**	**43.0%**			
% Total	**16.4%**	**12.9%**	**29.3%**		**16.8%**	**2.3%**	**19.1%**		**23.5%**	**4.1%**	**27.6%**		**13.7%**	**10.3%**	**24.0%**		
Lights	**6280**	**4972**	**11252**		**6406**	**897**	**7303**		**9044**	**1606**	**10650**		**5259**	**3971**	**9230**		**38435**
% Lights	**96.4%**	**96.9%**	**96.6%**		**95.8%**	**97.9%**	**96.1%**		**96.6%**	**98.2%**	**96.9%**		**96.5%**	**96.5%**	**96.5%**		**96.6%**
Heavy	**232**	**159**	**391**		**278**	**19**	**297**		**314**	**29**	**343**		**192**	**145**	**337**		**1368**
% Heavy	**3.6%**	**3.1%**	**3.4%**		**4.2%**	**2.1%**	**3.9%**		**3.4%**	**1.8%**	**3.1%**		**3.5%**	**3.5%**	**3.5%**		**3.4%**
Pedestrians				**33**				**51**				**40**				**47**	
% Pedestrians				**100.0%**				**100.0%**				**100.0%**				**100.0%**	

Lincoln Park Fort St Corridor Plan
Fort Street and Warwick Avenue/U-Turn

Leg	Warwick Ave.				U-Turn				Fort St.		Fort St.				
Direction	Eastbound				Westbound				Northbound		Southbound				
Start Time	Right	U-Turn	**Total**	Peds	Left	Thru	**Total**	Peds	**Total**	Peds	Thru	Right	**Total**	Peds	**Int Total**
2021-11-18 07:00:00	2	0	**2**	0	111	4	**115**	0	**0**	0	98	1	**99**	0	**216**
2021-11-18 07:15:00	0	0	**0**	1	124	7	**131**	0	**0**	0	155	0	**155**	0	**286**
2021-11-18 07:30:00	3	0	**3**	0	149	5	**154**	0	**0**	0	161	0	**161**	0	**318**
2021-11-18 07:45:00	0	0	**0**	0	156	4	**160**	0	**0**	0	133	1	**134**	0	**294**
2021-11-18 08:00:00	4	0	**4**	0	136	10	**146**	0	**0**	0	126	3	**129**	0	**279**
AM Peak Hour Totals	**7**	**0**	**7**	**1**	**565**	**26**	**591**	**0**	**0**	**0**	**575**	**4**	**579**	**0**	**1177**
AM PHF	**0.44**		**0.44**		**0.91**	**0.65**	**0.92**				**0.89**	**0.33**	**0.90**		**0.93**
2021-11-18 08:15:00	1	0	**1**	0	131	7	**138**	0	**0**	1	125	1	**126**	0	**265**
2021-11-18 08:30:00	0	0	**0**	1	87	6	**93**	0	**0**	0	113	2	**115**	0	**208**
2021-11-18 08:45:00	4	0	**4**	2	99	6	**105**	0	**0**	0	121	1	**122**	1	**231**
2021-11-18 11:00:00	1	0	**1**	1	106	3	**109**	0	**0**	0	155	3	**158**	1	**268**
2021-11-18 11:15:00	3	0	**3**	3	85	6	**91**	0	**0**	0	163	4	**167**	3	**261**
2021-11-18 11:30:00	2	0	**2**	1	116	3	**119**	0	**0**	0	150	3	**153**	0	**274**
2021-11-18 11:45:00	3	0	**3**	3	101	9	**110**	0	**0**	0	146	1	**147**	1	**260**
2021-11-18 12:00:00	2	0	**2**	2	99	4	**103**	0	**0**	0	128	4	**132**	0	**237**
2021-11-18 12:15:00	1	0	**1**	1	100	6	**106**	0	**0**	0	138	4	**142**	0	**249**
2021-11-18 12:30:00	1	1	**2**	0	103	5	**108**	0	**0**	0	175	3	**178**	0	**288**
2021-11-18 12:45:00	2	0	**2**	2	78	4	**82**	0	**0**	0	153	5	**158**	2	**242**
Mid-Day Peak Hour Totals	**6**	**1**	**7**	**5**	**380**	**19**	**399**	**0**	**0**	**0**	**594**	**16**	**610**	**2**	**1016**
Mid-Day PHF	**0.75**	**0.25**	**0.88**		**0.92**	**0.79**	**0.92**				**0.85**	**0.80**	**0.86**		**0.88**
2021-11-18 14:00:00	3	0	**3**	3	98	4	**102**	0	**0**	0	193	0	**193**	1	**298**
2021-11-18 14:15:00	7	0	**7**	1	126	5	**131**	0	**0**	0	234	1	**235**	0	**373**
2021-11-18 14:30:00	4	0	**4**	2	96	6	**102**	0	**0**	0	203	3	**206**	0	**312**
2021-11-18 14:45:00	4	0	**4**	2	118	9	**127**	0	**0**	0	244	1	**245**	1	**376**
2021-11-18 15:00:00	3	0	**3**	0	144	14	**158**	0	**0**	0	246	3	**249**	2	**410**
2021-11-18 15:15:00	4	0	**4**	2	122	14	**136**	0	**0**	0	233	2	**235**	0	**375**
2021-11-18 15:30:00	2	0	**2**	3	132	6	**138**	0	**0**	0	264	5	**269**	0	**409**
2021-11-18 15:45:00	1	0	**1**	0	119	10	**129**	0	**0**	0	293	2	**295**	0	**425**
2021-11-18 16:00:00	3	0	**3**	0	119	11	**130**	0	**0**	0	267	2	**269**	0	**402**
PM Peak Hour Totals	**10**	**0**	**10**	**5**	**492**	**41**	**533**	**0**	**0**	**0**	**1057**	**11**	**1068**	**0**	**1611**
PM PHF	**0.63**		**0.63**		**0.93**	**0.73**	**0.97**				**0.90**	**0.55**	**0.91**		**0.95**
2021-11-18 16:15:00	2	0	**2**	2	123	17	**140**	0	**0**	0	259	5	**264**	1	**406**
2021-11-18 16:30:00	0	0	**0**	1	138	9	**147**	0	**0**	0	285	2	**287**	0	**434**
2021-11-18 16:45:00	0	0	**0**	1	120	11	**131**	0	**0**	0	297	3	**300**	0	**431**
2021-11-18 17:00:00	3	0	**3**	0	135	5	**140**	0	**0**	0	292	1	**293**	0	**436**
2021-11-18 17:15:00	2	0	**2**	1	118	6	**124**	0	**0**	0	262	10	**272**	1	**398**
2021-11-18 17:30:00	2	0	**2**	0	122	7	**129**	0	**0**	0	283	2	**285**	0	**416**
2021-11-18 17:45:00	6	1	**7**	0	118	13	**131**	0	**0**	0	201	1	**202**	0	**340**
Grand Total	**75**	**2**	**77**	**35**	**3729**	**236**	**3965**	**0**	**0**	**1**	**6296**	**79**	**6375**	**14**	**10417**
% Approach	**97.4%**	**2.6%**			**94.0%**	**6.0%**					**98.8%**	**1.2%**			
% Total	**0.7%**	**0.0%**	**0.7%**		**35.8%**	**2.3%**	**38.1%**		**0.0%**		**60.4%**	**0.8%**	**61.2%**		
Lights	**74**	**2**	**76**		**3606**	**231**	**3837**		**0**		**6103**	**76**	**6179**		**10092**
% Lights	**98.7%**	**100.0%**	**98.7%**		**96.7%**	**97.9%**	**96.8%**				**96.9%**	**96.2%**	**96.9%**		**96.9%**
Heavy	**1**	**0**	**1**		**123**	**5**	**128**				**193**	**3**	**196**		**325**
% Heavy	**1.3%**	**0.0%**	**1.3%**		**3.3%**	**2.1%**	**3.2%**				**3.1%**	**3.8%**	**3.1%**		**3.1%**
Pedestrians				**35**				**0**		**1**				**14**	
% Pedestrians				**100.0%**				**0.0%**		**100.0%**				**100.0%**	

