BAILEY AVENUE CORRIDOR IMPROVEMENTS STUDY

CITY OF BUFFALO, NEW YORK
JANUARY 2021

GBNRTC
Greater Buffalo Niagara Regional Transportation Council

NFTA-METRO

SEAL OF THE CITY OF BUFFALO

ACKNOWLEDGMENTS

This study was funded through the Greater Buffalo Niagara Regional Transportation Council (GBNRTC) and the Niagara Frontier Transportation Authority (NFTA), in partnership with the City of Buffalo. The process was guided by an active Steering Committee, whom provided valuable input and feedback on future transit and streetscape treatments along the Bailey Avenue corridor.

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ARCHITECTS ENGINEERS PLANNERS

WSP

MARINE TIGER
TECHNOLOGIES
Business Solutions for Transportation

This study was completed by Bergmann in partnership with WSP and Marine Tiger Technologies.

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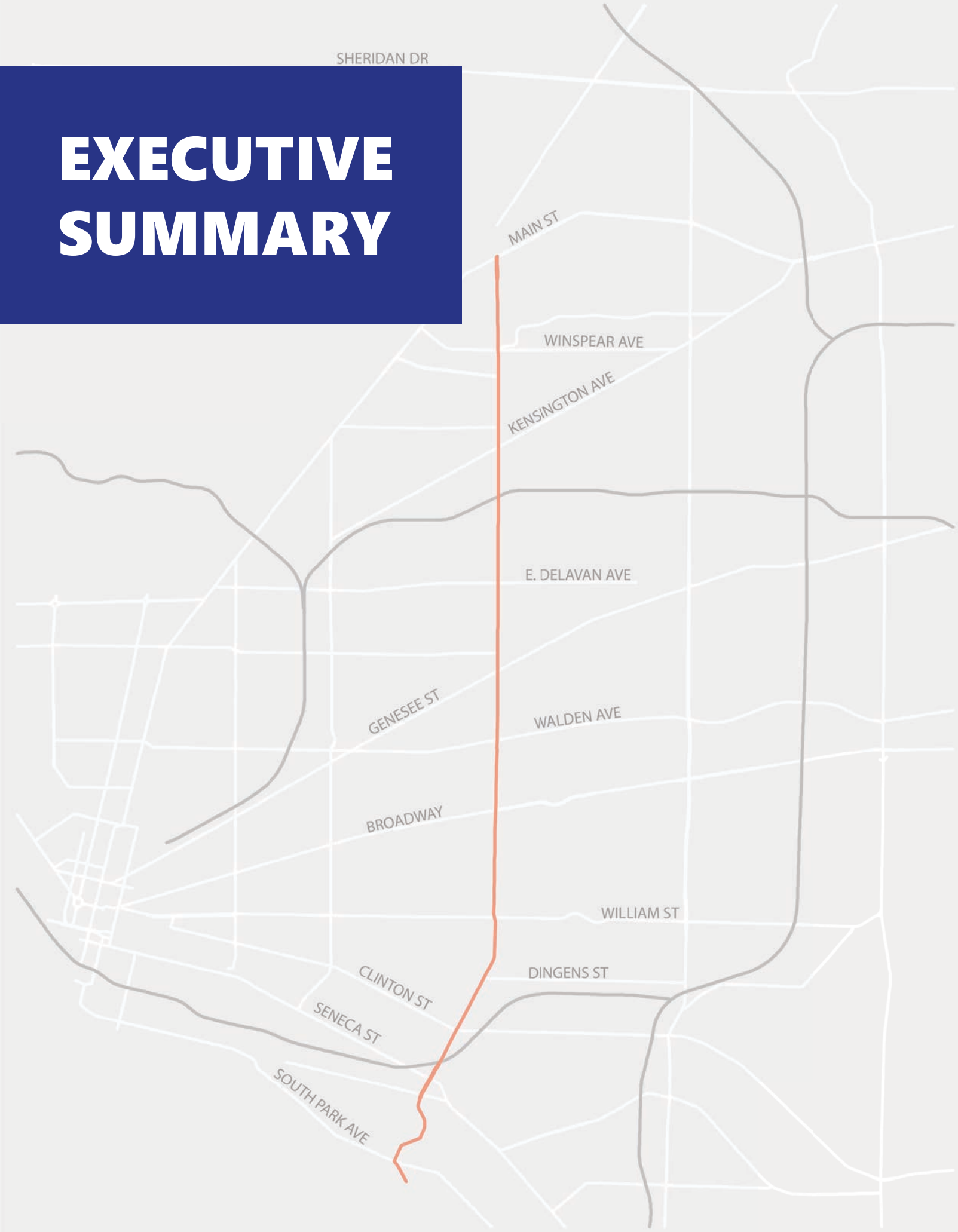
EXECUTIVE SUMMARY

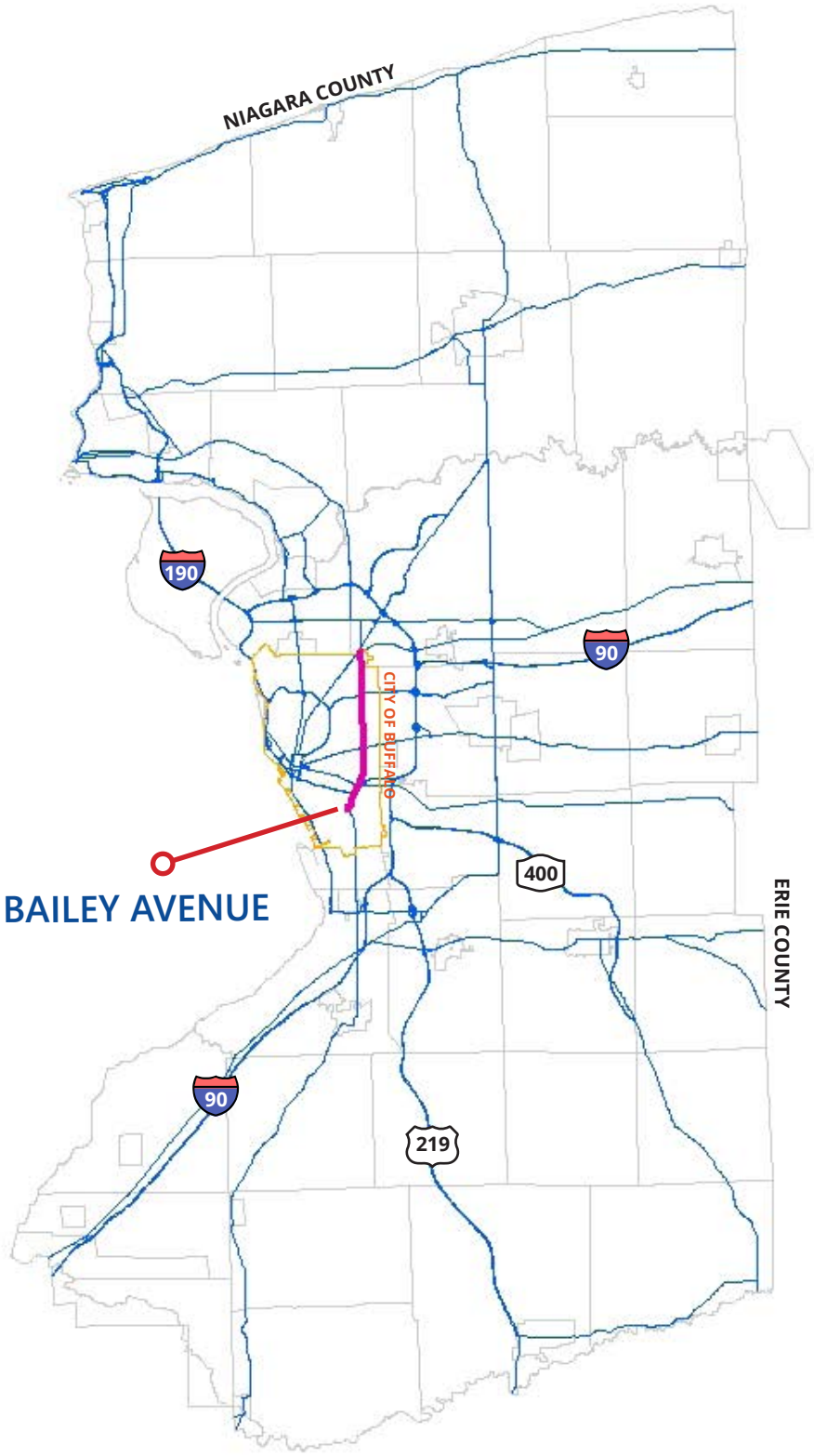


INTRODUCTION

The Greater Buffalo Niagara Regional Transportation Council (GBNRTC), in collaboration with the City of Buffalo and Niagara Frontier Transportation Authority (NFTA), commissioned this Bailey Avenue Corridor Transportation Study. This study focuses on a 7.5-mile section of Bailey Avenue from Main Street to South Park Avenue. The purpose of the study is to analyze existing transportation infrastructure along Bailey Avenue and identify long-term approaches to streetscape and transit enhancements. Recommended enhancements are intended to enhance multi-modal mobility options and improve the corridor's sense of place to facilitate economic development along Bailey Avenue and its surrounding neighborhoods.

This study includes the following components:

- Existing Conditions Analysis
- Corridor Design Alternatives
- Considerations Applicable to All Alternatives
- Evaluation of Alternatives
- Costs and Implementation

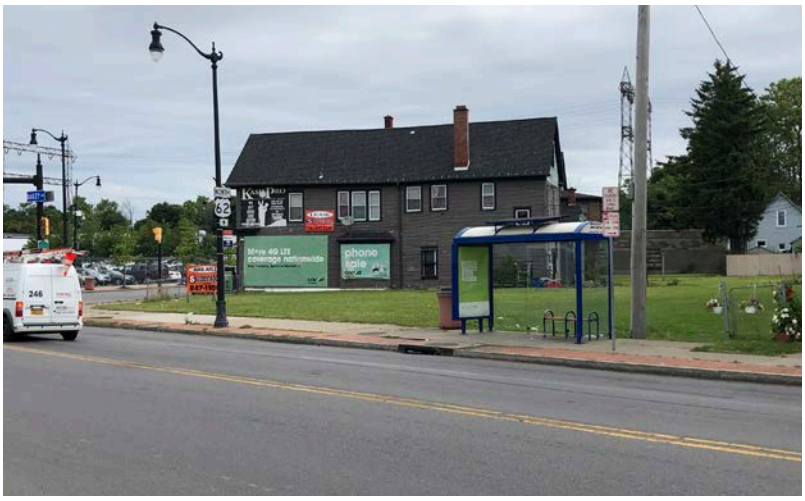


EXISTING CONDITIONS ANALYSIS: KEY TAKEAWAYS

An existing conditions analysis was conducted for Bailey Avenue. This analysis included a review of physical characteristics to derive key opportunities and challenges related to streetscape and transit enhancements along the corridor.

- Varying land uses exist along Bailey Avenue. Land uses, such as community services, commercial retail establishments, and residential areas contribute to its unique character.
- There are over 54 recreational amenities within proximity to Bailey Avenue for residents and visitors to enjoy.
- There are 10 zoning districts that regulate land uses along Bailey Avenue. These land uses allow a range of development types and densities.
- Land along Bailey Avenue is largely owned by private entities. Major public land owners along the corridor include the City of Buffalo, SUNY Buffalo, Erie County, and the U.S. Veterans Affairs Hospital.
- Bailey Avenue contains two- to four-vehicle travel lanes with a general curb to curb width between 40 - 50 feet.
- Bailey Avenue contains dedicated bicycle facilities from Elk Street to South Park Avenue.
- There are 31 traffic signals along Bailey Avenue; 30 of which are owned by the City of Buffalo and one owned by the New York State Department of Transportation (DOT).
- Traffic volumes along Bailey Avenue range from approximately 14,000 - 20,000 AADT. The heaviest volumes of traffic occur near major expressways, such as Kensington Avenue and South Park Avenue.
- Pavement markings along Bailey Avenue are in poor condition. Faded striping of travel lanes creates safety concerns for drivers, pedestrians, and bicyclists.

- Pedestrian crossings along Bailey Avenue are in poor condition and in need of improved striping, enhanced signage, and curb extensions.
- The majority of sidewalks along Bailey Avenue are in poor condition and in need of enhancements to create a easily accessible corridor experience.
- There are 22 existing bus shelters in proximity to Bailey Avenue.
- Bailey Avenue contains streetscape elements, such as bike racks, trash receptacles, planters, and benches. There is a significant gap in these user elements south of Kensington Avenue.
- Transit services are provided by NFTA. The NFTA Metro Bus Route 19 services Bailey Avenue between University Station and South Park Avenue. This route contains 51 stops that are found both nearside and farside along the corridor.
- The highest boarding and alighting counts along the Bailey Avenue are observed at the two endpoints of the service at University Station and Abbott-Bailey Loop as well as at major intersecting east-west running cross streets such as Kensington Avenue (Route 13) , East Delavan Avenue (Route 26), Genesee Street (Route 24), Walden Avenue (Route 6), Broadway (Route 4), William Street (Route 1), and Clinton Street (Route 2).
- The most utilized stops traveling south on Bus Route 19 include University Station, Kenmore Avenue, Amherst Street and Kensington Avenue University Station has by far the most ridership activity on Bus Route 19.
- The most utilized stops traveling north on Bus Route 19 include University Station, Amherst Street and East Delavan Avenue. Key transfer locations along the route offer great potential for consolidating stops into enhanced stations.



CORRIDOR DESIGN ALTERNATIVES

A series of design alternatives encompassing varying levels of streetscape improvements, transit features and incorporation of Bus Rapid Transit were identified for Bailey Avenue. All alternatives are intended to enhance mobility for vehicular, pedestrian, bicyclist and transit users on Bailey Avenue.

Enhanced transit improvements along Bailey Avenue are intended to increase access and mobility, provide critical transportation services for all users, create central places for people to gather, reduce traffic congestion, and encourage walkability.

Three transit alternatives were developed for Bailey Avenue. The three alternatives represent a range of enhanced bus typologies from existing service improvements to significant capital facility upgrades. This approach provides the ability to evaluate the benefits and feasibility of a variety of enhanced bus components and their impacts on the neighborhoods along Bailey Avenue.

BUSINESS AS USUAL

This scenario provides context on the Bailey Avenue transportation system if no improvements were completed. This allows the project team to analyze base conditions of the corridor against the potential alternatives.

ALTERNATIVE A - ENHANCED LOCAL TRANSIT

Alternative A includes the consolidation of underutilized bus stops to reduce dwell times, transit signal priority (TSP) at key locations, addition of new amenities like shelters and benches at busier stops, and an increase in service frequency throughout the day.

ALTERNATIVE B - ENHANCED LOCAL + LIMITED STOP

Alternative B adds a new frequent-service, limited-stop route and continues local bus service along the corridor. Limited stops are improved with larger shelters and other amenities, new Intelligent Transportation System (ITS) features are added and signal priority is expanded to more locations.

ALTERNATIVE C - ENHANCED LOCAL + BUS RAPID TRANSIT

Alternative C replaces the limited stop route with BRT service including Business Access Transit (BAT lanes), a type of bus lane along some segments, TSP, large custom station shelters, an upgraded fleet of dedicated vehicles, a full set of Intelligent Transportation System (ITS) features, and a more frequent schedule. Local service would also be provided.

CORRIDOR ALTERNATIVES MATRIX

ALTERNATIVE	RUNNING WAYS	VEHICLES	STATIONS	SMART CITIES AND ITS
BUSINESS AS USUAL	Mixed traffic	Standard diesel or Compressed Natural Gas (CNG) buses	Standard local bus signage with shelters at key stops.	None
ALTERNATIVE A - ENHANCED LOCAL TRANSIT	Mixed traffic with TSP and queue jumpers at key locations*	Standard diesel or CNG buses	New shelters at major stops and minor improvements at other stops, improved connections to Routes 14 and 16 at south end of route.	TSP at key locations, real time info on devices using real-time bus arrival data.
ALTERNATIVE B - ENHANCED LOCAL TRANSIT + LIMITED STOP SERVICE	Mixed traffic with TSP and queue jumpers at key locations*	Standard diesel or CNG buses	New larger limited stop shelters with minor improvements to local stops, improved connection to 14 and 16 at south end of route.	TSP at key locations, real time info on devices using real-time bus arrival data.
ALTERNATIVE C - ENHANCED LOCAL TRANSIT + BUS RAPID TRANSIT	Curbside bus or BAT lanes between Sherman Rd. and Winspear Ave., Walden Ave. and Stanley St., and William St. and Clinton St.; bus queue jumps at major intersections; and TSP at key signalized intersections*	Dedicated fleet of unique, alternative fuel 40-foot BRT buses for BRT, standard buses for local	Major improvements at BRT stations including substantial LRT-quality shelters and furniture, static and real-time information displays, access and streetscape improvements, and improved connections to 14 and 16 at south end of route. Minor improvements would be made to local stops.	TSP, real time information at BRT stations and via devices using real-time bus arrival data, and mobility hubs located at key transfer points.

*Any of the build alternatives could be designed to include curb extensions and/or bus bulbs at selected intersections in addition to the running way and station improvements listed for the alternative.

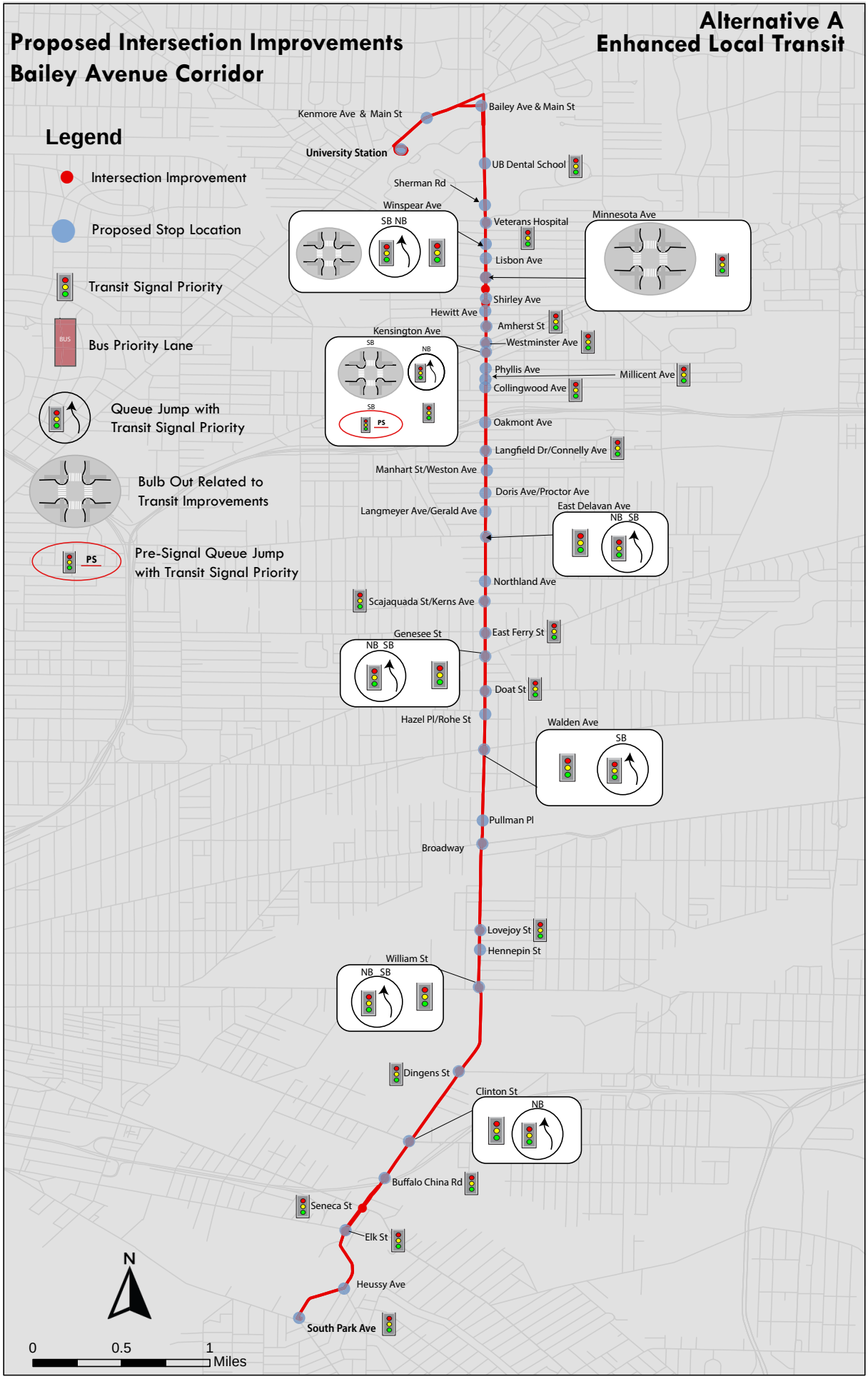
CORRIDOR ALTERNATIVES MATRIX (CONT.)

ALTERNATIVE	SERVICE	FARE COLLECTION	BRANDING	ROUTING	PEER SERVICES
BUSINESS AS USUAL	Service plan: 10 to 15 minute peak headways, 20-minute midday, 30-minute Saturday and Sunday daytime, and 40-minute evenings Stop spacing: No change from average of .15 miles	NFTA standard Metro Bus policies and procedures	None	Same as Bus Route 19	Other NFTA local routes
ALTERNATIVE A - ENHANCED LOCAL TRANSIT	Service plan: 10-minute peak headways, 15-minute midday and Saturday daytime, and 30-minute Sunday and evenings Stop spacing: Increased to average of 0.20 miles from 0.15 miles	NFTA standard Metro Bus policies and procedures	Distinct logo and colors applied to stop amenities, on-line, and marketing materials.	Same as Bus Route 19	RIPTA R-Line, Providence, RI
ALTERNATIVE B - ENHANCED LOCAL TRANSIT + LIMITED STOP SERVICE	Service plan limited: 15-minute peak headways, 30-minute midday, evening, Saturday, and Sunday daytime. Service plan local: 30-minute peak, midday, and Saturday daytime and 60-minute evening and Sunday Stop spacing: Limited (0.6 miles), local (0.2 miles)	NFTA standard Metro Bus policies and procedures	Distinct logo and colors applied to stop amenities, on-line, and marketing materials, if operational and funding allows.	Same as Bus Route 19	CDTA BusPlus Red Line, Albany, NY
ALTERNATIVE C - ENHANCED LOCAL TRANSIT + BUS RAPID TRANSIT	Service plan BRT: 10-minute headways peak and midday, 15-minute Saturday, and 30-minute evenings and Sunday. Service plan local: 30-minute peak, midday and Saturday, 30-minute evenings and Sundays Stop spacing: BRT (0.6 miles), local (0.2 miles)	TBD, BRT could use standard Metro Bus fare system but further consideration should be given to a Smart Card proof of payment system.	Logo, colors, and extensive branding for all stations, vehicles, facilities, on-line, and marketing materials.	Same as Bus Route 19	Community Transit Swift, Everett (Seattle), WA

** Service plans show an aspirational level of transit service. There is flexibility to start at lower levels and increase them over time.

ALTERNATIVE A - ENHANCED LOCAL TRANSIT

This alternative presents a lower capital cost approach to enhancing bus service along Bailey Avenue. The concept is based on incremental improvements to the elements of the existing Metro Bus Route 19 so they work better for riders resulting in faster, more frequent, and more comfortable service. This alternative could be implemented more quickly than the other alternatives with lower capital and operating costs but still provide significant improvements to service for transit users. It could also potentially serve as a first phase of improvements, which would be followed by Alternatives B and C. The following description provides a concept for further analysis and is not intended to reflect a final capital improvement proposal for Bailey Avenue.


Proposed Intersection Improvements
Bailey Avenue Corridor
Alternative A
Enhanced Local Transit
Legend
Intersection Improvement
Proposed Stop Location
Transit Signal Priority
Bus Priority Lane
Queue Jump with Transit Signal Priority
Bulb Out Related to Transit Improvements
Pre-Signal Queue Jump with Transit Signal Priority
Kenmore Ave & Main St
Bailey Ave & Main St
University Station
UB Dental School
Sherman Rd
Winspear Ave
SB NB
Veterans Hospital
Minnesota Ave
Lisbon Ave
Shirley Ave
Hewitt Ave
Amherst St
Kensington Ave
SB
NB
Westminster Ave
Phyllis Ave
Millicent Ave
Collingwood Ave
SB
PS
Oakmont Ave
Langfield Dr/Connelly Ave
Manhart St/Weston Ave
Doris Ave/Proctor Ave
Langmeyer Ave/Gerald Ave
East Delavan Ave
NB SB
Northland Ave
Scajaquada St/Kerns Ave
Genesee St
NB SB
East Ferry St
Doat St
Hazel Pl/Rohe St
Walden Ave
SB
Pullman Pl
Broadway
Lovejoy St
Hennepin St
William St
NB SB
Dingens St
Clinton St
NB
Buffalo China Rd
Seneca St
Elk St
Heussy Ave
South Park Ave
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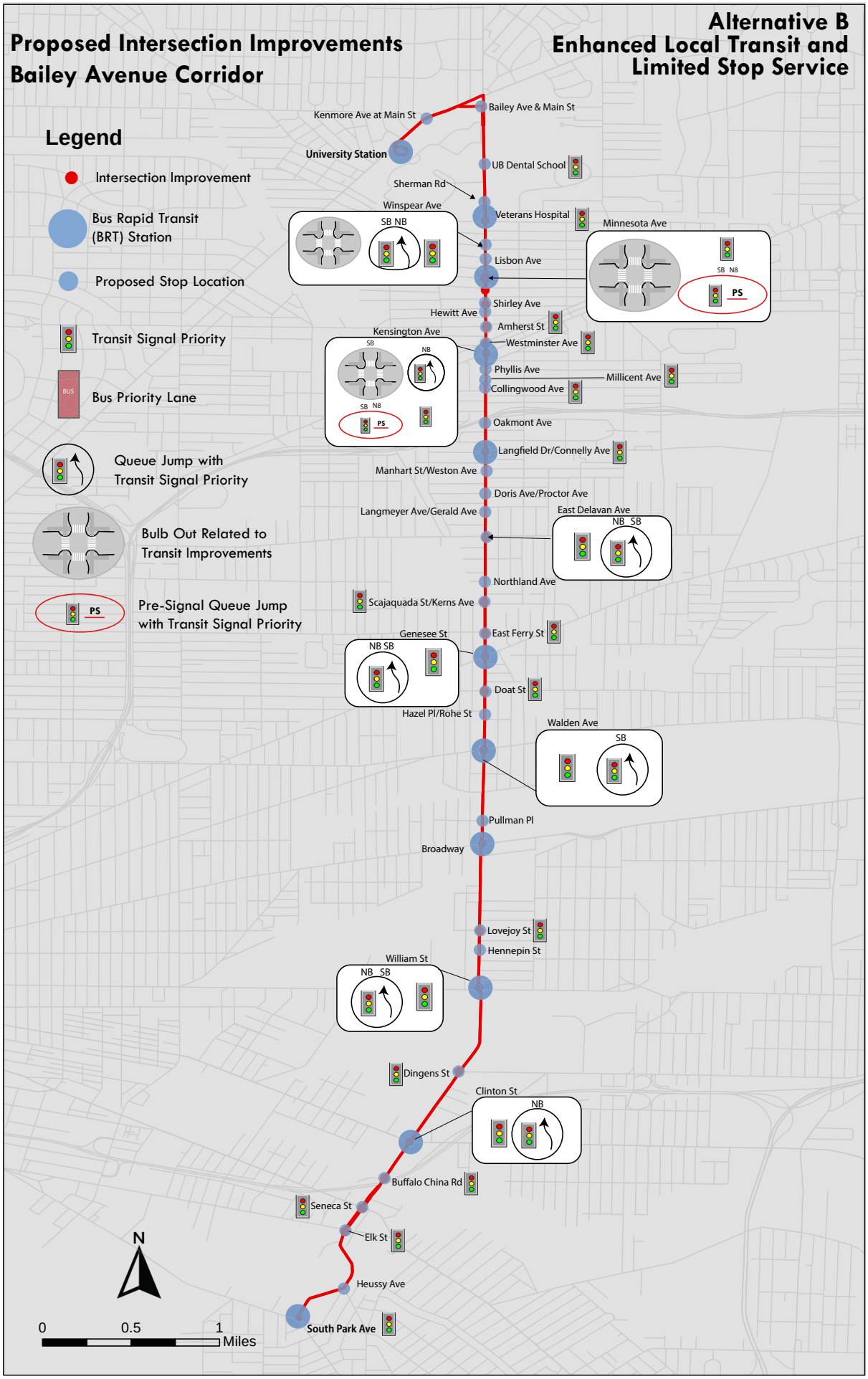
Miles

ALTERNATIVE B - ENHANCED LOCAL + LIMITED STOP SERVICE

Alternative B presents a medium capital cost approach to enhance bus service along Bailey Avenue. The concept includes a limited stop, frequent service route along Bailey Avenue, running in addition to local service. It would provide a faster service than is currently available in the corridor and, combined with improvements at the limited stops, would make longer trips less time consuming and more comfortable. The following description is preliminary and meant to provide a concept for further analysis, not a final capital improvement proposal.


Proposed Intersection Improvements
Bailey Avenue Corridor
Alternative B
Enhanced Local Transit and
Limited Stop Service
Legend
Intersection Improvement
Bus Rapid Transit (BRT) Station
Proposed Stop Location
Transit Signal Priority
Bus Priority Lane
Queue Jump with Transit Signal Priority
Bulb Out Related to Transit Improvements
Pre-Signal Queue Jump with Transit Signal Priority
Kenmore Ave at Main St
Bailey Ave & Main St
University Station
UB Dental School
Sherman Rd
Winspear Ave
SB NB
Veterans Hospital
Minnesota Ave
SB N8
PS
Lisbon Ave
Shirley Ave
Hewitt Ave
Amherst St
Kensington Ave
SB
NB
Westminster Ave
Phyllis Ave
Millicent Ave
Collingwood Ave
Oakmont Ave
Langfield Dr/Connelly Ave
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Doris Ave/Proctor Ave
Langmeyer Ave/Gerald Ave
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East Ferry St
Doat St
Hazel Pl/Rohe St
Walden Ave
Pullman Pl
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William St
Dingens St
Clinton St
Buffalo China Rd
Seneca St
Elk St
Heussy Ave
South Park Ave
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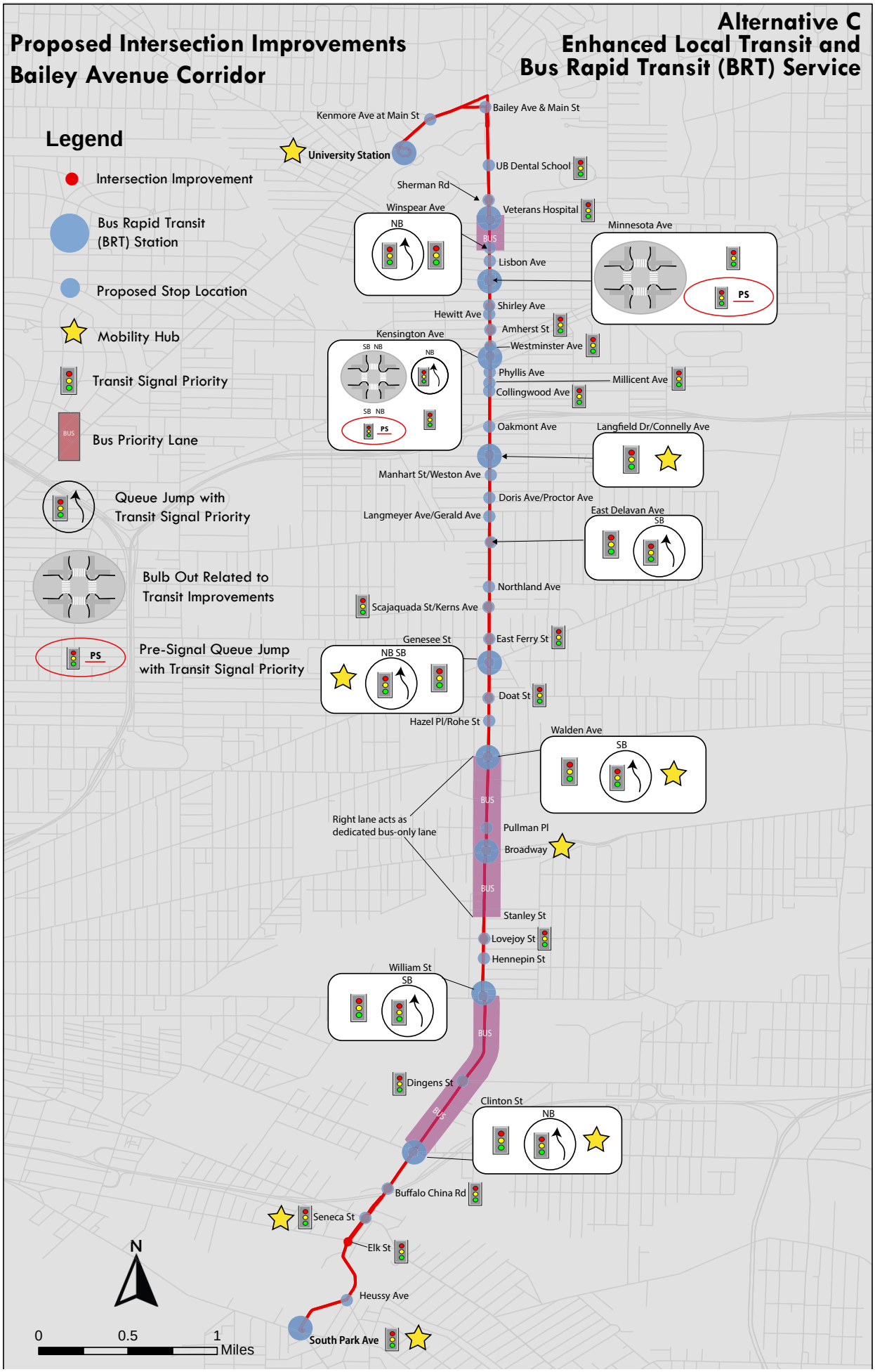
ALTERNATIVE C - ENHANCED LOCAL + BUS RAPID TRANSIT

Alternative C presents a higher capital cost approach to further enhance bus service along Bailey Avenue. The concept converts the limited stop route to a BRT route, running in addition to the existing local service. It would improve upon the limited stop route by adding Business Access Transit (BAT) lanes in sections of the corridor, which would provide an even faster service. Combined with improvements at the BRT stops to make them similar to light rail stations, it would continue to improve upon the service provided by the limited stop route in Alternative B. The following description is preliminary and meant to provide a concept for further consideration.

WHAT IS BUS RAPID TRANSIT?

Bus Rapid Transit or BRT is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at light rail level capacities. BRT can include dedicated bus lanes and bus priority to increase reliability and convenient bus services to its users.


Proposed Intersection Improvements
Bailey Avenue Corridor
Alternative C
Enhanced Local Transit and
Bus Rapid Transit (BRT) Service
Legend
Intersection Improvement
Bus Rapid Transit (BRT) Station
Proposed Stop Location
Mobility Hub
Transit Signal Priority
Bus Priority Lane
Queue Jump with Transit Signal Priority
Bulb Out Related to Transit Improvements
Pre-Signal Queue Jump with Transit Signal Priority
Kenmore Ave at Main St
Bailey Ave & Main St
University Station
UB Dental School
Sherman Rd
Winspear Ave
NB
Veterans Hospital
Minnesota Ave
PS
Lisbon Ave
Shirley Ave
Hewitt Ave
Amherst St
Kensington Ave
SB NB
NB
Westminster Ave
Phyllis Ave
Millicent Ave
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Oakmont Ave
Langfield Dr/Connelly Ave
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Doris Ave/Proctor Ave
Langmeyer Ave/Gerald Ave
East Delavan Ave
SB
Northland Ave
Scajaquada St/Kerns Ave
Genesee St
NB SB
East Ferry St
Doat St
Hazel Pl/Rohe St
Walden Ave
SB
BUS
Right lane acts as dedicated bus-only lane
Pullman Pl
Broadway
Stanley St
Lovejoy St
Hennepin St
William St
SB
Dingens St
Clinton St
NB
Buffalo China Rd
Seneca St
Elk St
Heussy Ave
South Park Ave
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CONSIDERATIONS APPLICABLE TO ALL ALTERNATIVES

Several additional design considerations are also recommended to complement transit improvements on Bailey Avenue. Recommendations include enhancements related to streetscape design, transit stops and station, and Smart City / Intelligent Transportation System Technology (ITS).

STREETSCAPE DESIGN

Streetscape improvements are recommended along Bailey Avenue to create a strong sense of place and connection between the neighborhood and its people; both residents and visitors, which will result in increased economic vitality along the corridor. The addition of pedestrian and bicycle facilities and infrastructure upgrades on Bailey Avenue are anticipated to transform the function and feel of the neighborhoods surrounding this roadway.

ROADWAY INFRASTRUCTURE

- Vehicle Lane Markings - striping to delineate travel, turning, and parking lanes are recommended to increase safety for all users.
- Sidewalks - replacement of sidewalks in poor condition is critical to ensure safe pedestrian movement.
- Curb Extensions (Bulb Outs) - curb extensions are recommended at intersections where transit enhancements are installed.

PLACEMAKING ELEMENTS

- Public Seating - placement of public seating along the corridor to encourage walkability and enhance sense of place.
- Bicycle Amenities - incorporation of amenities to enhance multi-modal options.
- Trees + Landscaping - incorporation of landscaping to soften the streetscape and add opportunities for shade and relaxation.
- Lighting - incorporation of street lighting to illuminate the roadway and create a more comfortable environment for users.

PLACEMAKING ON BAILEY AVENUE

Placemaking elements are important to incorporate with transit enhancements since they add vibrancy and creativity into the roadway infrastructure. Landscaping and planters, public art, and branded signage have the ability to change the public realm and create a more welcoming sense of place for residents and visitors. The pictures shown display potential placemaking elements that can be incorporated into the Bailey Avenue corridor and show the impact of placemaking on the streetscape.

TRANSIT STOPS AND STATIONS

Stops and stations bring together multiple transportation options in one location. There are four types of stops and stations proposed for Bailey Avenue transit improvements, including:

1. Basic Bus Stop
Basic bus stops provide an ADA-compatible paved area making it safe and convenient for all passengers to board and alight.

Basic NFTA Bus Stop with Signage and Amenities

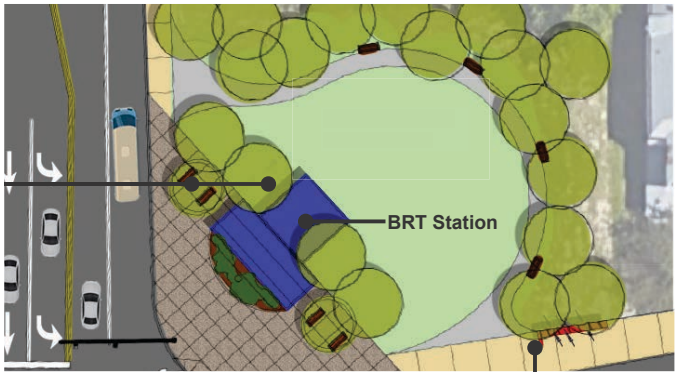
2. Bus Shelter
All bus stop locations should be installed where connections to other routes are available have at least a shelter with a bench and static route display that provides information related to NFTA route services and connections.