Lincoln Park Fort St Corridor Plan
SB Fort St. U-turn

Leg	SB Fort St. U-Turn at Southfield Rd.		
Direction	Northbound		
Start Time	Direction	**Total**	**Int Total**
2021-11-18 07:00:00	14	**14**	**14**
2021-11-18 07:15:00	11	**11**	**11**
2021-11-18 07:30:00	17	**17**	**17**
2021-11-18 07:45:00	14	**14**	**14**
2021-11-18 08:00:00	18	**18**	**18**
AM Peak Hour Totals	**60**	**60**	**60**
AM PHF	**0.83**	**0.83**	**0.83**
2021-11-18 08:15:00	24	**24**	**24**
2021-11-18 08:30:00	16	**16**	**16**
2021-11-18 08:45:00	25	**25**	**25**
2021-11-18 11:00:00	36	**36**	**36**
2021-11-18 11:15:00	26	**26**	**26**
2021-11-18 11:30:00	24	**24**	**24**
2021-11-18 11:45:00	26	**26**	**26**
2021-11-18 12:00:00	34	**34**	**34**
2021-11-18 12:15:00	41	**41**	**41**
2021-11-18 12:30:00	36	**36**	**36**
2021-11-18 12:45:00	19	**19**	**19**
Mid-Day Peak Hour Totals	**130**	**130**	**130**
Mid-Day PHF	**0.79**	**0.79**	**0.79**
2021-11-18 14:00:00	25	**25**	**25**
2021-11-18 14:15:00	29	**29**	**29**
2021-11-18 14:30:00	34	**34**	**34**
2021-11-18 14:45:00	36	**36**	**36**
2021-11-18 15:00:00	34	**34**	**34**
2021-11-18 15:15:00	34	**34**	**34**
2021-11-18 15:30:00	39	**39**	**39**
2021-11-18 15:45:00	40	**40**	**40**
2021-11-18 16:00:00	43	**43**	**43**
PM Peak Hour Totals	**156**	**156**	**156**
PM PHF	**0.91**	**0.91**	**0.91**
2021-11-18 16:15:00	25	**25**	**25**
2021-11-18 16:30:00	31	**31**	**31**
2021-11-18 16:45:00	39	**39**	**39**
2021-11-18 17:00:00	30	**30**	**30**
2021-11-18 17:15:00	36	**36**	**36**
2021-11-18 17:30:00	43	**43**	**43**
2021-11-18 17:45:00	39	**39**	**39**
Grand Total	**938**	**938**	**938**
% Approach	**100.0%**		
% Total	**100.0%**	**100.0%**	
Lights	**904**	**904**	**904**
% Lights	**96.4%**	**96.4%**	**96.4%**
Heavy	**34**	**34**	**34**
% Heavy	**3.6%**	**3.6%**	**3.6%**

Lincoln Park Fort St Corridor Plan
Fort Street and Champaign Road

Leg	Champaign Rd.					Fort St.					Fort St.					
Direction	Eastbound					Northbound					Southbound					
Start Time	Left	Right	U-Turn	**Total**	Peds	Left	Thru	U-Turn	**Total**	Peds	Thru	Right	U-Turn	**Total**	Peds	**Int Total**
2021-11-18 07:00:00	22	8	0	**30**	0	0	390	0	**390**	5	166	39	0	**205**	0	**625**
2021-11-18 07:15:00	38	19	0	**57**	1	0	508	0	**508**	3	244	63	0	**307**	1	**872**
2021-11-18 07:30:00	69	25	0	**94**	0	0	549	0	**549**	4	279	58	0	**337**	1	**980**
2021-11-18 07:45:00	53	29	0	**82**	0	0	538	0	**538**	1	270	30	0	**300**	0	**920**
2021-11-18 08:00:00	22	17	0	**39**	0	0	486	0	**486**	0	216	22	0	**238**	0	**763**
AM Peak Hour Totals	**182**	**90**	**0**	**272**	**1**	**0**	**2081**	**0**	**2081**	**8**	**1009**	**173**	**0**	**1182**	**2**	**3535**
AM PHF	**0.66**	**0.78**		**0.72**			**0.95**		**0.95**		**0.90**	**0.69**		**0.88**		**0.90**
2021-11-18 08:15:00	26	14	0	**40**	0	0	452	0	**452**	0	223	27	0	**250**	0	**742**
2021-11-18 08:30:00	19	10	0	**29**	0	0	382	0	**382**	0	220	18	0	**238**	0	**649**
2021-11-18 08:45:00	19	14	0	**33**	0	0	317	0	**317**	0	257	22	0	**279**	1	**629**
2021-11-18 11:00:00	28	16	0	**44**	1	0	254	0	**254**	0	242	28	0	**270**	0	**568**
2021-11-18 11:15:00	12	20	0	**32**	0	0	267	0	**267**	1	276	22	0	**298**	0	**597**
2021-11-18 11:30:00	21	20	0	**41**	0	0	317	0	**317**	1	279	21	0	**300**	1	**658**
2021-11-18 11:45:00	17	22	0	**39**	2	0	304	0	**304**	2	273	26	0	**299**	2	**642**
2021-11-18 12:00:00	23	19	0	**42**	0	0	315	0	**315**	0	216	17	0	**233**	0	**590**
2021-11-18 12:15:00	18	19	0	**37**	0	0	312	0	**312**	0	239	21	0	**260**	0	**609**
2021-11-18 12:30:00	21	22	0	**43**	0	0	272	0	**272**	0	258	20	0	**278**	0	**593**
2021-11-18 12:45:00	31	22	0	**53**	0	0	284	0	**284**	0	227	25	0	**252**	0	**589**
Mid-Day Peak Hour Totals	**93**	**82**	**0**	**175**	**0**	**0**	**1183**	**0**	**1183**	**0**	**940**	**83**	**0**	**1023**	**0**	**2381**
Mid-Day PHF	**0.75**	**0.93**		**0.83**			**0.94**		**0.94**		**0.91**	**0.83**		**0.92**		**0.98**
2021-11-18 14:00:00	20	26	0	**46**	1	0	334	0	**334**	0	320	34	0	**354**	2	**734**
2021-11-18 14:15:00	23	26	0	**49**	0	0	343	0	**343**	1	351	49	0	**400**	1	**792**
2021-11-18 14:30:00	54	26	0	**80**	1	0	388	0	**388**	21	384	45	0	**429**	5	**897**
2021-11-18 14:45:00	93	32	0	**125**	3	0	407	0	**407**	36	413	29	0	**442**	6	**974**
2021-11-18 15:00:00	69	42	0	**111**	1	0	492	0	**492**	16	397	33	0	**430**	4	**1033**
2021-11-18 15:15:00	44	41	0	**85**	0	0	432	0	**432**	1	365	35	0	**400**	0	**917**
2021-11-18 15:30:00	42	34	0	**76**	0	0	438	0	**438**	0	433	26	0	**459**	0	**973**
2021-11-18 15:45:00	40	29	0	**69**	2	0	405	0	**405**	8	473	28	0	**501**	1	**975**
2021-11-18 16:00:00	30	39	0	**69**	0	0	367	0	**367**	0	531	32	0	**563**	0	**999**
PM Peak Hour Totals	**156**	**143**	**0**	**299**	**2**	**0**	**1642**	**0**	**1642**	**9**	**1802**	**121**	**0**	**1923**	**1**	**3864**
PM PHF	**0.89**	**0.87**		**0.88**			**0.94**		**0.94**		**0.85**	**0.86**		**0.85**		**0.97**
2021-11-18 16:15:00	25	29	0	**54**	1	0	417	0	**417**	1	475	36	0	**511**	0	**982**
2021-11-18 16:30:00	40	44	0	**84**	1	0	374	0	**374**	0	483	31	0	**514**	0	**972**
2021-11-18 16:45:00	32	35	0	**67**	1	0	380	0	**380**	1	504	40	0	**544**	1	**991**
2021-11-18 17:00:00	40	33	0	**73**	1	0	418	0	**418**	0	428	51	0	**479**	0	**970**
2021-11-18 17:15:00	44	35	0	**79**	1	0	416	0	**416**	1	408	46	0	**454**	0	**949**
2021-11-18 17:30:00	44	33	0	**77**	2	0	395	0	**395**	0	399	33	0	**432**	0	**904**
2021-11-18 17:45:00	35	34	0	**69**	0	0	347	0	**347**	0	346	35	0	**381**	1	**797**
Grand Total	**1114**	**834**	**0**	**1948**	**19**	**0**	**12300**	**0**	**12300**	**103**	**10595**	**1042**	**0**	**11637**	**27**	**25885**
% Approach	**57.2%**	**42.8%**	**0.0%**			**0.0%**	**100.0%**	**0.0%**			**91.0%**	**9.0%**	**0.0%**			
% Total	**4.3%**	**3.2%**	**0.0%**	**7.5%**		**0.0%**	**47.5%**	**0.0%**	**47.5%**		**40.9%**	**4.0%**	**0.0%**	**45.0%**		
Lights	**1098**	**817**	**0**	**1915**		**0**	**11941**	**0**	**11941**		**10284**	**1023**	**0**	**11307**		**25163**
% Lights	**98.6%**	**98.0%**	**0.0%**	**98.3%**		**0.0%**	**97.1%**	**0.0%**	**97.1%**		**97.1%**	**98.2%**	**0.0%**	**97.2%**		**97.2%**
Heavy	**16**	**17**	**0**	**33**		**0**	**359**	**0**	**359**		**311**	**19**	**0**	**330**		**722**
% Heavy	**1.4%**	**2.0%**	**0.0%**	**1.7%**		**0.0%**	**2.9%**	**0.0%**	**2.9%**		**2.9%**	**1.8%**	**0.0%**	**2.8%**		**2.8%**
Pedestrians					**19**					**103**					**27**	
% Pedestrians					**100.0%**					**100.0%**					**100.0%**	