Newly branded NFTA Bus Shelters

3. BRT Bus Station
BRT bus stations are the most robust bus station option. These stations are prominently featured along the streetscape and are equipped with technology services and multi-modal connectivity. Specifically, at this type of bus station there could be real-time bus location information for transit users, fare collection services and a bike share facility and/or bike parking. The integration of technology into the BRT station will elevate the convenience and user-friendliness of the NFTA bus system. For example, providing real-time information to users will allow individuals more flexibility to adjust travel choices as changes occur. Additionally, providing bike share facilities in close proximity to the BRT station will afford individuals point-to-point transportation for shorter trips.

BRT Station

4. Mobility Hubs
Mobility hubs are BRT stations where connections to other forms of transportation are made. Convenient real time information and fare collection systems make connecting between modes fast, convenient and easy. BRT transportation options could include local buses on connecting routes, ride share and taxi, car share, park and ride, micro transit, bike share and bike storage, and new micro-mobility modes. The design of the mobility hub facilitates movement from one mode to the other for all users of the transportation system. Incorporation of green and civic space can also create a neighborhood center at mobility hub locations.



Mobility Hub / Greenspace Node

SMART TECHNOLOGY / INTELLIGENT TRANSPORTATION SYSTEM (ITS) TECHNOLOGIES

Traffic signal coordination, traffic signal priority, advanced analytics, and passenger information signs - were explored to improve traffic flow and reduce bus travel time along the corridor, provide improved data analysis, and improve trip information presented to travelers.Smart technology components are recommended for Bailey Avenue:

- Signal controllers are recommended for upgrade to support TSP and traffic signal coordination. The replacement of controllers and cabinets is dependent on the condition of the existing infrastructure. Modification of the overhead or underground infrastructure may also be necessary to accommodate a pre-signal queue jump display.

- Opticom GPS hardware is recommended for installation at 23 intersections along the Bailey Avenue corridor.

- Transparity central software, which is currently utilized by the City of Buffalo, should be continued. Additional licenses for Bailey Avenue intersections can be added to the existing system and offers a low cost way to implement remove management of Bailey Avenue intersections.

- MioVision should be deployed at Bailey Avenue intersections on an as needed basis. MioVision is recommended for 10 intersections along Bailey Avenue to facilitate signal timing optimization.

- Where in-ground detectors need to be replaced at other locations, a lower cost version of MioVision can provide video detection. The cost of this alternative may be very cost competitive with in-ground detectors.

ESTIMATED COSTS

Costs for smart technology installation along the Bailey Avenue corridor has been estimated. These costs should be considered preliminary and may need to be modified during the final design process.

TSP CONTROLLERS	QUANTITY	UNIT PRICE	TOTAL
Remove + Replace Controllers and Cabinets (with infrastructure changes)	2	$20,000	$40,000
Remove + Replace Controllers and Cabinets (with no infrastructure changes)	11	$14,000	$154,000
Remove + Replace Controllers only	14	$3,000	$42,000
Install Opticom	23	$10,000	$230,000
Miovision Traffic Link	10	$19,000	$190,000
Miovision Video Detection	10	$14,000	$140,000

*Design and contingency costs are not included

TOTAL $796,000

COSTS + IMPLEMENTATION

Operating and capital costs were estimated for proposed improvements along Bailey Avenue. A financing and funding plan was also developed and identifies potential funding sources to achieve the transit and physical improvements recommended for Bailey Avenue.

OPERATING COSTS

Operating costs were estimated as a base for comparison of the alternatives and whether they are worth implementing given their benefit in terms of more frequent service, reduced travel time, and travel convenience and comfort. The estimated baseline operating cost of existing service is $3,958,000. Alternative A is estimated to cost $4,645,000 annually to operate, or 17% more than the baseline. Alternative B is estimated to cost $4,969,000 or 26% more and Alternative C is estimated to cost $5,308,000 or 34% more. Each of the alternatives provided a reasonable level of improvements in frequency and travel time for the estimated annual operating cost incurred.

ANNUAL OPERATING COSTS

BASELINE COST OF EXISTING SERVICE	$3,958,000	
ALTERNATIVE A	$4,645,000	+ $687,000
Increase from Baseline Cost		
ALTERNATIVE B	$4,969,000	
Increase from Baseline Cost		+ $1,011,000
ALTERNATIVE C	$5,308,000	
Increase from Baseline Cost		+ $1,350,000

CAPITAL COSTS - STREETSCAPE IMPROVEMENTS

Recommended capital improvement costs were estimated by segment to facilitate more manageable implementation. These cost estimates include improvements recommended along Bailey Avenue including intersection and streetscape enhancements. Encompassing improvements include sidewalk construction, curb ramps, street tree planting, lighting, as well as streetscape features (bus shelters, benches, bike racks, trash receptacles, planters, and kiosks). Streetscape estimates also include budget for placement of future conduit to support utility expansion, if needed.

SEGMENT	ESTIMATED COST
Main Street to Winspear Avenue	$4,000,000
Winspear Avenue to Kensington Avenue	$8,500,000
Kensington Avenue to E. Delavan Avenue	$9,500,000
E. Delavan Avenue to Genesee Street	$5,500,000
Genesee Street to Broadway	$8,400,000
Broadway to Williams Street	$5,800,000
Williams Street to Clinton Street	$5,700,000
Clinton Street to South Park Avenue	$6,000,000
TOTAL	$53.4 M

FUNDING OPPORTUNITIES

A funding and financial plan containing a number of state and federal funding programs can be utilized to implement transit and transportation enhancements along Bailey Avenue. Implementing these improvements will require coordination between multiple agencies and organizations, including the City of Buffalo, New York State Department of Transportation and NFTA.

Capital improvements, such as streetscape enhancements, can be implemented separate from transit improvements, if necessary.

SOURCE	PROGRAM
TRANSIT ENHANCEMENTS	
New York State Department of Transportation	Transit State Dedicated Fund (SDF) Program
	Statewide Mass Transportation Operating Assistance (STOA) and Mass Transportation Trust Fund
	Public Transportation Modernization and Enhancement Program
	Accelerated Transit Capital (ATC) program
	State Omnibus and Transit Purpose Appropriations
Empire State Development	Buffalo Billion II East Side Corridor Economic Development Fund
	Transit Oriented Development (TOD)
	Buffalo Main Streets Initiative
	WNY Regional Economic Development Council
U.S. Department of Transportation	Better Utilizing Investments to Leverage Development (BUILD)
FHWA / EPA	Congestion Mitigation and Air Quality (CMAQ) Improvement Program
	Transportation Infrastructure Finance and Innovation Act (TIFIA) Program
	Surface Transportation Block Grant (STBG)
U.S. Department of Commerce	EDA Public Works Program
Federal Transit Administration	Section 5309 Capital Investment Grant (CIG) – "New Starts or Small Starts"
	Section 5339 Grants for Buses and Bus Facilities Program
	Section 5339 (c) Low or No Emission Vehicle Program
	Advanced Transportation and Congestion Management Technologies Deployment
NITTEC	Revolving Loan Fund
STREETSCAPE ENHANCEMENTS	
Utilities	Main Street Revitalization Program
	Charge NY
	Electric Transportation and Charging Program
	PILOT Increment Financing (PIF)
New York State	Transportation Alternatives Program (TAP)
	Green Innovation Grant Program (GIGP)
	New York Main Street Program (NYMS)
U.S. Department of Transportation	Consolidated Local Street and Highway Improvement Program (CHIPS) - NYS Administered
	Highway Safety Improvement Program (HSIP)

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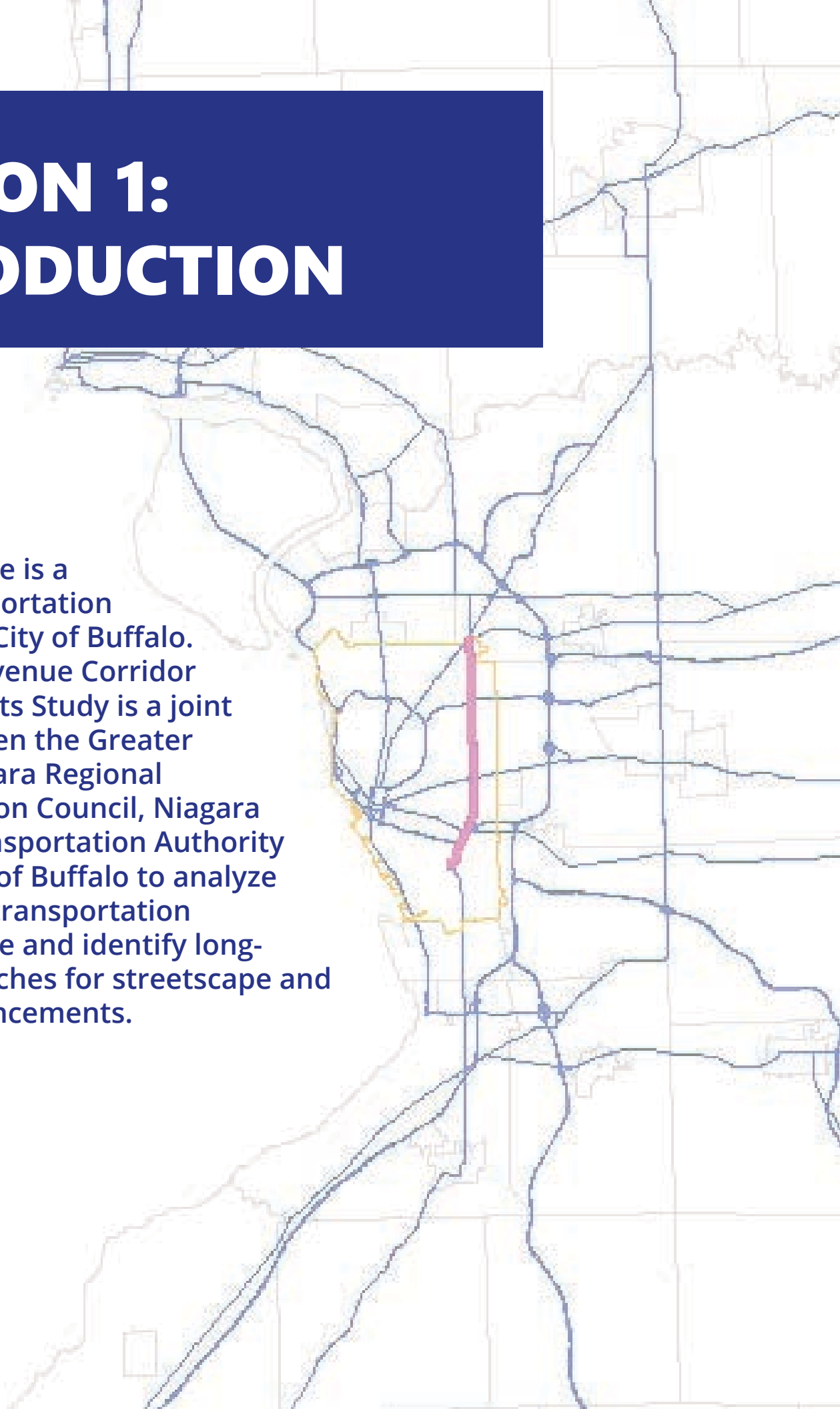
SECTION 1: INTRODUCTION

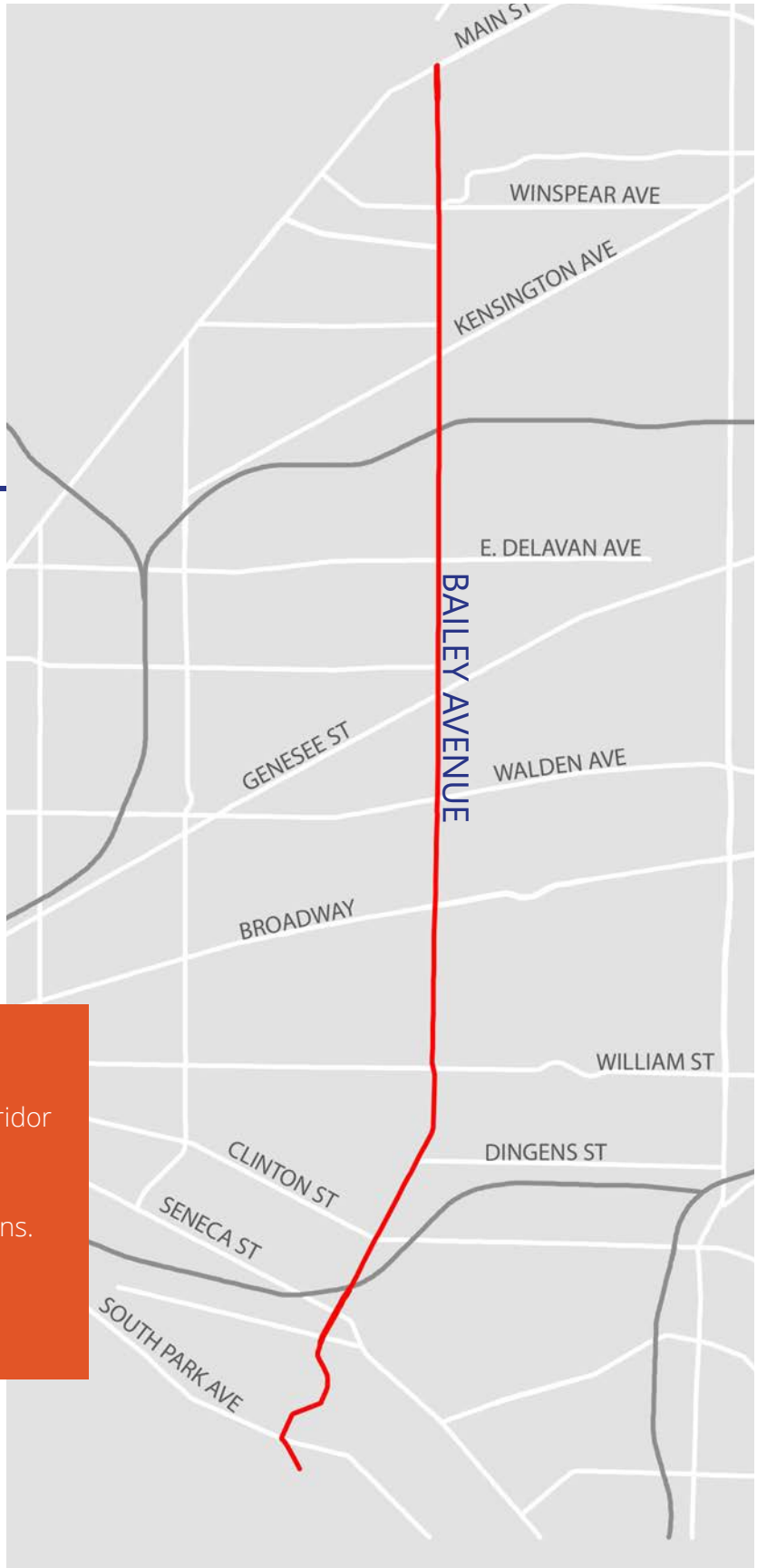


Bailey Avenue is a major transportation route in the City of Buffalo. The Bailey Avenue Corridor Improvements Study is a joint effort between the Greater Buffalo Niagara Regional Transportation Council, Niagara Frontier Transportation Authority and the City of Buffalo to analyze the existing transportation infrastructure and identify long-term approaches for streetscape and transit enhancements.

STUDY AREA

Bailey Avenue is a major north-south corridor serving the greater Buffalo metropolitan region. This study focuses on a 7.5-mile section of Bailey Avenue from Main Street to South Park Avenue. The corridor has a variety of land use types ranging from institutional and commercial to residential.

BAILEY AVENUE CORRIDOR STUDY AREA



PURPOSE OF THE STUDY

The neighborhoods in this area have experienced economic decline and infrastructure deterioration. Areas of the roadway are unsafe for pedestrians and bicyclists and public transportation options experience delays and inefficiencies. Opportunities to improve mobility for all users exist due to the roadway's current activity levels and its investment potential. This study will help inform the City of Buffalo and the NFTA's stakeholders and decision-makers on future improvements, and will guide conversations about roadway and streetscape design, and transit options.

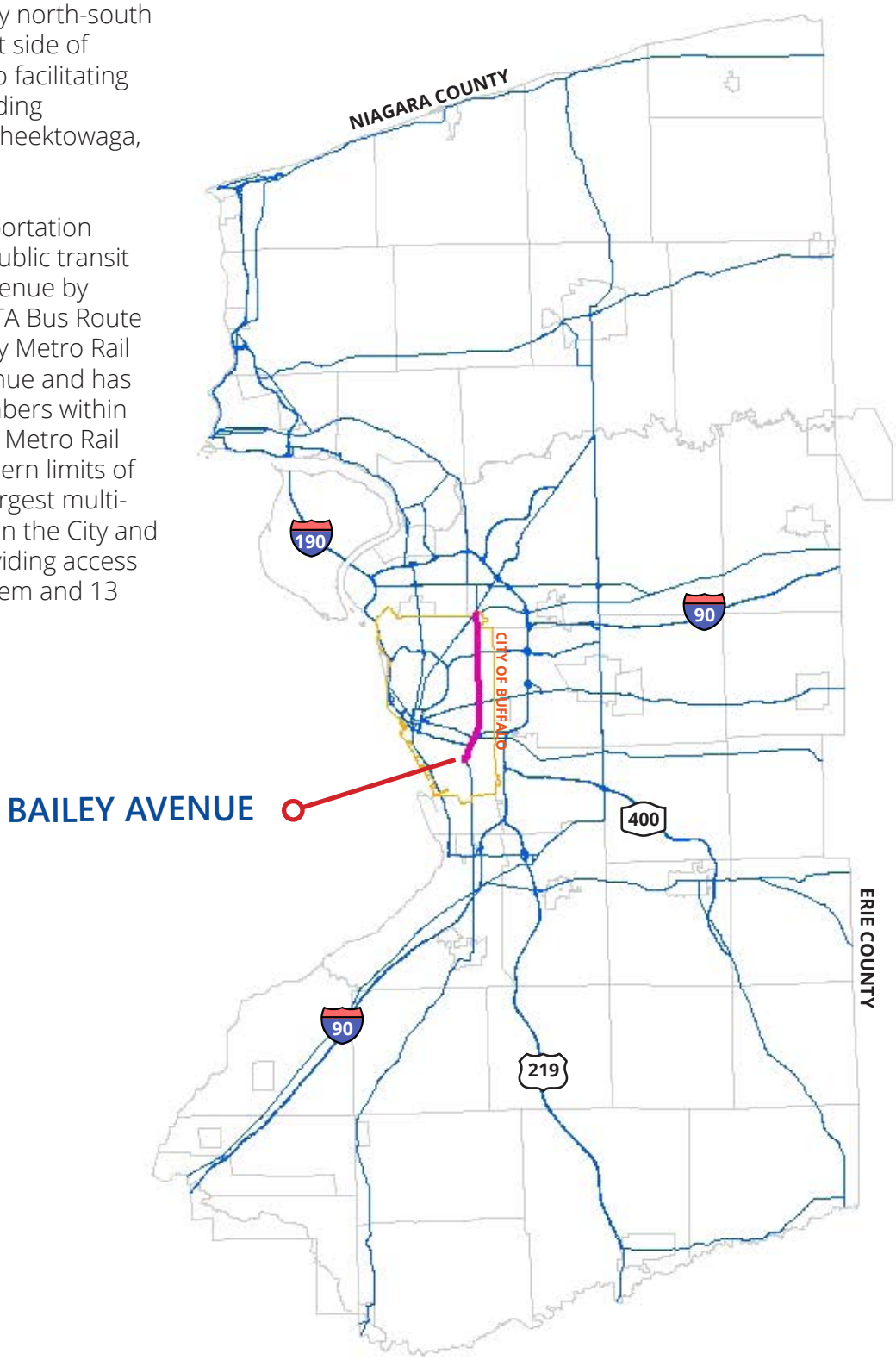
WHAT IS A FEASIBILITY STUDY?

- Examines current conditions along the corridor to assess physical space and current use.
- This study does not recommend a single alternative, but instead offers several options.
- This study sets the stage for future grant funding from the state and federal government.

REGIONAL FRAMEWORK

Bailey Avenue provides a key north-south connection through the east side of the City of Buffalo, while also facilitating connections to the surrounding municipalities of Amherst, Cheektowaga, and Lackawanna.

The Niagara Frontier Transportation Authority (NFTA) operates public transit bus services along Bailey Avenue by means of Bus Route 19. NFTA Bus Route operates between University Metro Rail Station and South Park Avenue and has the strongest ridership numbers within the NFTA system. University Metro Rail Station, located at the northern limits of the corridor, is one of the largest multi-modal transportation hubs in the City and Buffalo-Niagara region, providing access to the public transit rail system and 13 bus routes.

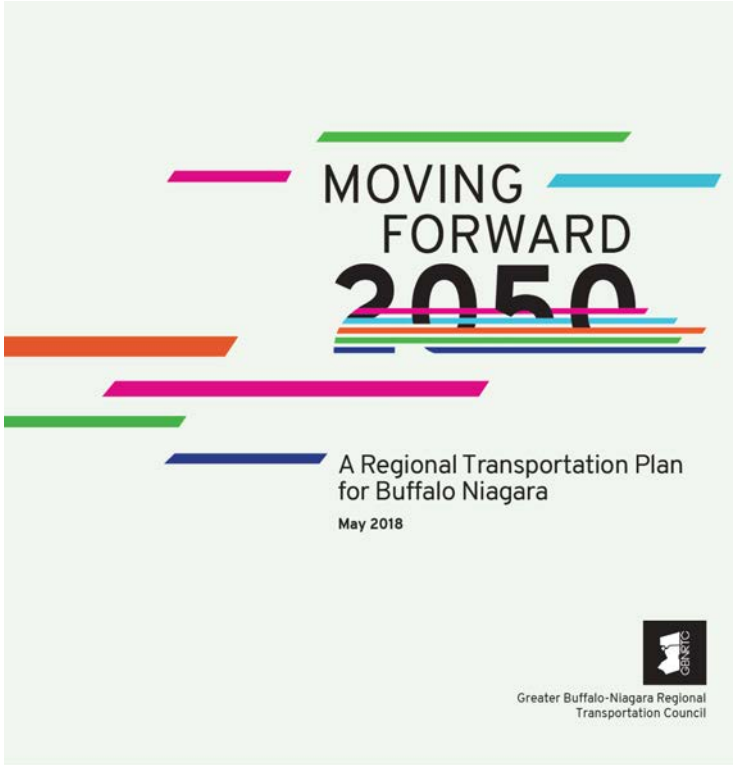


RECENT INITIATIVES

Local agencies and community organizations have helped lay the framework for future Bailey Avenue improvements. The initiatives completed by these agencies and organizations are described in this section.

MOVING FORWARD 2050

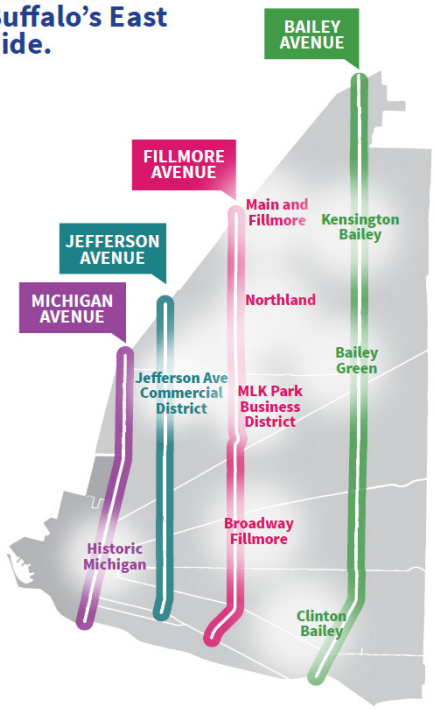
The Greater Buffalo Niagara Regional Transportation Council (GBNRTC), the regional Metropolitan Planning Organization, is a partnership of local and state governments that develops transportation plans and programs for the region. Moving Forward 2050, a Metropolitan Transportation Plan developed by GBNRTC, allocates federal, state and local dollars to transportation improvement projects and sets a vision for the region's future. This plan describes strategies for mobility and technology improvements to accommodate anticipated development and effectively provide adequate multi-modal access to Buffalo-Niagara residents.



EAST SIDE CORRIDOR ECONOMIC DEVELOPMENT FUND

A total of $65 million was dedicated to revitalization efforts on the City of Buffalo's East Side as part of the Buffalo Billion Phase II. Bailey Avenue was selected as one of four corridors for public investment focused on creating mixed-use walkable districts, workforce development and strengthening commercial corridors. Community input facilitated the development of an overarching priority for Bailey Avenue, to create "complete street that accommodates all modes of transport and serves all ages". The investment portfolio includes direct funding, programs, and infrastructure that will be allocated to each of the four corridors over the next five years.

Corridors and investment areas on Buffalo's East Side.



BUFFALO BICYCLE MASTER PLAN

The City of Buffalo developed the Buffalo Bicycle Master Plan in January 2016. This master plan provides a blueprint for the expansion of Buffalo's existing bicycle network, and outlines a phased approach to implementation. The plan recommends 300 miles of bikeways to be implemented within the City over the next 10 years.

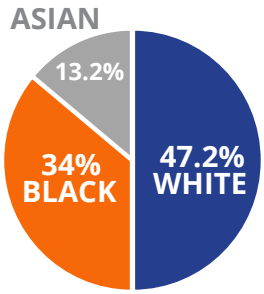
BETTER ON BAILEY: INFRASTRUCTURE PLAN

This plan was developed for the University District Community Development Association (UDCDA) in August 2018. The plan identified deficiencies of the transportation infrastructure on Bailey Avenue and recommended potential improvements. Recommendations made by UDCDA included sidewalk reconstruction, installation of pedestrian infrastructure, implementation of a facade improvement program and infill development.

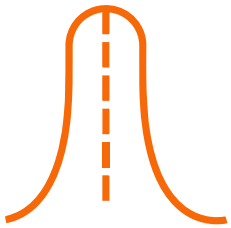
DEMOGRAPHIC SNAPSHOT

Demographic and economic information is often utilized to understand a community and plan for resident needs. Data, such as population trends, median household income, unemployment rate and other representative figures help planners identify potential opportunities. The following figures present a snapshot of demographic conditions for the Bailey Avenue corridor from Main Street to South Park Avenue.

There are 3,395 people living along the Bailey Avenue corridor.

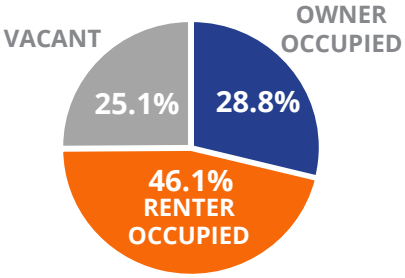


The Bailey Avenue corridor is racially diverse.



The corridor has a young population with a median age of 22.2 years old.

The median household income of residents along the corridor is $28,078.



The majority of residents rent their homes and approximately 25% of the corridor has vacant housing units.

The corridor has a high unemployment rate of 18.2%.

There are 183 business along the corridor, 75% of which are service-related.

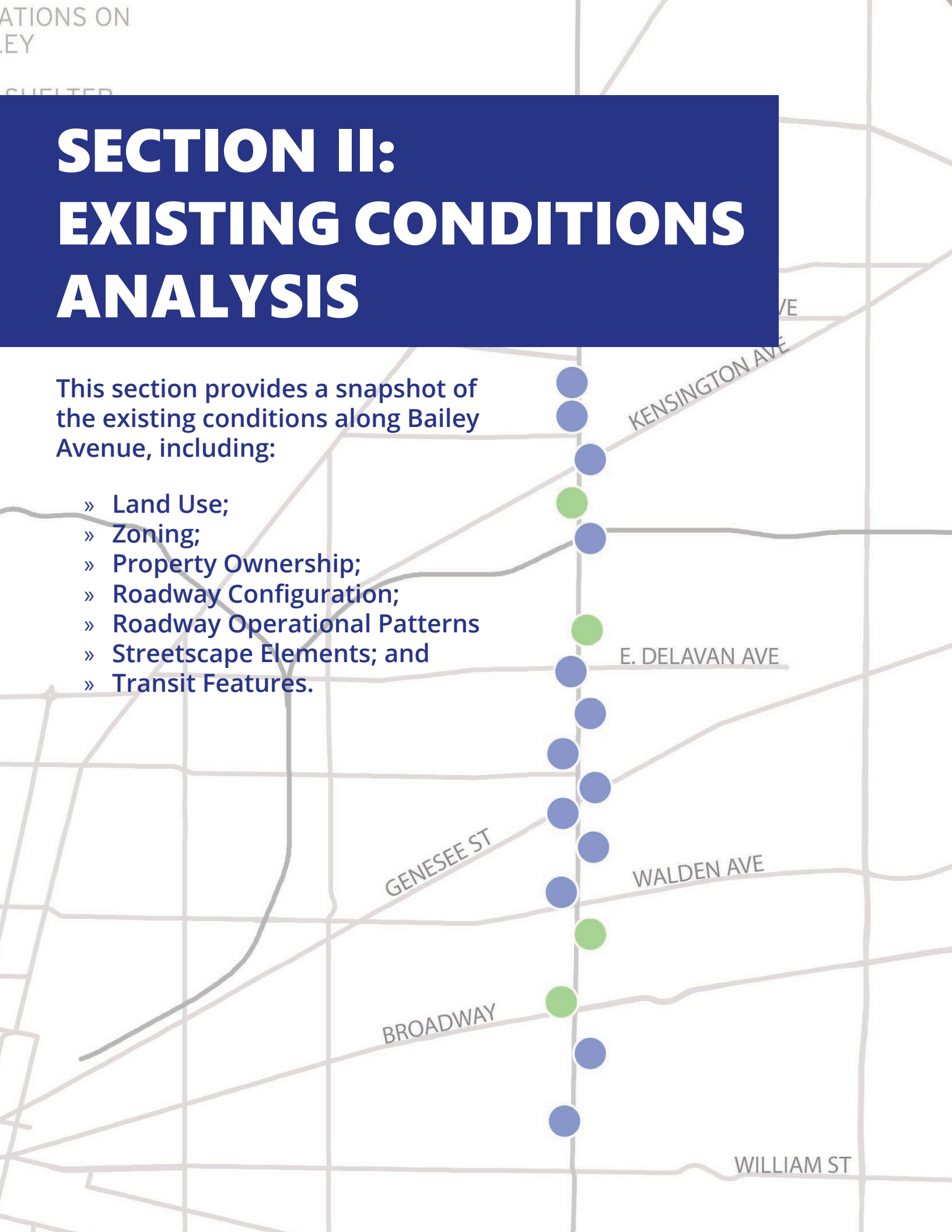
Bailey Avenue businesses employ 4,761 people.

Approximately 16% of residents utilize public transportation to travel to their place of work.

SECTION II: EXISTING CONDITIONS ANALYSIS

This section provides a snapshot of the existing conditions along Bailey Avenue, including:

- Land Use;
- Zoning;
- Property Ownership;
- Roadway Configuration;
- Roadway Operational Patterns
- Streetscape Elements; and
- Transit Features.



LAND USE

To understand the context of the Bailey Avenue Corridor it is important to understand current usage, beginning with existing land use patterns. Land uses are classified based on New York State Property Class codes.

The land use map (Map 1) shows the existing land use patterns along Bailey Avenue. The corridor is primarily commercial and generally well-served with community services. Commercial uses, such as small-scale retail, are seen along Bailey Avenue. Community services also exist along the corridor in the form of religious, educational and medical institutions. For example, the University at Buffalo (UB) South Campus and the Buffalo Veterans Affairs Hospital are located on the northern end of the corridor and encompass approximately 160 acres.

Primarily residential areas along the corridor comprise approximately 5% of the corridor's land uses. These areas are defined by single- and two-family homes interspersed with commercial and service uses. These residential areas are concentrated north of UB and between Delavan Avenue to William Street.

952 ACRES

5% RESIDENTIAL

7% VACANT

30% COMMUNITY SERVICES

28% COMMERCIAL

8% INDUSTRIAL

4% PUBLIC SERVICES

17% RECREATION & CONSERVATION

*Data for this section includes the parcels with block faces along the Bailey Avenue Corridor.
*Land uses were identified using GIS parcel data derived from Erie County, NY (2019). Land uses were categorized based on New York State Property Class Code classifications.

MAP 1: GENERALIZED LAND USE ALONG BAILEY AVENUE

ZONING

Zoning refers to the laws that dictate how property can be used and what type of development can take place within a municipality. The recently adopted Green Code is the primary regulation code governing development in the City of Buffalo. There are 10 zoning districts that apply to Bailey Avenue. A description of these districts is provided below and in Map 2.

N-3C MIXED USE CENTER

The N-3C zone addresses mixed-use, walkable centers in the City of Buffalo. These areas were originally served by Buffalo's streetcar system. Generally, development in these areas allow for carriage house, civic buildings, and commercial block buildings designed to facilitate a vertical mix of uses and pedestrian-friendly ground floor retail and upper floor residential.

N-3E MIXED USE EDGE

The N-3E zone addresses transitional areas and are typically located at the edges of more intense mixed-use centers. These areas are defined primarily by a mix of homes and stores.

N-3R RESIDENTIAL

The N-3E zone addresses residential areas adjoining the centers of Buffalo's streetcar neighborhoods. These areas as generally defined by moderately compact residential blocks, which occasionally include mixed-use buildings.

D-E EDUCATIONAL CAMPUS

The D-E zone addresses educational campuses. The UB South Campus on the northern end of the Corridor falls under this zone.

D-M MEDICAL CAMPUS

The D-M zone addresses medical campuses, which are either primarily single-use or mixed-use. The Buffalo VA Hospital on the northern end of the Corridor falls under this zone.

D-R RESIDENTIAL CAMPUS

The D-R zone addresses residential campuses, sometimes comprised of garden apartments or towers in a park. The Buffalo Municipal Housing Authority (BMHA) Geary Apartment building, near Hennepin Street, is categorized under this zone.

D-S STRIP RETAIL

The D-S zone addresses strip retail development, which may be mixed-use or contain prominent parking areas. These areas may be centered around one or more "big box" format buildings and are typically located adjacent to broad arterials or highway access points.

D-IL LIGHT INDUSTRIAL

The D-IL zone addresses sites intended for low- to moderate- impact employment uses, which may benefit from close proximity to mixed-use residential neighborhoods. These areas are typically located adjacent to highway, rail, and water access points.

D-OG GREEN

The D-OG zone addresses civic greens and parks, characterized primarily by trees and landscape. These areas are designed for passive or recreational use.

C-R RAIL

The C-R zone addresses rail lines and yards, including vacant rights-of-way, and are intended to be reserved as permanent transportation corridors. A few parcels near the intersection of Bailey and William Street are zoned C-R at an existing rail corridor that crosses over Bailey Avenue.

MAP 2: GENERALIZED ZONING MAP

KEY TAKEAWAY

Zoning provides context for understanding future development potential, population patterns, and evaluation of transportation alternatives.

PROPERTY OWNERSHIP

Property ownership patterns provide a better understanding of current land use and the type of developments that may be proposed in the future. Property ownership for this section was calculated using parcels with block faces along Bailey Avenue. It should be noted that the ownership percentages do not represent the total land frontage on Bailey Avenue.

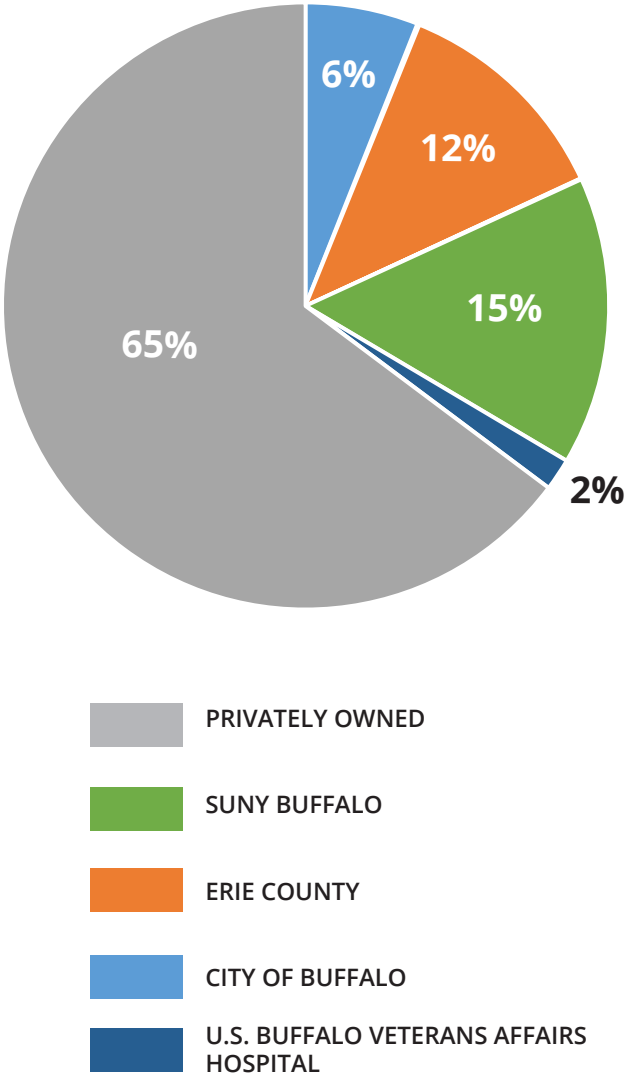
The majority of properties adjacent to Bailey Avenue are privately owned (65%) ; however, there are several public entities that own land along the corridor, including Erie County, the City of Buffalo, the State University of New York at Buffalo, and the United States Veterans Affairs.

The City of Buffalo owns 116 parcels comprising approximately 57 acres along Bailey Avenue. These include 102 parcels categorized as vacant commercial and residential land, 13 community service parcels, including parks, schools, police and fire service and one City water and sewer facility.

Erie County owns 114 acres along the corridor, which include land in association with the Grover Cleveland Golf Course and land held under the Buffalo Erie Niagara Land Improvement Corporation.

The State University of New York at Buffalo owns University at Buffalo South Campus at the northern limits of the corridor.

The Buffalo Veterans Affairs Hospital on the northern end of Bailey Avenue is federally owned.



KEY TAKEAWAY

Public entities make up a large percentage of property ownership on the corridor. Future land use and transportation alternatives may be easier to implement due to public ownership.

PARKS AND OPEN SPACE

Destinations and amenities that people walk to, or walk from, are called "pedestrian generators". Parks and open spaces are significant pedestrian generators, especially in urban cities. Bailey Avenue has a number of parks, open spaces, and recreational amenities within a 1/2 mile walk. Understanding the nearby pedestrian generators helps to provide better context and insight for future Bailey Ave improvement recommendations.