OFFICE OF SAFETY

Proven Safety Countermeasures

SPEED MANAGEMENT

- NEW Speed Safety Cameras
- NEW Variable Speed Limits
- NEW Appropriate Speed Limits for All Road Users

ROADWAY DEPARTURE

- NEW Wider Edge Lines
- Enhanced Delineation for Horizontal Curves
- Longitudinal Rumble Strips and Stripes on Two-Lane Roads
- SafetyEdge℠
- Roadside Design Improvements at Curves
- Median Barriers

INTERSECTIONS

- Backplates with Retroreflective Borders
- Corridor Access Management
- Dedicated Left- and Right-Turn Lanes at Intersections
- Reduced Left-Turn Conflict Intersections
- Roundabouts
- Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections
- Yellow Change Intervals

PEDESTRIANS/BICYCLES

- NEW Crosswalk Visibility Enhancements
- NEW Bicycle Lanes
- NEW Rectangular Rapid Flashing Beacons (RRFB)
- Leading Pedestrian Interval
- Medians and Pedestrian Refuge Islands in Urban and Suburban Areas
- Pedestrian Hybrid Beacons
- Road Diets (Roadway Reconfiguration)
- Walkways

CROSSCUTTING

- NEW Pavement Friction Management
- NEW Lighting
- Local Road Safety Plans
- Road Safety Audit

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Safety Benefits:

Traffic fatalities in the City of Seattle decreased 26 percent after the city implemented comprehensive, city-wide speed management strategies and countermeasures inspired by Vision Zero. This included setting speed limits on all non-arterial streets at 20 mph and 200 miles of arterial streets at 25 mph.[5]

One study found that on rural roads, when considering other relevant factors in the engineering study along with the speed distribution, setting a speed limit no more than 5 mph below the 85th-percentile speed may result in fewer total and fatal plus injury crashes, and lead to drivers complying closely with the posted speed limit.[6]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/speedmgt/ref_mats/.

FHWA-SA-21-034

Appropriate Speed Limits for All Road Users

See MCL 257.627 and 257.628 for setting speed limits in Michigan

There is broad consensus among global roadway safety experts that speed control is one of the most important methods for reducing fatalities and serious injuries. Speed is an especially important factor on non-limited access roadways where vehicles and vulnerable road users mix.

A driver may not see or be aware of the conditions within a corridor, and may drive at a speed that feels reasonable for themselves but may not be for all users of the system, especially vulnerable road users, including children and seniors. A driver traveling at 30 miles per hour who hits a pedestrian has a 45 percent chance of killing or seriously injuring them.[1] At 20 miles per hour, that percentage drops to 5 percent.[1] A number of cities across the United States, including New York, Washington, Seattle and Minneapolis, have reduced their local speed limits in recent years in an effort to reduce fatalities and serious injuries, with most having to secure State legislative authorization to do so.

States and local jurisdictions should set appropriate speed limits to reduce the significant risks drivers impose on others—especially vulnerable road users—and on themselves. Addressing speed is fundamental to the Safe System Approach to making streets safer, and a growing body of research shows that speed limit changes alone can lead to measurable declines in speeds and crashes.[2]

Applications

Posted speed limits are often the same as the legislative statutory speed limit. Agencies with designated authorities to set speed limits, which include States, and sometimes local jurisdictions, can establish non-statutory speed limits or designate reduced speed zones, and a growing number are doing so. While non-statutory speed limits must be based on an engineering study, conducted in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD) involving multiple factors and engineering judgment, FHWA is also encouraging agencies to use the following:[3]

- Expert Systems tools.
  - USLIMITS2.
  - NCHRP 966: Posted Speed Limit Setting Procedure and Tool.
- Safe System approach.

Based on international experience and implementation in the United States, the use of 20 mph speed zones or speed limits in urban core areas where vulnerable users share the road environment with motorists may result in further safety benefits.[4]

Considerations

When setting a speed limit, agencies should consider a range of factors such as pedestrian and bicyclist activity, crash history, land use context, intersection spacing, driveway density, roadway geometry, roadside conditions, roadway functional classification, traffic volume, and observed speeds.

To achieve desired speeds, agencies often implement other speed management strategies concurrently with setting speed limits, such as self-enforcing roadways, traffic calming, and speed safety cameras. Additional information is in the following FHWA resources:

- FHWA Speed Management website.
- Self-Enforcing Roadways: A Guidance Report.
- Noteworthy Speed Management Practices.
- Jurisdiction Speed Management Action Plan Development Package.
- Traffic Calming ePrimer.

1 Reducing the speed limit to 20 mph in urban areas: Child deaths and injuries would be decreased.
2 Lowering the speed limit from 30 to 25 mph in Boston: effects on vehicle speeds.
3 FHWA's Methods and Practices for Setting Speed Limits: An Informational Report, (2012).
4 Recommendations of the Academic Expert Group for the 3rd Global Ministerial Conference on Road Safety.
5 https://safety.fhwa.dot.gov/speedmgt/ref_mats/fhwasa20047/sec8.cfm#foot813
6 Safety and Operational Impacts of Setting Speed Limits below Engineering Recommendations.