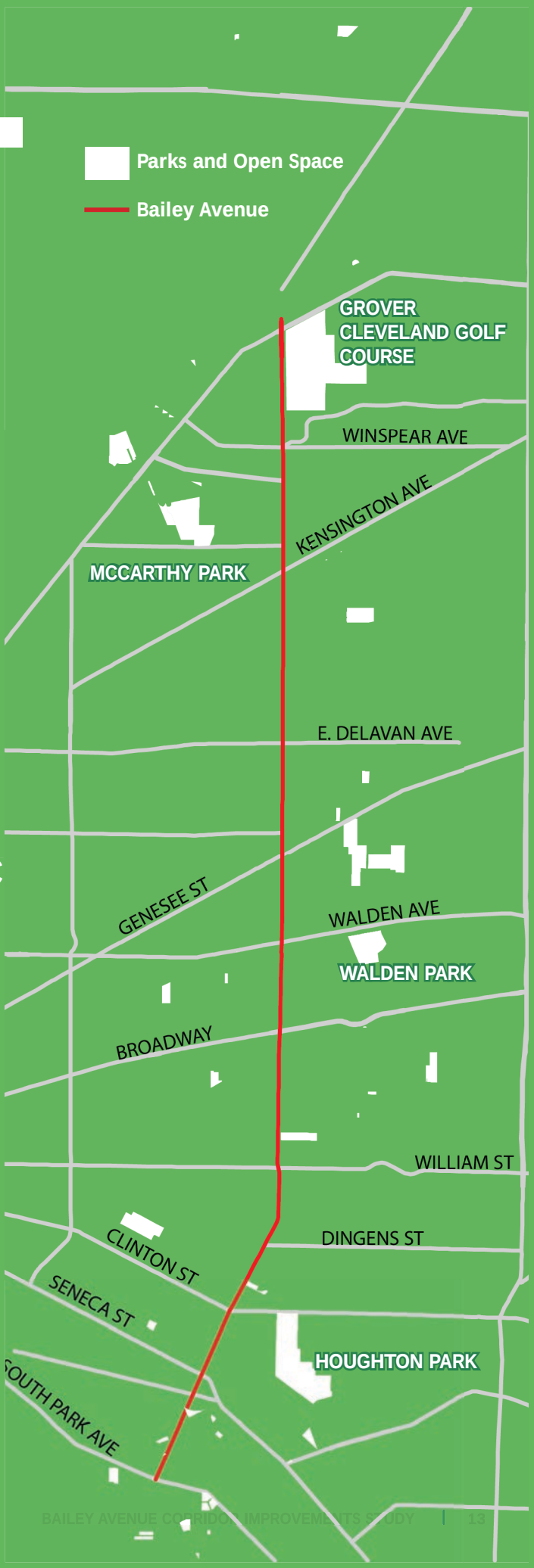
54 RECREATIONAL AMENITIES WITHIN 1/2 MILE OF CORRIDOR

- 47 PARKS/ OPEN SPACES
- 1 GOLF COURSE
- 1 YMCA
- 2 INDOOR REC. CENTERS
- 2 BOWLING ALLEYS
- 1 ATHLETIC FIELD

WALKING DISTANCE

People's willingness to walk varies greatly, depending on age, health, time availability, quality of surroundings, safety, and climate. Most people are willing to walk up to 1/2 mile to a recreation-based destination.

1/2 mile = ~ 9 minutes



ROADWAY CONFIGURATION

This section examines the existing curb-to-curb transportation infrastructure along Bailey Avenue, including:

- Lane Use
- Traffic Signals
- Bicycle Accommodations
- Pedestrian Crossings

Bailey Avenue near Highgate Avenue is absent of pavement markings.

LANE USE

The curb-to-curb width of Bailey Avenue ranges between 40 and 50 feet. The number of vehicular travel lanes range between two and four throughout the corridor, with some two lane sections operating as four lanes where street parking is prohibited or not being utilized.

On street bicycle infrastructure, separated from vehicular traffic, is generally not present throughout the corridor, with the exception of a segment between Elk Street and McKinley Parkway where there are dedicated bicycle lanes within the roadway shoulders.

The segments of Bailey Avenue with two travel lanes generally allow for short-term on-street parking on both sides of the street, but parking regulations and associated signage tend to be inconsistent or unclear. Where street parking is permitted, posted restrictions include no parking during peak travel hours (7 AM to 10 AM and 4 PM to 7 PM) and no parking overnight (1:30 AM to 7 AM) in the winter (November 15 - April 1) for bus route snow clearing.

The segments of Bailey Avenue with four travel lanes prohibit parking on both sides of the street at all times. This includes the roadway sections from Main Street to Winspear Avenue, William Street to Clinton Street, and Walden Avenue to Stanley Street.

A four-lane section of Bailey Avenue near Genesee Street.

A two-lane section of Bailey Avenue near Minnesota Ave that operates as four lanes when street parking is prohibited or not being utilized.

TABLE 1: EXISTING ROADWAY LANE USE AND PARKING REGULATIONS

FROM	TO	VEHICULAR TRAVEL LANES	CURB-TO-CURB WIDTH (FT)	EXISTING STREET PARKING REGULATIONS*	SEPARATED BIKE INFRASTRUCTURE
Main St	Winspear Ave	4	49	No parking	No
Winspear Ave	E. Delavan Ave	2 to 4	49	2-hour parking 7 AM - 7 PM	No
E. Delavan Ave	Kerns Ave	2 to 4	40	No standing 7 -10 AM and 4-7 PM	No
Kerns Ave	Genesee St	2 to 4	40	No parking	No
Genesee St	Walden Ave	2 to 4	40	No standing 7 -10 AM and 4-7 PM	No
Walden Ave	Stanley St	4	48	No parking	No
Stanley St	William St	2 to 4	40	No standing 4 -7 PM	No
William St	Clinton St	4	50	No parking	No
Clinton Street	South Park Ave	4	50	No parking	Elk St to South Park Ave

*Note: This column generalizes the observed existing parking regulations along Bailey Avenue, Parking regulations tend to be inconsistent or unclear.

MAP 3: GENERALIZED ROADWAY CONFIGURATION ON BAILEY AVENUE

TRAFFIC SIGNALS

There are 31 traffic signals along Bailey Avenue within the study area. Of those, 30 signals are owned by the City of Buffalo and operate with National Electrical Manufacturers Association (NEMA) protocols. The exception is the signal at the bus lay-by within the University at Buffalo, just south of Main Street, which is owned by the New York State Department of Transportation (NYSDOT).

COMMUNICATIONS INFRASTRUCTURE

According to Northeast Signal, Inc. there are no wired communications along Bailey Avenue; however, underground fiber optic cable does connect to Bailey Avenue from Buffalo City Hall near the Kensington Expressway. Two wireless communications systems exist; one covering Bailey Avenue north of Route 33 and the other covering Bailey Avenue south of Route 33. It is unknown who owns these systems.

VEHICLE DETECTION

Vehicle detection along Bailey Avenue and its cross streets is provided by in-ground detectors. These detectors are able to sense the presence of vehicles and provide an output signal to traffic lights along Bailey Avenue. Bailey Avenue contains mainline detectors at signals with left hand turn bays, while cross streets intersecting with Bailey Avenue are equipped with side street detectors. Many of the cross street vehicle detectors are inoperable, which does not allow Bailey Avenue signals to detect side street vehicle demand. This results in uncoordinated signal timing on Bailey Avenue, reflected through more red lights that cause increased traffic delays.

SIGNAL COORDINATION

The National Electrical Manufacturers Association (NEMA) protocol allows coordination between adjacent NEMA controllers but will not communicate with 2070 controllers without translating the signal. Existing signals along the Bailey Avenue Corridor are not currently coordinated with the adjacent intersection, nor do they share communication between intersections.

The National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) is a family of standards designed to achieve interoperability and interchangeability between computers and electronic traffic control equipment from different manufacturers.

MAP 4: TRAFFIC SIGNAL LOCATIONS

TABLE 2: EXISTING TRAFFIC SIGNALS ALONG BAILEY AVENUE

		OWNER	SIGNAL CONTROLLER TYPE (NEMA OR 2070)	SIGNAL CONTROLLER MANUFACTURER	SIGNAL CONTROLLER MODEL
1	E Main Street	City of Buffalo	NEMA	PEEK	3000E
2	E Main (South) Street/UB Exit Driveway	NYSDOT	2070	PEEK	3000E
3	Sherman Street (UB Entrance)	City of Buffalo	NEMA	PEEK	3000E
4	VA Medical Center Driveway/ Coal Street	City of Buffalo	NEMA	PEEK	3000E
5	Winspear Avenue	City of Buffalo	NEMA	PEEK	3000E
6	Minnesota Avenue	City of Buffalo	NEMA	PEEK	3000E
7	Dartmouth Avenue	City of Buffalo	NEMA	PEEK	3000E
8	Fire Station 23/Hewitt Avenue	City of Buffalo	NEMA	PEEK	3000E
9	E Amherst Street	City of Buffalo	NEMA	PEEK	3000E
10	Westminster Avenue	City of Buffalo	NEMA	PEEK	3000E
11	Kensington Avenue	City of Buffalo	NEMA	PEEK	3000E
12	Collingwood Avenue/ Millicent Avenue	City of Buffalo	NEMA	PEEK	3000E
13	Cloverdate Avenue/Ruspin Avenue	City of Buffalo	NEMA	PEEK	3000E
14	Connelly Avenue/Langfield Drive	City of Buffalo	NEMA	PEEK	3000E
15	Gerald Avenue/Schreck Avenue	City of Buffalo	NEMA	McCain	ATCx
16	E Delavan Avenue	City of Buffalo	NEMA	PEEK	3000E
17	Scajaquada Street/Kerns Avenue	City of Buffalo	NEMA	McCain	ATCx
18	E Ferry Street	City of Buffalo	NEMA	PEEK	3000E
19	E Genesee Street	City of Buffalo	NEMA	PEEK	3000E
20	Doat Street/Mueller Street	City of Buffalo	NEMA	PEEK	3000E
21	Walden Avenue	City of Buffalo	NEMA	PEEK	3000E
22	Broadway	City of Buffalo	NEMA	PEEK	3000E
23	Pedestrian Signal @ Hennepin Park	City of Buffalo	NEMA	PEEK	3000E
24	E Lovejoy Street	City of Buffalo	NEMA	PEEK	3000E
25	William Street	City of Buffalo	NEMA	US Traffic	3000
26	Dingens Street	City of Buffalo	NEMA	Gramtronix	
27	Clinton Street	City of Buffalo	NEMA	McCain	ATCx
28	Seneca Street	City of Buffalo	NEMA	PEEK	LMD
29	Elk Street	City of Buffalo	NEMA	PEEK	LMD
30	McKinley Avenue	City of Buffalo	NEMA	McCain	ATCx
31	South Park Avenue	City of Buffalo	NEMA	PEEK	3000E

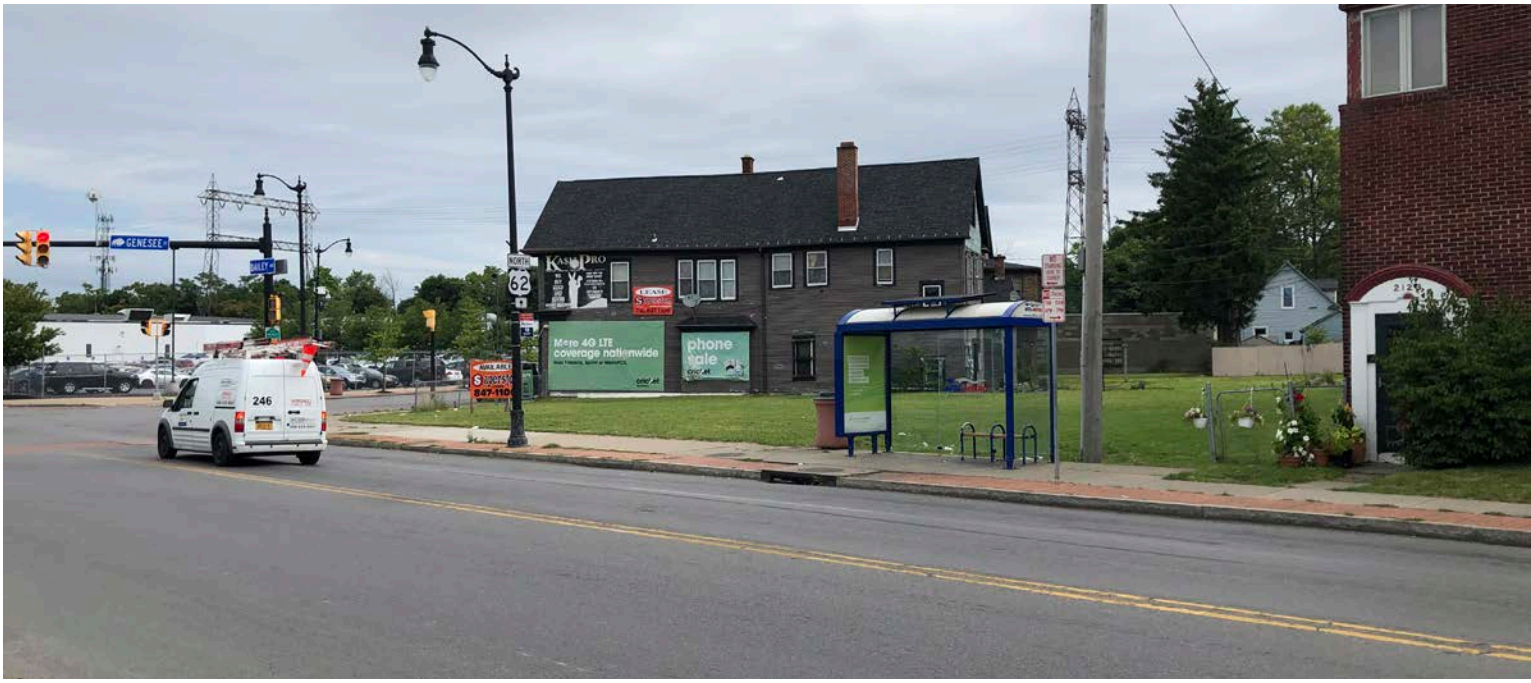
PAVEMENT MARKINGS

Pavement markings on Bailey Avenue are generally in poor condition. Centerline stripes are worn or not present and, in many cases, there is no defined delineation between travel lanes and parking lanes. This leads to confusion regarding lane usage throughout the corridor, with parking lanes often acting as travel lanes when not being utilized.

KEY TAKEAWAY

The lack of pavement markings on the Bailey Avenue Corridor is one of the most pressing issues in terms of the Corridor's function and safety. Many long sections of the Corridor have severely faded lane delineations while other sections appear to have no lane delineations at all. This presents many issues; vehicles are not sure of where they are able to drive, and pedestrians and bicyclists do not have safe spaces to be present on the roadway.

A lack of pavement markings can be seen on Bailey Avenue near Highgate Avenue.



Faded pavement markings can be seen on Bailey Avenue near Genesee Street.

BICYCLE ACCOMMODATIONS

Bailey Avenue is identified as a route for future study in the City of Buffalo's Bicycle Master Plan. On-road accommodations, such as dedicated bicycle lanes are present on the corridor from Elk Street to South Park Avenue. There are a total of six bicycle racks along the corridor.

Several streets that intersect with Bailey Avenue are recommended for bicycle facilities, as described in the Buffalo Bicycle Master Plan; however, the only intersecting roadway containing bicycle facilities is west of Bailey Avenue on Broadway.

MAP 5: BUFFALO BIKE MASTER PLAN

BUFFALO'S BIKE MASTER PLAN

The City of Buffalo's Bike Master Plan identified roadways within the City of Buffalo that could potentially support bicycle accommodations. According to this plan there are several segments with either available curb-to-curb width or 4-lane roadways with AADT volumes that could accommodate a road diet. Several segments of Bailey Avenue were identified as somewhat- to not- feasible for a road diet and likely not feasible to accommodate on-street bicycle amenities.

PEDESTRIAN CROSSINGS

Pedestrians crossing Bailey Avenue must contend with high traffic volumes and vehicular speeds. Crosswalk markings and pedestrian safety features are faded or non-existent at most signalized intersections. There are limited pedestrian-activated signals along the corridor. These signals typically contain a pedestrian push-button that activates the signal with a pedestrian crossing time. Based on field observations, the highest utilized signal is located at Westminster Avenue, which is used by students attending Westminster Community Charter School.

Combined with the faded condition of crosswalk markings, offset side street intersections create confusion about where to cross Bailey Avenue. These intersections are seen between Delavan Avenue and Winspear Avenue.

Additionally, existing mid-block crossings are also in need of improvements. The mid-block at Hennepin Park is the only mid-block crossing along the corridor with a pedestrian signal. This signal is not functioning, which is a cause of concern due to the high pedestrian activity at this location. This mid-block crossing should be improved through high visibility crosswalk paint.

Overall, the majority of roadway crossings on Bailey Avenue are in poor condition and in need of improvements. Improvements should include new high-visibility pavement markings, visible signage, pedestrian signals with countdown timers at signalized intersections, curb extensions (where feasible) and ADA-compliant sidewalk ramps.

PAVEMENT MARKINGS NEAR WINSPEAR AVENUE

VISIBLE CROSSWALKS ARE LOCATED AT THE INTERSECTION OF BAILEY AVENUE AND GENESEE STREET; HOWEVER, THE CROSSWALK COULD BE FURTHER ENHANCED. ALL OTHER INTERSECTIONS ARE IN NEED OF IMPROVEMENTS IN THE FORM OF HIGH VISIBILITY PAINT, PEDESTRIAN SIGNAL AND SIGNS, AND ADA-ACCESSIBLE CURB RAMPS.

ROADWAY OPERATIONAL PATTERNS

This section examines the operational patterns of traffic along the Bailey Avenue corridor, including :

- Traffic Volumes
- Vehicle Speed
- Accident Data

TRAFFIC ALONG BAILEY AVENUE

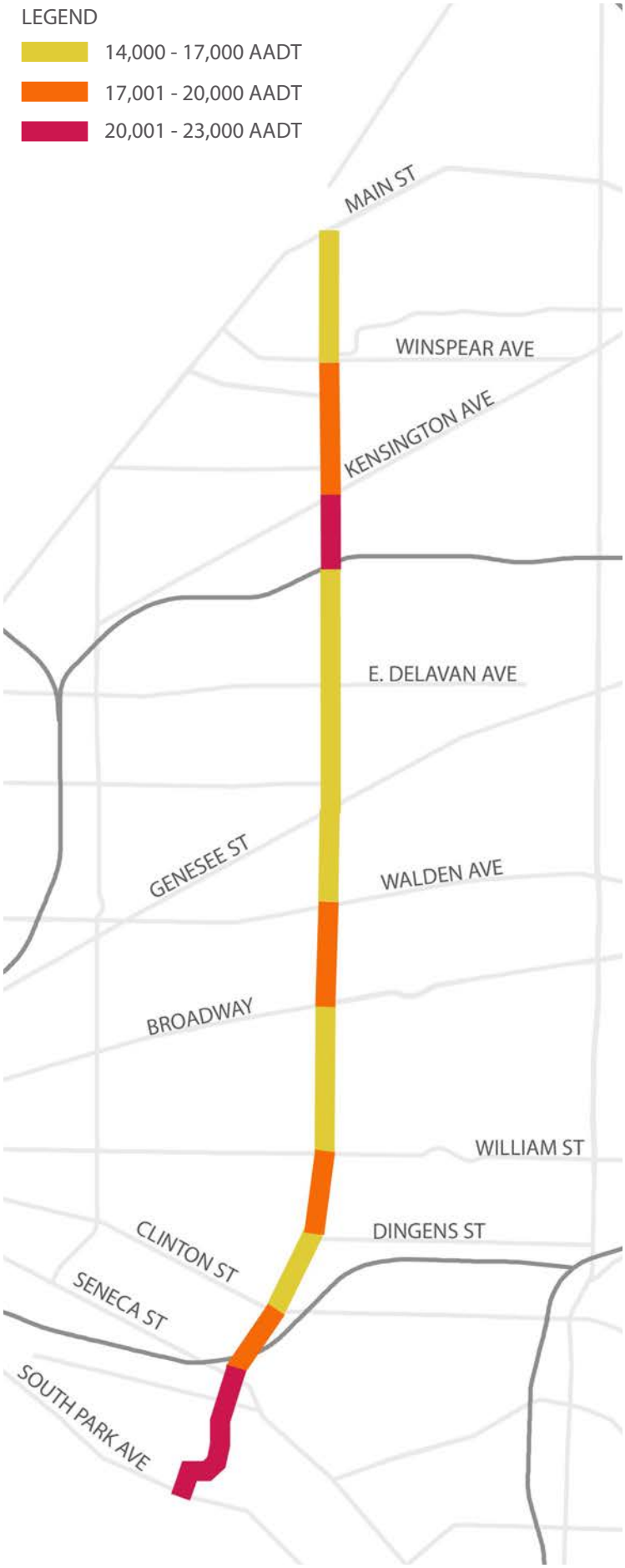
TRAFFIC VOLUMES

The New York State Department of Transportation (NYS DOT) provides traffic volumes indicated as annual average daily traffic (AADT). This data was used to determine traffic counts on Bailey Avenue. Traffic volumes on Bailey Avenue vary from a minimum AADT of 14,876 vehicles/day (between Walden Avenue and Genesee Street) to a maximum of 20,582 vehicles/day (between the Kensington Expressway and Kensington Avenue). The average AADT for Bailey Avenue is 17,190 vehicles/day. Higher volume segments along Bailey Avenue can likely be attributed to proximity to regional transportation corridors such as the Kensington Expressway and New York State Interstate I-90. It should be noted that this traffic volume data was collected previous to the COVID-19 pandemic.

WHAT IS AADT?

Annual average daily traffic (AADT) is a measure used primarily in transportation planning, transportation engineering and retail location selection. Traditionally, it is the total volume of vehicle traffic of a highway or road for a year divided by 365 days.

MAP 6: TRAFFIC VOLUME



VEHICLE SPEEDS

Bailey Avenue is signed for a 30 MPH speed limit from Clinton Street to Main Street. Actual operating speeds, as provided by the New York State DOT Traffic Data Viewer, are highly variable by segment. The segment between Kensington Avenue and Winspear Avenue has the lowest speeds, with an 85th percentile speed of 32.4 mph. The segment between Dingens Street and William Street has the highest speeds, with an 85th percentile speed of 47.4 mph.

85th percentile speed is the speed that 85% of drivers will drive at or below. Engineers typically use this as their "design speed" for determining geometric features of the roadway such as lane and shoulder widths, curb radii, etc.

Comparing speed data, lane configurations, and traffic volumes, a clear pattern emerges. Segments with four travel lanes have higher speeds than segments with two travel lanes, . Generally, segments with higher traffic speeds see high volumes of traffic on the corridor.

WHY DO DRIVERS SPEED?

The built urban environment and streetscape can contribute to the rate at which drivers speed. The driver's experience of the roadway should be consistent with the intended travel speed. Wider travel lanes, absence of street trees, unclear pavement markings and lack of signage contribute to increased traffic speeds. These speeds can be reduced using traffic calming methods, such as reducing lanes and lane width, adding street trees to the streetscape, infilling development close to the street, and adding signage.

MAP 7: OPERATING SPEEDS (85TH PERCENTILE)

COLLISION DATA

Collision data from January 2014 to December 2019 was analyzed along Bailey Avenue. Analyzing the number and type of collisions provides context on the corridor's safety for all types of users, including vehicles, pedestrians and bicyclists.

From 2014 to 2019, a total of 2,561 collisions were recorded. The majority of crashes involved a collision with a motor vehicle (86.2%). A total of 125 accidents (4.9%) involved a collision with a pedestrian, 51 accidents (2%) involved a collision with a light support or utility pole, and 41 accidents (1.6%) involved a collision with a bicyclist. Although there was a higher concentration of bicycle or pedestrian accidents recorded between Winspear Avenue and Walden Avenue, accidents occurred throughout the corridor length.

The majority of collisions resulted in a combination of property damage (48.8%), property damage and injury (24.8%) or injury alone (24.4%). Out of all recorded crashes, a total of six were fatal with two involving a collision with a pedestrian.

Additionally, the majority of the recorded collisions occurred during daylight hours (62.6%); however, 30.6% of accidents occurred in poor lighting conditions (dark, dawn or dusk) and 6.8% were either unknown or "not entered".

KEY TAKEAWAY

There were a high number of collisions recorded along Bailey Avenue from 2014 to 2019. These collisions may indicate the need for traffic calming measures, enhanced pavement markings for the various types of users along the corridor.

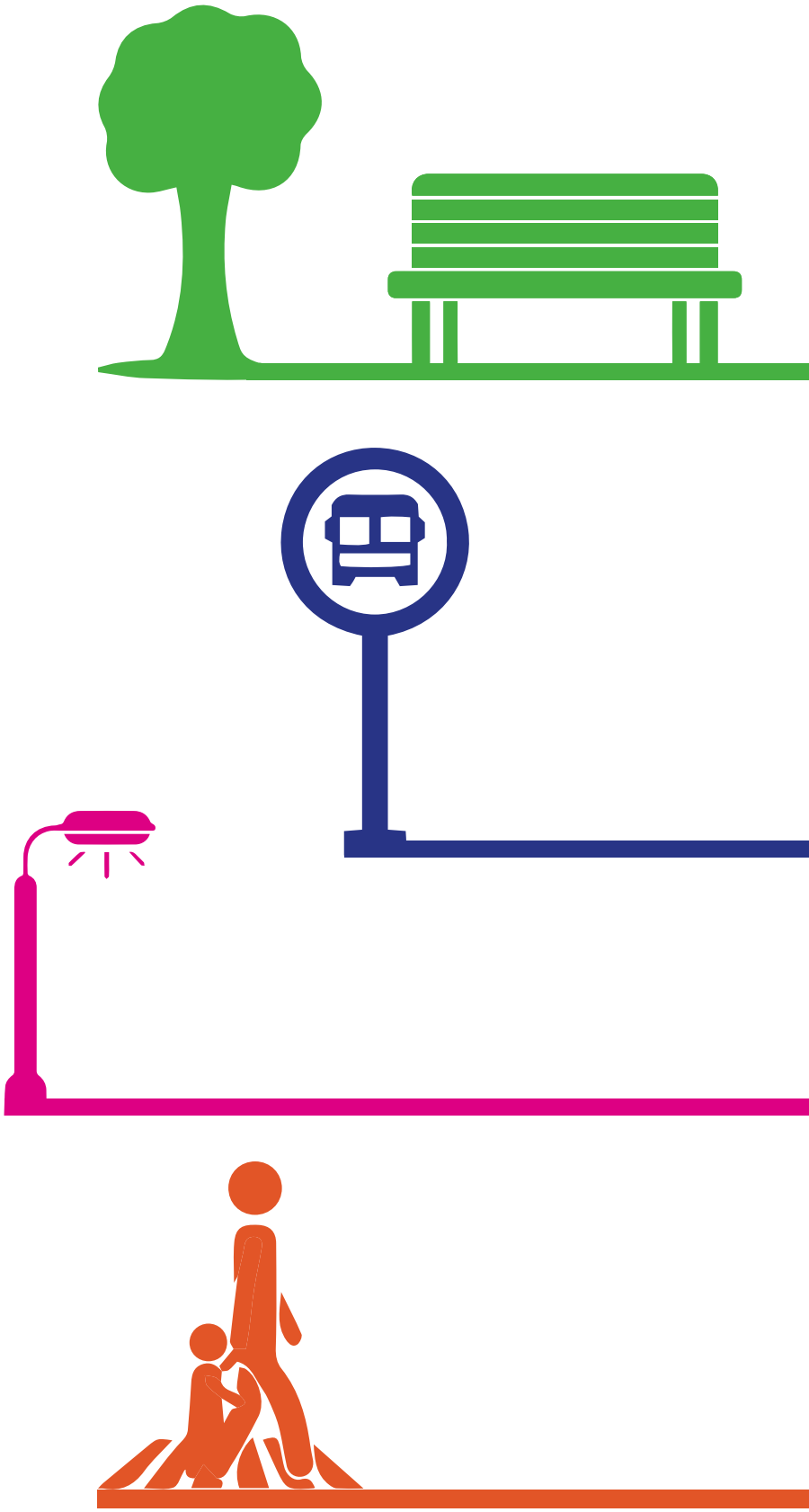
MAP 8: COLLISIONS INVOLVING A COLLISION WITH A PEDESTRIAN OR BICYCLIST

STREETSCAPE ELEMENTS

The streetscape refers to the natural and built fabric of the street, and defined as the design quality of the street and its visual effect. The elements of a streetscape are key to creating a sense of place and unique identity. Understanding the existing Bailey Avenue streetscape is critical to determining the improvements that would help to create a more user-friendly and welcoming environment.

An assessment of the existing streetscape elements was completed as they relate to the implementation of transit and walkablity enhancements. This assessment included:

- Sidewalks / Curb Ramps
- Transit Infrastructure
- Pedestrian Crossings
- Street Trees



SIDEWALKS / CURB RAMPS

Sidewalks existing along Bailey Avenue on both sides of the roadway, except on the east side from Sherman Road to Main Street. Existing sidewalks on Bailey Avenue were observed in regard to their location, width, condition, and accessibility. The sidewalks are generally in poor, deteriorated condition with large cracks and in need of repair. Areas of narrow sidewalk are created throughout the corridor by competing infrastructure such as light poles, fire hydrants, and overpasses. Curb ramps exist at most crossings; however, many do not include a detectable warning strip or a five-foot landing area.

At the time of this study (Fall 2019), curb ramp work and segments of the sidewalk were being replaced between Lasalle and Shirley Avenue. The improvements are addressing some of the curb ramp ADA-accessibility issues; however, the improvements do not include full sidewalk replacement.

The narrowest sidewalk segments along Bailey Avenue are less than five feet wide, which can be seen in the section between William Street and Genesee. The sidewalks north of Kensington Avenue are wider, ranging from approximately 5 – 10 feet in width.

Adjacent to the UB campus, north of Winspear Avenue, is a sidewalk in excellent condition on the west side of Bailey Avenue that is 10 feet in width.

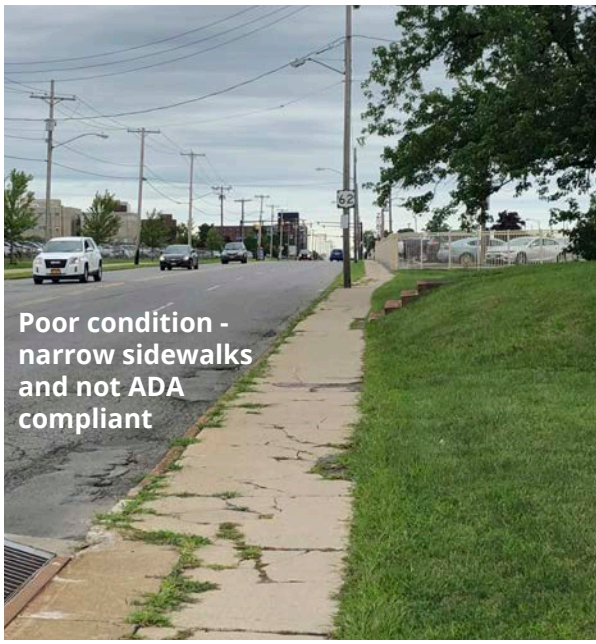
At a minimum sidewalks on Bailey Avenue should be made five feet wide and curb ramps made ADA accessible. In areas where wider sidewalks exist there is the opportunity to incorporate additional amenities including bike racks, bike share stations, street trees, planters and outdoor cafe seating.

KEY TAKEAWAY

Enhancements to existing sidewalks are necessary to create a safer, walkable and easily accessible corridor experience.

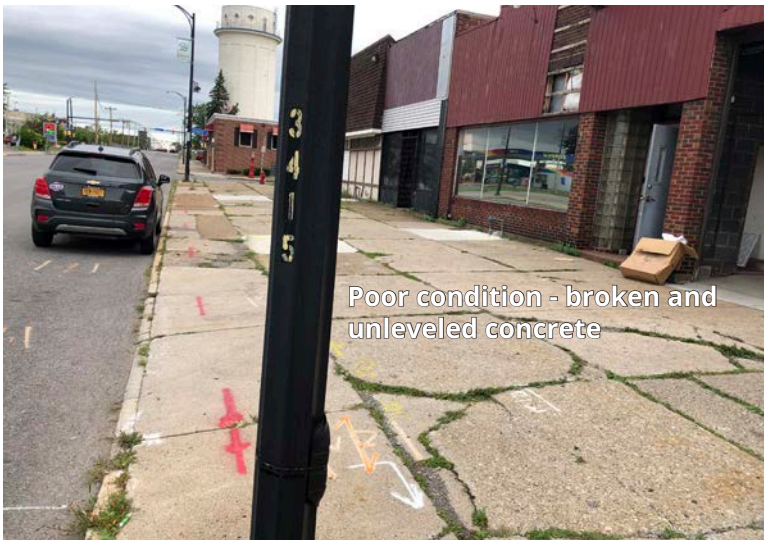
SIDEWALK CONDITIONS ON BAILEY AVENUE

BAILEY AVENUE AND WINSPEAR



BAILEY AVENUE NORTH OF WINSPEAR

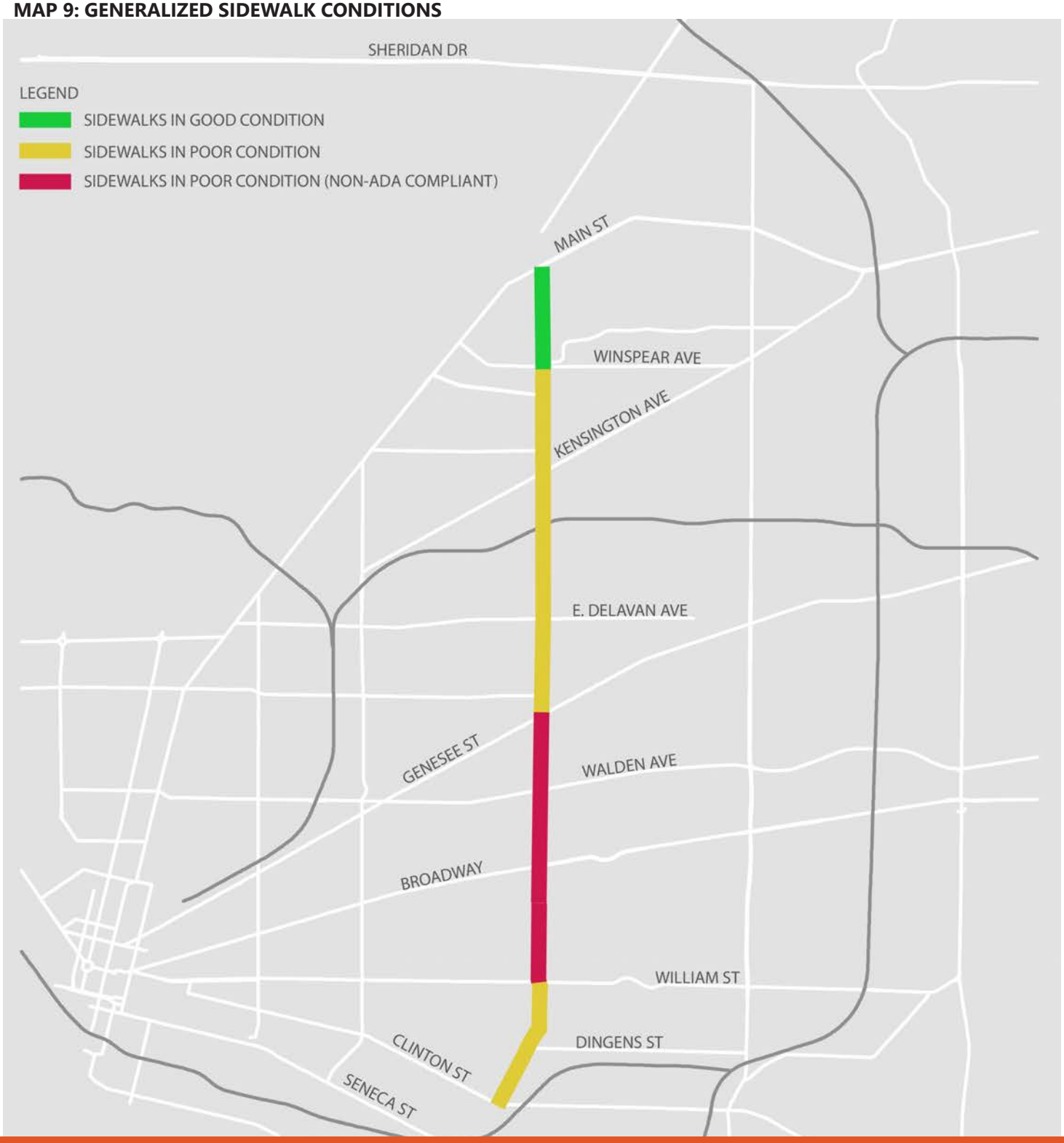
BAILEY AVENUE AND HENNEPIN



BAILEY AVENUE AND HIGHGATE

BAILEY AVENUE AND GENESEE

MAP 9: GENERALIZED SIDEWALK CONDITIONS



SIDEWALKS THROUGHOUT THE CORRIDOR ARE GENERALLY IN POOR CONDITION AND IN NEED OF REPLACEMENT

"IT SHALL BE THE DUTY OF EVERY OWNER OR OCCUPANT OF ANY PREMISES FRONTING ON ANY PUBLIC STREET OR GROUND TO KEEP THE SIDEWALK IN FRONT OF THE SAME IN GOOD ORDER AND REPAIR, AND HE SHALL ALLOW NO ACCUMULATION OF DIRT, REFUSE OR OTHER MATERIAL TO REMAIN THEREON."

- CITY OF BUFFALO CODE 413-48 MAINTENANCE OF SIDEWALKS

TRANSIT INFRASTRUCTURE

Transit infrastructure contributes to the user friendliness of Bailey Avenue and public transportation accessibility. On Bailey Avenue, there are 22 existing bus shelters, 17 located directly on Bailey Avenue and 5 immediately adjacent to the Corridor on side streets.

The style of bus shelters varies. A majority of the shelters are an older model branded with the NFTA logo and colors with the exception of the shelter adjacent to the VA Hospital. The shelter adjacent to the UB campus just south of Main Street is a newer NFTA branded model. The shelter adjacent to the slip lane from Main Street to Bailey Avenue is a small building/station. All of the shelters appear in good condition.

As roadway and bus transit improvements are implemented along the corridor, the incorporation of branding for potential Bus Rapid Transit stops is possible. Additional amenities including bike racks and real time bus arrival information displays could also be implemented to enhance the user experience.

VARYING BUS SHELTERS

Various styles of bus shelters exist on the Corridor. Examples of two types are shown below.

MAP 10: SHELTER LOCATIONS

STREET TREES

Street trees can help define a corridor's character by creating a distinct visual edge between pedestrian and vehicular environments, providing protection from environmental elements such as sun and rain, and creating a more welcoming environment.

There are 104 existing street trees on Bailey Avenue. Based on a visual assessment of the trees (by a licensed landscape architect), 60% appear to be in fair condition while 40% are in poor condition and have visible signs of decline including dead branches and wounded trunks. The placement of the trees close to the road in small tree pits may be contributing to their decline, making them more susceptible to being hit by cars/car doors and salt spray. The tree pits are not only small, but are also located in urban compacted soils, preventing the trees from getting sufficient water and nutrients.

Additionally, there are approximately 60 empty tree pits on the corridor, where trees were once planted but did not survive. Most of these empty tree pits are concentrated north of Kensington Avenue. Currently, the City's Bureau of Forestry is responsible for maintaining all street trees located within the City right of way.

STREET TREES LOCATED NEAR HARMAC MEDICAL PRODUCTS

ABSENCE OF STREET TREES NEAR HIGHGATE AVENUE

104 EXISTING STREET TREES

60% FAIR CONDITION

40% POOR CONDITION

60 EMPTY TREE PITS ON THE CORRIDOR

STREET TREES CONCENTRATED NORTH OF KENSINGTON AVENUE

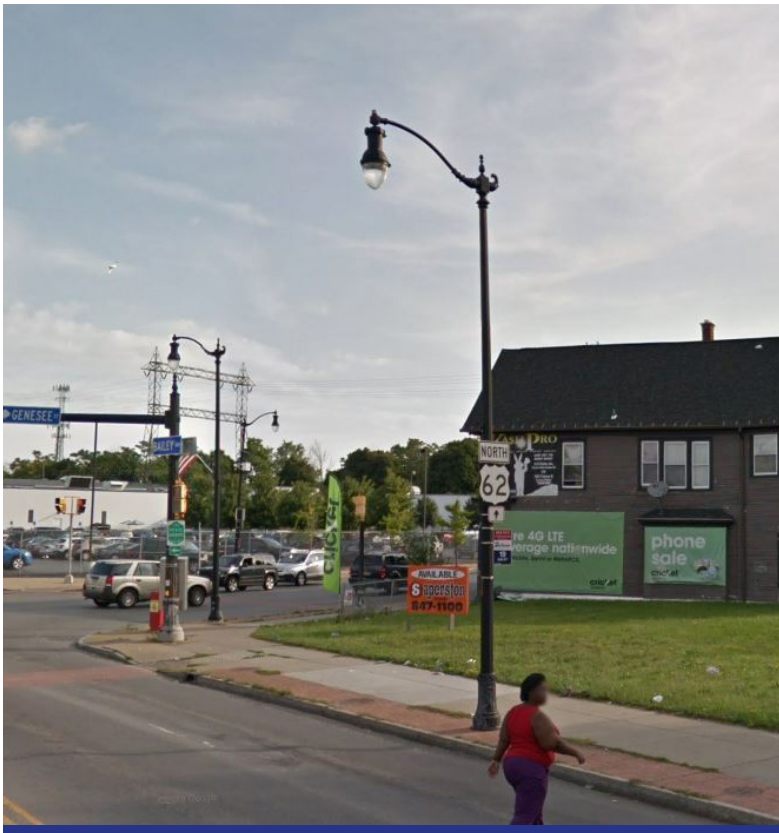
STREET LIGHTING

Street lights increase visibility for corridor users when there is little to no ambient light. Light poles also provide the structure for neighborhood defining elements such as light pole banners and hanging baskets. The existing light poles on Bailey Avenue were assessed based on their physical appearance and character defining elements. A lighting level assessment was not done as part of this analysis.

Lighting styles vary along the corridor. A majority of the light poles are basic cobra head light fixtures. At the intersection of Genesee Street and Bailey Avenue there are more ornate light poles adjacent to the intersection that are representative of the current City of Buffalo light standard.

As streetscape enhancement and roadway improvement projects are implemented on Bailey Avenue, City standard ornamental light poles, fixtures, and pedestrian-scaled lighting should be further assessed. This type of lighting has been shown to benefit and contribute to corridor character.

MAJORITY OF THE LIGHT POLES ON BAILEY AVENUE ARE VEHICULAR, TRADITIONAL STYLE



MORE ORNATE-STYLE LIGHT POLES ARE SEEN NEAR THE GENESEE INTERSECTION - CITY STANDARD

OTHER STREETSCAPE ELEMENTS

Other streetscape elements, including benches, bike racks, trash receptacles, and pavement treatments contribute to a sense of place and identity for the corridor. Generally, Bailey Avenue lacks consistently and evenly placed streetscape elements that contribute to a unified and welcoming streetscape environment. A majority are in poor, deteriorated condition and do not contain any corridor defining elements.

Most of the existing streetscape elements are located between Winspear Avenue and Kensington Avenue. Bailey Avenue contains five planters in total, four of which are located at the Lovejoy Street intersection. There are also a total of 12 trash receptacles, six bike racks, and one bench located at the intersection of Dartmouth Avenue and Bailey Avenue owned by the City of Buffalo.

City of Buffalo bike racks along the corridor have been installed based on requests from business owners and residents at specific locations, on an on-going basis. Overall, enhancement of streetscape elements should be considered for all future corridor improvement projects to create a welcoming and vibrant streetscape environment.

KEY TAKEAWAY

There is a significant gap in streetscape elements south of Kensington Avenue. Adding additional transit user facilities south of Kensington Avenue will enhance the pedestrian environment and corridor character along Bailey Avenue.

MAP 11: OTHER STREETSCAPE ELEMENTS

LACK OF STREETSCAPE AMENITIES BETWEEN HIGHGATE AVENUE AND ROUNDS AVENUE

PLANTER AND TRASH CAN AT LOVEJOY STREET

EXISTING BICYCLE RACKS BETWEEN HEMPSTEAD AVENUE AND LANGFIELD DRIVE

EXISTING STREET BENCH AT DARTMOUTH AVENUE

TRANSIT FEATURES

Understanding the existing public transportation options and amenities on Bailey Avenue is essential to improving transportation access for the neighborhood. This section provides an analysis of the existing public transportation options and network along the Bailey Avenue Corridor, including:

- Bus Routes and Stops
- Bus Boardings and Alightings
- Passenger Load

Public transportation provides people with access to employment, community resources, medical care, and recreational opportunities. The incorporation of public transportation options and considerations into broader economic and land use planning can also help a community expand business opportunities, reduce sprawl, and create a sense of community and place.

BUS ROUTES AND STOPS

The NFTA Metro Bus Route 19 services Bailey Avenue running 7.8 miles between University Station and South Park Avenue. Route 19 contains 51 stops (25 with shelters) that are found both nearside and far side along the corridor.

Metro Bus Route 19 service operates seven days a week on varying schedules, as follows:

- Weekdays from 5:00am to 1:05am
- Saturdays from 6:00am to 12:10am
- Sundays and Holidays from 7:23am to 10:52pm

Weekday headways for the Route 19 bus are 10 minutes during peak hours and 20 minutes during off-peak hours. Saturday headways range between 20 minutes and 30 minutes. Sunday and holiday headways range from 30 to 40 minutes.

The scheduled weekday running time of Route 19 buses from University Station to the Bailey & Abbott Loop averages approximately 40 minutes. Based on data from several weekdays during the spring of 2019, the actual trip duration of Route 19 buses running from University Station to the Bailey & Abbott Loop ranges from 32 to 65 minutes, with an average actual run time of 42 minutes. The average deviation of scheduled time versus actual run time is only 2 minutes, however there were 21 occasions where the deviation was greater than 5 minutes. The average travel speed of Route 19 buses is 12 MPH.

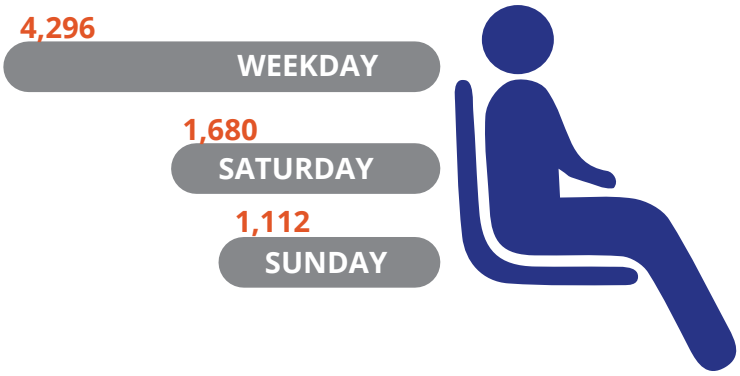
Average weekday ridership on Route 19 is 4,296, average Saturday ridership is 1,680, and average Sunday ridership is 1,112. The 2017-2018 annual total ridership on Route 19 was 1,245,623, making it one of the most utilized Metro Bus routes in the system (6 out of 59).

Metro Bus Route #5 was the most utilized route in 2017-2018. This route intersects with Route 19 at University Circle. Routes 12 – Utica (1,504,078 annual riders) is the next busiest cross/ connecting route. Route 4 – Broadway, Route 13 – Kensington, Route 24 – Genesee, Route 26 – Delavan, and Route 32 – Amherst all experience annual ridership over 700,000. The following figures display Route #19 with stop and shelter locations as well as cross/ connecting routes.

WHAT IS A HEADWAY?

In transit speak, "headway" is the amount of time between transit vehicle arrivals at a stop. Frequent service buses in the US often have 10-15 minute headways. Very high service transit, most often seen in subways or Bus Rapid Transit (BRT) can sometimes reach headways of 2-5 minutes.

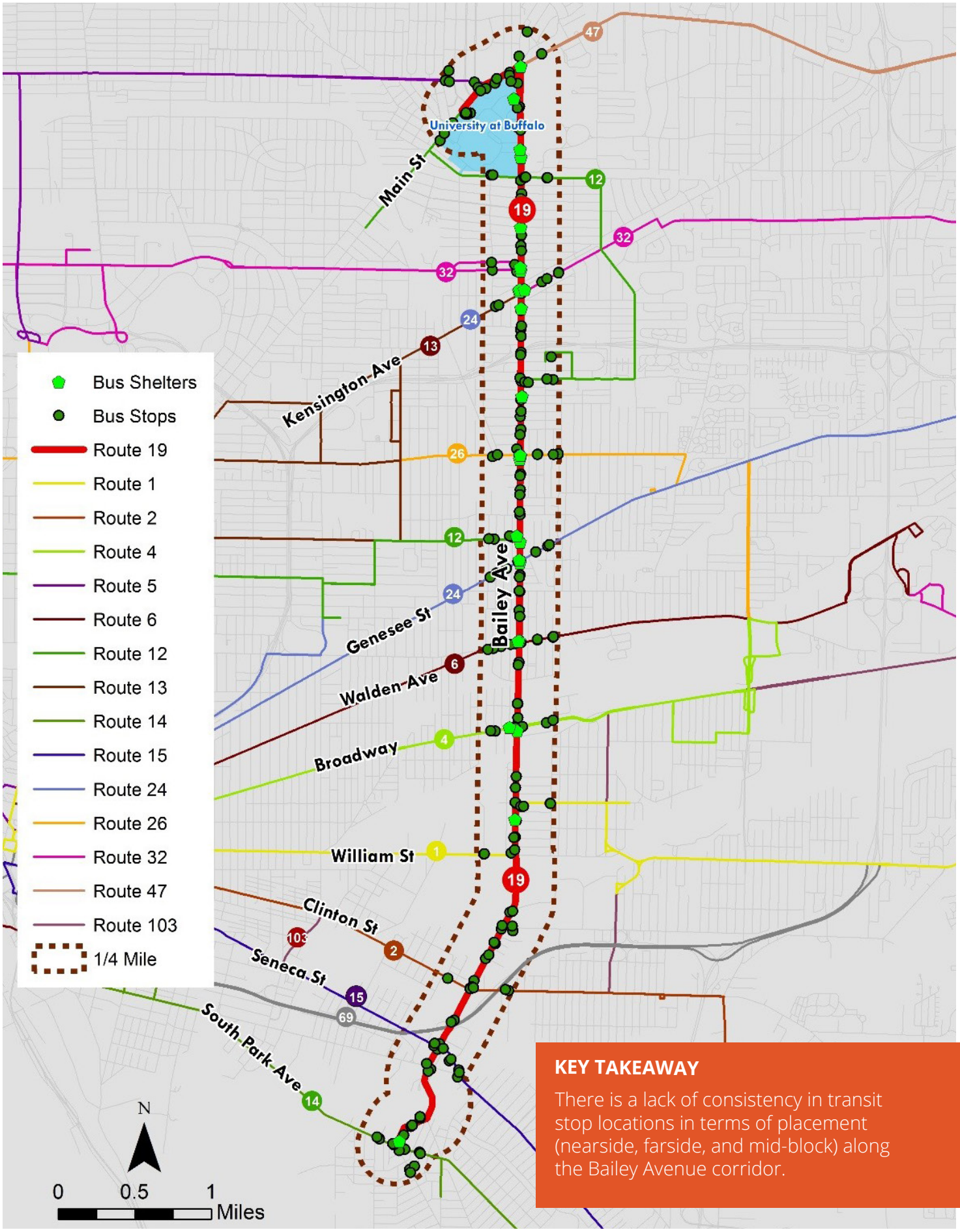
BUS RIDERSHIP - ROUTE 19 (2018)



KEY TAKEAWAY

NFTA Bus Route 19 is one of the most utilized routes on the NFTA metro system. Stops on this route are frequent, which adds to passenger travel time.

MAP 12: BAILEY AVENUE BUS ROUTES & CONNECTIONS



KEY TAKEAWAY

There is a lack of consistency in transit stop locations in terms of placement (nearside, farside, and mid-block) along the Bailey Avenue corridor.

Route 19 is intersected or connected with 24 different Metro Bus routes:

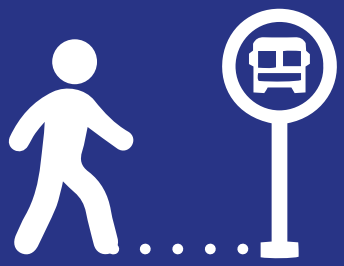
- Route 1 William
- Route 2 Clinton
- Route 4 Broadway
- Route 5 Niagara-Kenmore
- Route 6 Sycamore
- Route 8 Main
- Route 12 Utica
- Route 13 Kensington
- Route 14 Abbott
- Route 15 Seneca
- Route 22 Porter-Best
- Route 24 Genesee
- Route 26 Delavan
- Route 32 Amherst
- Route 34 Niagara Falls Boulevard
- Route 44 Lockport
- Route 47 Youngs Road
- Route 48 Williamsville
- Route 49 Millard Suburban
- Route 81 Eastside

School Special 100 Series Routes include:

- Route 102 Bailey-East
- Route 103 East-Suburban
- Route 106 South-Suburban
- Route 111 South-Michigan

BAILEY AVENUE BUS RIDERS

A survey of customers utilizing Bus Route 19 was conducted in September 2019. This survey was designed to capture information related to the user's travel patterns and behavior as well as understand their perception of the existing bus service and potential improvements.



91% OF THOSE SURVEYED WALK TO THE BUS STOP

4X-5X
PER WEEK

86% OF THOSE SURVEYED RIDE BUS ROUTE 19 4-5X PER WEEK

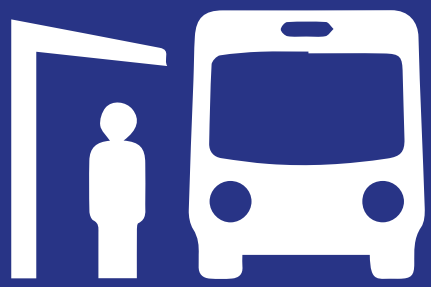
MOST RIDERS REQUESTED INCREASED FREQUENCY OF BUSES

BOARDINGS & ALIGHTINGS

Data obtained from NFTA was used to display the number of daily boardings and alightings at stops along Route #19. The highest boarding and alighting counts along the Corridor are observed at the two endpoints of the service at University Station and Abbott-Bailey Loop as well as at major intersecting east-west running cross streets such as Kensington Avenue (Route #13) , East Delavan Avenue (Route #26), Genesee Street (Route #24), Walden Avenue (Route #6), Broadway (Route #4), William Street (Route #1), and Clinton Street (Route #2). The figures display Route #19 stop locations with graduated symbols based on the number of boardings and alightings registered at each location, the larger the symbol, the greater the number of boardings and alightings.

WHAT DOES BOARDING & ALIGHTING MEAN?

Bus boarding refers to the entry of passengers onto the bus vehicle.



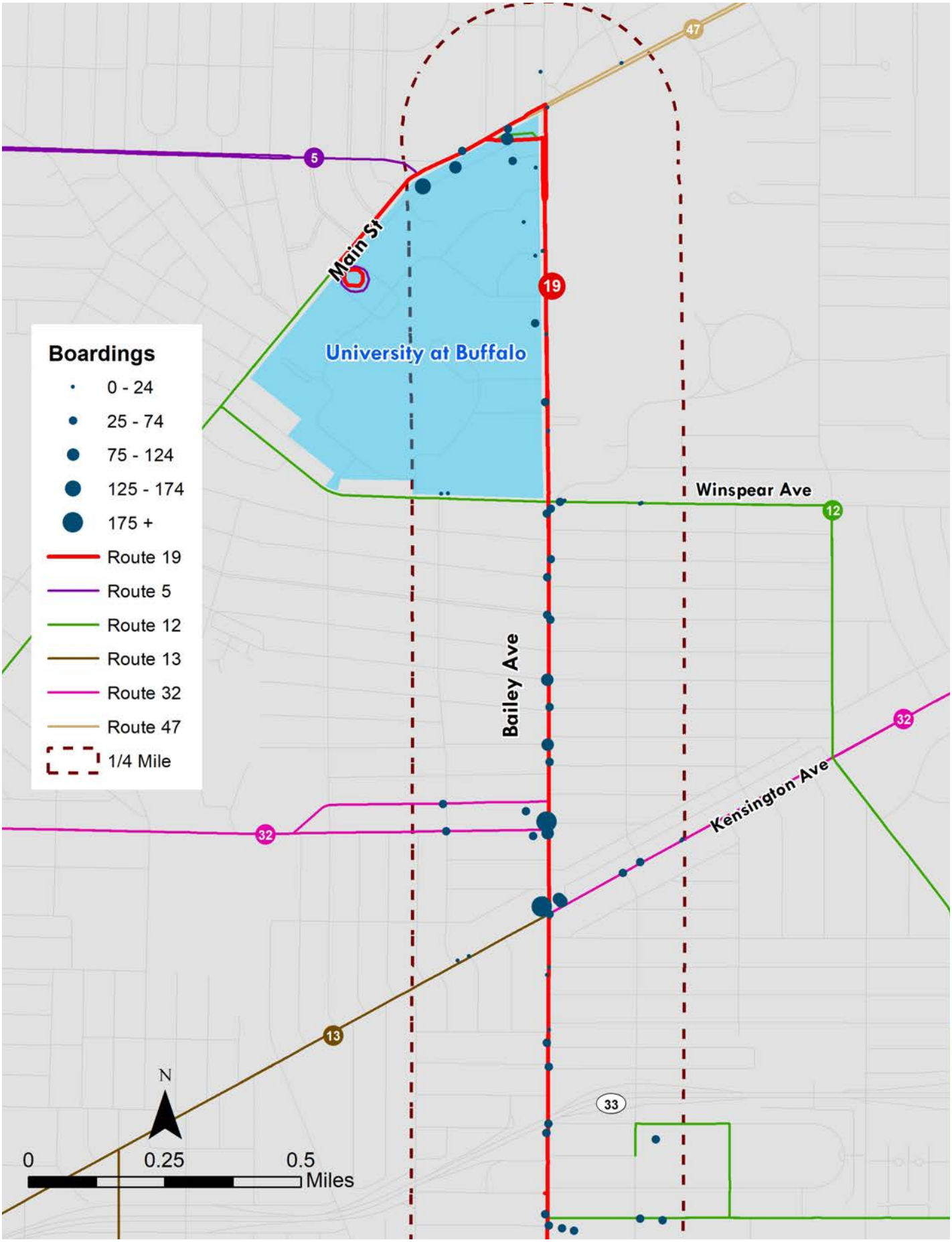
Bus alighting refers to the exit of passengers off the bus vehicle.

PASSENGERS WAITING FOR NFTA METRO ON BAILEY AVENUE

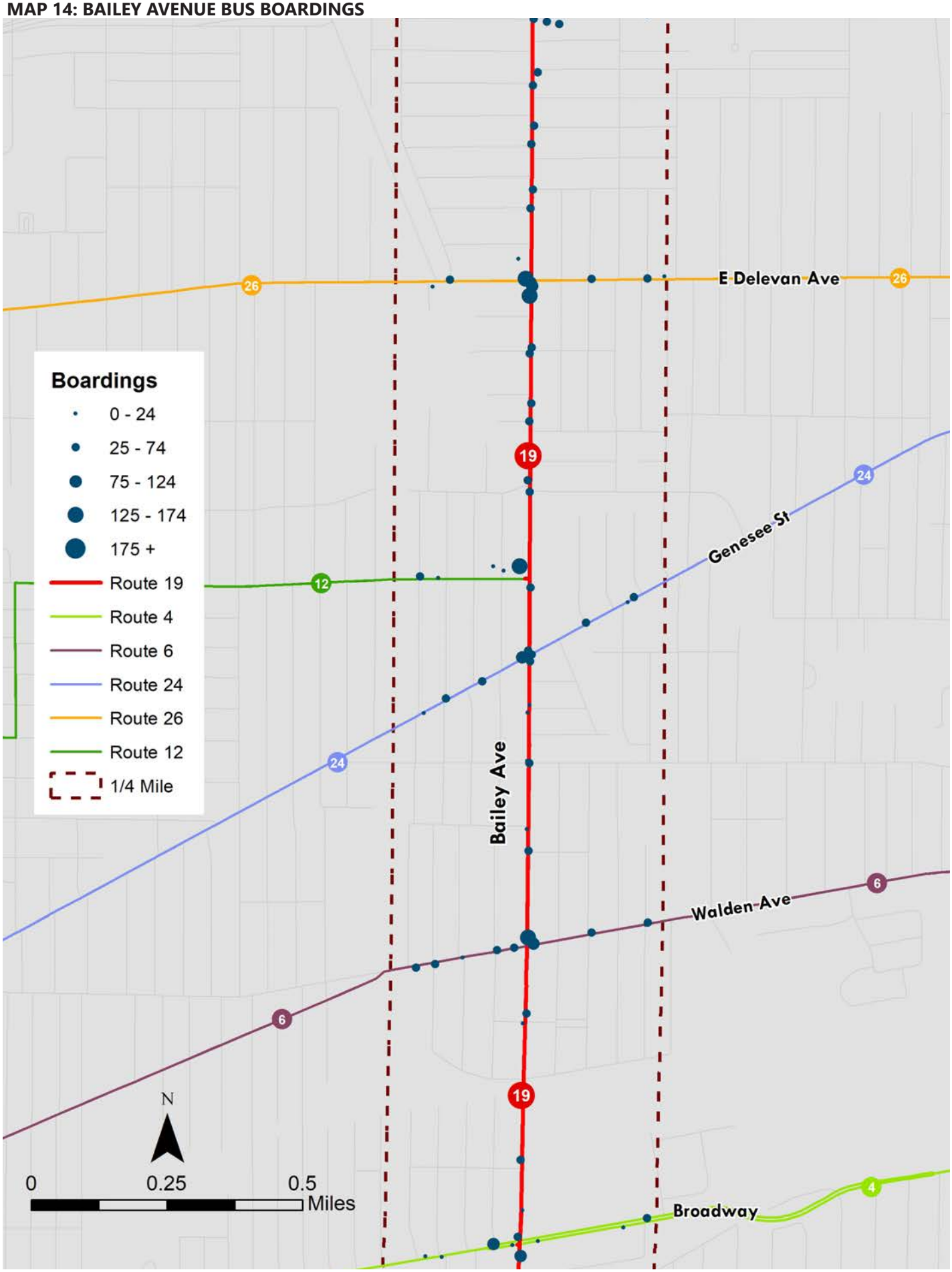
KEY TAKEAWAY

The corridor lacks consistent user amenities, such as bus shelters, which creates an uncomfortable transit user experience.

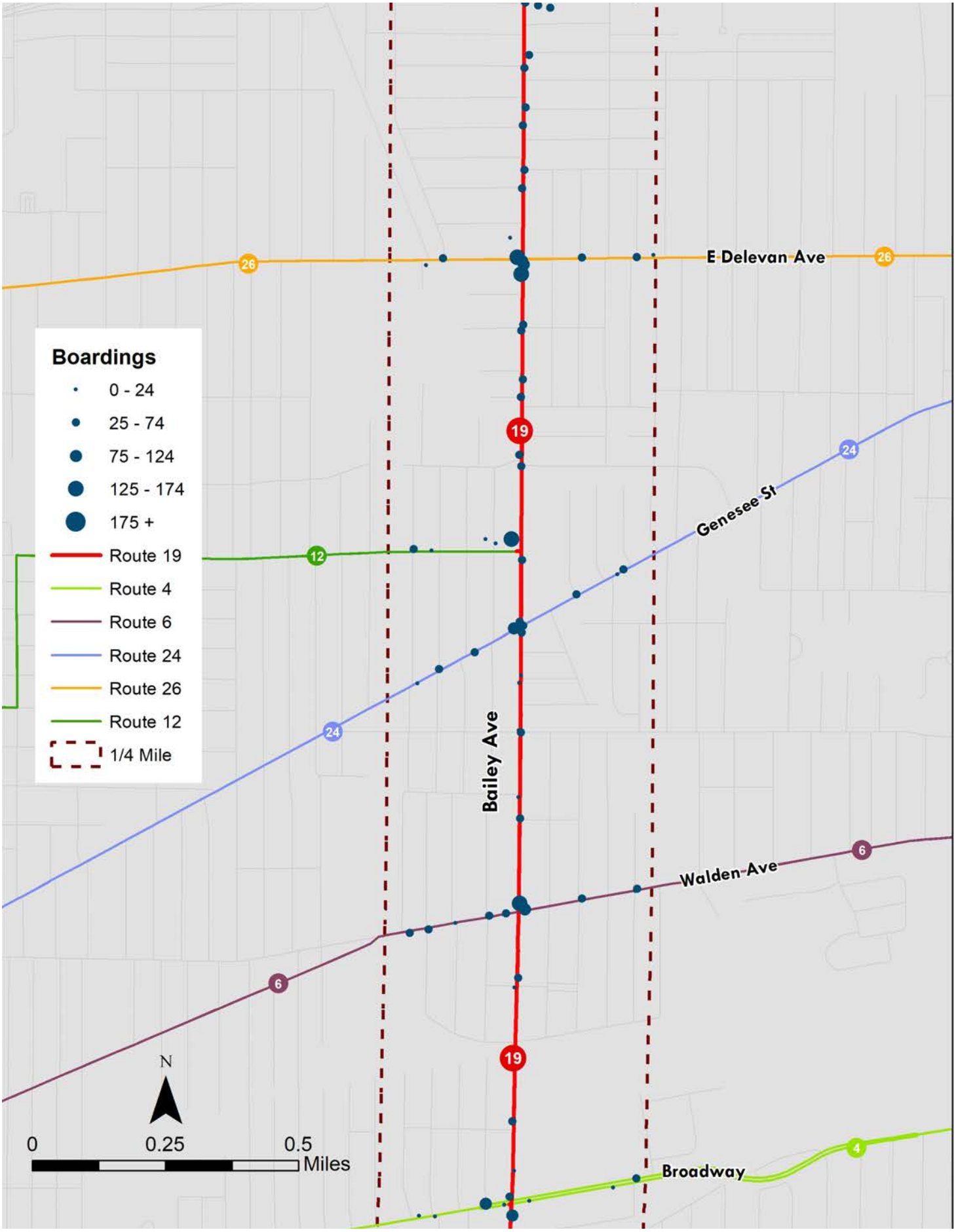
MAP 13: BAILEY AVENUE BUS BOARDINGS



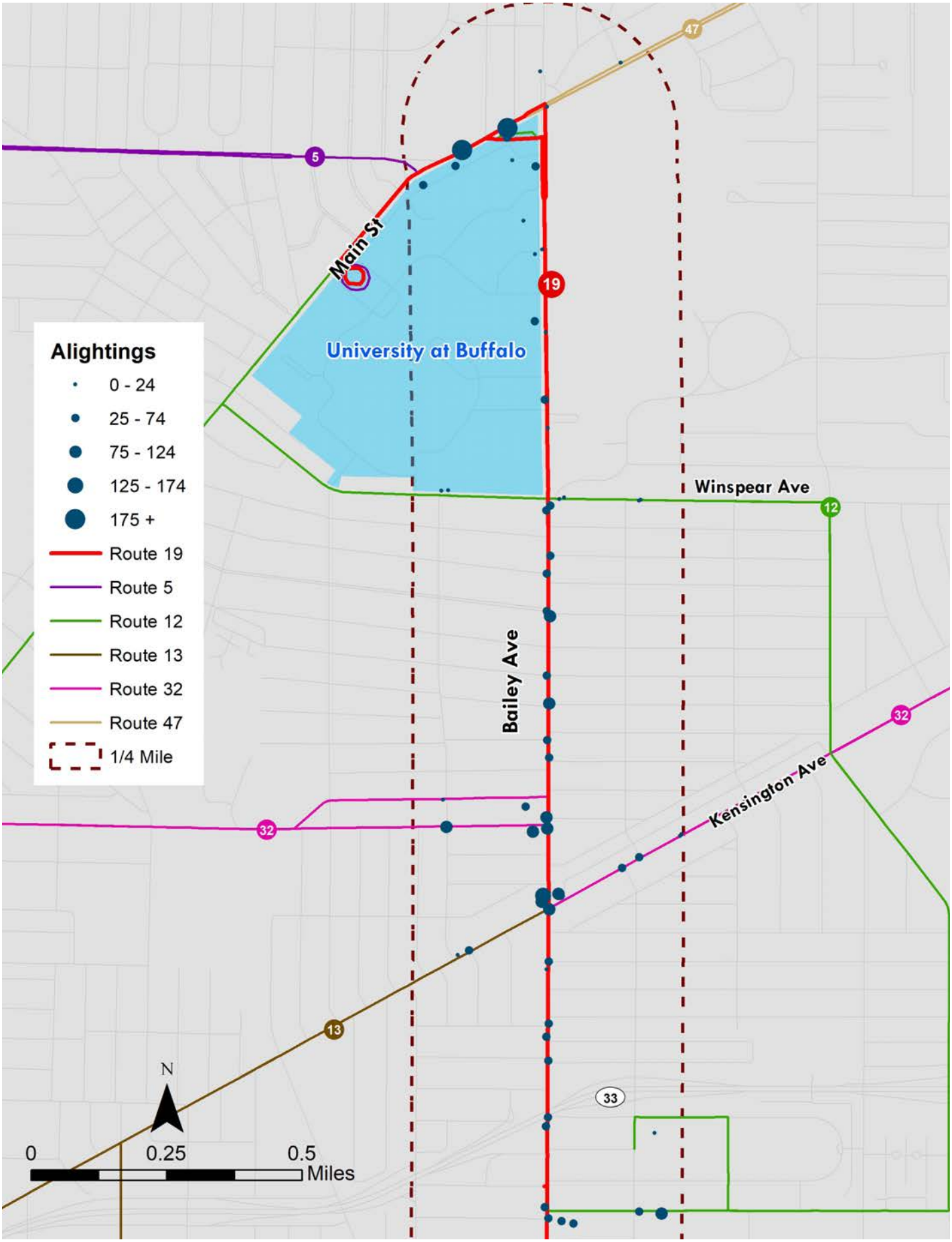
MAP 14: BAILEY AVENUE BUS BOARDINGS



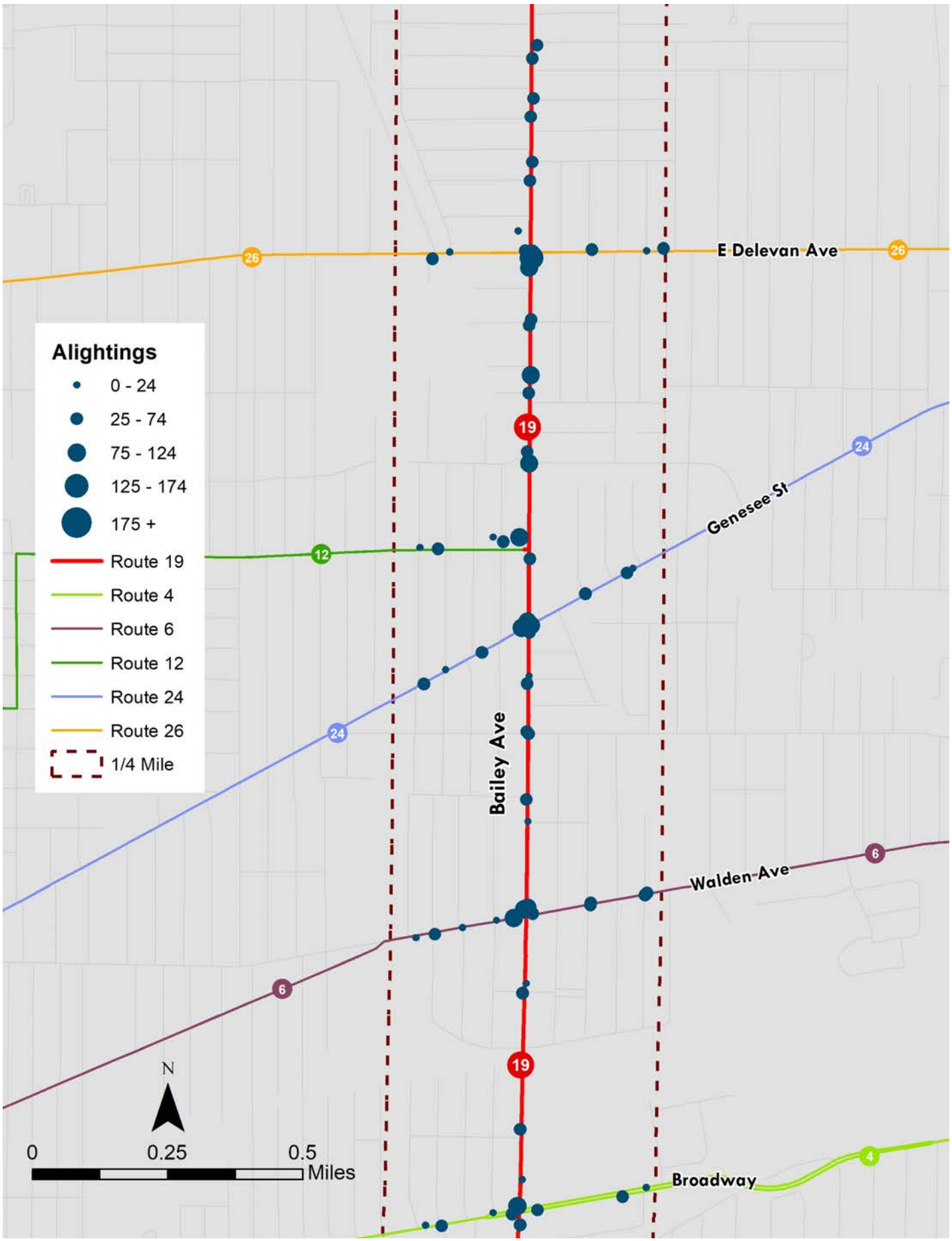
MAP 15: BAILEY AVENUE BUS BOARDINGS



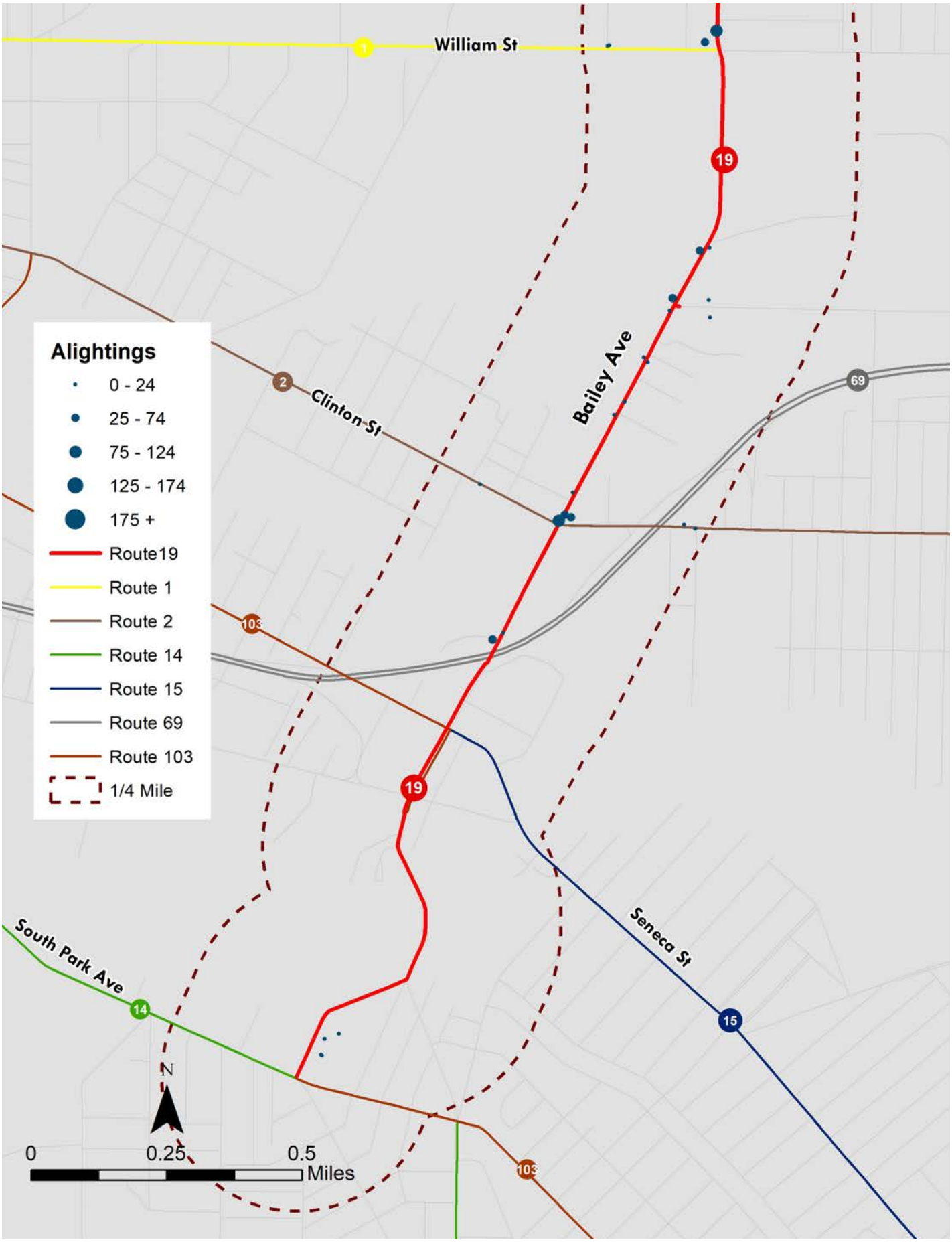
MAP 16: BAILEY AVENUE BUS ALIGHTINGS



MAP 17: BAILEY AVENUE BUS ALIGHTINGS



MAP 18: BAILEY AVENUE BUS ALIGHTINGS



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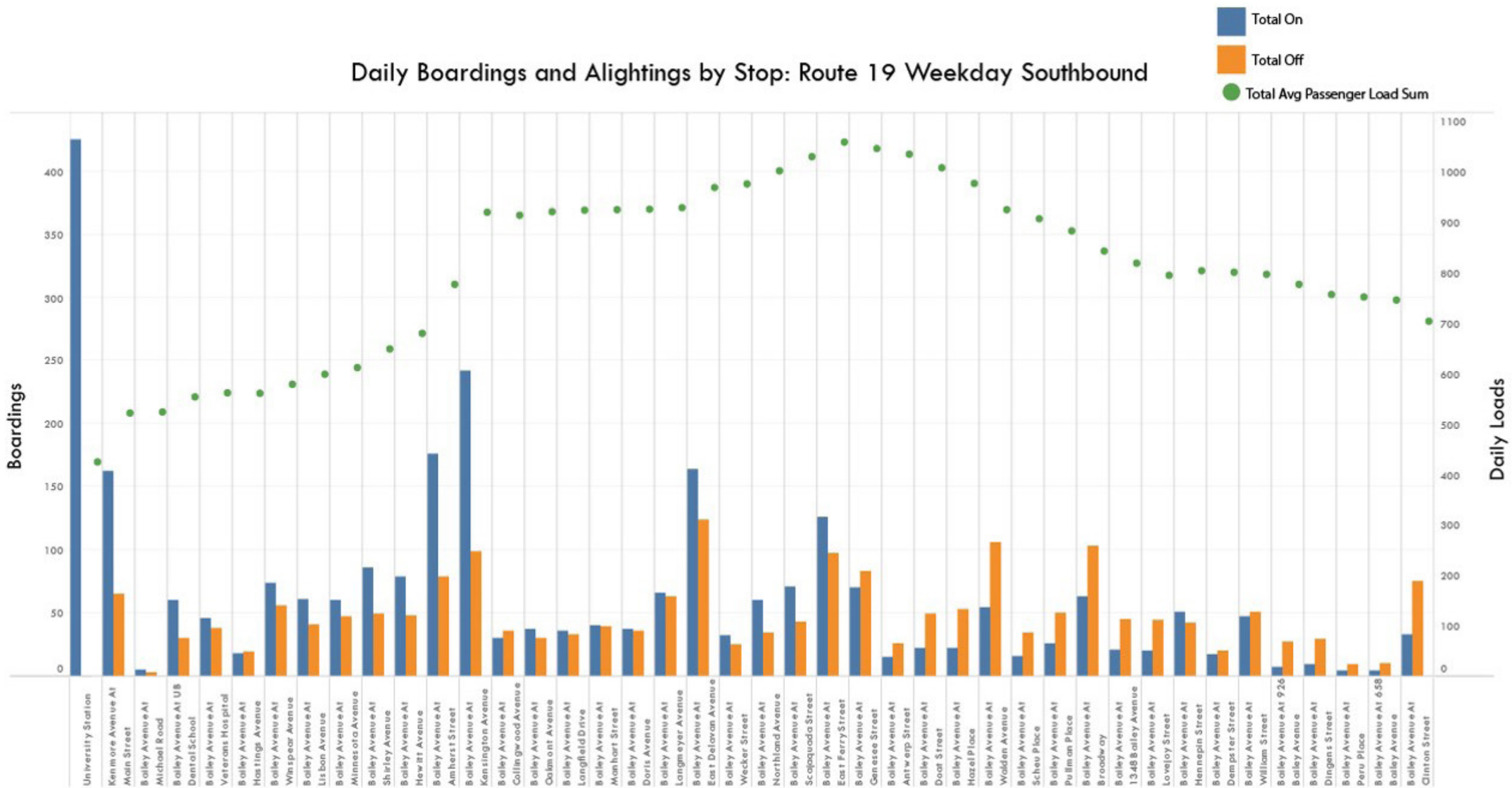
PASSENGER LOAD

Weekend and weekday passenger load counts for each stop on Route 19 were calculated. Along the southbound service of Route 19, the highest passenger loads are experienced between Langmeyer Avenue and Walden Avenue, with significant boarding numbers at Amherst Street, Kensington Avenue, and East Delavan Avenue. The passenger load is reduced with higher alighting numbers at Walden Avenue, Broadway, and Clinton Street.