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Safety Benefits:

15%

reduction in total crashes.[1]

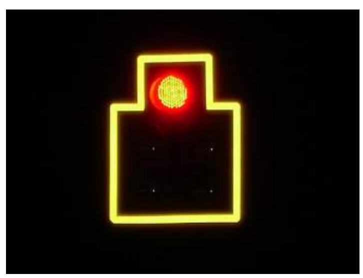
For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://rosap.ntl.bts.gov/view/dot/42807.

FHWA-SA-21-039

Backplates with Retroreflective Borders

Backplates added to a traffic signal head improve the visibility of the illuminated face of the signal by introducing a controlled-contrast background. The improved visibility of a signal head with a backplate is made even more conspicuous by framing it with a 1- to 3-inch yellow retroreflective border. Signal heads that have backplates equipped with retroreflective borders are more visible and conspicuous in both daytime and nighttime conditions.

This treatment is recognized as a human factors enhancement of traffic signal visibility, conspicuity, and orientation for both older and color vision deficient drivers. This countermeasure is also advantageous during periods of power outages when the signals would otherwise be dark, providing a visible cue for motorists to stop at the intersection ahead.



Retroreflective borders are highly visible during the night. Source: South Carolina DOT

Considerations

Transportation agencies should consider backplates with retroreflective borders as part of their efforts to systematically improve safety performance at signalized intersections. Adding a retroreflective border to an existing signal backplate is a very low-cost safety treatment. This can be done by either adding retroreflective tape to an existing backplate or purchasing a new backplate with a retroreflective border already incorporated. The most efficient means of implementing this proven safety countermeasure is to adopt it as a standard treatment for signalized intersections across a jurisdiction or State.

Implementation challenges include minimizing installation time, accessing existing signal heads, and structural limitations due to added wind load in instances where an entire backplate is added. Agencies should consider the design of the existing signal support structure to determine if the design is sufficient to support the added wind load.

Signal backplate framed with a retroreflective border. Source: FHWA

1 Sayed, T., Leur, P., and Pump, J., "Safety Impact of Increased Traffic Signal Backboards Conspicuity." 2005 TRB 84th Annual Meeting: Compendium of Papers CD-ROM, Vol. TRB#05-16, Washington, D.C., (2005).

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Proven Safety Countermeasures

Safety Benefits:

Reducing driveway density

5-23%

reduction in total crashes along 2-lane rural roads.[3]

25-31%

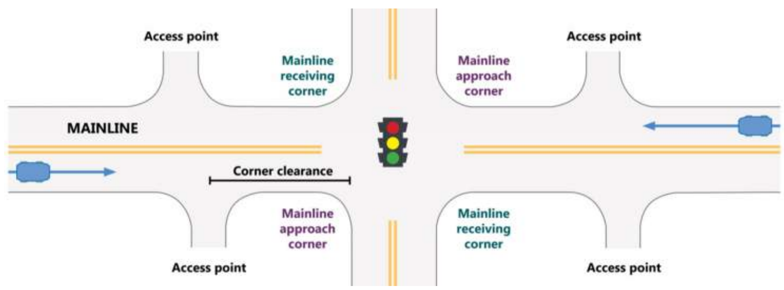
reduction in fatal and injury crashes along urban/suburban arterials.[4]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/cam/index.cfm.

FHWA-SA-21-040

Corridor Access Management

Access management refers to the design, application, and control of entry and exit points along a roadway. This includes intersections with other roads and driveways that serve adjacent properties. Thoughtful access management along a corridor can simultaneously enhance safety for all modes, facilitate walking and biking, and reduce trip delay and congestion.



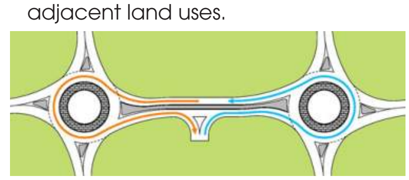
Schematic of an intersection and adjacent access points. Source: FHWA

Every intersection, from a signalized intersection to an unpaved driveway, has the potential for conflicts between vehicles, pedestrians, and bicyclists. The number and types of conflict points—locations where the travel paths of two users intersect—influence the safety performance of the intersection or driveway. FHWA developed corridor-level crash prediction models to estimate and analyze the safety effects of selected access management techniques for different area types, land uses, roadway variables, and traffic volumes.[1]

The following access management strategies can be used individually or in combination with one another:

- Reduce density through driveway closure, consolidation, or relocation.
- Manage spacing of intersection and access points.
- Limit allowable movements at driveways (such as right-in/right-out only).
- Place driveways on an intersection approach corner rather than a receiving corner, which is expected to have fewer total crashes.[2]
- Implement raised medians that preclude across-roadway movements.
- Utilize designs such as roundabouts or reduced left-turn conflicts (such as restricted crossing U-turn, median U-turns, etc.).
- Provide turn lanes (i.e., left-only, right-only, or interior two-way left).
- Use lower speed one-way or two-way off-arterial circulation roads.

Successful corridor access management involves balancing overall safety and mobility for all users along with the needs of adjacent land uses.



Tandem roundabouts with a continuous raised median eliminates left-turn and across-roadway conflicts. Source: FHWA

1 Gross et al. Safety Evaluation of Access Management Policies and Techniques. FHWA-HRT-14-057, (2018).
2 Le et al. Safety Evaluation of Corner Clearance at Signalized Intersections. FHWA-HRT-17-084, (2018).
3 Harwood et al. Prediction of the Expected Safety Performance of Rural Two-Lane Highways. FHWA-RD-99-207, (2000).
4 Elvik, R. and Vaa, T., Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).

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Safety Benefits:

RCUT

Two-Way Stop-Controlled to RCUT:

54%

reduction in fatal and injury crashes.[2]

Signalized Intersection to Signalized RCUT:

22%

reduction in fatal and injury crashes.[3]

Unsignalized Intersection to Unsignalized RCUT:

63%

reduction in fatal and injury crashes.[4]

MUT

30%

reduction in intersection-related injury crash rate.[5]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/rltci/index.cfm.

FHWA-SA-21-030

Reduced Left-Turn Conflict Intersections

Reduced left-turn conflict intersections are geometric designs that alter how left-turn movements occur. These intersections simplify decision-making for drivers and minimize the potential for higher severity crash types, such as head-on and angle. Two highly effective designs that rely on U-turns to complete certain left-turn movements are known as the Restricted Crossing U-turn (RCUT) and the Median U-turn (MUT).