KEY TAKEAWAY

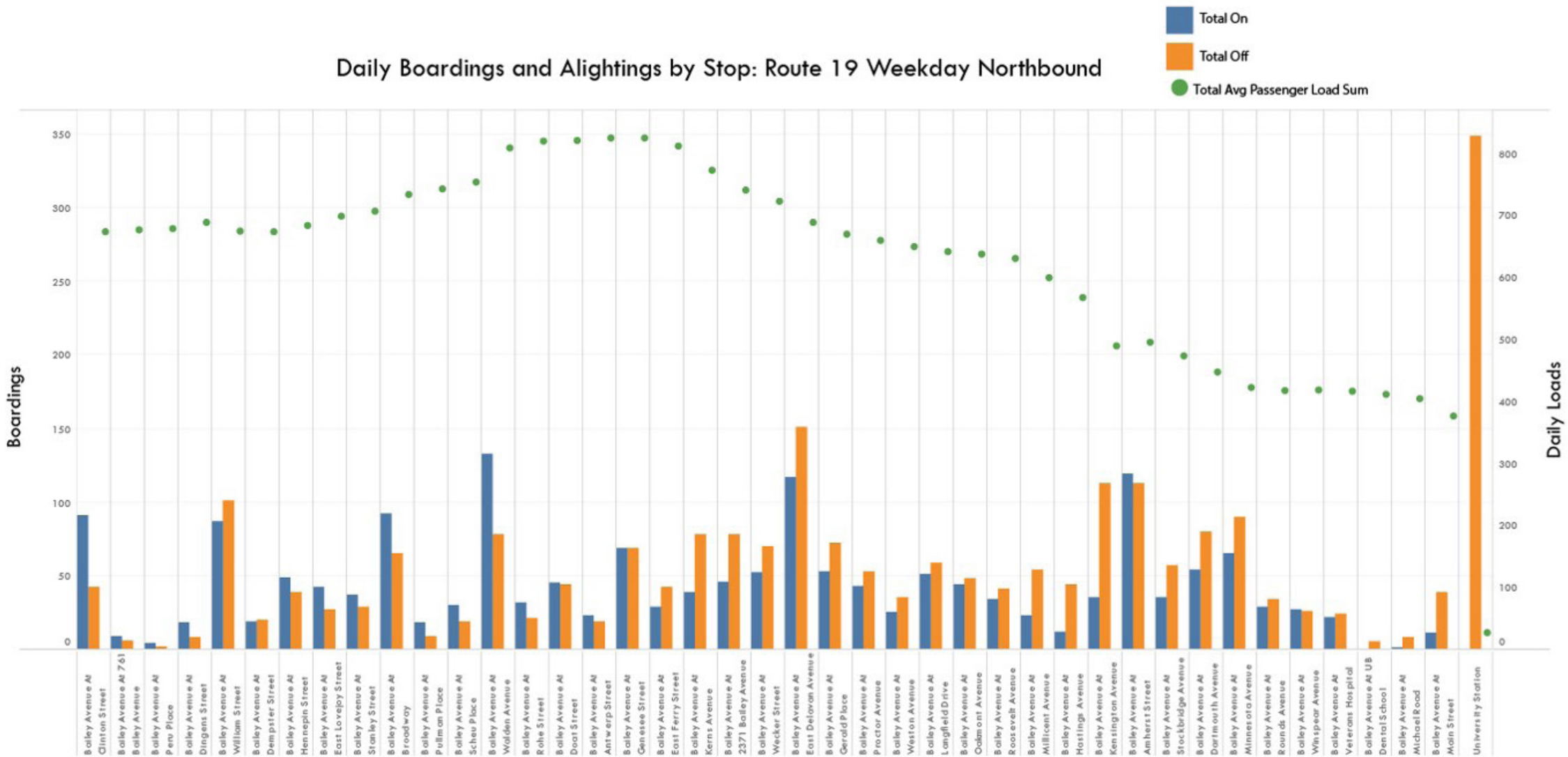
The most utilized stops traveling south on Bus Route 19 include University Station, Kenmore Avenue, Amherst Street and Kensington Avenue University Station has by far the most ridership activity on Bus Route 19.



Along the northbound service of Route 19, the highest passenger loads are experienced between Walden Avenue and Kerns Avenue, with significant boarding numbers at Clinton Street, Broadway, and Walden Avenue. The passenger load is reduced with higher alighting numbers at Kerns Avenue, East Delavan Avenue, and Kensington Avenue.

KEY TAKEAWAY

The most utilized stops traveling north on Bus Route 19 include University Station, Amherst Street and East Delavan Avenue. Key transfer locations along the route offer great potential for consolidating stops into enhanced stations.



SECTION III: CORRIDOR DESIGN ALTERNATIVES

This section presents a series of design alternatives for the Bailey Avenue corridor. These alternatives encompass varying levels of streetscape improvements, transit features and incorporation of Bus Rapid Transit. All are intended to enhance mobility for vehicular, pedestrian, bicyclist and transit users on Bailey Avenue. These alternatives can help inform conversations on more detailed design moving forward.

OVERVIEW

Transit enhancements are one of the many improvements being considered as part of this study. The integration of the enhanced transit service with roadway design improvements, public realm enhancements, and land use recommendations is an important aspect of the project. Enhanced transit improvements along Bailey Avenue are intended to increase access and mobility, provide critical transportation services for all users, create central places for people to gather, reduce traffic congestion, and encourage walkability.

Three transit alternatives were developed for the Bailey Avenue corridor. The three alternatives represent a range of enhanced bus typologies from existing service improvements to significant capital facility upgrades. This approach provides the ability to evaluate the benefits and feasibility of a variety of enhanced bus components and their impacts on the neighborhoods along Bailey Avenue.

The BRT alternatives presented in this section are conceptual and do not reflect final design of proposed improvements. All alternatives will require further engineering review and a formal public input process.

Recommendations are also listed as a menu of strategies that can be implemented in phases as funding and operational considerations allow, and not as an all or nothing recommendation. If funding or other operational constraints restrict particular components of an alternative, then components from other alternatives can be implemented as necessary.

BUSINESS AS USUAL

This scenario provides context on the Bailey Avenue transportation system if no improvements were completed. This allows the project team to analyze base conditions of the corridor against the potential alternatives.

ALTERNATIVE A - ENHANCED LOCAL TRANSIT

Alternative A includes the consolidation of underutilized bus stops to reduce dwell times, transit signal priority (TSP) at key locations, addition of new amenities like shelters and benches at busier stops, and an increase in service frequency throughout the day.

ALTERNATIVE B - ENHANCED LOCAL + LIMITED STOP

Alternative B adds a new frequent-service, limited-stop route and continues local bus service along the corridor. Limited stops are improved with larger shelters and other amenities, new Intelligent Transportation System (ITS) features are added and signal priority is expanded to more locations.

ALTERNATIVE C - ENHANCED LOCAL + BUS RAPID TRANSIT

Alternative C replaces the limited stop route with BRT service including Business Access Transit (BAT lanes), a type of bus lane along some segments, TSP, large custom station shelters, an upgraded fleet of dedicated vehicles, a full set of Intelligent Transportation System (ITS) features, and a more frequent schedule. Local service would also be provided.

METHODOLOGY

The alternatives were created using national best practices, peer review of similar systems, existing conditions, NFTA policies, and steering committee input to develop the alternative. It included the maximum level of transit priority envisioned for the corridor given its physical constraints, likely funding availability, and the most optimistic ridership expectations. From there, Alternative C, with the most impacts, was modeled in VISSIM traffic flow simulation software and the results were used to fine tune the transit priority measures, and find suitable locations for TSP and bus or Business Access Transit (BAT) lane locations.

The transit priority elements of Alternatives A and B were then created by including only the most cost-effective improvements based on which ones the VISSIM model found to be most useful. Further explanation of the VISSIM traffic modeling results are discussed in a separate section. Service plans including frequency, travel time and routing were developed for each enhanced transit alternative, which were then used to estimate operating costs and fleet requirements.

GENERAL FEATURES APPLICABLE TO ALL BRT ALTERNATIVES

This section defines terms and transit features utilized within the corridor transportation alternatives.

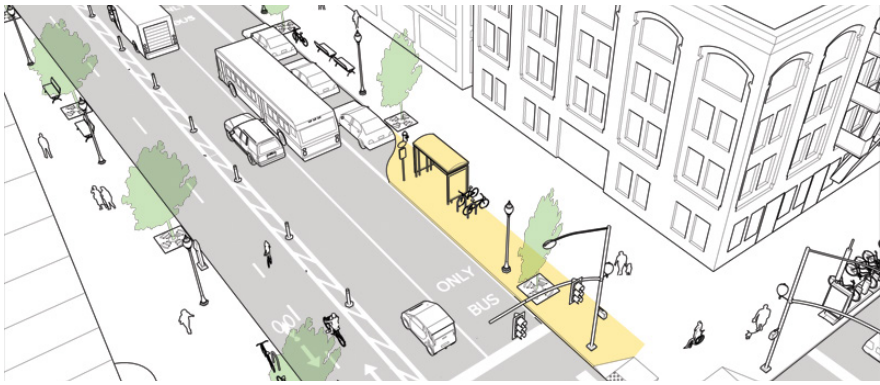
Access + Placemaking
To make transit convenient and attractive to use, stops and stations should be treated like important places in their communities. Similarly, easy access by foot and bicycle from surrounding residential and commercial areas is necessary to reduce the time and effort required to use transit. Together they lead to increased ridership and help to invigorate the surrounding neighborhoods.

BRT (Bus Rapid Transit) Stations
BRT stops are referred to as stations to indicate the similarities in terms of shelters, furniture, paving, fare collection equipment, real time information displays, accessibility, and sidewalk paving, to light rail stations.

Business Access Transit (BAT) Lanes
BAT lanes are curb side bus lanes that also allow general traffic to travel for short distances to make right turns into driveways and side streets.

Bus Boarding Bulbs
Bus Boarding Bulbs are curb extensions that are as long as the buses used at that stop. It allows buses to stop in the travel lane and quickly board and alight passengers with a minimum of delay, and don't require the bus to merge back into a travel lane. They also provide additional room for station shelters and furniture.

BRT Station



Bus Boarding Bulbs

Bus Lanes
Bus lanes can only be used by buses either all day or during certain times, typically peak traffic hours. Bus lanes can be in the center of the roadway, or along the curbs. Private vehicles are not permitted in bus lanes to allow for improved travel time for transit users.

Bus Stops
Bus stops serve standard local bus service and include at a minimum a sign, safe and convenient sidewalk paving, and accessibility. They can also include static signage, furniture, and shelters.

Computer Aided Dispatch / Automatic Vehicle Location (CAD/AVL)
CAD/AVL technology collects real-time location data from geo-located vehicles to track buses and provide data for real time information, and transit operators. This technology would be used for several smart technologies, and could eventually also be used to coordinate timing of transfers.

Connected Vehicle (CV) Equipment
Connected vehicle equipment can be utilized to dynamically control traffic lights to adjust for changing conditions. This equipment can also be expanded to improve the timing of transfers so that bus routes at major stop intersection can be coordinated.

Curb Extensions
Curb extensions extend the sidewalk at intersections to shorten the crossing distance for pedestrians. They generally extend into the street as far as the outside edge of the parking lane and are at least as wide as the crosswalk markings.

Fare Collection
NFTA is installing a fare collection system that uses smart cards with fare gates at Metro Rail stations. Local and limited stop routes would use the new standard NFTA system, which uses a fare box that accepts smart cards and cash located at the front door of the bus. BRT services could use the same system or a system similar to the current Metro Rail approach where riders purchase their passes or tickets before they board and are required to show proof of payment if requested.

Bus Lane


Connected Vehicle Equipment


Curb Extensions

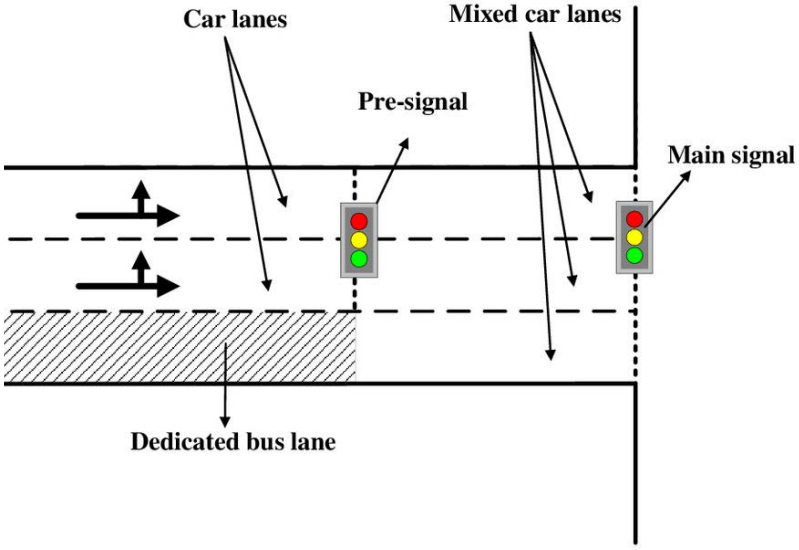
Mobility Hubs

Mobility hubs provide physical integration among modes by co-locating carsharing, bikesharing, and other shared-mobility services close to public transit stops and large residential developments. With their physical presence and clear, prominent branding, these spaces offer visibility to and connection between public transit and shared mobility services that in turn support multimodal living and reduced dependence on personal cars and solo driving.

Mobility Hubs

On-Board WiFi

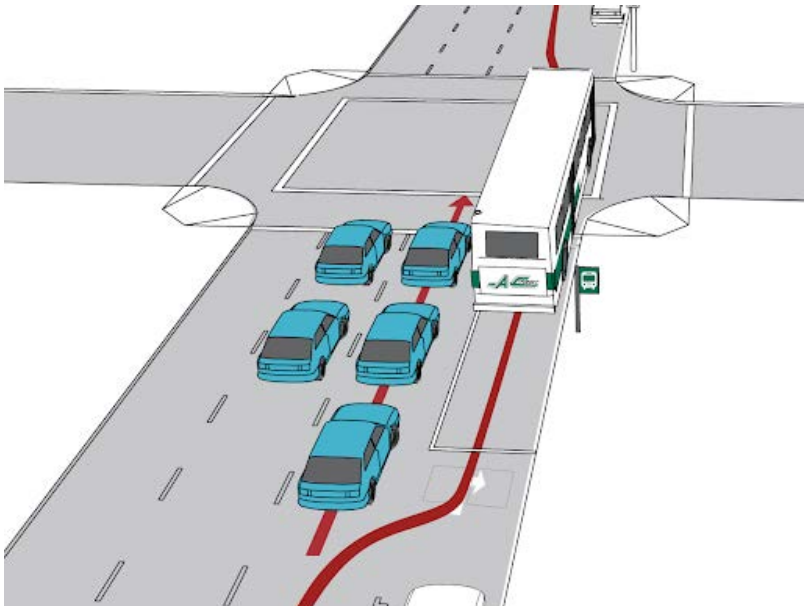
WiFi and internet connection can be wired into vehicles for passenger use. NFTA buses are currently WiFi enabled through a CAD/AVL system.



Pre-Signal Queue Jump

Pre-Signal Queue Jump

Pre-signal queue jumps are used in concert with queue jump lanes and curb extensions. When curb extensions are used with queue jump lanes, buses would become "trapped" behind the curb extension while traffic queues up next to them in the general travel lane. A pre-signal queue jump stops traffic before the curb extension and provides a bus only green allowing the bus to merge into the travel lane and proceed ahead of general traffic and take advantage of the queue jump lane.



Queue Jump Lane

Queue Jump Lanes

Queue jump lanes are short bus-only curbside lanes that allow buses to by-pass general traffic queued up at traffic signals. Right turn lanes can double as queue jump lanes for buses traveling straight through an intersection.

Real Time Data

The use of real time data provided by Intelligent Transportation Systems would be used by NFTA to provide real time arrival data information. This information also has the ability display arrival time and other updates at stations.

Service Plans

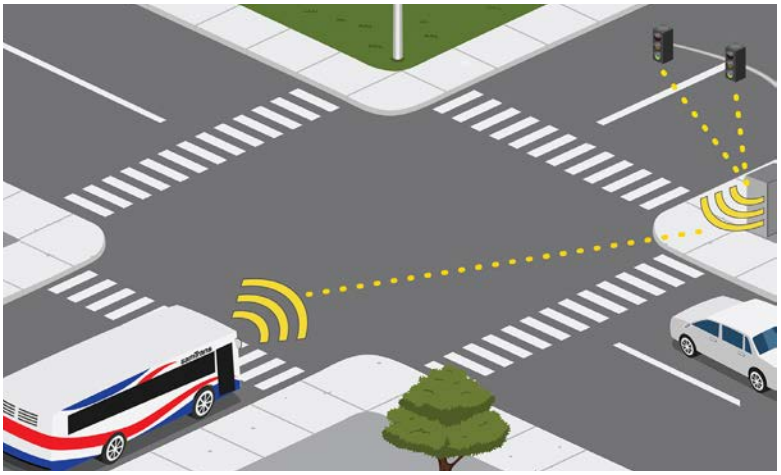
Each alternative includes a service plan that shows the ideal headway for each route at different times of the day. Ideal headways are based on ridership, peer review, and industry standards. Any alternative could be started with longer headways and phased into the ideal headways as long as the initial headway represents an improvement over existing service. If FTA Capital Improvement Program grants are used for funding as some point in the future the minimum headways required by that program would need to be followed.

Transit Signal Priority

TSP is a system that can either lengthen green time when a bus is approaching a traffic signal or shorten red time while a bus is waiting at a signal based on predetermined parameters. It can be used to shorten bus travel time and improve schedule reliability. Parameters include schedule adherence, passenger load, side street traffic volume and others.

Vehicles

Several different types of buses are proposed to be used on the different routes included in the alternatives. Standard NFTA 40-foot transit buses would be used on the local and limited stop routes and upgraded 40-foot buses with BRT styling, features and branding would be used on the BRT route.



Transit Signal Priority

TABLE 3: CORRIDOR ALTERNATIVES MATRIX

ALTERNATIVE	RUNNING WAYS	VEHICLES	STATIONS	SMART CITIES AND ITS
BUSINESS AS USUAL	Mixed traffic	Standard diesel or Compressed Natural Gas (CNG) buses	Standard local bus signage with shelters at key stops.	None
ALTERNATIVE A - ENHANCED LOCAL TRANSIT	Mixed traffic with TSP and queue jumpers at key locations*	Standard diesel or CNG buses	New shelters at major stops and minor improvements at other stops, improved connections to Routes 14 and 16 at south end of route.	TSP at key locations, real time info on devices using real-time bus arrival data.
ALTERNATIVE B - ENHANCED LOCAL TRANSIT + LIMITED STOP SERVICE	Mixed traffic with TSP and queue jumpers at key locations*	Standard diesel or CNG buses	New larger limited stop shelters with minor improvements to local stops, improved connection to 14 and 16 at south end of route.	TSP at key locations, real time info on devices using real-time bus arrival data.
ALTERNATIVE C - ENHANCED LOCAL TRANSIT + BUS RAPID TRANSIT	Curbside bus or BAT lanes between Sherman Rd. and Winspear Ave., Walden Ave. and Stanley St., and William St. and Clinton St.; bus queue jumps at major intersections; and TSP at key signalized intersections*	Dedicated fleet of unique, alternative fuel 40-foot BRT buses for BRT, standard buses for local	Major improvements at BRT stations including substantial LRT-quality shelters and furniture, static and real-time information displays, access and streetscape improvements, and improved connections to 14 and 16 at south end of route. Minor improvements would be made to local stops.	TSP, real time information at BRT stations and via devices using real-time bus arrival data, and mobility hubs located at key transfer points.

*Any of the build alternatives could be designed to include curb extensions and/or bus bulbs at selected intersections in addition to the running way and station improvements listed for the alternative.

TABLE 3: CORRIDOR ALTERNATIVES MATRIX (CONT.)

ALTERNATIVE	SERVICE	FARE COLLECTION	BRANDING	ROUTING	PEER SERVICES
BUSINESS AS USUAL	Service plan: 10 to 15 minute peak headways, 20-minute midday, 30-minute Saturday and Sunday daytime, and 40-minute evenings Stop spacing: No change from average of .15 miles	NFTA standard Metro Bus policies and procedures	None	Same as Bus Route 19	Other NFTA local routes
ALTERNATIVE A - ENHANCED LOCAL TRANSIT	Service plan: 10-minute peak headways, 15-minute midday and Saturday daytime, and 30-minute Sunday and evenings Stop spacing: Increased to average of 0.20 miles from 0.15 miles	NFTA standard Metro Bus policies and procedures	Distinct logo and colors applied to stop amenities, on-line, and marketing materials.	Same as Bus Route 19	RIPTA R-Line, Providence, RI
ALTERNATIVE B - ENHANCED LOCAL TRANSIT + LIMITED STOP SERVICE	Service plan limited: 15-minute peak headways, 30-minute midday, evening, Saturday, and Sunday daytime. Service plan local: 30-minute peak, midday, and Saturday daytime and 60-minute evening and Sunday Stop spacing: Limited (0.6 miles), local (0.2 miles)	NFTA standard Metro Bus policies and procedures	Distinct logo and colors applied to stop amenities, on-line, and marketing materials, if operational and funding allows.	Same as Bus Route 19	CDTA BusPlus Red Line, Albany, NY
ALTERNATIVE C - ENHANCED LOCAL TRANSIT + BUS RAPID TRANSIT	Service plan BRT: 10-minute headways peak and midday, 15-minute Saturday, and 30-minute evenings and Sunday. Service plan local: 30-minute peak, midday and Saturday, 30-minute evenings and Sundays Stop spacing: BRT (0.6 miles), local (0.2 miles)	TBD, BRT could use standard Metro Bus fare system but further consideration should be given to a Smart Card proof of payment system.	Logo, colors, and extensive branding for all stations, vehicles, facilities, on-line, and marketing materials.	Same as Bus Route 19	Community Transit Swift, Everett (Seattle), WA

** Service plans show an aspirational level of transit service. There is flexibility to start at lower levels and increase them over time.

ALTERNATIVE A - ENHANCED LOCAL TRANSIT

This alternative presents a lower capital cost approach to enhancing bus service along the Bailey Avenue corridor. The concept is based on incremental improvements to the elements of the existing Metro Bus Route 19 so they work better for riders resulting in faster, more frequent, and more comfortable service. This alternative could be implemented more quickly than the other alternatives with lower capital and operating costs but still provide significant improvements to service for transit users. It could also potentially serve as a first phase of improvements, which would be followed by Alternatives B and C. The following description provides a concept for further analysis and is not intended to reflect a final capital improvement proposal for Bailey Avenue.

This alternative, when compared to Alternatives B + C, provides improvements to the existing Metro bus route provided by NFTA today. Improvements are lower in cost and scale; however, would provide a more convenient and comfortable ride for existing users.

Potential Improvements at the Bailey Avenue / Kensington Avenue Intersection

RUNNING WAYS

Queue Jump Lanes

This alternative would operate in mixed traffic except for queue jump lanes in eight strategic locations where transit vehicles could take advantage of priority without significantly impacting cross street traffic. There would be two basic types of queue jump lanes, some consisting of nearside stops, bulb outs, pre-signals, and transit signal priority at the main intersections, and others consisting of near or far side stops and TSP. The following intersections are proposed to include queue jump lanes and TSP only:

- Winspear Avenue (northbound) – Queue jump lane with near side stop.
- Minnesota Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop.
- Kensington Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop southbound; queue jump lane to far side stop northbound.
- Delavan Avenue (southbound only) – Queue jump lane with far side stop.
- Genesee Street (northbound and southbound) – Queue jump lane with far side stop in both directions.
- Walden Avenue (southbound only) – Queue jump lane with near side stop.
- William Street (southbound only) – Queue jump lane with near side stop.
- Clinton Street (northbound only) – Queue jump lane with far side stop.

Refer to Section IV for additional detail regarding transit signal priority recommendations.

Transit Signal Priority

TSP is proposed at the following intersections to reduce travel time and improve transit reliability along the corridor. Locations were chosen where traffic volumes were high enough on Bailey to provide benefit for buses but not so high on the cross street that they would create more delay there, especially for other bus routes. Lower volume cross streets were not included because they cause little delay. It should be noted that this list is preliminary and final locations should be determined through a detailed traffic engineering analysis.

- Sherman Road
- Veterans Hospital/Coal Road
- Winspear Avenue
- Minnesota Avenue
- Amherst Street
- Westminster Avenue
- Kensington Avenue
- Millicent Avenue
- Collingwood Avenue
- Langfield Drive
- East Delavan Avenue
- Scajaquada Street/Kerns Avenue
- East Ferry Street
- Genesee Street
- Doat Street
- Walden Avenue
- Lovejoy Street
- William Street
- Dingens Street
- Clinton Street
- Buffalo China Road
- Seneca Street
- Elk Street
- South Park Avenue

SMART CITIES/ITS

Alternative A would implement Intelligent Transportation Systems (ITS) such as TSP at the locations mentioned on the previous page and would make full use of NFTA's new systems including real time arrival information and the new system-wide smart card fare collection system.

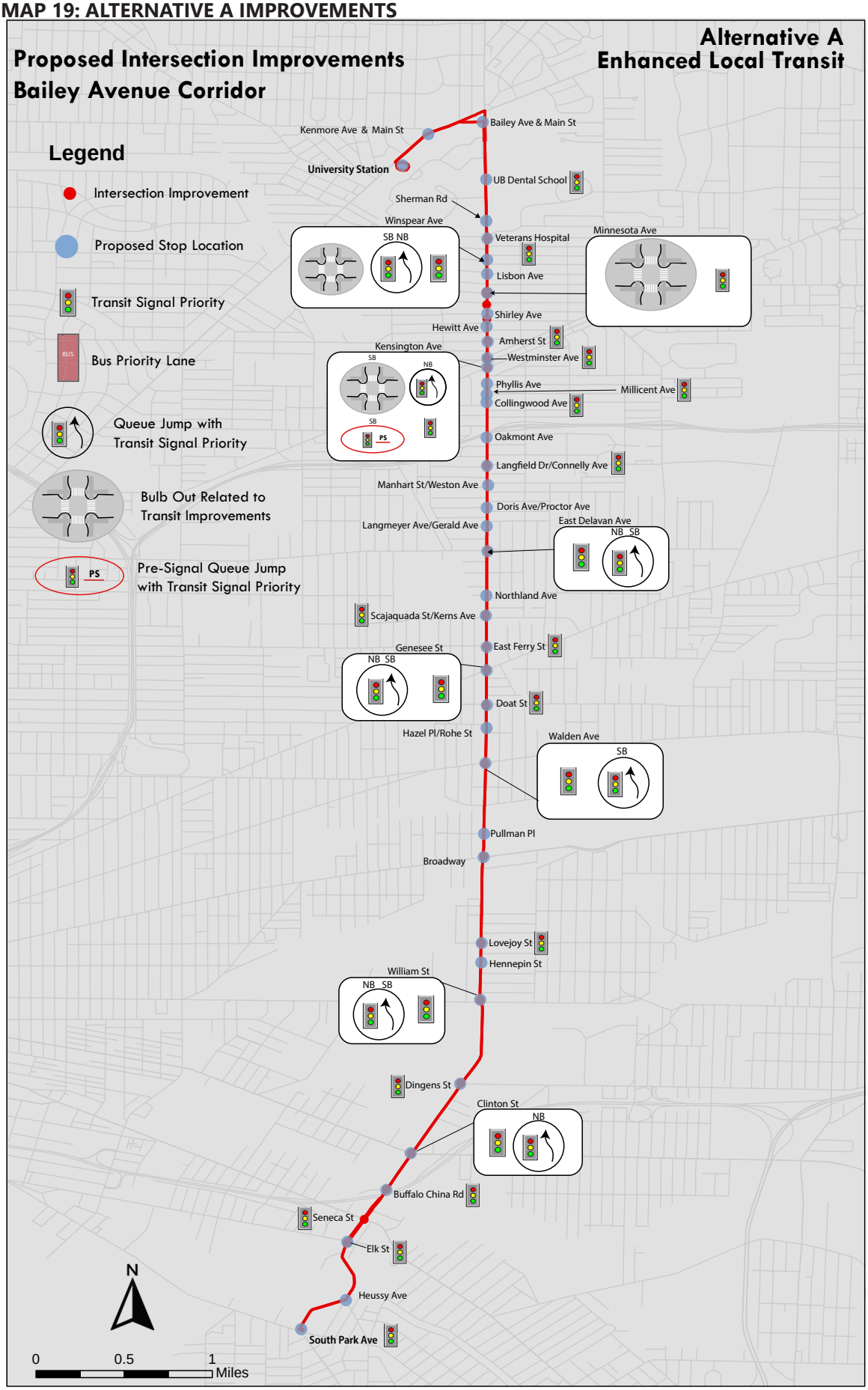
STATIONS/STOPS

There would be 36 stops in each direction between University Station and South Park Avenue in Alternative A, a reduction of 10 compared to what exists today. This would be achieved by eliminating or combining low ridership stops and would result in a faster and more comfortable ride for the majority of riders in the corridor. Stops would generally be paired with one in each direction at the same intersection. Stop improvements would include a new signage pylon with static route and schedule information, a bench, and improved sidewalk and shelter pad paving. High volume stops would receive a new shelter. A possible new layover location at the south end of the corridor to improve connections to Routes 14 and 16 may be included. Average stop spacing would increase from 0.15 miles to 0.20 miles, reducing running time and improving reliability.

Stops would be located at the following intersections:

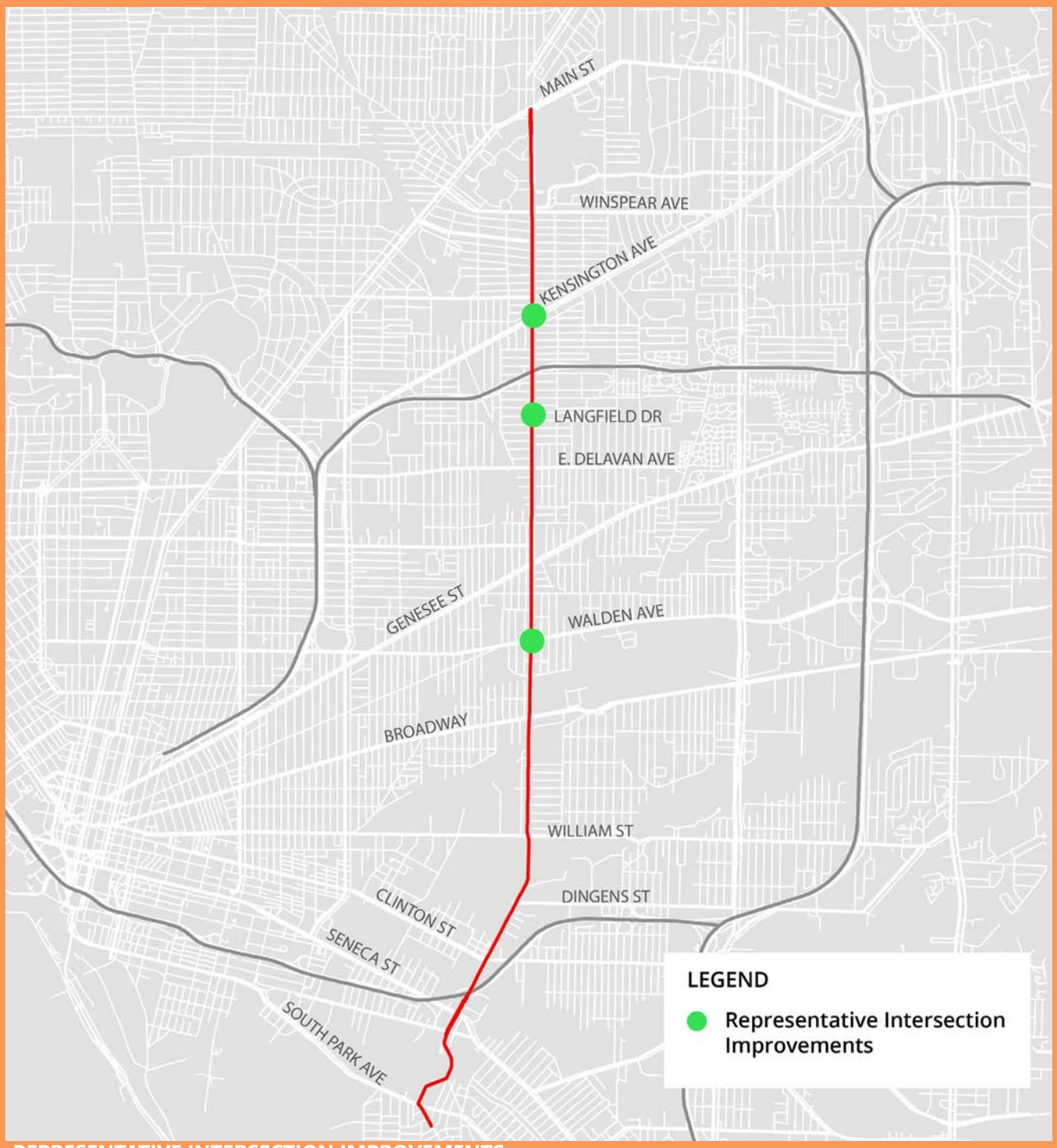
- University Station
- Kenmore Avenue at Main Street
- UB Dental School
- Veterans Hospital/Coal Road
- Winspear Avenue
- Lisbon Avenue/Rounds Avenue
- Minnesota Avenue
- Shirley Avenue
- Hewitt Avenue
- Amherst Street
- Kensington Avenue
- Phyllis Avenue
- Oakmont Avenue
- Langfield Drive/Connelly Avenue
- Manhart Street/Weston Avenue
- Doris Avenue/Proctor Avenue
- Langmeyer Avenue/Gerald Avenue
- East Delavan Avenue
- Northland Avenue
- Scajaquada Street/Kerns Avenue
- East Ferry Street
- Genesee Street
- Doat Street
- Hazel Place/Rohe Street
- Walden Avenue
- Pullman Place
- Broadway
- Lovejoy Street
- Hennepin Street
- William Street
- Dingens Street
- Clinton Street
- Buffalo China Road
- Seneca Street
- Heussy Avenue
- South Park Avenue

MAP 19: ALTERNATIVE A IMPROVEMENTS



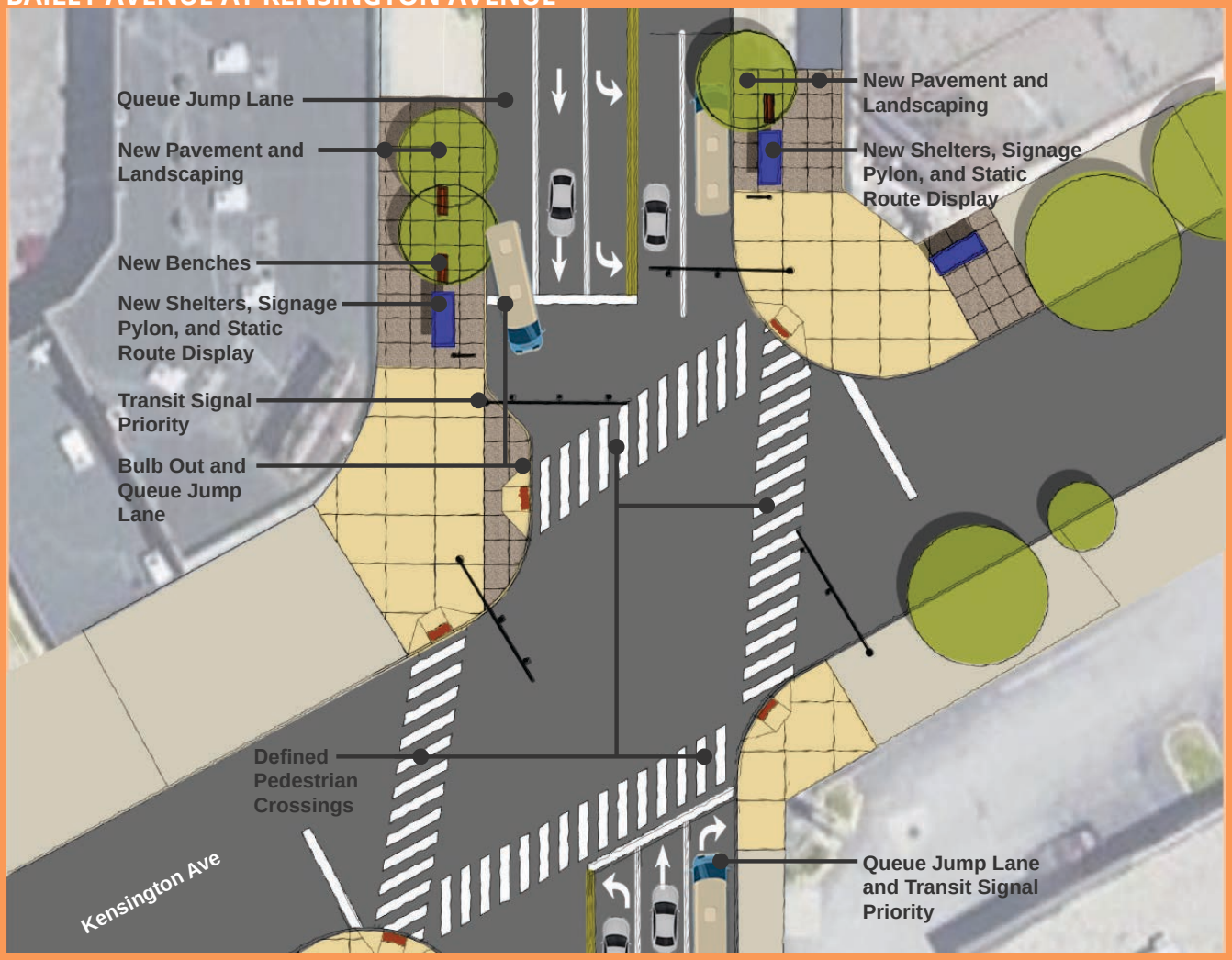
REPRESENTATIVE INTERSECTION IMPROVEMENTS

Alternative A recommends specific improvements to intersections that are intended to improve local bus service on Bailey Avenue. There are three main types of intersections along the corridor with unique configurations and qualities; Kensington Avenue, Langfield Drive and Walden Avenue were selected to depict improvements at these representative intersections. Improvements in Alternative A are geared toward increasing pedestrian safety with features such as enhanced pedestrian crossings, curb extensions to shorten pedestrian distances and landscaping. Transit improvements to local route service include defined queue jump lanes, transit signal priorities and new bus shelters with route displays.