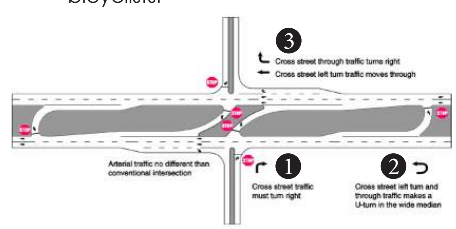
Restricted Crossing U-turn

The RCUT intersection, also known as a J-Turn, Superstreet, or Reduced Conflict Intersection, modifies the direct left-turn and through movements from cross-street approaches. Minor road traffic makes a right turn followed by a U-turn at a designated location—either signalized or unsignalized—to continue in the desired direction. The RCUT is suitable for and adaptable to a wide variety of circumstances, ranging from isolated rural, high-speed locations to urban and suburban high-volume, multimodal corridors. It is a competitive and less costly alternative to constructing an interchange. RCUTs work well when consistently used along a corridor, but also can be used effectively at individual intersections. Studies have shown that installing an RCUT can result in a 30-percent increase in throughput and a 40-percent reduction in network intersection travel time.[1]

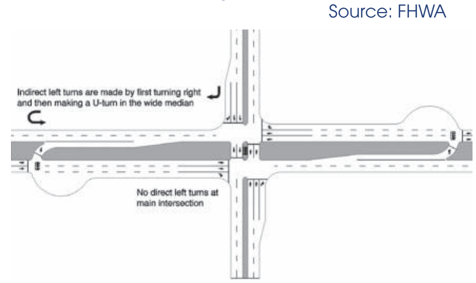
Median U-turn

The MUT intersection modifies direct left turns from the major approaches. Vehicles proceed through the main intersection, make a U-turn a short distance downstream, followed by a right turn at the main intersection. The U-turns can also be used for modifying the cross-street left turns, similar to the RCUT.

The MUT is an excellent choice for intersections with heavy through traffic and moderate left-turn volumes. Studies have shown a 20- to 50-percent improvement in intersection throughput for various lane configurations as a result of implementing the MUT design. When implemented at multiple intersections along a corridor, the efficient two-phase signal operation of the MUT can reduce delay, improve travel times, and create more crossing opportunities for pedestrians and bicyclists.



Example of a unsignalized RCUT intersection.
Source: FHWA



Example of a MUT intersection.
Source: FHWA

Michigan Left

30 - 60% reduction in total, 60 - 90% reduction in rear-end and head-on left-turn, and 60% reduction in angle crashes

1 Hugher and Jagannathan. Restricted Crossing U-Turn Intersection. FHWA-HRT-09-059, (2009).
2 Edara et al. Evaluation of J-turn Intersection Design Performance in Missouri. MoDOT, (2013).
3 Hummer and Rao. Safety Evaluation of a Signalized Restricted Crossing U-Turn. FHWA-HRT-17-082, (2017).
4 Hummer et al. Superstreet Benefits and Capacities. FHWA/NC/2009-06, NC State University, (2010).
5 Synthesis of the Median U-Turn Treatment, Safety, and Operational Benefits, FHWA-HRT-07-033, (2007).

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Safety Benefits:

36-50%
reduction in red light running.[2]

8-14%
reduction in total crashes.[2]

12%
reduction in injury crashes.[2]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/intersection/signal/fhwasa13027.pdf.

FHWA-SA-21-043

Yellow Change Intervals

At a signalized intersection, the yellow change interval is the length of time that the yellow signal indication is displayed following a green signal indication. The yellow signal confirms to motorists that the green has ended and that a red will soon follow.

Since red-light running is a leading cause of severe crashes at signalized intersections, it is imperative that the yellow change interval be appropriately timed. Too brief an interval may result in drivers being unable to stop safely and cause unintentional red-light running. Too long of an interval may result in drivers treating the yellow as an extension of the green phase and invite intentional red-light running. Factors such as the speed of approaching and turning vehicles, driver perception-reaction time, vehicle deceleration, and intersection geometry should all be considered in the timing calculation.

Transportation agencies can improve signalized intersection safety and reduce red-light running by reviewing and updating their traffic signal timing policies and procedures concerning the yellow change interval. Agencies should institute regular evaluation and adjustment protocols for existing traffic signal timing. Refer to the ***Manual on Uniform Traffic Control Devices*** for basic requirements and further recommendations about yellow change interval timing. As part of strategic signal system modernization and updates, incorporating automated traffic signal performance measures (ATSPMs) is a proven approach to improve on traditional retiming processes. ATSPMs provide continuous performance monitoring capability and the ability to modify timing based on actual performance, without requiring expensive modeling or data collection.[1]

Appropriately timed yellow change intervals can reduce red-light running and improve overall intersection safety. Source: FHWA

1 Federal Highway Administration. "Automated Traffic Signal Performance," (2020).
2 NCHRP Report 731: Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections, (2011).

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Safety Benefits:

High-visibility crosswalks can reduce pedestrian injury crashes up to:

40%[1]

Intersection lighting can reduce pedestrian crashes up to:

42%[2]

Advance yield or stop markings and signs can reduce pedestrian crashes up to:

25%[3]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_VizEnhancemt2018.pdf.

FHWA-SA-21-049

Crosswalk Visibility Enhancements

Poor lighting conditions, obstructions such as parked cars, and horizontal or vertical roadway curvature can reduce visibility at crosswalks, contributing to safety issues. For multilane roadway crossings where vehicle volumes are in excess of 10,000 Average Annual Daily Traffic (AADT), a marked crosswalk alone is typically not sufficient. Under such conditions, more substantial crossing improvements could prevent an increase in pedestrian crash potential.

Three main crosswalk visibility enhancements help make crosswalks and the pedestrians, bicyclists, wheelchair and other mobility device users, and transit users using them more visible to drivers. These include high-visibility crosswalks, lighting, and signing and pavement markings. These enhancements can also assist users in deciding where to cross. Agencies can implement these features as standalone or combination enhancements to indicate the preferred location for users to cross.

High-visibility crosswalks

High-visibility crosswalks use patterns (i.e., bar pairs, continental, ladder) that are visible to both the driver and pedestrian from farther away compared to traditional transverse line crosswalks. They should be considered at all midblock pedestrian crossings and uncontrolled intersections. Agencies should use materials such as inlay or thermoplastic tape, instead of paint or brick, for highly reflective crosswalk markings.

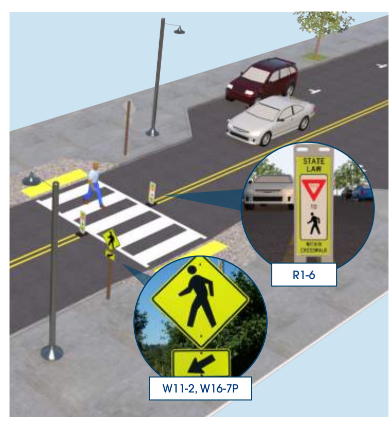
Improved Lighting

The goal of crosswalk lighting should be to illuminate with positive contrast to make it easier for a driver to visually identify the pedestrian. This involves carefully placing the luminaires in forward locations to avoid a silhouette effect of the pedestrian.

Enhanced Signing and Pavement Markings

On multilane roadways, agencies can use "YIELD Here to Pedestrians" or "STOP Here for Pedestrians" signs 20 to 50 feet in advance of a marked crosswalk to indicate where a driver should stop or yield to pedestrians, depending on State law. To supplement the signing, agencies can also install a STOP or YIELD bar (commonly referred to as "shark's teeth") pavement markings.

In-street signing, such as "STOP Here for Pedestrians" or "YIELD Here to Pedestrians" may be appropriate on roads with two- or three-lane roads where speed limits are 30 miles per hour or less.



Source: FHWA

1 Chen, L., C. Chen, and R. Ewing. The Relative Effectiveness of Pedestrian Safety Countermeasures at Urban Intersections - Lessons from a New York City Experience. (2012).
2 Elvik, R. and Vaa, T. Handbook of Road Safety Measures. Oxford, United Kingdom, Elsevier, (2004).
3 Zeeger et al. Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, FHWA, (2017).