REPRESENTATIVE INTERSECTION IMPROVEMENTS

BAILEY AVENUE AT KENSINGTON AVENUE

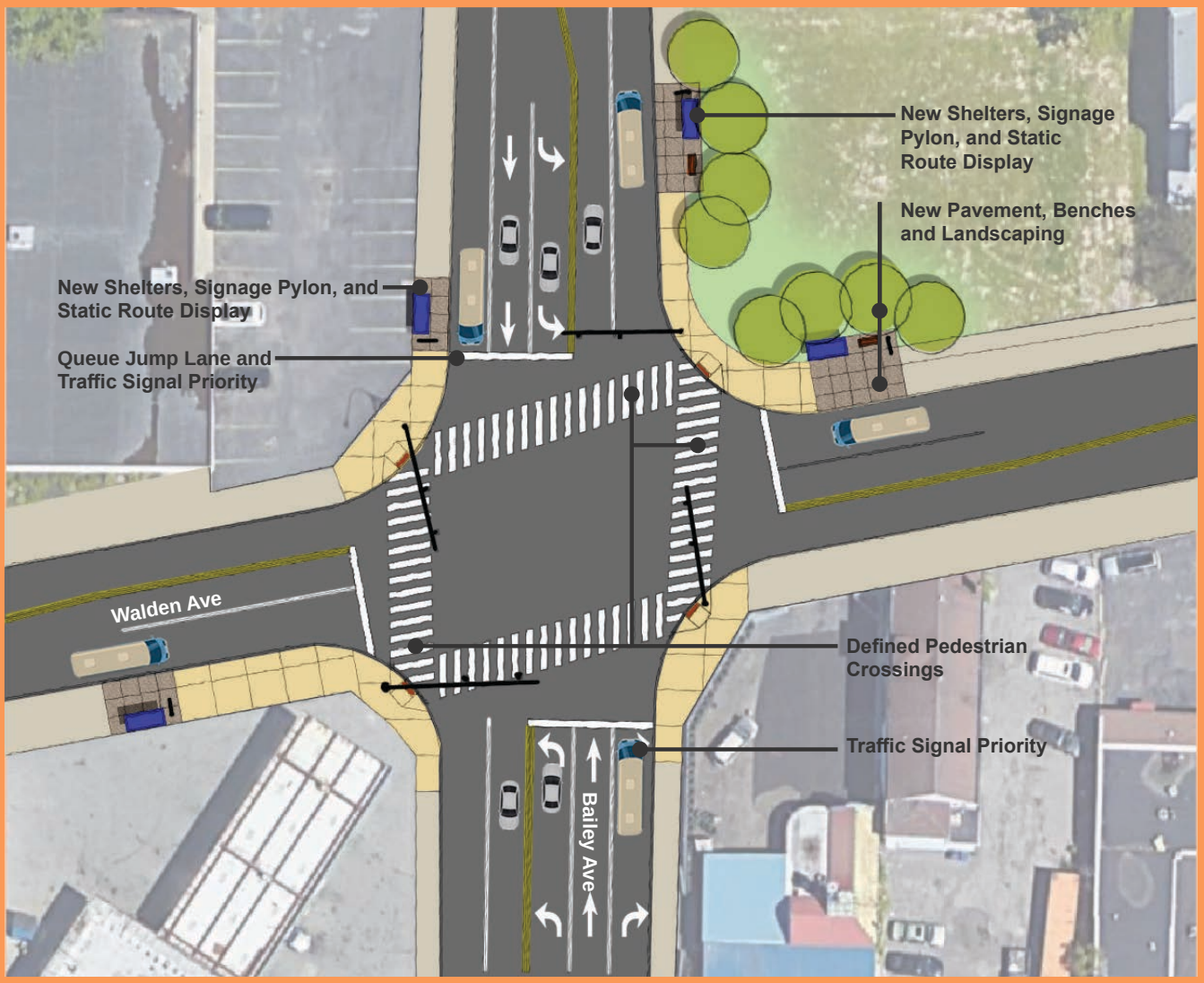


Kensington Avenue is representative of a four-way intersection along Bailey Avenue. Enhanced bus shelters and accessibility improvements are anticipated to improve the experience associated with local bus services along Bailey Avenue.

BAILEY AVENUE AT LANGFIELD DRIVE

Langfield Drive is representative of an off-set street intersection along Bailey Avenue. Improvements are intended to provide new pavement to restore the sidewalks and landscaping features to enhance the user experience. Improvements also include accessible curb ramps (where necessary), new bus shelters and benches.

BAILEY AVENUE AT WALDEN AVENUE



Improvements at this intersection in Alternative A will provide defined queue jump lanes and traffic signal priority for local buses. Improvements will also provide an enhanced sense of place for pedestrians and transit users by restoring sidewalks, providing accessible curb ramps, planting new street trees and landscaping and installing new shelters, where necessary.

SERVICE

Running time for the trip from University Station to Bailey and Abbott is estimated to decrease by 4 minutes from an average of 40 minutes to an average of 36 minutes during the morning peak. Two minutes of this savings is expected to be due to the reduction in stops (20 seconds per stop assuming that under normal circumstances each bus would stop at half the stops or 5 x 20 = 1m 40s) and two minutes is due to TSP (assuming a saving of .3 minutes per mile or .3 x 7.8 = 2m 20s).

ROUTING

The route would be the same as the existing Metro Bus Route 19 except for the possible short extension to the new South Park and Abbott Road layover on the south end. The route would be 7.8 miles long and extend from University Station to South Park and Abbott Road via Main Street and Bailey Avenue.

VEHICLES

Alternative A would use standard 40-foot diesel or CNG buses from NFTA's general fleet. This would maintain flexibility in dispatching buses and allow existing garage assignments to remain unchanged, although it would not create a distinctive image for the route. The vehicles would not be branded.

FARE COLLECTION

Fare collection policies, procedures, and fares would be the same as other NFTA Metro Bus routes and would correspond to the new fare system that is about to be launched.

BRANDING

A distinct name, logo, and colors would be applied to shelters, stop signage, and marketing materials, both electronic and paper. Vehicles would not be permanently branded in order to maintain flexibility of assignments between the various fleets and garages, but would include a name or logo on the destination sign. This branding option is listed as an option that can be implemented as funding and operational considerations allow. If funding or other operational constraints restrict branding, then branding should be implemented utilizing the existing Metro Bus branding.

TABLE 4: LOCAL ROUTE

TIME PERIOD	IDEAL HEADWAY
Weekday Peak 6 AM-9 AM / 3 PM-6 PM	10 minutes
Weekday Midday + Early Evening 9 AM-3 PM / 6 PM-9 PM	15 minutes
Weekday Evening + Early Morning 5 AM-6 AM, 9 PM-1AM	30 minutes
Saturday Daytime 10 AM-6 PM	15 minutes
Saturday Morning + Evening 6 AM-10 AM, 6 PM-12 AM	30 minutes
Sunday All Day 7 AM- 11 PM	30 minutes

*Headways shown are aspirational and there is flexibility for them to be phased in over time.

NFTA Standard 40-foot Vehicle

PEER SERVICES

A similar service called the R Line is operated by the Rhode Island Public Transit Authority in Providence, Rhode Island.

COMPARATIVE BUS SERVICE FROM AROUND THE COUNTRY

R-Line | Providence, Rhode Island

The R-Line operates along North Main Street and Broad Street, connecting both Pawtucket and South Providence to downtown Providence. The approximately 8-mile route from South Providence to Pawtucket was selected as RIPTA's first rapid route because it is currently the busiest bus route in the City, serving more than 10,000 passengers a day. The R Line operates in mixed traffic and employs high frequency limited-stop service through transit signal priority, queue jumps, and 30 upgraded bus stations.

The R-Line in Providence is branded as "rapid transit" rather than bus rapid transit since it operates in mixed traffic and does not have fully dedicated bus only lanes.

ALTERNATIVE B - ENHANCED LOCAL + LIMITED STOP SERVICE

Alternative B presents a medium capital cost approach to enhance bus service along Bailey Avenue. The concept includes a limited stop, frequent service route along Bailey Avenue, running in addition to local service. It would provide a faster service than is currently available in the corridor and, combined with improvements at the limited stops, would make longer trips less time consuming and more comfortable. The following description is preliminary and meant to provide a concept for further analysis, not a final capital improvement proposal.

Alternative B takes the improvements to the existing Metro bus route service in Alternative A a step further. In addition to the existing Metro Bus service, a new route would provide more frequent service at targeted bus stop locations to decrease travel times and improve transit reliability.

Potential Improvements at the Bailey Avenue / Kensington Avenue Intersection

RUNNING WAYS

Queue Jump Lanes

This alternative would operate in mixed traffic except for queue jump lanes in eight strategic locations where transit vehicles could take advantage of priority without significantly impacting cross street traffic. There would be two basic types of queue jump lanes, some consisting of nearside stops, bulb outs, pre-signals, and TSP at the main intersections, and others consisting of near or far side stops and TSP.

- Winspear Avenue (northbound) – Queue jump lane with near side stop.
- Minnesota Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop.
- Kensington Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop southbound; queue jump lane to far side stop northbound.
- Delavan Avenue (southbound only) – Queue jump lane with far side stop.
- Genesee Street (northbound and southbound) – Queue jump lane with far side stop in both directions.
- Walden Avenue (southbound only) – Queue jump lane with near side stop.
- William Street (southbound only) – Queue jump lane with near side stop.
- Clinton Street (northbound only) – Queue jump lane with far side stop.

Refer to Section IV for additional detail regarding transit signal priority recommendations.

Transit Signal Priority

Transit signal priority (TSP) is proposed at the following 24 intersections to reduce travel time and improve transit reliability along the corridor. Locations were chosen where traffic volumes were high enough on Bailey to provide benefit for buses but not so high on the cross street that they would create more delay there. It should be noted that this list is preliminary and final locations will be determined through a detailed traffic engineering analysis.

- Sherman Road
- Veterans Hospital/Coal Road
- Winspear Avenue
- Minnesota Avenue
- Amherst Street
- Westminster Avenue
- Kensington Avenue
- Millicent Avenue
- Collingwood Avenue
- Langfield Drive
- East Delavan Avenue
- Scajaquada Street/Kerns Avenue
- East Ferry Street
- Genesee Street
- Doat Street
- Walden Avenue
- Lovejoy Street
- William Street
- Dingens Street
- Clinton Street
- Buffalo China Road
- Seneca Street
- Elk Street
- South Park Avenue

SMART CITIES/ITS

Alternative B would implement Intelligent Transportation Systems (ITS) such as TSP at the locations mentioned above and would make full use of NFTA's new systems including real time information displays at major stops, and the new system-wide smart card fare collection system. NFTA already uses a Computer Aided Dispatch/Automatic Vehicle Location (CAD/AVL) system to track buses that provides data for real time information and TSP. The system also provides WiFi on all buses.

STATIONS/STOPS

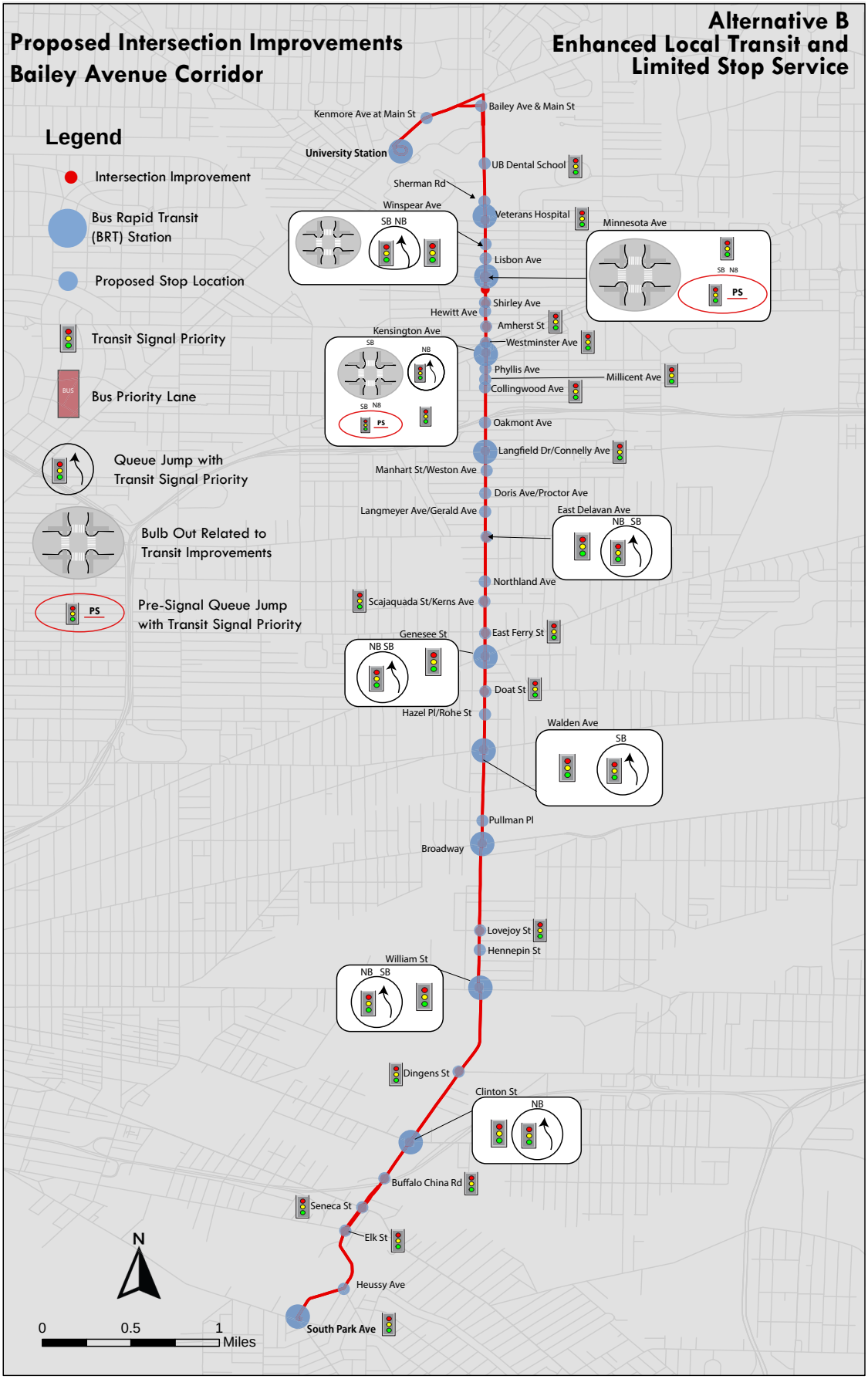
Alternative B would include a local bus service stopping at all of the stop included in Alternative A. It would also include a limited stop service that stops at only 13 locations along the line, including the end points of University Station and South Park Avenue. This would result in a faster and more comfortable ride for the majority of riders in the corridor.

Station improvements would include new larger shelters at all limited stops, other improvements at local stops, and a possible new layover location at south end to improve connections to Routes 14 and 16. All limited stops would include new signage with static route and schedule information, a bench, and improved sidewalk and shelter pad paving. Average stop spacing for the limited stop route would be approximately 0.6 miles, and 0.2 miles for the local service.

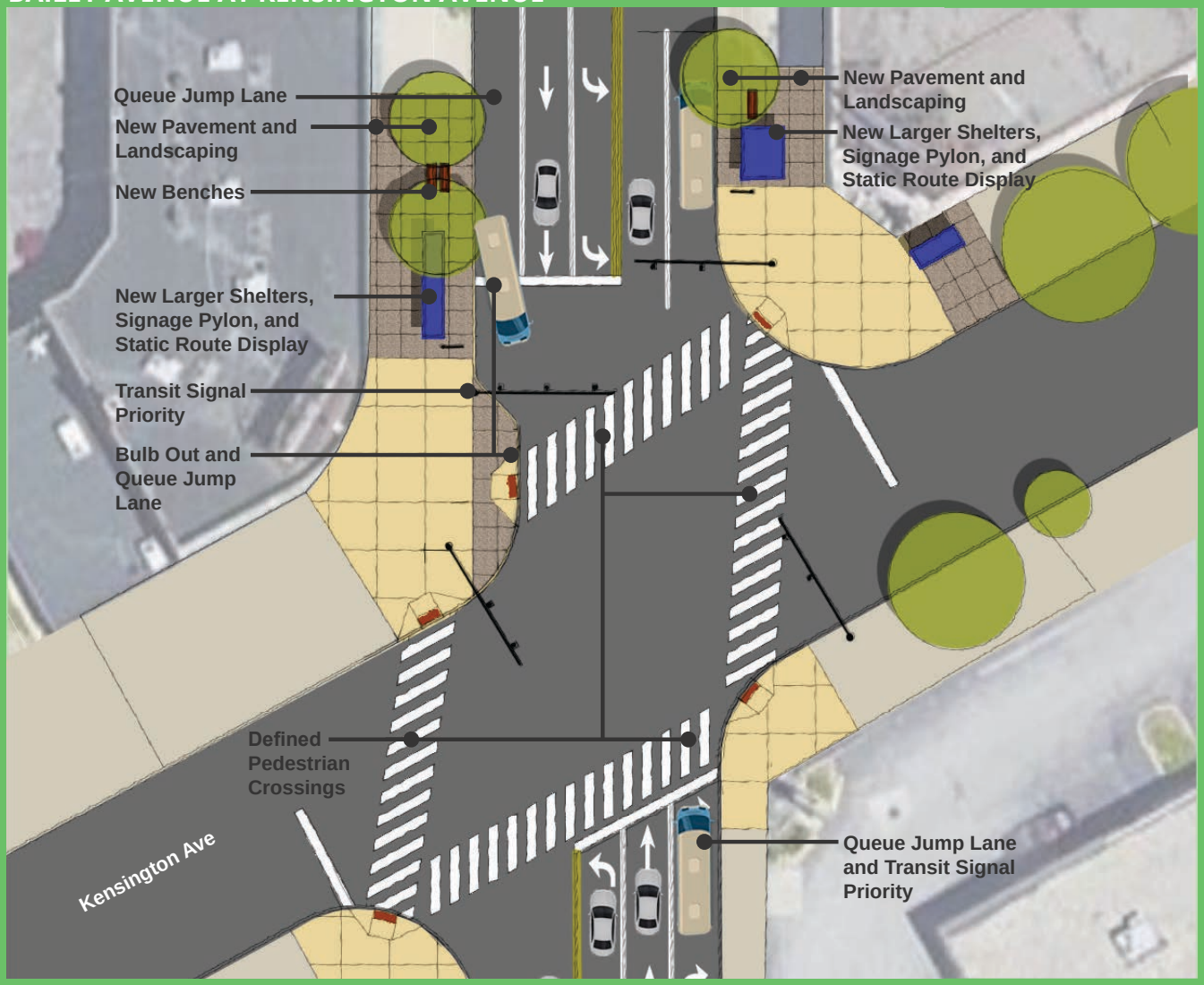
Limited stops would be located at the following intersections.

- University Station
- Veterans Hospital/Coal Road
- Minnesota Avenue
- Kensington Avenue
- Langfield Drive/Connelly Avenue
- East Delavan Avenue
- Genesee Street
- Walden Avenue
- Broadway
- William Street
- Clinton Street
- Seneca Street
- South Park Avenue

MAP 20: ALTERNATIVE B IMPROVEMENTS



BAILEY AVENUE AT KENSINGTON AVENUE

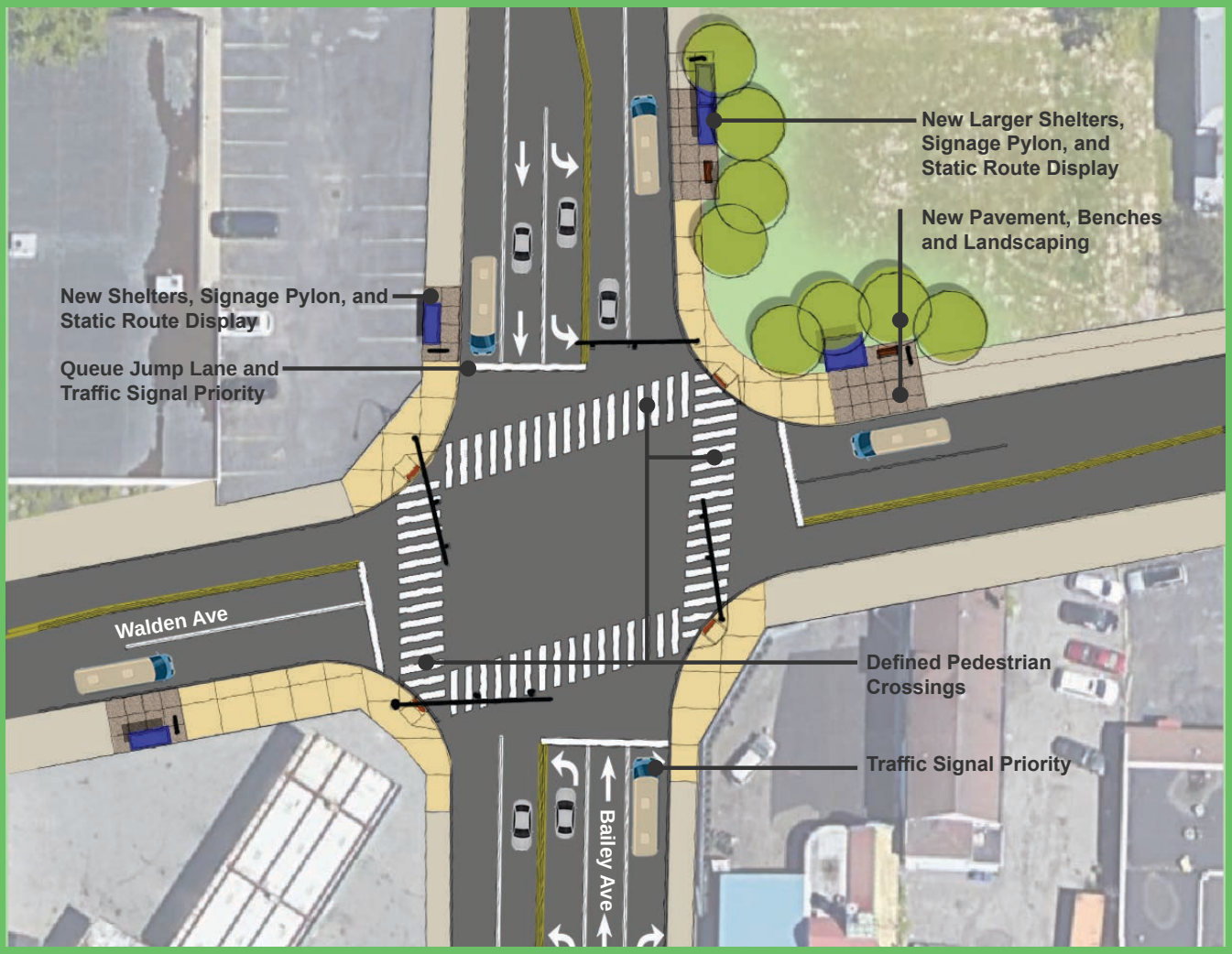


In this alternative there are more robust service stations to accommodate the limited stop service. There is also landscaping improvements at the shelter locations to provide an enhanced node.

BAILEY AVENUE AT LANGFIELD DRIVE

Improvements at this intersection in Alternative B are intended to provide additional transit rider and pedestrian comfort with the installation of bump outs at the bus stop, reducing the crossing distance for pedestrians.

BAILEY AVENUE AT WALDEN AVENUE



Improvements at the Bailey Avenue and Walden Avenue intersection in Alternative B are similar to the Kensington Avenue improvements, which feature more prominent bus stops for the limited bus service.

SERVICE

The service plan for Alternative B is shown in the following tables. The service plan seeks to balance the headways of the limited stop and local routes, providing an attractive service for the public at a reasonable operating cost. Total service provision is increased over existing service and Alternative A. The headway times provided in the tables are ideal and subject to change.

Running time for the trip from University Station to Bailey and Abbott on the local service would be 36 minutes, the same as for Alternative A. Running time for the limited stop route is estimated to be 12 minutes less than existing service, decreasing from an average of 40 minutes to an average of 28 minutes during the morning peak. Eight minutes of this savings is expected to be due to the reduction in stops (20 seconds per stop assuming that under normal circumstances each bus would stop at three-quarters of the stops or 24 x 20s = 8m) and four minutes is due to TSP (assuming a savings of .5 minutes per mile or .5 x 7.8 = 3m 55s).

ROUTING

The route of both the limited and local routes would be the same as the existing Metro Bus Route 19 except for the possible short extension to the new South Park and Abbott Road layover on the south end. The route would be 7.8 miles long and would extend from University Station to South Park and Abbott Road via Main Street and Bailey Avenue.

VEHICLES

The limited stop and local routes on Bailey Avenue would use standard 40-foot diesel or CNG buses from NFTA's general fleet. Buses could be assigned to any garage to maintain flexibility in dispatching and allow existing garage assignments to remain unchanged. Vehicles would not be branded.

TABLE 5: LIMITED STOP ROUTE

TIME PERIOD	IDEAL HEADWAY
Weekday Peak 6 AM-9 AM / 3 PM-6 PM	15 minutes
Weekday Midday + Early Evening 9 AM-3 PM / 6 PM-9 PM	30 minutes
Weekday Evening + Early Morning 5 AM-6 AM, 9 PM-1AM	30 minutes
Saturday Daytime 10 AM-6 PM	30 minutes
Saturday Morning + Evening 6 AM-10 AM, 6 PM-12 AM	30 minutes
Sunday All Day 7 AM- 11 PM	30 minutes

TABLE 6: LOCAL BUS ROUTE

TIME PERIOD	IDEAL HEADWAY
Weekday Peak 6 AM-9 AM / 3 PM-6 PM	30 minutes
Weekday Midday + Early Evening 9 AM-3 PM / 6 PM-9 PM	30 minutes
Weekday Evening + Early Morning 5 AM-6 AM, 9 PM-1AM	60 minutes
Saturday Daytime 10 AM-6 PM	30 minutes
Saturday Morning + Evening 6 AM-10 AM, 6 PM-12 AM	60 minutes
Sunday All Day 7 AM- 11 PM	60 minutes

*Headways shown are aspirational and there is flexibility for them to be phased in over time.

FARE COLLECTION

Fare collection policies, procedures, and fares would be the same as other NFTA Metro Bus routes and would correspond to the new fare system that is about to be launched.

BRANDING

A distinct name, logo, and colors would be applied to limited stop shelters, pylons or other stop signage, and marketing materials, both electronic and paper. This branding option is listed as an option that can be implemented as funding and operational considerations allow. If funding or other operational constraints restrict branding, then branding should be implemented utilizing the existing Metro Bus branding.

PEER SERVICES

A similar service called BusPlus is operated by the Capital District Transportation Authority in Albany. Please refer to Appendix A: Best Practices Summary.

COMPARATIVE BUS SERVICE IN NEW YORK STATE

BusPlus Service | Albany, NY

The BusPlus service on Route 5 (Central Avenue/ State Street) in Albany, New York is a limited stop service along a 17-mile stretch between downtown Albany and downtown Schenectady which started operations in 2011. The BRT hybrid electric vehicles operate in mixed traffic. The BusPlus system bolsters amenities such as larger stations with real-time arrival information and complimentary WiFi.

The BusPlus service in Albany, NY features sleek, efficient buses serve with enhanced customer amenities. Distinctive signage signifies premium service as well as upgraded stations, real time information and complimentary Wi-Fi service.

ALTERNATIVE C - ENHANCED LOCAL + BUS RAPID TRANSIT

Alternative C presents a higher capital cost approach to further enhance bus service on Bailey Avenue. The concept converts the limited stop route to a BRT route, running in addition to the existing local service. It would improve upon the limited stop route by adding Business Access Transit (BAT) lanes in sections of the corridor, which would provide an even faster service. Combined with improvements at the BRT stops to make them similar to light rail stations, it would continue to improve upon the service provided by the limited stop route in Alternative B. The following description is preliminary and meant to provide a concept for further consideration.

WHAT IS BUS RAPID TRANSIT?

Bus Rapid Transit or BRT is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at light rail level capacities. BRT can include dedicated bus lanes and bus priority to increase reliability and convenient bus services to its users.

Potential Improvements at the Bailey Avenue / Kensington Avenue Intersection

RUNNING WAYS

Queue Jump Lanes

This alternative would operate in mixed traffic, in bus or BAT lanes, and in queue jump lanes in eight strategic locations where transit vehicles could take advantage of the improvements without significantly impacting cross street traffic. There would be two basic types of queue jump lanes, some consisting of nearside stops, bulb outs, pre-signals, and TSP at the main intersections, and others consisting of near or far side stops and TSP. The queue jumps would be located at the following intersections:

- Winspear Avenue (northbound) – Queue jump lane with near side stop.
- Minnesota Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop.
- Kensington Avenue (northbound and southbound) – Pre-signal queue jump lane with bulb out and near side stop southbound; queue jump lane to far side stop northbound.
- Delavan Avenue (southbound only) – Queue jump lane with far side stop.
- Genesee Street (northbound and southbound) – Queue jump lane with far side stop in both directions.
- Walden Avenue (southbound only) – Queue jump lane with near side stop.
- William Street (southbound only) – Queue jump lane with near side stop.
- Clinton Street (northbound only) – Queue jump lane with far side stop.

Refer to Section IV for additional detail regarding transit signal priority recommendations.

Transit Signal Priority

Transit signal priority (TSP) is proposed at the following intersections to reduce travel time and improve reliability along the corridor. Locations were chosen where traffic volumes were high enough on Bailey to provide benefit for buses but not so high on the cross street that they would create more delay there. Lower volume cross streets were not included because they cause little delay. It should be noted that this list is preliminary and final locations will be determined through a detailed traffic engineering analysis.

- Sherman Road
- Veterans Hospital/Coal Road
- Winspear Avenue
- Minnesota Avenue
- Amherst Street
- Westminster Avenue
- Kensington Avenue
- Millicent Avenue
- Collingwood Avenue
- Langfield Drive
- East Delavan Avenue
- Scajaquada Street/Kerns Avenue
- East Ferry Street
- Genesee Street
- Doat Street
- Walden Avenue
- Lovejoy Street
- William Street
- Dingens Street
- Clinton Street
- Buffalo China Road
- Seneca Street
- Elk Street
- South Park Avenue

SMART CITIES/ITS

Alternative C would implement Intelligent Transportation Systems such as TSP at the locations mentioned above and would make full use of NFTA's new systems including real time arrival data and the new system-wide smart card fare collection system. Stations and buses would be equipped with real time information displays. NFTA already uses a Computer Aided Dispatch/Automatic Vehicle Location (CAD/AVL) system to track buses that provides data for real time information and TSP. The system also provides WiFi on all buses.

STATIONS/STOPS

There would be 13 stops along the line, including the end points of University Station and South Park Avenue, in the BRT alternative. Stops would be at the same locations as for the limited stop service in Alternative B. Eight stations would include mobility hubs where a variety of modes of transportation, including transit, bike and car share, bike racks, and ride hailing services, come together to provide comprehensive services to the surrounding community.

Compared with existing service, this would result in a faster and more comfortable ride for the majority of riders in the corridor.

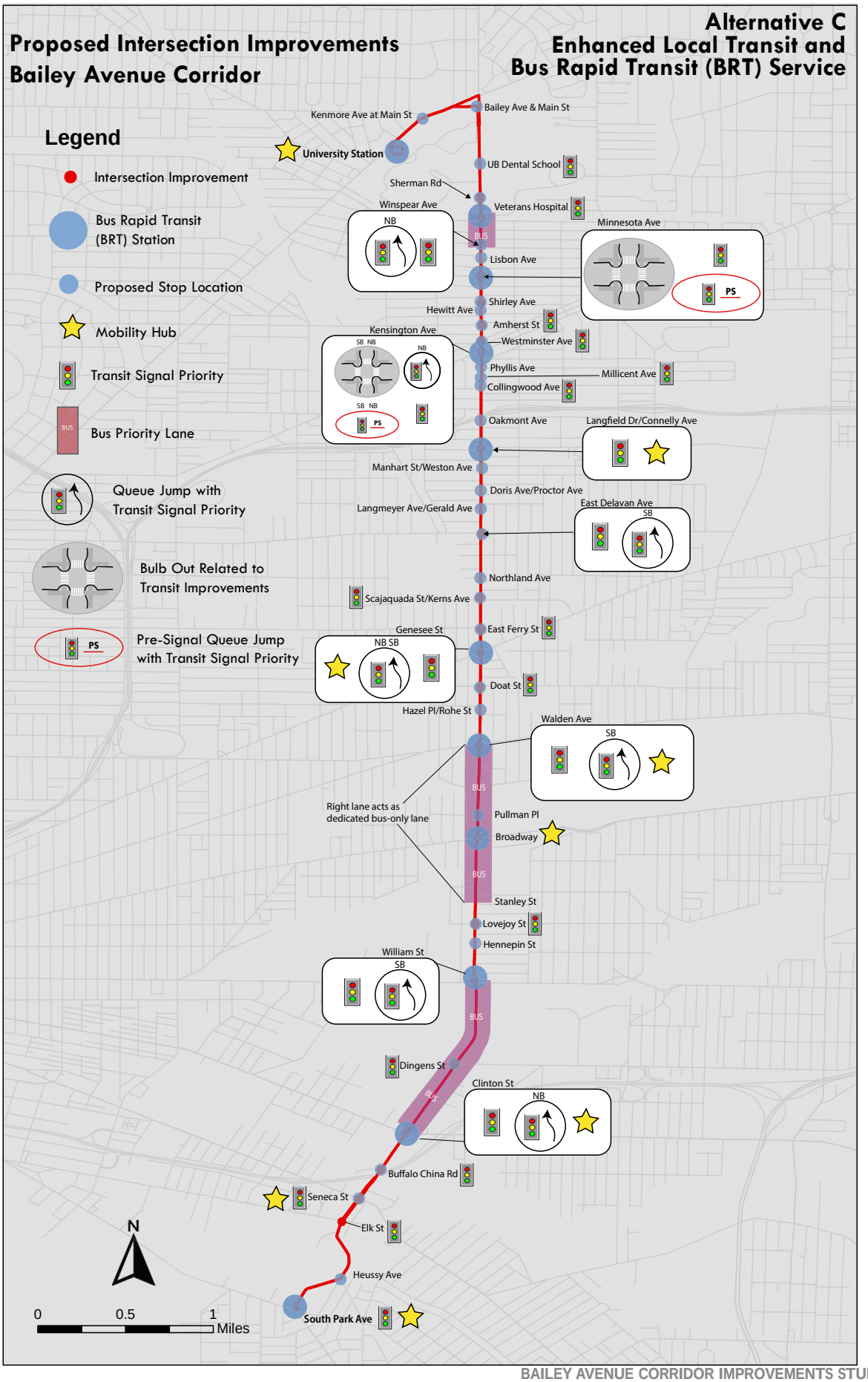
- University Station - Mobility Hub
- Veterans Hospital/Coal Road
- Minnesota Avenue
- Kensington Avenue
- Langfield Drive/Connelly Avenue
- East Delavan Avenue
- Genesee Street
- Walden Avenue
- Broadway
- William Street
- Clinton Street
- Seneca Street
- South Park Avenue

Improvements would include new shelters at BRT stations, other improvements at local stops, and a new layover location at south end to improve connections to Routes 14 and 16. Average stop spacing for the BRT route would be approximately 0.6 miles. All BRT stations would include large new shelters with BRT features like real-time information, furniture and landscaping, static route and schedule information, and improved sidewalk and shelter pad paving. The stations would be substantial enough to create central places in the neighborhoods where they are located. Some would be classified as mobility hubs where all modes of transportation - BRT, local bus, walking, bicycling, bike, scooter, and car share/ taxi/ ride-hailing services - come together.