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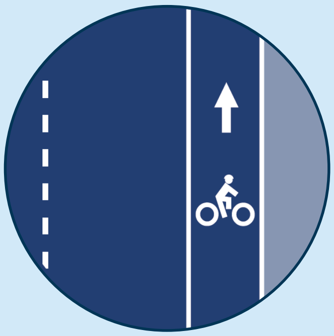

Safety Benefits:

Bicycle Lane Additions can reduce crashes up to:

57%

for total crashes on urban 4-lane undivided collectors and local roads.[6]

30%

for total crashes on urban 2-lane undivided collectors and local roads.[6]

Separated bicycle lane in Washington, DC. Source: Alex Baca, Washington Area Bicyclist Association

Separated bicycle lanes may provide further safety benefits. FHWA is anticipating completion of research in Fall 2022.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf.

FHWA-SA-21-051

Bicycle Lanes

Most fatal and serious injury bicyclist crashes occur at non-intersection locations. Nearly one-third of these crashes involve overtaking motorists[1]; the speed and size differential between vehicles and bicycles can lead to severe injury. To make bicycling safer and more comfortable for most types of bicyclists, State and local agencies should consider installing bicycle lanes. These dedicated facilities for the use of bicyclists along the roadway can take several forms. Providing bicycle facilities can mitigate or prevent interactions, conflicts, and crashes between bicyclists and motor vehicles, and create a network of safer roadways for bicycling. Bicycle Lanes align with the Safe System Approach principle of recognizing human vulnerability—where separating users in space can enhance safety for all road users.

Applications

FHWA's *Bikeway Selection Guide* and *Incorporating On-Road Bicycle Networks into Resurfacing Projects* assist agencies in determining which facilities provide the most benefit in various contexts. Bicycle lanes can be included on new roadways or created on existing roads by reallocating space in the right-of-way.

In addition to the paint stripe used for a typical bicycle lane, a lateral offset with painted buffer can help to further separate bicyclists from vehicle traffic. State and local agencies may also consider physical separation of the bicycle lane from motorized traffic lanes through the use of vertical elements like posts, curbs, or vegetation.[2] Based on international experience and implementation in the United States, there is potential for further safety benefits associated with separated bicycle lanes. FHWA is conducting research on separated bicycle lanes, which includes the development of crash modification factors, to be completed in 2022 to address significant interest on this topic.

1 Thomas et al. Bicyclist Crash Types on National, State, and Local Levels: A New Look. Transportation Research Record 673(6), 664-676, (2019).
2 Separated Bike Lane Planning and Design Guide. FHWA-HEP-15-025, (2015).
3 Park and Abdel-Aty. "Evaluation of safety effectiveness of multiple cross sectional features on urban arterials". Accident Analysis and Prevention, Vol. 92, pp. 245-255, (2016).
4 FHWA Tech Advisory Shoulder and Edge Line Rumble Strips, (2011).
5 Sandt et al. Pursuing Equity in Pedestrian and Bicycle Planning. FHWA, (2016).
6 Avelar et al. Development of Crash Modification Factors for Bicycle Lane Additions While Reducing Lane and Shoulder Widths. FHWA, (2021).

Considerations

- City and State policies may require minimum bicycle lane widths, although these can differ by agency and functional classification of the road.
- Bicycle lane design should vary according to roadway characteristics (e.g., motor vehicle volumes and speed) in order to maximize the facility's suitability for riders of all ages and abilities and should consider the travel needs of low-income populations likely to use bicycles. The *Bikeway Selection Guide* is a useful resource.
- While some in the public may oppose travel lane narrowing if they believe it will slow traffic or increase congestion, studies have found that roadways did not experience an increase in injuries or congestion when travel lane widths were decreased to add a bicycle lane.[3]
- Studies and experience in US cities show that bicycle lanes increase ridership and may help jurisdictions better manage roadway capacity without increased risk.
- In rural areas, rumble strips can negatively impact bicyclists' ability to ride if not properly installed. Agencies should consider the dimensions, placement, and offset of rumble strips when adding a bicycle lane.[4]
- Strategies, practices, and processes can be used by agencies to enhance their ability to address equity in bicycle planning and design.[5]

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Safety Benefits:

RRFBs can reduce crashes up to:

47%

for pedestrian crashes.[4]

RRFBs can increase motorist yielding rates up to:

98%

(varies by speed limit, number of lanes, crossing distance, and time of day).[3]

RRFBs used at a trail crossing.
Source: LJB

Rectangular Rapid Flashing Beacons (RRFB)

A marked crosswalk or pedestrian warning sign can improve safety for pedestrians crossing the road, but at times may not be sufficient for drivers to visibly locate crossing locations and yield to pedestrians. To enhance pedestrian conspicuity and increase driver awareness at uncontrolled, marked crosswalks, transportation agencies can install a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) to accompany a pedestrian warning sign. RRFBs consist of two, rectangular- shaped yellow indications, each with a light-emitting diode (LED)-array-based light source.[1] RRFBs flash with an alternating high frequency when activated to enhance conspicuity of pedestrians at the crossing to drivers.

For more information on using RRFBs, see the Interim Approval in the ***Manual on Uniform Traffic Control Devices (MUTCD).***[1]

Applications

The RRFB is applicable to many types of pedestrian crossings but is particularly effective at multilane crossings with speed limits less than 40 miles per hour.[2] Research suggests RRFBs can result in motorist yielding rates as high at 98 percent at marked crosswalks, but varies depending on the location, posted speed limit, pedestrian crossing distance, one- versus two-way road, and the number of travel lanes.[3] RRFBs can also accompany school or trail crossing warning signs.

RRFBs are placed on both sides of a crosswalk below the pedestrian crossing sign and above the diagonal downward arrow plaque pointing at the crossing.[1] The flashing pattern can be activated with pushbuttons or passive (e.g., video or infrared) pedestrian detection, and should be unlit when not activated.

Considerations

Agencies should:[2]

- Install RRFBs in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median.
- Use solar-power panels to eliminate the need for a power source.
- Reserve the use of RRFBs for locations with significant pedestrian safety issues, as over-use of RRFB treatments may diminish their effectiveness.

Agencies shall not:[2]

- Use RRFBs without the presence of a pedestrian, school or trail crossing warning sign.
- Use RRFBs for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons, except for the approach or egress from a roundabout.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RRFB_2018.pdf.

1 *MUTCD* Interim Approval 21 - RRFBs at Crosswalks.
2 "Rectangular Rapid Flash Beacon" in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. FHWA, (2013).
3 Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).
4 NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).

FHWA-SA-21-053

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Safety Benefits:

13%

reduction in pedestrian-vehicle crashes at intersections.[1]

Leading Pedestrian Interval

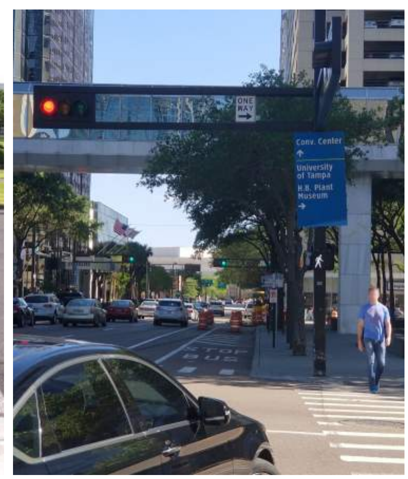
A leading pedestrian interval (LPI) gives pedestrians the opportunity to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left.

LPIs provide the following benefits:

- Increased visibility of crossing pedestrians.
- Reduced conflicts between pedestrians and vehicles.
- Increased likelihood of motorists yielding to pedestrians.
- Enhanced safety for pedestrians who may be slower to start into the intersection.

FHWA's Handbook for ***Designing Roadways for the Aging Population*** recommends the use of the LPI at intersections with high turning vehicle volumes. Transportation agencies should refer to the ***Manual on Uniform Traffic Control Devices*** for guidance on LPI timing and ensure that pedestrian signals are accessible for all users. Costs for implementing LPIs are very low when only signal timing alteration is required.

An LPI allows a pedestrian to establish a presence in the crosswalk before vehicles are given a green indication. Source: FHWA



LPIs reduce potential conflicts between pedestrians and turning vehicles. Source: FHWA

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa19040.pdf.

FHWA-SA-21-032

1 Goughnour, E., D. Carter, C. Lyon, B. Persaud, B. Lan, P. Chun, I. Hamilton, and K. Signor. "Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety." Report No. FHWA-HRT-18-044. Federal Highway Administration. (October 2018)

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Safety Benefits:

Median with Marked Crosswalk

46%

reduction in pedestrian crashes.[2]

Pedestrian Refuge Island

56%

reduction in pedestrian crashes.[2]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_PedRefugeIsland2018.pdf.

FHWA-SA-21-044

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.

A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.[1] For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.

Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.

Example of a road with a median and pedestrian refuge islands. Source: City of Charlotte, NC

Median and pedestrian refuge island near a roundabout. Source: www.pedbikeimages.org / Dan Burden

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration

2 Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.

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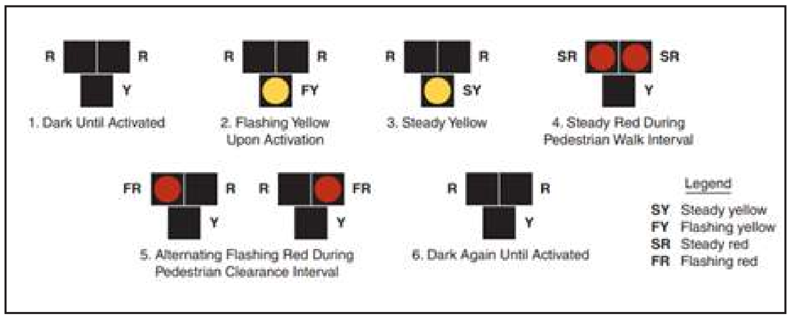
Pedestrian Hybrid Beacons

The pedestrian hybrid beacon (PHB) is a traffic control device designed to help pedestrians safely cross higher-speed roadways at midblock crossings and uncontrolled intersections. The beacon head consists of two red lenses above a single yellow lens. The lenses remain "dark" until a pedestrian desiring to cross the street pushes the call button to activate the beacon, which then initiates a yellow to red lighting sequence consisting of flashing and steady lights that directs motorists to slow and come to a stop, and provides the right-of-way to the pedestrian to safely cross the roadway before going dark again.



Sequence for a PHB. Source: MUTCD 2009 Edition, p. 511, FHWA

Safety Benefits:

55% reduction in pedestrian crashes.[2]

29% reduction in total crashes.[3]

15% reduction in fatal and serious injury crashes.[3]

Example of PHBs mounted on a mast arm. Source: FHWA

Nearly 74 percent of pedestrian fatalities occur at non-intersection locations, and vehicle speeds are often a major contributing factor.[1] As a safety strategy to address this pedestrian crash risk, the PHB is an intermediate option between a flashing beacon and a full pedestrian signal because it assigns right of way and provides positive stop control. It also allows motorists to proceed once the pedestrian has cleared their side of the travel lane(s), reducing vehicle delay.

Transportation agencies should refer to the *Manual on Uniform Traffic Control Devices* (MUTCD) for information on the application of PHBs.

In general, PHBs are used where it is difficult for pedestrians to cross a roadway, such as when gaps in traffic are not sufficient or speed limits exceed 35 miles per hour. They are very effective at locations where three or more lanes will be crossed or traffic volumes are above 9,000 annual average daily traffic. Installation of a PHB must also include a marked crosswalk and pedestrian countdown signal. If PHBs are not already familiar to a community, agencies should conduct appropriate education and outreach as part of implementation.

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa18064.pdf.

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration
2 Zegeer et al. NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. TRB, (2017).
3 Fitzpatrick, K. and Park, E.S. Safety Effectiveness of the HAWK Pedestrian Crossing Treatment, FHWA-HRT-10-042, (2010).

FHWA-SA-21-045

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Safety Benefits:

4-Lane to 3-Lane Road Diet Conversions

40%

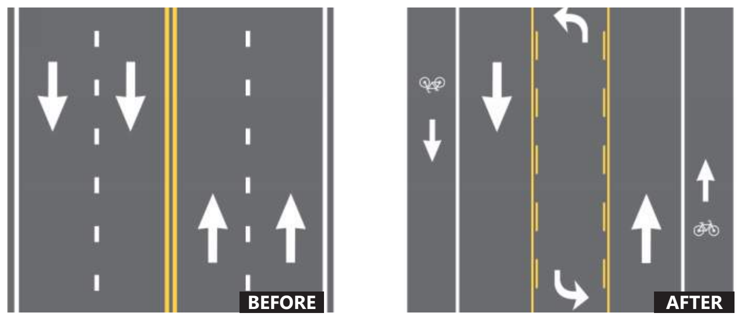
reduction in total crashes.[MDOT]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/road_diets/.

FHWA-SA-21-046

Road Diets (Roadway Reconfiguration)

A Road Diet, or roadway reconfiguration, can improve safety, calm traffic, provide better mobility and access for all road users, and enhance overall quality of life. A Road Diet typically involves converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane (TWLTL).



Before and after example of a Road Diet. Source: FHWA

Benefits of Road Diet installations may include:

- Reduction of rear-end and left-turn crashes due to the dedicated left-turn lane.
- Reduced right-angle crashes as side street motorists cross three versus four travel lanes.
- Fewer lanes for pedestrians to cross.
- Opportunity to install pedestrian refuge islands, bicycle lanes, on-street parking, or transit stops.
- Traffic calming and more consistent speeds.
- A more community-focused, Complete Streets environment that better accommodates the needs of all road users.

A Road Diet can be a low-cost safety solution when planned in conjunction with a simple pavement overlay, and the reconfiguration can be accomplished at no additional cost. Typically, a Road Diet is implemented on a roadway with a current and future average daily traffic of 25,000 or less.

Road Diet project in Honolulu, Hawaii. Source: Leidos

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Safety Benefits:

Sidewalks

65-89%

reduction in crashes involving pedestrians walking along roadways.[3]

Paved Shoulders

71%

reduction in crashes involving pedestrians walking along roadways.[3]

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=1.

FHWA-SA-21-047

Walkways

A walkway is any type of defined space or pathway for use by a person traveling by foot or using a wheelchair. These may be pedestrian walkways, shared use paths, sidewalks, or roadway shoulders.

With more than 6,200 pedestrian fatalities and 75,000 pedestrian injuries occurring in roadway crashes annually,[1] it is important for transportation agencies to improve conditions and safety for pedestrians and to integrate walkways more fully into the transportation system. Research shows people living in low-income communities are less likely to encounter walkways and other pedestrian-friendly features.[2]

Well-designed pedestrian walkways, shared use paths, and sidewalks improve the safety and mobility of pedestrians. Pedestrians should have direct and connected network of walking routes to desired destinations without gaps or abrupt changes. In some rural or suburban areas, where these types of walkways are not feasible, roadway shoulders provide an area for pedestrians to walk next to the roadway, although these are not preferable.

Transportation agencies should work towards incorporating pedestrian facilities into all roadway projects unless exceptional circumstances exist. It is important to provide and maintain accessible walkways along both sides of the road in urban areas, particularly near school zones and transit locations, and where there is a large amount of pedestrian activity. Walkable shoulders should also be considered along both sides of rural highways when routinely used by pedestrians.