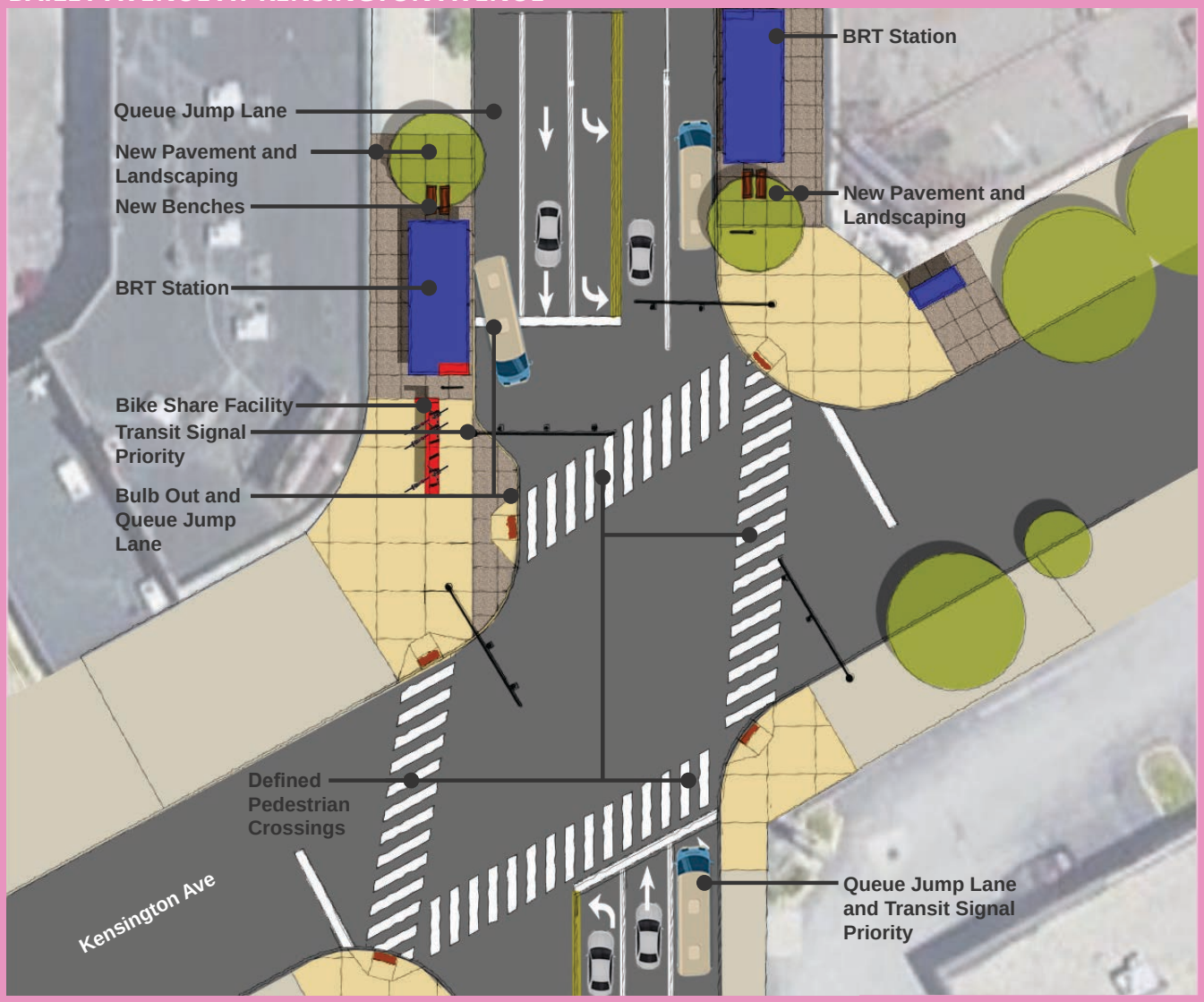
BUSINESS ACCESS AND TRANSIT (BAT) LANES

BAT lanes would be located along the curbside lanes along Bailey Avenue between the VA Hospital and Winspear Avenue, Walden Avenue and Stanley Street, and William Street and Clinton Street. BAT lanes provide priority through travel for buses and also allow other vehicle to make right turns from the BAT lane to local businesses or cross streets. Existing traffic volumes and roadway width allow BAT lanes to be installed in these segments without significant negative impacts for motorists.

MAP 21: ALTERNATIVE C IMPROVEMENTS

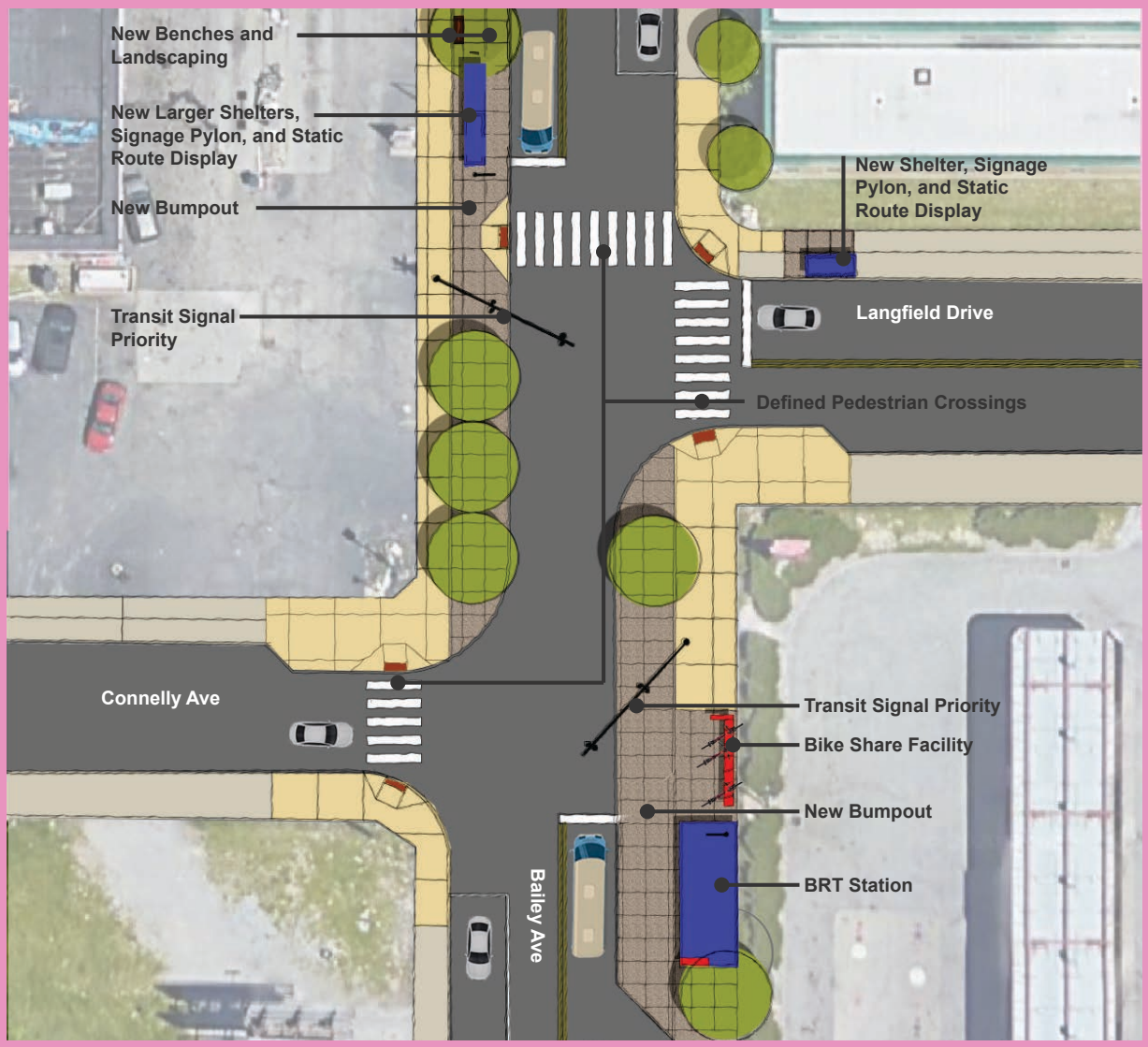


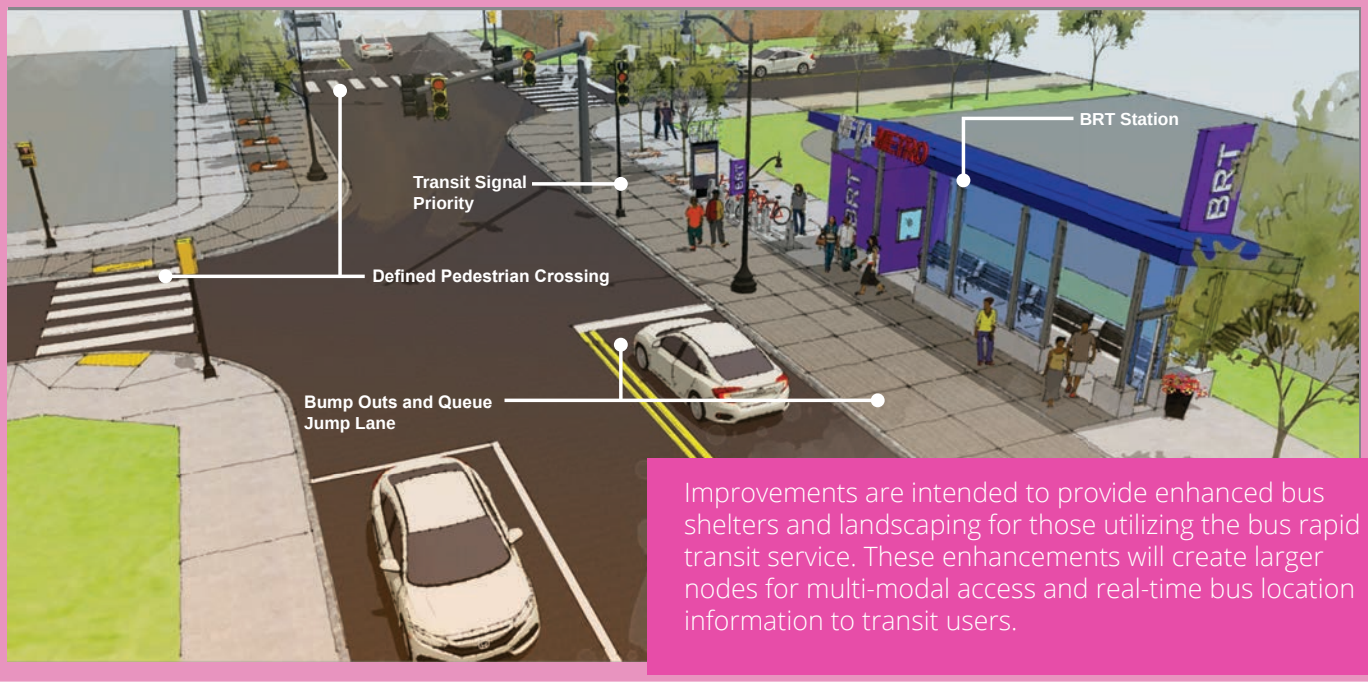
BAILEY AVENUE AT KENSINGTON AVENUE



Improvements at this intersection will provide more robust bus stations to accommodate the bus rapid transit service. These shelters would be complemented with bike share facilities to create a mobility hub capable of providing multi-modal transportation options.

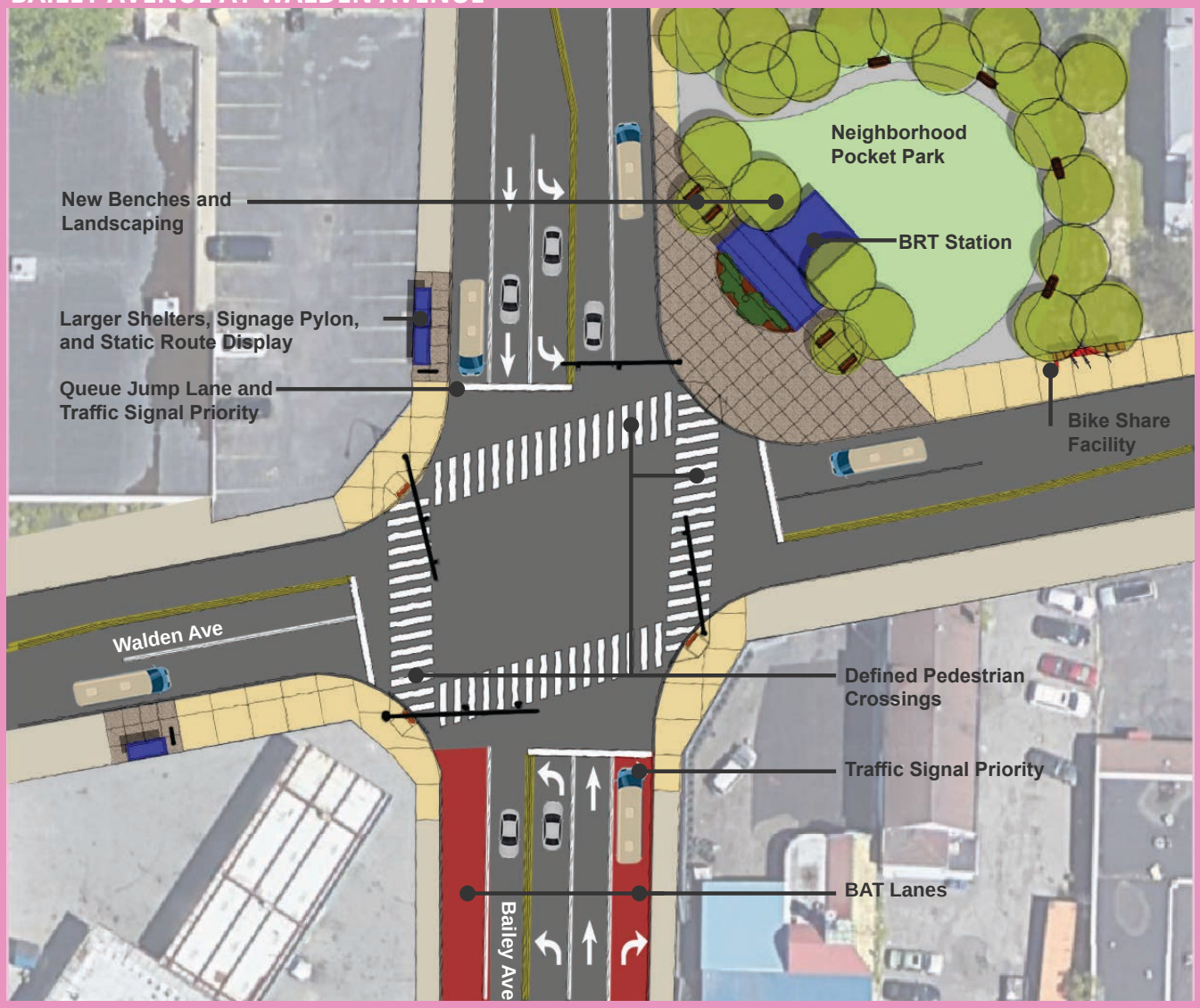
BAILEY AVENUE AT LANGFIELD DRIVE





Improvements are intended to provide enhanced bus shelters and landscaping for those utilizing the bus rapid transit service. These enhancements will create larger nodes for multi-modal access and real-time bus location information to transit users.

BAILEY AVENUE AT WALDEN AVENUE



Large BRT station (equipped with real-time information) and dedicated BAT lanes would be implemented at this intersection to prioritize bus ridership and convenience along Bailey Avenue. The BRT station would be complemented with greenspace to create a node of activity along the corridor.

SERVICE

Running time for the trip from University Station to South Park Avenue and Abbott Road on the local service would be 36 minutes, the same as for Alternative A. Running time for the BRT route is estimated to be 16 minutes less than existing service, decreasing from an average of 40 minutes to an average of 24 minutes during the morning peak and an average of 25 minutes in the afternoon peak. This running time estimate was calculated using VISSIM traffic simulation software and is due to the reduction in stops, TSP, and BAT lanes, as well as the overall optimization of traffic flow along Bailey Avenue. The headway times provided in the tables are ideal and subject to change.

ROUTING

The route would be the same as the existing Metro Bus Route 19 except for the short extension to the new South Park Avenue and Abbott Road layover on the south end. The route would be University Station to South Park Avenue and Abbott Road via Main Street, Bailey Avenue, and South Park Avenue.

VEHICLES

The BRT route for Alternative C would use a dedicated fleet of unique, alternative-fuel 40-foot BRT buses with special branding to set the service apart from local service. The local route on Bailey would continue to use standard 40-foot buses from NFTA's general fleet. The dedicated BRT fleet would be dispatched from a single garage to centralize maintenance for the distinctive vehicles and minimize the size of the required fleet. Local buses could be assigned to any garage to maintain flexibility in dispatching buses and allow existing garage assignments to remain.

TABLE 7: BRT SERVICE

TIME PERIOD	IDEAL HEADWAY
Weekday Peak 6 AM-9 AM / 3 PM-6 PM	10 minutes
Weekday Midday + Early Evening 9 AM-3 PM / 6 PM-9 PM	15 minutes
Weekday Evening + Early Morning 5 AM-6 AM, 9 PM-1AM	30 minutes
Saturday Daytime 10 AM-6 PM	15 minutes
Saturday Morning + Evening 6 AM-10 AM, 6 PM-12 AM	30 minutes
Sunday All Day 7 AM- 11 PM	30 minutes

TABLE 8: LOCAL BUS ROUTE

TIME PERIOD	IDEAL HEADWAY
Weekday Peak 6 AM-9 AM / 3 PM-6 PM	30 minutes
Weekday Midday + Early Evening 9 AM-3 PM / 6 PM-9 PM	30 minutes
Weekday Evening + Early Morning 5 AM-6 AM, 9 PM-1AM	60 minutes
Saturday Daytime 10 AM-6 PM	30 minutes
Saturday Morning + Evening 6 AM-10 AM, 6 PM-12 AM	60 minutes
Sunday All Day 7 AM- 11 PM	60 minutes

*Headways shown are aspirational and there is flexibility for them to be phased in over time.

FARE COLLECTION

Two different fare collection systems are under consideration for Alternative C. Policies, procedures, and fares could be the same as Metro Bus, as with the other alternatives. The other option is for the BRT route to use a system similar to what is now used on Metro Rail where riders purchase their passes or tickets before they board and are required to show proof of payment if requested. Further analysis is necessary to develop a final plan.

BRANDING

A distinct name, logo, and colors would be applied to BRT vehicles, shelters, pylons or other stop signage, and marketing materials, both electronic and static. This allows the BRT service to stand out as a unique and enhanced service from regular Metro Bus service.

PEER SERVICES

A similar service called Swift is operated by Community Transit in Everett, Washington. Please refer to Appendix A: Best Practices Summary.

COMPARATIVE BUS SERVICE IN WASHINGTON STATE

Swift Blue Line | Everett, WA

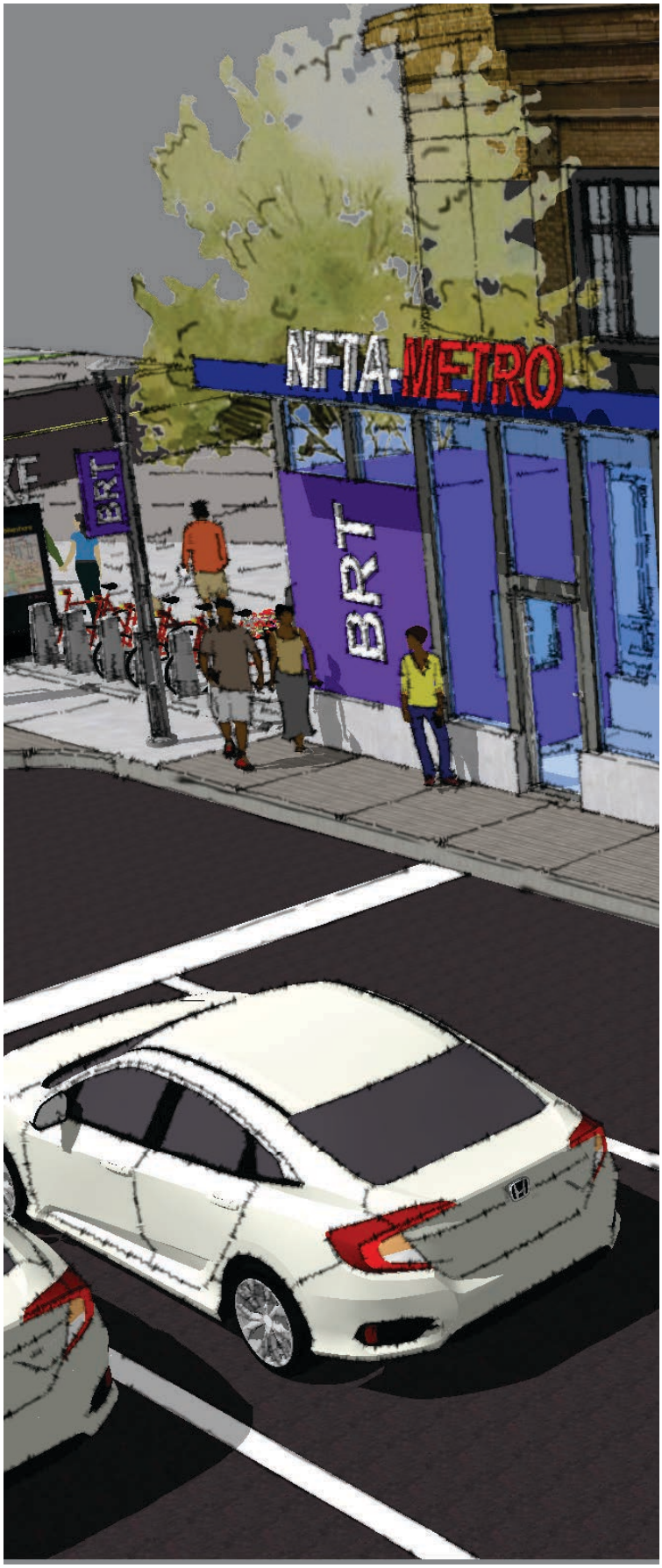
The Swift Blue Line is a 16.7-mile BRT connection between downtown Seattle and Everett. The system operates 60-foot articulated hybrid buses between 17 stations spaced approximately a mile apart. The system utilizes off-board payment systems through ticket vending machines and the ORCA tap payment cards and are enforced by random inspection. The system features BAT lanes, limited stops, Transit Signal Priority, and queue jumping.

The Swift Bus Line provides buses every 10 minutes on weekdays and makes it easy to connect with destinations within the community. It has matching pylons and BRT vehicles to signify Bus Rapid Transit options to users.

SUMMARY OF ALTERNATIVES + POTENTIAL PHASING

All three alternatives provide cost effective improvements to transit service in the Bailey Avenue corridor. Each level provides additional benefits over previous levels to the riding public, starting with basic improvements to local service in Alternative A, then adding a faster limited stop service to the corridor in Alternative B, and finally adding BRT service with BAT lanes and other features that set the service apart from other bus services in the region in Alternative C. Each of the alternatives contributes to the project goals of increasing transit frequency, reliability, and mobility; enhancing passenger amenities; reducing travel time and integrating creative placemaking in the corridor.

Instead of simply selecting an alternative for implementation, it should be noted that the three alternatives could also be looked at as phases implemented over time. Alternative A could be implemented first and improvements added until Alternative C levels of service and infrastructure are reached. Incremental implementation is a particular advantage of BRT as long as each step provides a noticeable improvement over previous steps, and therefore communicates to the public the advantages of each new step.



MODELING + ANALYSIS

OVERVIEW

Analysis was completed to understand how the proposed alternatives will effect vehicle flow on Bailey Avenue. VISSIM traffic simulation computer models were developed to analyze traffic operations and identify the Level of Service (LOS) at the intersections under future conditions (2030) with and without transit enhancements. Existing and build year traffic counts and turning movement counts were provided by GBNRTC. Traffic analysis was conducted for the morning peak (6 AM- 9 AM) and afternoon peak (4 PM - 7 PM) periods.

WHAT IS A VISSIM MODEL?

VISSIM is a visual program that is utilized for simulation of traffic improvements. The program provides a realistic and detailed overview of existing traffic conditions and how changes in lane configurations, signal changes, and future development can impact changed flow and travel times.

METHODOLOGY

The following is an outline of modeling efforts undertaken for Bailey Avenue using VISSIM traffic modeling software. VISSIM analyzes traffic operations through Level of Service (LOS) for various scenarios for both the morning and afternoon peak periods.

WHAT IS LEVEL OF SERVICE?

- Measure used to relate the quality of vehicle traffic service.
- Used to analyze roadways and intersections by categorizing traffic flow and assigning quality levels based on vehicle speed, density, and congestion.
- Federal funding sources require LOS be considered in funding applications.

TABLE 9: LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTION

LOS	DESCRIPTION	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)
A	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low control delay occurring with good progression and/or short cycle lengths.	> 10.0 and ≤ 20.0
C	Operations with average control delays resulting from fair progression and/or short cycle lengths. Individual cycle failures begin to appear.	> 20 and ≤ 35.0
D	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high volume to capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35.0 and ≤ 55.0
E	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered the limit of acceptable delay.	> 55.0 and ≤ 80.0

Baseline No-Build: Future 2030 conditions for Bailey Avenue taking the existing conditions and including reconfiguration of Bailey Avenue between Winspear Avenue and Kensington Avenue to a 3-lane section with on-street parking (this reconfiguration is a pilot project under consideration regardless of this project) and using the projected 2030 traffic volumes identified through the GBNRTC regional model. This was the baseline condition for which the build conditions are measured against.

Future Build: Future 2030 conditions for Bailey Avenue with the BRT alternative (which assumes the highest transit frequency and most intensive capital improvement program) and including a number of roadway configurations and potential projects, such as:

- Converting portions of Bailey Avenue to incorporate a transit only or BAT lane where transit is separated from general traffic either all the time or during peak hours. BAT lanes would still allow for right turn movements from the transit lane.
- Continuing portions of Bailey Avenue between Winspear Avenue and Kensington Avenue as a 3-lane cross-section with the BRT alternative where transit mixes with general traffic.
- Incorporating Transit Signal Priority at key intersections.
- Incorporating Queue Jump Lanes and pre-signal queue jump lanes at key intersections.
- Coordinated traffic signals.

Future Build with Numerous Bulb-Outs: This scenario builds off of the Future Build model and incorporates the same enhanced transit operations but expands the number of curb bulb-outs along Bailey Avenue and converts the bus stops to in-lane bus stops with bus bulbs.

The traffic analysis compared the Future Build scenarios to the Baseline No-Build to understand the effects of various transit enhancements and capital improvements on the transportation system. The Future Build scenarios represent the most intense transit and corridor enhancements, therefore, and alternative that implements a less intense transit or corridor enhancement would not expect to experience traffic conditions worse than the Future Build scenarios, thus they were not modeled separately.

SUMMARY OF RESULTS

The following summarizes the results of the VISSIM model runs and overall traffic analysis. The basis for determining LOS is a combination of delay per vehicle and queuing lengths at signalized intersections, portrayed as the intersection as a whole as well as individual approaches at an intersection. The below table displays criteria for signalized intersection LOS.

The tables below illustrate morning peak and afternoon peak operational results from the model. The tables indicate the LOS of many of the intersections along Bailey Avenue is either maintained or improved when the most intense transit and capital improvement project is introduced to Bailey Avenue; and LOS is not significantly impacted when the scenario of numerous bulb-outs is introduced. Improvements to LOS can be realized mainly by traffic signal optimization and coordination, which reduce delay for both general purpose vehicles and transit vehicles, and reduction in transit travel times can be realized through transit signal priority and queue jumps for buses. In summary, the VISSIM model results suggest implementation of either the Future Build or Future Build with Numerous Bulb-Outs can be accomplished without negatively impacting traffic operations, and can actually improve operations of the corridor for vehicle and transit users.

TABLE 10: MORNING PEAK LOS

INTERSECTION	BASELINE	FUTURE BUILD	FUTURE BUILD WITH BULB-OUTS
Main Street	C	C	C
Main Street (Bus Pullout)	A	B	B
Sherman Rd/ VA Medical Lot	B	A	A
Coal Rd/ VA Hospital	A	B	A
VA Hospital	B	A	A
Winspear Ave	C	A	A
Minnesota Ave	B	B	B
Dartmouth Ave	A	A	A
Hewitt Ave (East)	A	A	A
Hewitt Ave (West)	A	A	A
E. Amherst St	A	B	B
Westminster Ave	A	A	A
Kensington Ave	C	B	B
Millicent Ave	B	A	A
Collingwood Ave	A	A	A
Ruspin Ave	A	B	A
Langfield Dr	B	B	B
Connelly Ave	A	A	A
E. Delavan Ave	B	C	B
Scajaquada St/ Kerns Ave	A	B	B
E. Ferry St	A	A	A
Genesee St	C	B	B
Moeller St	A	A	A
Doat St	B	B	B
Walden Ave	B	B	B
Broadway	B	B	B
E. Lovejoy St	B	A	A
William St	B	B	B
Dingens St	A	A	A
Clinton St	C	C	C
Buffalo China Rd	B	A	A
Seneca St	C	C	C

TABLE 11: EVENING PEAK LOS

INTERSECTION	BASELINE	FUTURE BUILD	FUTURE BUILD WITH BULB-OUTS
Main Street	B	C	C
Main Street (Bus Pullout)	B	B	B
Sherman Rd/ VA Medical Lot	B	B	B
Coal Rd/ VA Hospital	A	A	A
VA Hospital	B	A	A
Winspear Ave	C	A	B
Minnesota Ave	C	B	B
Dartmouth Ave	B	A	A
Hewitt Ave (East)	A	A	A
Hewitt Ave (West)	A	A	A
E. Amherst St	B	A	B
Westminster Ave	A	A	A
Kensington Ave	C	C	C
Millicent Ave	B	A	A
Collingwood Ave	A	A	A
Ruspin Ave	A	A	A
Langfield Dr	A	A	A
Connelly Ave	A	A	A
E. Delavan Ave	B	C	C
Scajaquada St/ Kerns Ave	A	B	B
E. Ferry St	B	B	B
Genesee St	C	C	C
Moeller St	A	A	A
Doat St	B	B	B
Walden Ave	B	C	C
Broadway	B	C	C
E. Lovejoy St	B	B	B
William St	B	B	B
Dingens St	A	B	B
Clinton St	E	D	D
Buffalo China Rd	B	A	A
Seneca St	C	C	C

CORRIDOR TRAVEL TIMES

Estimated corridor travel times for general purpose (GP) vehicles, local buses operating the Metro Bus Route 19 (L), and BRT buses operating future BRT service (BRT) were modeled using VISSIM. The below table outlines travel times for Baseline No-Build, Future Build, and Future Build with Numerous Bulb-Outs. Some travel time improvements are experienced by general purpose vehicles (generally 1-2 minute reduction in travel time), however, transit vehicles used for local service experience a more significant travel time improvement (generally up to 5 minutes) and the introduction of a BRT service can reduce a transit riders travel time from end-to-end by almost 20 minutes).

TABLE 12: BAILEY AVENUE CORRIDOR TRAVEL TIMES

DIRECTION	BASELINE						FUTURE BUILD						FUTURE BUILD WITH BULB-OUTS					
	AM (mins)			PM (mins)			AM (mins)			PM (mins)			AM (mins)			PM (mins)		
	GP	L	BRT	GP	L	BRT	GP	L	BRT	GP	L	BRT	GP	L	BRT	GP	L	BRT
North	19.2	39.5	-	25.6	43.9	-	18.1	37.2	24.0	20.1	37.1	25.0	18.0	37.4	24.1	20.2	36.5	25.1
South	19.4	36.4	-	22.5	37.6	-	18.6	35.4	24.2	22.2	36.8	24.9	18.6	35.1	24.3	22.2	36.0	24.5

LEGEND

GP = General Purpose Vehicle
L = Local Bus Route 19
BRT - Future Bus Rapid Transit Service

WHAT DOES THE MODEL TELL US?

The VISSIM Model tells us a few things about the proposed transportation alternatives:

- Proposed alternatives have a limited effect on the traffic level of service on Bailey Avenue.
- Enhanced transit services significantly reduce travel times on Bailey Avenue from South Park Avenue to Main Street for transit riders.
- Traffic signal coordination and optimization will enhance traffic flow for all vehicles and users.

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SECTION IV: CONSIDERATIONS APPLICABLE TO ALL ALTERNATIVES

There are a number of additional design considerations that should be taken into account to ensure a safe and efficient multi-modal transportation network along Bailey Avenue, in concert with the implementation of any transit improvements. Elements applicable to any alternative include:

- Streetscape Design
- Transit Stops and Stations
- Smart City / Intelligent Transportation System Technology (ITS)

STREETSCAPE DESIGN

Streetscape improvements are critical to enhancing Bailey Avenue and creating a strong sense of place. Improvements in this section are intended to create a strong connection between the neighborhood and its people; both residents and visitors, which will result in increased economic vitality along the corridor. The addition of pedestrian and bicycle facilities and infrastructure upgrades on Bailey Avenue is anticipated to transform the function and feel of the neighborhoods surrounding this roadway.

ROADWAY INFRASTRUCTURE

- Vehicle Lane Markings
- Curb-to-Curb Striping
- Sidewalks
- Curb Extensions (Bulb Outs)

PLACEMAKING ELEMENTS

- Public Seating
- Bicycle Amenities
- Trees + Landscaping
- Lighting
- Green Infrastructure
- Public Art

VEHICLE LANE MARKINGS

One of the most important aspects of a safe and efficient roadway are pavement markings. Markings communicate information to roadway users, whether vehicular, pedestrian or bicycle. Roadway striping on Bailey Avenue is essentially non-existent causing confusion for drivers and bicyclists. Striping to delineate travel, turning, and parking lanes, as well as crosswalk markings will significantly change the Bailey Avenue corridor.

Existing lack of roadway striping on Bailey Avenue

RECOMMENDED DESIGN FEATURES

STANDARDS

The Manual on Uniform Traffic Control Devices (MUTCD) provides standards for pavement and curb markings for roadways in the United States. These guidelines should be utilized for future striping projects on Bailey Avenue.

CONSIDERATIONS

Roadway striping can be completed prior to streetscape or transit improvements on Bailey Avenue. Roadway markings to delineate lanes and boundaries for users has the potential to decrease accidents and will increase safety for all users.

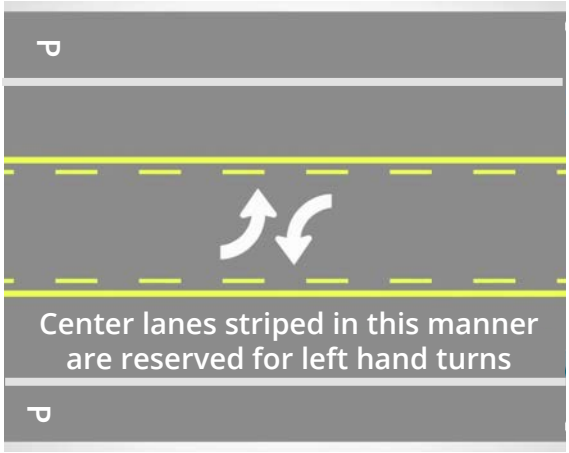
Potential Defined Travel Lanes on Bailey Avenue

CURB-TO-CURB STRIPING + BIKE INFRASTRUCTURE

The curb-to-curb width on Bailey Avenue varies between Main Street to South Park Avenue. Generally, the curb width is narrower on the northern end and wider toward the southern end. Streetscape and transit improvements on Bailey Avenue assumes retainment of the existing curb-to-curb width. The development of the BRT alternatives considered the addition of bicycle lanes along Bailey Avenue to enhance multi-modal transport.

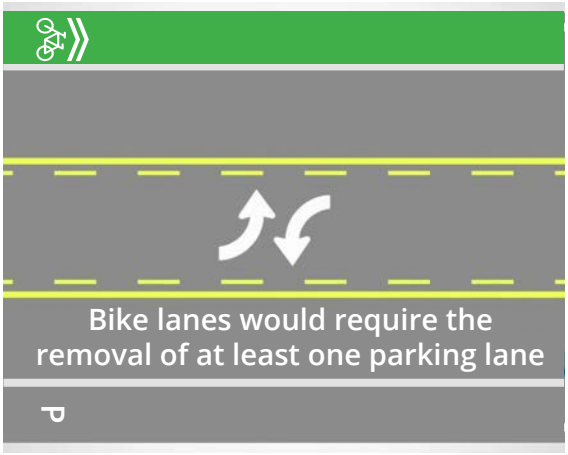
Based on the configuration of the existing roadway, it was determined that the addition of bicycle lanes along Bailey Avenue would require the removal of one or more of the following:

- **Center left turn lane;**
- **At least one or both of the parking lanes; or**
- **Transit priority facilities.**



Presence of Center Left Turn Lanes on Bailey Avenue

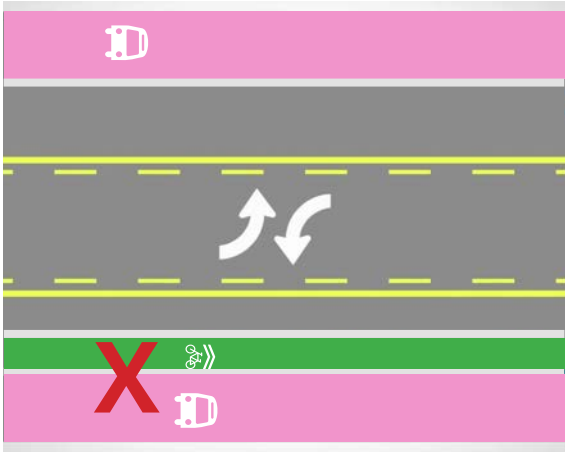
Center Left Turn Lanes are used to remove left turning vehicles from the travel lane. In all of the proposed alternatives Bailey Avenue would be restriped for one travel lane in each direction between Winspear and Kensington with a center left turn lane. The VISSIM traffic model indicates that without a continuous center left turn lane in this section, significant vehicle queuing and delays would be experienced due to the number of and offset nature of intersections; therefore, the removal of the center left turn lane on the corridor would not be feasible.



Reduction of On-street Parking Lanes to Accommodate Designated Bicycle Lane

On-street parking lanes exist, and are proposed to continue on both sides of Bailey Avenue along certain sections. Providing bicycle lanes in these areas could occur with the removal of on-street parking from one side (and possibly both sides in the narrowest sections) of Bailey Avenue. There are several sections of Bailey Avenue where removal of one side of on-street parking would still allow for two travel lanes, a continuous center left turn lane, and one side of on-street parking, and continue to allow transit priority facilities to exist as outlined in several alternatives.

Transit Priority Facilities



The addition of a bus priority lane and separated bike lane is not feasible on Bailey Avenue

Bus-Only Lane

Bicycle-Bus Lane

Transit Priority Facilities are used to provide enhanced operations for transit vehicles so that they can operate more efficiently than general traffic. One of the main objectives for the Bailey Avenue Corridor is to enhance transit operations. This involves several alternatives that include dedicated transit facilities such as Transit Queue Jump Lanes at intersections, Pre-Signal Transit Queue Jump Lanes, and Dedicated Transit Lanes at various locations throughout the corridor, depending upon the alternative. Providing bicycle lanes while maintaining parking and the center turn lane would either not allow for many of these transit priority facilities to fit within the pavement width, requiring transit to continue to operate as it does today in the travel lane with very little improvement to operations, or require shared bus-bike facilities, which as outlined below has guidance from NACTO but does come with some operational and safety impacts.

In the sections where on-street parking is not proposed, bus-only lanes are proposed for the outside lanes of some alternatives (generally between Walden and Clinton), there is the option to create a shared bus-bike lane. Since NACTO recommends limiting speeds in a mixed bus-bike lane to 15 mph, a formal bike/bus lane is not likely to be feasible on this corridor.

NEIGHBORHOOD GREENWAYS

Neighborhood greenways are residential streets with low volumes and speeds of vehicle traffic where bicycles and pedestrians are given priority. Due to constraints associated with adding dedicated bicycle infrastructure on Bailey Avenue, bicycle infrastructure in the form of neighborhood greenways could be implemented on the side streets in proximity to Bailey Avenue. The potential for neighborhood greenways should be further evaluated to understand feasibility.

SIDEWALKS

Sidewalks are critical for pedestrian movement and connectivity to establishments along Bailey Avenue. They are necessary to provide access between various modes of transportation, storefronts, and residences within the neighborhood. Sidewalks are also important public spaces, providing opportunities for social interactions and activating local businesses. Many sidewalks along Bailey Avenue are in poor condition and do not meet current accessibility guidelines. Ensuring safe sidewalks along Bailey Avenue is important to encouraging walkability within the City.