Example of a sidewalk in a residential area. Source: pedbikeimages.org / Burden

Paved shoulder used as a walkway. Source: pedbikeimages.org / Burden

1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts. Report No. DOT HS 812 850). National Highway Traffic Safety Administration.
2 Gibbs, et all. Income Disparities in Street Features that Encourage Walking. Bridging the Gap, (2012, March).
3 Gan et al. Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects. Florida DOT, (2005).

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Safety Benefits:

Lighting can reduce crashes up to:

42%
for nighttime injury pedestrian crashes at intersections.[1]

33-38%
for nighttime crashes at rural and urban intersections.[1]

28%
for nighttime injury crashes on rural and urban highways.[1]

Source: WSDOT

For more information on this and other FHWA Proven Safety Countermeasures, please visit https://safety.fhwa.dot.gov/provencountermeasures/ and https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadwayresources.cfm.

FHWA-SA-21-050

Lighting

The number of fatal crashes occurring in daylight is about the same as those that occur in darkness. However, the nighttime fatality rate is three times the daytime rate because only 25 percent of vehicle miles traveled (VMT) occur at night. At nighttime, vehicles traveling at higher speeds may not have the ability to stop once a hazard or change in the road ahead becomes visible by the headlights. Therefore, lighting can be applied continuously along segments and at spot locations such as intersections and pedestrian crossings in order to reduce the chances of a crash.

Adequate lighting (i.e., at or above minimum acceptable standards) is based on research recommending horizontal and vertical illuminance levels to provide safety benefits to all users of the roadway environment. Adequate lighting can also provide benefits in terms of personal security for pedestrians, wheelchair and other mobility device users, bicyclists, and transit users as they travel along and across roadways.

Applications

Roadway Segments

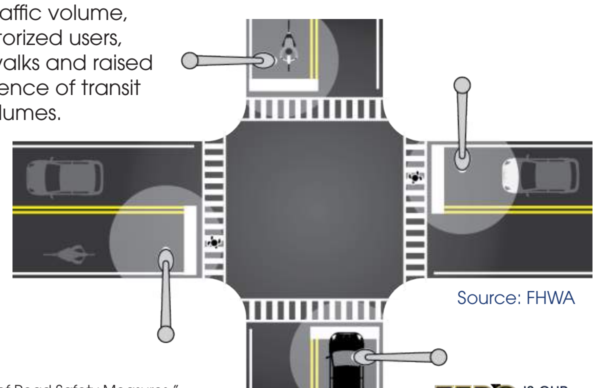
Research indicates that continuous lighting on both rural and urban highways (including freeways) has an established safety benefit for motorized vehicles.[1] Agencies can provide adequate visibility of the roadway and its users through the uniform application of lighting that provides full coverage along the roadway and the strategic placement of lighting where it is needed the most.

Intersections and Pedestrian Crossings

Increased visibility at intersections at nighttime is important since various modes of travel cross paths at these locations. Agencies should consider providing lighting to intersections based on factors such as a history of crashes at nighttime, traffic volume, the volume of non-motorized users, the presence of crosswalks and raised medians, and the presence of transit stops and boarding volumes.

Considerations

Most new lighting installations are made with breakaway features, shielded, or placed far enough from the roadway to reduce the probability and/or severity of fixed-object crashes. Modern lighting technology gives precise control with minimal excessive light affecting the nighttime sky or spilling over to adjacent properties. Agencies can equitably engage with underserved communities to determine where and how new and improved lighting can most benefit the community by considering their priorities, including eliminating crash disparities, connecting to essential neighborhood services, improving active transportation routes, and promoting personal safety.



Source: FHWA

1 Elvik, R. and Vaa, T., "Handbook of Road Safety Measures." Oxford, United Kingdom, Elsevier, (2004).

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SEMCOG | MDOT

MDOT Complete Streets Process Guide for Southeast Michigan

What Objective is the Project Attempting to Accomplish?

A municipality or agency desires to change lanes or curbs within a road (such as conversion of 4 or 5 lanes to 3 lanes) and a change is recommended in the master plan or other plan adopted by the municipality.

OR

A study has been requested by an authorized representative (Mayor, City Manager, City/ Village Council/ Commission, DDA Board, City Engineer, etc.).

OR

The road has been identified by SEMCOG as a high priority safety location, a potential "road diet" corridor, or for reconstruction in the transportation improvement plan.

OR

An MDOT Road Safety Audit (RSA) has been conducted that suggested evaluating a change in the number or design of travel lanes.

Is the road segment under consideration an **MDOT trunkline** or does it intersect with an MDOT trunkline?

YES → Does the road meet **all three of the following criteria**?

1. The municipality or agency has an adopted complete streets policy, resolution, or ordinance
2. The desired design will result in average daily traffic volumes of 9,000 vehicles per lane or less (e.g. 18,000 daily to go from 4 or 5 lanes to 3) in an urban context, 6,500 in suburban, and 6,000 for rural
3. The road is not on the National Highway System as a Major Truck Route

- **YES** → **Contact MDOT** Regional Planner and TSC Manager to discuss situation, goals, and desired outcomes; performance measures; potential alternatives; and study methodology (i.e. scoping meeting); and agree on city or MDOT funding for study, implementation, and maintenance. The advocate must also inform MDOT of who is an "authorized agent" to approve a change (e.g. elected body, manager, staff). → Use Multimodal Tool and conduct study.
- **NO** → MDOT Regional Engineer determines whether standard **MDOT Road Diet Checklist** applies.

NO → **Use Multimodal Tool and conduct study**. You may contact SEMCOG for available data, any safety studies, or advice.

If **study outcome** recommends reallocation of space within the ROW (and, if applicable, MDOT and municipality agree on funding for design, construction and maintenance based on the type of project), there are three types of projects:

Project Classification

	1. Temporary test	2. Low-cost options	3. Street reconstruction
Project Classification	A trial period to evaluate outcomes	No change to curbs	Bumpouts, change to curbs, etc.
Project Requirements for MDOT Trunklines *These requirements may be used as guidelines for local and county roads but are not required.*	Agreement with MDOT must be achieved on: • Duration of test period, design, materials, signs, etc. • Public awareness of trial project • Collection of data before and during the pilot period to evaluate outcome (multimodal counts, traffic speeds, etc.) If outcome satisfies expectations, then proceed to category 2 or 3.	• Municipality's authorized agent endorses the change • Change has been approved by MDOT • MDOT may require agreement on restoration of prior design under certain outcomes	• Public meeting has been conducted and comments documented • Municipality's authorized agent endorses the change

Implement complete streets project → **Conduct follow-up studies on performance measures**

6 | Multimodal Tool User Guide

Appendix E Traffic & Crash Analyses Resources

Bicycle and Pedestrian Mobility Plan for Southeast Michigan; SEMCOG; March 2020

Making Our Roads Safer | One Countermeasure at a Time; FHWA; 2021 Edition

MDOT Complete Streets Process Guide for Southeast Michigan; SEMCOG & MDOT

Guidance for Installation of Pedestrian Crosswalks on Michigan State Trunkline Highways; MDOT; March 2020

Guidance for Trunkline Main Streets; MDOT; Unknown Date

Geometric Design Guide for Crossovers GEO-670e; MDOT; June 2014

Multimodal Tool; SEMCOG

The Detroit River International Crossing Study - Level Three Traffic Analysis Technical Report (TAR) 2040 Update; MDOT & WSP

Ecorse Creek Committee Vision Plan; City of Ecorse & SmithGroup July 2020

West Jefferson Corridor Plan; Cities of Ecorse & River Rouge; McKenna; November 2019

MDOT Design Manuals

www.semcog.org – Various Data and Map Sources