- New, accessible sidewalks should be installed wherever poor conditions are apparent.
- All existing sidewalks along the corridor should be replaced over time to achieve a cohesive, clean, and accessible pedestrian zone
- At intersection corners, a concrete surface is recommended. An accessible permeable surface (e.g., repurposed Belgian blocks or pavers) with structural soils as a sub-base is recommended for long linear sections of new sidewalk.

RECOMMENDED DESIGN FEATURES

WIDTH

All sidewalks should provide an absolute minimum of 5 feet of clear space to support accessible pedestrian movement (a minimum of 6 feet of clear space is preferred).

MATERIALS

- **Surface:** Concrete or ADA accessible pavers in a permeable setting
- **Preferred Subsurface:** Structural soils or other permeable material, where possible

MAINTENANCE

Sidewalk maintenance is critical to ensuring safe pedestrian movement. Maintenance varies in scope from regular litter and debris removal to intermittent replacement to address cracks and heaving. Sidewalks can last up to 25 years if maintenance is prioritized. Maintenance is the property owner's responsibility.

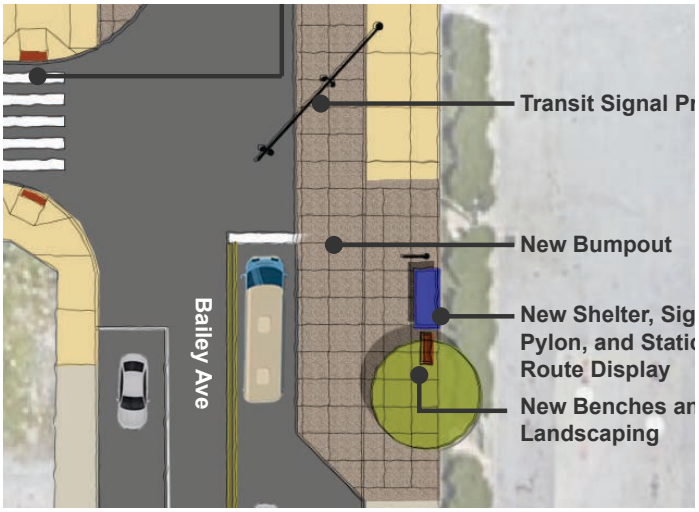
Existing deteriorating sidewalks on Bailey Avenue

Example of accessible sidewalks with buffer

CURB EXTENSIONS (BULB OUTS)

Curb extensions or bulb outs narrow the roadway, slow traffic, shorten crossing distances, improve pedestrian visibility, define on-street parking areas, and create additional sidewalk space for landscaping, site furnishings, public art, and other amenities. Curb extensions are recommended at specific locations associated with transit improvements, including:

- Minnesota Avenue;
- Kensington Avenue; and
- Langfield Drive.



Example of curb extension at Langfield Drive

Representative image of curb extension in association with transit stop

RECOMMENDED DESIGN FEATURES

CITY STANDARDS

The City of Buffalo Unified Development Ordinance provides specific standards for curb extensions.

WIDTH

At least 6 feet wide, as measured perpendicularly from the face of the curb.

LENGTH

The curb extension must be at least 15 feet in length or long enough to accommodate the front and rear doors of transit vehicles (for boarding and alighting).

POTENTIAL AMENITIES/USES

Several amenities are appropriate in the new space created by curb extensions, including: site furnishings, green infrastructure, street trees, public art, lighting, and/or interpretive signage. During the winter season, curb extensions may also provide additional space for snow storage.

UTILITY CONSIDERATIONS

Fire hydrants may need to be relocated to maintain adequate curbside access. Curb extensions can be designed with curb cuts and green infrastructure to limit the need to relocate drainage infrastructure.

MAINTENANCE

Temporary installation of flexible delineators along the perimeter of curb extensions is recommended prior to the winter season to increase curb extension visibility during snow removal operations. These delineators can be removed and stored during spring, summer, and fall seasons to ensure they do not detract from the streetscape's aesthetic.

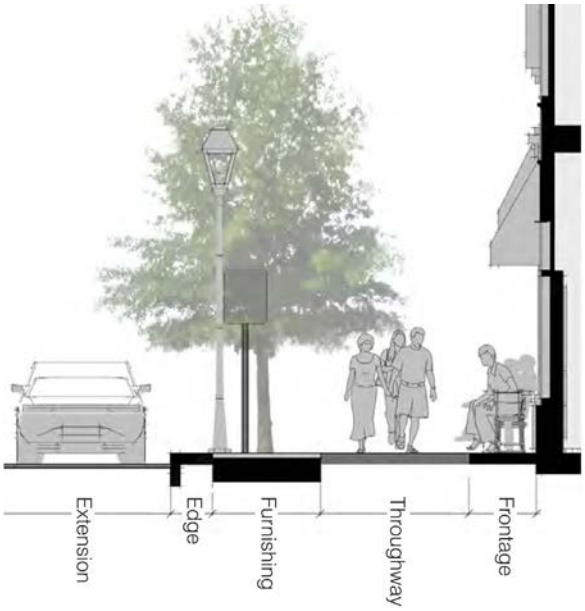
PUBLIC SEATING

Opportunities for public seating are important to achieving an active and safe streetscape. When provided in appropriate places, public seating has the ability to make a space more inviting and welcoming. Seating opportunities can also support local businesses by increasing visitation of establishments. Placement in locations that will not encourage unwanted uses during late night hours is key, as are partnerships with local authorities and agencies who can facilitate appropriate uses. Examples of public seating include fixed benches, seats built into landscape amenities such as planters and tree wells, and movable tables and chairs.

Typical bench style for the City of Buffalo

Example of bench placement on Niagara Street in Buffalo

RECOMMENDED DESIGN FEATURES



CITY STANDARDS

The City of Buffalo Unified Development Ordinance regulates the placement of street furniture in the public right of way. According to the ordinance, streetscape elements, such as benches, cafe seating, trees and planting, and bicycle racks are permitted in the "furnishing" zone.

CONSIDERATIONS

- Seating should be placed under trees where possible to provide shade and comfort.
- Where seating is oriented parallel to the curb, it should face toward the buildings.
- On curb extensions, seating should be organized to create social spaces.

BICYCLE AMENITIES

Incorporating bicycle amenities on Bailey Avenue, such as bike share station and bike racks will enhance multi-modal transportation options within the neighborhood. Bike racks are common streetscape elements that allow for easier access to destinations, reduce the need for vehicular parking, and encourage cyclists to visit local retail establishments. Bike racks should be installed where necessary along the corridor to ensure consistent access.

Bicycle Racks in the City of Buffalo

RECOMMENDED DESIGN FEATURES

CONSIDERATIONS

- Bike racks should provide at least two points of attachment for secure locking
- Bike amenities come in a variety of materials and colors
- Utilizing a combination of wood and metal can add a contemporary, warm feel to the streetscape
- Targeted applications of color can help to activate the streetscape year-round
- Bike amenities should be placed in locations with ample space where their use will not conflict with pedestrian use zones, such as sidewalk buffer zones.
- Bicycle amenities should be placed in high visibility locations to leverage branding opportunities. Different configurations can be used as a way of accomplishing other project goals, such as creating additional defensible space that can be used for outdoor seating.

ENHANCING THE STREETSCAPE EXPERIENCE

Pedestrian-oriented design encourages a dense mix of land uses and design features that prioritize pedestrian safety and the integration of amenities such as benches, bike racks, street trees and public art. Improvements such as clear, comfortable pedestrian pathways, bicycle connections, bicycle parking, access to trails, walkways, and transit options enhance the pedestrian experience.

Pedestrian and bicycle amenities can also be uniquely branded to create a cohesive identity throughout the Corridor. Amenities can be branded using similar colors or with the incorporation of a logo.

STREET TREES + LANDSCAPING

The incorporation of street trees and landscaping into the urban environment can dramatically enhance a corridor's sense of place and aesthetic appeal. By providing an organic, pedestrian-scale canopy, street trees are capable of softening the streetscape, and add opportunities for shade and relaxation. In addition to their visual benefits, street trees are often used to absorb and treat stormwater, improve air quality, and mitigate urban heat island effects. Recommendations to improve the presence of street trees along Bailey Avenue include:

- Prune and fertilize existing trees to remain to help them adjust to new conditions. Install structural soils where possible.
- Introduce new trees where existing trees are missing, dead, or in severe decline. Install with structural soils as defined by City of Buffalo standards.
- As existing trees age out, replace with new ones and install structural soils and appropriate tree grates.
- Shrubs and bushes should be installed along the streetscape to provide visual appeal and variation.

Example of Street Trees and Landscaping near the Buffalo Niagara Medical Campus

RECOMMENDED DESIGN FEATURES

CITY STANDARDS

All street trees must be installed in accordance to the City of Buffalo's Street Tree Planting Standards.

CONSIDERATIONS

- Species selection should consider salt tolerance, weather, root growth, presence of overhead wiring, leaf and litter drop, and overall tolerance of urban conditions.
- Permeable surfaces and structural soils and other strategies to control root growth, minimize sidewalk heaving, and maximize access to resources should be used whenever possible.
- New trees should be phased into the project as old trees are removed so as to avoid losing all of the existing tree canopy at once
- Diversity of species will help the urban canopy resist disease and insect infestations. Closer spacing of trees can create a more favorable growing environment

PLACEMENT

Trees should be placed in the utility and amenity strip and spacing should be coordinated with site lighting.

MAINTENANCE

Trees should be pruned regularly to promote healthy growth and avoid sidewalk conflicts. Choosing species with minimal leaf and litter drop can reduce tree cleanup needs. Business associations, block clubs, and other volunteer organizations can help take on responsibility for maintenance.

CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

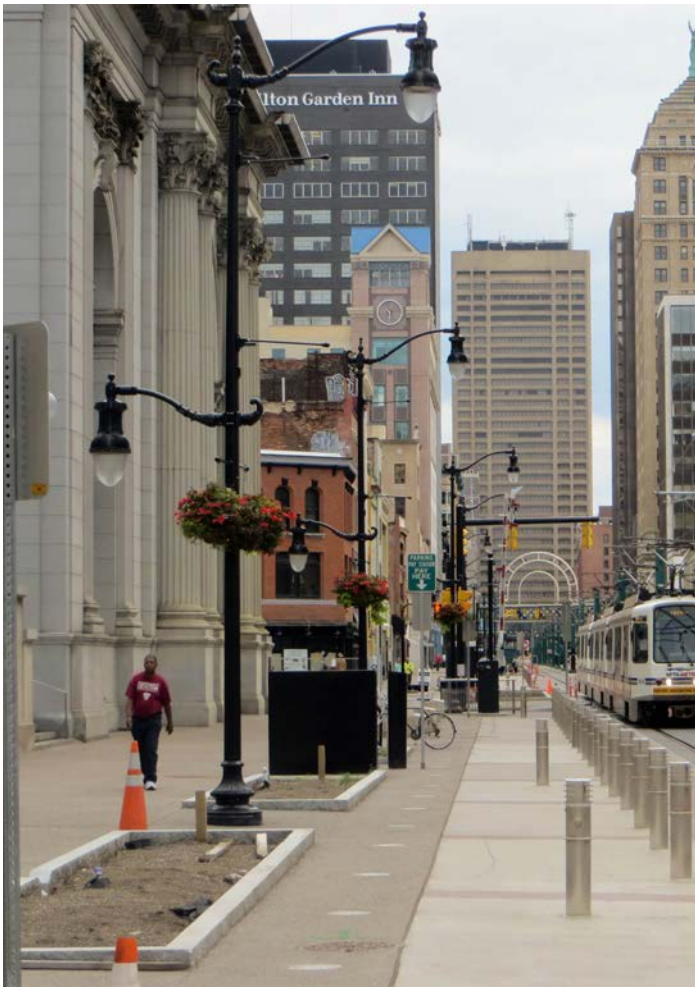
The goal of Crime Prevention Through Environmental Design (CPTED) is to implement a set of design principals to reduce the opportunity for crime to occur. This can be achieved in the streetscape/public realm with the inclusion of pedestrian amenities, lighting, pavement treatments, and by creating environments that encourage positive activity. These elements have the potential to increases the number of eyes and years on the street, reducing criminal activity.

Principles to keep in mind when looking at design solutions for Bailey Avenue include the following:

- **Keep areas well lit;**
- **Don't create areas to be used as hiding spots and for illegal activity to occur;**
- **Make sure sight lines are not obstructed by vegetation; and**
- **Place design elements and site amenities strategically to guide pedestrians to walk in well lit visible areas.**

LIGHTING

The purpose of lighting within the streetscape is to illuminate both the roadway and the sidewalk area. Lighting is intended to improve pedestrian access and mobility by illuminating signage, street furnishings and other potential obstacles, and creates a more comfortable environment for users of the street. Lighting is essential to providing nighttime orientation and security while also contributing to a festive atmosphere. Both vehicular and pedestrian-scaled lighting should be incorporated into the Bailey Avenue corridor. Pedestrian-scale lighting fixtures are applicable and necessary along both sides of the street, as well as both sides of all intersecting streets.



Light poles on Main Street in Buffalo serve a dual purpose by lighting zones for vehicles and pedestrians

RECOMMENDED DESIGN FEATURES

CITY STANDARDS

The City of Buffalo Department of Public Works has specifications for street light luminaries that should be utilized.

CONSIDERATIONS

- Pedestrian-scaled lighting fixtures are generally between 12 to 15 feet in height
- Intersections, crosswalks, transit stops and seating areas should be well lit and highly visible.
- Lighting poles should provide opportunities for banners and flower baskets to enhance the streetscape character and add a pop of color to the corridor.
- LED lighting should be used to provide a warm and consistent light.
- Fixtures and poles should complement the character of the streetscape.
- Pedestrian lighting should be coordinated with street trees and site furnishings.
- Light poles can also be utilized for smart sensors, cameras, banners, hanging planters, and artwork display.

MAINTENANCE

LED lighting has lower energy and maintenance costs. Broken bulbs or fixtures should be replaced as needed and stickers/tags removed on a regular

PLACEMAKING ON BAILEY AVENUE

Placemaking is an important component of creating a unique sense of place along a corridor and within a community. Placemaking has a specific role in streetscaping projects since they add vibrancy and creativity into the roadway infrastructure, which are tied to increased economic vitality. Elements such as robust landscaping and planters, public art, and branded signage has the ability to change the public realm and create a more welcoming location. The pictures shown display potential placemaking elements that can be incorporated into the Bailey Avenue corridor and show the impact of placemaking on the streetscape.

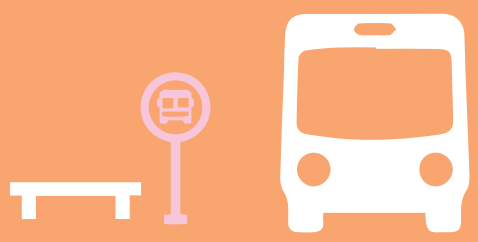
TRANSIT STOPS + STATIONS

Stops and stations bring together multiple transportation options in one location. Their goal is to maximize connectivity and create a comfortable and convenient service for pedestrians, bicyclists and transit users. These stations range from simple bus stops and shelters to full-service BRT stations and mobility hubs. There are four types of stops and stations proposed along Bailey Avenue, including:

1. Basic Bus Stop
2. Bus Shelter
3. BRT Station
4. Mobility Hub

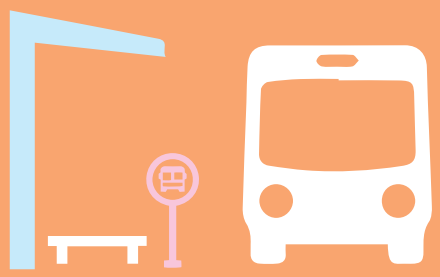
TRANSIT STOP AND STATION TYPOLOGIES

1. BASIC BUS STOP



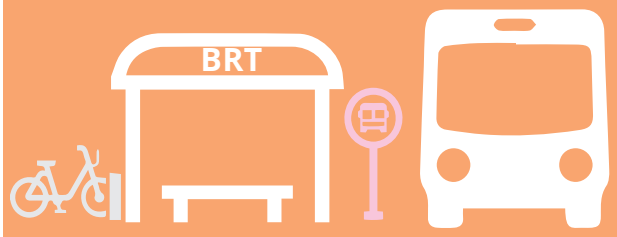
Pylon sign and bench with static map display.

2. BUS SHELTER



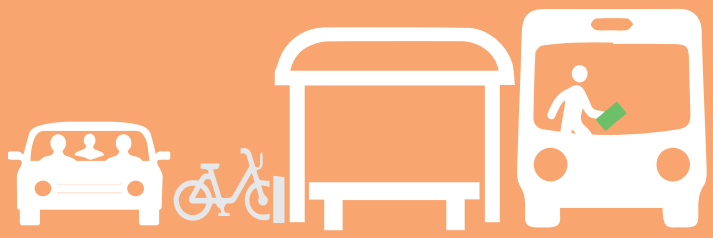
Bus shelter with static map display or kiosk and signage pylon.

3. BRT STATION



Full service BRT Station with real-time information kiosk and fare collection capability and bike share facilities.

4. MOBILITY HUB



Full service BRT Station with real-time information kiosk and fare collection capability, ride share pick-up/drop off and taxi stands, possible bike share and racks, vehicle charging stations, WiFi, and other micro-mobility options.

1. Basic Bus Stop

Basic bus stops provide an ADA-compatible paved area making it safe and convenient for all passengers to board and alight. It is recommended that all bus stop locations on Bailey Avenue also include benches and pylons with static route and schedule information. All bus stops should conform to NFTA standards.

Basic NFTA Bus Stop with Signage and Amenities

2. Bus Shelter

Bus Shelters currently exist in many locations within the City of Buffalo and along the Bailey Avenue corridor. These shelters provide a location for bus boarding and alighting and a covered area for transit riders to wait for their bus. It is recommended that all bus stop locations where connections to other routes are available have at least a shelter with a bench and static route display that provides information related to NFTA route services and connections. All installed bus shelters should conform to NFTA standards.

Newly branded NFTA Bus Shelters

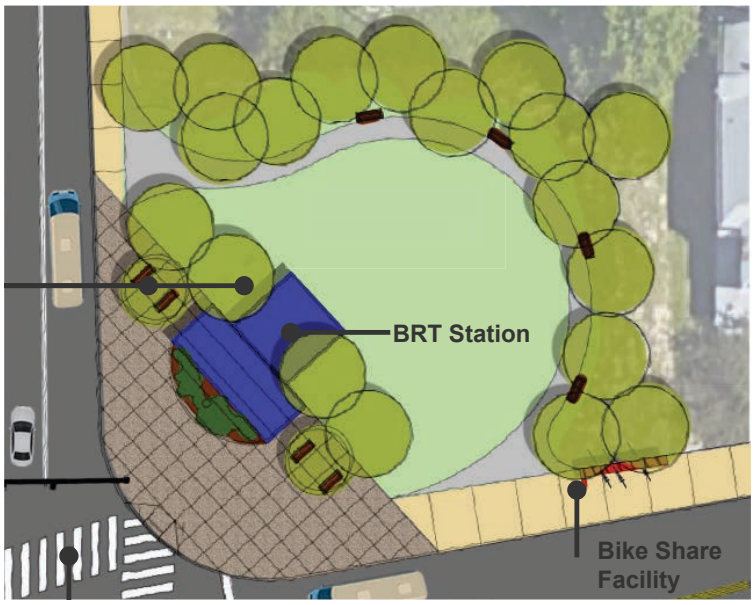
3. BRT Bus Station

BRT bus stations are the most robust bus station option. These stations are prominently featured along the streetscape and are equipped with technology services and multi-modal connectivity. Specifically, at this type of bus station there could be real-time bus location information for transit users, fare collection services and a bike share facility and/or bike parking. The integration of technology into the BRT station will elevate the convenience and user-friendliness of the NFTA bus system. For example, providing real-time information to users will allow individuals more flexibility to adjust travel choices as changes occur. Additionally, providing bike share facilities in close proximity to the BRT station will afford individuals point-to-point transportation for shorter trips.

Example of BRT Station

4. Mobility Hubs

Mobility hubs are BRT stations where connections to other forms of transportation are made. Convenient real time information and fare collection systems make connecting between modes fast, convenient and easy. BRT transportation options could include local buses on connecting routes, ride share and taxi, car share, park and ride, micro transit, bike share and bike storage, and new micro-mobility modes. The design of the mobility hub facilitates movement from one mode to the other for all users of the transportation system. Incorporation of green and civic space can also create a neighborhood center at mobility hub locations.



Mobility Hub / Greenspace Node

CONSIDERATIONS FOR TRANSIT STOPS + LOCATIONS

PLACEMENT

- Station location and size will be dictated by the available land and property ownership along the corridor.
- Stations should be centrally located near the end or start of bus lines.
- Stations should be adjacent to or in close proximity to activity centers and major places of employment.

BIKE SHARE/PARKING

- Collaboration with third-parties may be necessary to implement bike share facilities.
- Bike parking should be located as close to the station as possible without obstructing pedestrian pathways or building entrances.

SIGNAGE

- Signage should be placed at and immediately adjacent to all stations/shelters.
- Signs should clearly indicate the type of bus service provided.

TECHNOLOGY

- Real-time information, including arrivals and departures at BRT stations should be provided to keep users informed.
- Free Wi-fi should be incorporated where possible.
- Community information, news, and public service message can be incorporated into real-time information kiosks.
- Electric vehicles would require adequate utility hook up and maintenance.

SMART TECHNOLOGY / INTELLIGENT TRANSPORTATION SYSTEM (ITS) TECHNOLOGIES

Smart Technology and ITS Technologies cover a wide range of options to improve and enhance mobility and safety along transportation corridors, such as Bailey Avenue. Fundamental technologies - such as traffic signal coordination, traffic signal priority, advanced analytics, and passenger information signs - were explored to improve traffic flow and reduce bus travel time along the corridor, provide improved data analysis, and improve trip information presented to travelers. These are examined in greater detail to help identify the specific benefits of each, as well as the deployment requirements and costs.

INTELLIGENT TRANSPORTATION SYSTEM TECHNOLOGIES

- Traffic Signal Coordination
- Traffic Signal Priority
- MioVision

Columbus, Ohio CBUS

TRAFFIC SIGNAL COORDINATION

Traffic signal coordination along Bailey Avenue does not exist today. As discussed in the Existing Conditions Section, all signals except for three are equipped with Peek 3000E signals; therefore, to achieve traffic signal coordination along Bailey Avenue all signals (except for three McCain ATC controllers, located at Gerald Avenue, Scajaquada Street and Clinton Street), must be replaced. Once replaced, the signal controller will have the ability to receive time synchronization signals from the Opticom GPS system or from a central master computer. Additionally, intersections where queue jump lanes are proposed along the Bailey Avenue corridor may require modification to signal displays and signal timing. If necessary, re-wiring of the signal cabinet will be required.

Traffic signal coordination can also be achieved through replacement of both the signal controller and cabinet. Since the cabinets along Bailey Avenue are approximately 11 years old, replacement of this infrastructure may be advantageous in term of cost savings. Further investigation into the infrastructure necessary to replace controllers and cabinets (such as potential conduit or signals) will be required during the detailed design phase.

WHAT IS TRAFFIC SIGNAL COORDINATION?

Traffic Signal Coordination provides smooth flow to all vehicles on an arterial. Clusters of vehicles are grouped into "platoons" that travel along the roadway. As the platoon reaches the next signalized intersection, the signal is already or just turning green, allowing the platoon to pass through without stopping. As the platoon starts up and travels, it tends to spread out such that the vehicles in back of the platoon may not get through and will have to stop.

When there is a heavy turning movement onto the roadway, the signal timing of downstream intersections must be set to accommodate the larger platoon, if possible, to enable the additional vehicles to pass without stopping. Except in extreme conditions, there is usually sufficient excess time to accommodate progression in the reverse direction too, although the number of expected stops is normally higher in the reverse flow. When more vehicles leave the traffic stream than enter accommodating platoons becomes easier and it is more likely that stops can be avoided.

CENTRAL MANAGEMENT OF CONTROLLERS | TRANSPARITY

Transparity is a Windows-based central traffic management system designed to operate over wire-line communication systems as well as wireless communications. The Transparity modules, can remotely monitor timing parameters, phase sequences, and plan selections for multiple intersections in real-time. This program also provides various graphic displays and customized reports intended to maximize the operation of the traffic controllers. While it may be feasible to operate the Time Based Control (TBC) system without central management, the benefits and flexibility of Transparity are unmatched.

The City of Buffalo currently has a license for Transparity through the Niagara International Transportation Technology Coalition (NITTEC) that can be utilized for intersections along the Bailey Avenue corridor. Bailey Avenue could benefit from the Transparity system and if necessary, additional licenses can be purchased on an intersection by intersection basis for a nominal cost.

TRAFFIC SIGNAL PRIORITY

Traffic Signal Priority (TSP) utilizes tools to modify signal timing or phasing when transit vehicles are present and can be used to improve transit reliability and travel time, especially on corridor streets such as Bailey Avenue. TSP is typically achieved directly through the intersection traffic controller. The majority of signal controllers along the corridor are equipped with Peek 3000E, which does not have TSP capability. However, this functionality is available in most newer traffic controllers such as the McCain ATC, which has the ability to handle TSP on multiple approaches and can be programmed to provide early and extended green lights for bus movement.

TSP module programming can also be equipped to coordinate multiple TSP requests in close proximity to one another, limiting signal disruption and operation. Additional external equipment, such as Opticom TSP, is required to communicate with transit vehicles.

TRAFFIC SIGNAL PRIORITY AND OPTICOM TSP

Opticom GPS and its associated transmitter equipment allows a transit vehicle traveling along a corridor to understand its location in real-time. This Opticom GPS signal has the ability to transmit a TSP request to the local intersection, providing information such as bus speed and heading. This request then triggers the intersection signal to provide the requested priority at the appropriate time.

NFTA currently utilizes Opticom TSP on all transit vehicles that travel along Bailey Avenue; therefore, this approach should be continued.

KEY TAKEAWAY

TSP operation can be achieved with or without traffic signal coordination; however, traffic signal coordination is desirable and recommended for the Bailey Avenue corridor due to its ability to reduce travel times for all vehicles along the corridor.

MIOVISION

Currently, vehicle detection equipment along the Bailey Avenue corridor is provided by in-ground detectors, many of which are inoperative or in need of service. In many instances, these in-ground detectors may be able to be replaced by MioVision equipment due to its use in other City locations.

MioVision is a detection system that can be utilized to program traffic signal timing based on the data it receives using a 360-degree camera. This program uses advanced analytics to enhance TSP and Time Based Coordination (TBC) operation by measuring intersection operations and fine tuning the associated intersection timing. MioVision also has the ability to collect specific data necessary to create optimized timing plans for corridors if installed at multiple intersections; however, it does not create the timing optimization plan itself. In this case, another traffic program, such as SYNCHRO, is necessary. MioVision also has the ability to detect and control intersections for bicycles and pedestrians.

MioVision TrafficLink with advanced analytics is recommended for 10 intersections along the Bailey Avenue corridor. These intersections were selected based on the higher traffic counts and heavy turning movements at these locations. The installation of MioVision Traffic Link at these intersections is intended to facilitate signal timing optimization along Bailey Avenue. Additional MioVision installations may be identified during the final design evaluation process and will depend on factors such as number of traffic lanes and traffic demand. The recommended intersections include:

- Elk Street;
- Seneca Street;
- Clinton Street;
- Williams Street;
- Broadway;
- Walden Avenue;
- Genesee Street;
- Kensington Avenue;
- Winspear Avenue; and
- Main Street.

MIOVISION IN BUFFALO

MioVision is currently in use at the Allen Street / Franklin Street intersection in the City of Buffalo. This intersection utilizes a 360-degree camera to collect traffic data. Local signal timing of this intersection is adjusted by a signal technician and optimization is completed in isolation.

A recurring annual cost per intersection for the software and cellular communications will be required after an initial two-year period. This cost should be accounted for in the City's annual operations budget.

ITS RECOMMENDATIONS

Implementation of the following smart technology components are recommended for the Bailey Avenue corridor:

- Signal controllers are recommended for upgrade to support TSP and traffic signal coordination. The replacement of controllers and cabinets is dependent on the condition of the existing infrastructure. Modification of the overhead or underground infrastructure may also be necessary to accommodate a pre-signal queue jump display.

- Opticom GPS hardware is recommended for installation at 23 intersections along the Bailey Avenue corridor.

- Transparity central software, which is currently utilized by the City of Buffalo, should be continued. Additional licenses for Bailey Avenue intersections can be added to the existing system and offers a low cost way to implement remove management of Bailey Avenue intersections.

- MioVision should be deployed at Bailey Avenue intersections on an as needed basis. MioVision is recommended for 10 intersections along the Bailey Avenue corridor to facilitate signal timing optimization.

- Where in-ground detectors need to be replaced at other locations, a lower cost version of MioVision can provide video detection. The cost of this alternative may be very cost competitive with in-ground detectors.

PREPARING BAILEY AVENUE FOR AUTONOMOUS CONNECTED VEHICLES (CV)

A Smart City is an urban area that utilizes various types of electronic methods and sensors to collect targeted data. A Smart Corridor requires an integrated network of sensors and communication devices to establish the backbone of a Smart City network and maximize the potential for Smart City applications. Once a foundation of infrastructure and operations structure is in place, a myriad of Smart City applications can be supported. Several short-term actions to be undertaken early on in the planning process to prepare the Bailey Avenue corridor to accommodate future Smart City technologies are described.

If a larger scale reconstruction project were to occur, the installation of conduit and hand boxes to accommodate future Smart City communications networks along the corridor is recommended. In the near term, restriping and some reconstruction at intersections are proposed along Bailey Avenue rather than a large scale reconstruction. Under these smaller improvements, the corridor can still be "prepped" through the reliance upon wireless sensors and communications. These sensors are devices that collect data on anything from weather conditions to vehicle and pedestrian movements. Sensors are typically placed on existing infrastructure such as light poles or traffic signals and connected to a data management center.

1. Installation of Smart Sensors

The City of Buffalo is considering acquiring street lights City-wide from National Grid, which would enable for the deployment of Smart City applications city-wide and along the Bailey Avenue corridor. Street light ownership would allow for the deployment of Smart City sensors in select areas, allowing the City to retrofit light poles and fixtures to begin building the network of sensors needed to capture data for Smart City applications. If desirable, the City could then develop an RFP for vendors to respond to for the deployment of Smart City sensors and network along Bailey Avenue. Smart sensors initially could perform basic tasks such as traffic control, weather observation, public safety surveillance, and control of lights of energy efficiency. The capability of sensors could eventually be expanded to allow for greater potential of Smart City applications. A centralized data/ communications hub is a key component to the communications framework.

2. Implementation of Dedicated Short Range Communications

The testing of Connected Vehicles and Autonomous Vehicles (CV/AV) technology is not currently permitted by New York State on public roads; however, the implementation of Dedicated Short Range Communications (DSRCs) can be implemented to prepare the corridor to pilot CV/AV. To pilot CV/AVs along the corridor, thicker roadway striping and the implementation of roadside units (RSUs) must be completed along the designed route. Since much of the future of CV/AV is unknown, it only makes sense to "ready" the corridor in the near-term with the previously mentioned elements.

Once the testing of autonomous vehicles is permitted on public roads, additional supporting infrastructure can be added along the corridor, such as RSUs that allow for Vehicle to Vehicle (V2V), Vehicle to Infrastructure (V2I), and Vehicle to Cloud (V2X) communication. It is likely that these units and associated CV/AV infrastructure will continue to evolve, so placing roadside units along Bailey Avenue is not recommended until further guidance from New York State on CV/AV use is provided. Further, the Federal Highway Administration (FHWA) is in the process of developing standards for roadway signage and striping that would accommodate CV/AV vehicles. The first step is "prepping" the corridor by having the sensor and communications framework in place to allow for additional Smart City applications.

SECTION V: EVALUATION OF ALTERNATIVES

This section provides an evaluation of each of the alternatives presented in the previous sections. The purpose of this evaluation is to understand the potential for each alternative to meet goals related to mobility improvements, safety, economic development, placemaking and cost.

TABLE 13: EVALUATION MATRIX

	Goal	Measures		*Alternatives*			
				No Build	*A – Enhanced Local*	*B – Enhanced Local + Limited Service*	*C – Enhanced Local + BRT*
1	Enhance transit frequency, reliability, and passenger amenities along the corridor to continue to provide high-quality transit service and increase ridership.	• Estimated frequency • Level of enhanced bus stops/shelters. (High-Med-Low) • Other types of amenities • Passenger travel time	**PROS**	• There is no change to existing bus schedules or stops locations, which provides users with a familiar transit service along the corridor. • No change in stop spacing provides users with an easily accessible transit option.	• Improved headways over existing local service. • Reduces local service travel times by 4 minutes. • Improved connections to Routes 14 + 16.	• Improves travel times due to TSP integration at key locations. • Reduces travel times for local service by 4 minutes during peak hours. • Adds a limited service line that provides increased speed, frequency, capacity, and reliability along the corridor. • Limited stop travel time is reduced by 12 minutes. • Improved connections to Routes 14 + 16.	• Reduces travel times for local bus service (4 minutes). • Reduces travel times for transit users on BRT (~20 minutes). • Significantly enhances mobility hubs along the corridor with technology integration. • Significantly increases bus frequency and reliability along the corridor. • Provides real-time information and convenience for transit users.
			CONS	• Limited service frequency and transit reliability. • No additional amenities available to transit users. • No improvements to ITS or smart technology; therefore, delays in service may occur for riders.	• Minimal improvements to bus stop locations. • Smaller improvement to travel times than other alternatives. • Smaller improvements to headways than other alternatives.	• Limited stop services do not serve all stops. • Improvements are not as extensive as BRT alternative.	• BRT stations do not serve all current stops. • Limited service to specific locations. • May require new fare procedures.
2	Improve economic and community development opportunities in the corridor through upgraded mobility services and infrastructure	• Describe economic and community development elements (including any quantitative estimates) • Workforce access	**PROS**	N/A	• Corridor branding and marketing may increase transit users and visitors to the corridor which would increase economic development in the neighborhood.	• Use of larger bus stops with enhanced amenities to improve the transit user experience. • Enhanced service increases workforce access to employment opportunities in the neighborhood and along connecting bus routes.	• Anticipated increased development and investment near mobility hubs due to enhanced public infrastructure and reliable transit service. • Enhanced service increases workforce access to employment opportunities in the corridor and along connecting bus routes.
			CONS	• No improvement to bus amenities or vehicles. • No upgrades to existing services routes.	• Limited improvements to bus amenities and vehicles are not anticipated to drive surrounding property development along the corridor.	• Physical improvements at stops are not as extensive as BRT alternative.	• Large bus shelters and mobility hubs require more ROW to construct.

	Goal	Measures		Alternatives			
				No Build	*A – Enhanced Local*	*B – Enhanced Local + Limited Service*	*C – Enhanced Local + BRT*
3	Improve safety for people walking and bicycling	• Number of crosswalks / reduced crossing distance • Cyclist stress level • Crash reductions	**PROS**	N/A	• Enhances crosswalk visibility and bulb outs at select intersections where enhanced transit amenities are recommended. • Sidewalk improvements along the corridor enhance walkability. • Added channelization would improve safety for bicyclists.	• Enhances crosswalk visibility and bulb outs at select intersections where enhanced transit amenities are recommended. • Sidewalk improvements near transit stops. • Added traffic channelization would improve safety for bicyclists.	• Enhances crosswalk visibility and bulb outs at select intersections where enhanced transit stops are recommended. • Sidewalk improvements limited to areas adjacent to transit hubs. • Inclusion of bicycle amenities, such as bike share facilities and bike racks, at select mobility hubs. • Added traffic channelization would improve safety for bicyclists.
			CONS	• No improvement to pedestrian accessibility and safety. • There would continue to be an absence of any bike facilities along the corridor.	• Intersection improvements limited to intersections with transit improvements. • No change in bicycle accessibility along the corridor.	• Intersection improvements do not occur at all intersections. • Sidewalk improvements limited to areas adjacent to transit hubs. • No change to bicycle accessibility along the corridor.	• Intersection improvements do not occur at all intersections. • Sidewalk improvements limited to areas adjacent to transit hubs. • No dedicated or shared bike lanes along the corridor.
4	Improve safety for people driving/riding in vehicles	• Traffic Speed • Travel time for cars • Channelization • Traffic calming	**PROS**	• No change to traffic speeds along the corridor, with no adverse impacts on travel times.	• Limited reduction in travel speeds for vehicles if signal optimization occurs along the corridor and implementation of bulb outs at select intersections.	• Limited reduction in travel times for vehicles due to signal optimization along the corridor.	• Designated bus/BAT lanes in select locations provides separation between transit and vehicles.
			CONS	• No change to traffic speeds along the corridor, allowing vehicles to continue to travel at high and unsafe speeds.	N/A	N/A	N/A

	Goal	Measures		Alternatives			
				No Build	*A – Enhanced Local*	*B – Enhanced Local + Limited Service*	*C – Enhanced Local + BRT*
5	Integrate creative placemaking where appropriate	• Placemaking elements implemented	**PROS**	N/A	• Establishes branding, including a unique logo and colors for transit service along the corridor, if desired and funding/operational considerations allow. • Implements new bus shelters, signage pylon, benches, and a static route display at select stops along the corridor. • Enhances landscaping at select locations to improve the corridor's sense of place.	• Establishes a unique logo and branding colors for transit service, if desired and funding/operational considerations allow . • Incorporates new sidewalk pavement, larger bus shelters, landscaping, signage pylon, benches to enhance the sense of place at select bus stops. • Branding is applied to buses to enhance recognizability of the enhanced transit service.	• Establishes an identifiable and recognizable brand for the BRT system for transit amenities/vehicles. • Implementation of BRT stations at select intersections. • Robust placemaking and open space improvements in conjunction with mobility hubs, including enhanced wayfinding/signage pylons and public art.
			CONS	• No placemaking elements implemented in this alternative.	• No branding or logos applied to buses. • Fewer opportunities for placemaking at stops.	• Lower level of physical improvement relative to BRT alternative results in less potential for placemaking at stations.	• Extensive opportunities for placemaking result in higher total project cost.
6	Understand financial implications of each alternative	• Expected revenue • Describe any additional revenue streams	**PROS**	• Covered under existing funding streams.	• Would likely result in increased ridership commensurate with costs.	• Would likely result in increased ridership commensurate with costs.	• Significant improvement in service quality will lead to increased revenue.
			CONS	• No new funding streams would be created.	• Additional revenue sources are limited.	• Additional revenue sources are limited.	• Requires identification of more revenue than other alternatives.
7	Financial cost of implementation	• Capital costs • Operational costs • Change in costs related to safety	**PROS**	• Covered under existing funding streams.	• Low cost improvements provide real benefits for corridor users.	• Limited stop service improves operating cost efficiency.	• Greatest level of improvements opens up the widest variety of grant funding programs. • BRT service improves operating cost efficiency.
			CONS	• No new grant funds would be tapped for the corridor.	• Limited scope of improvements may limit available funding sources.	• Limited scope of improvements may limit available funding sources.	• Highest absolute capital cost. • Highest absolute operating and maintenance costs.

SECTION VI: COSTS + IMPLEMENTATION

This section provides detail regarding the estimated costs of the proposed improvements along Bailey Avenue. These costs are categorized based on transit operating costs and capital costs. A financing and funding plan is also presented, which identifies potential funding options to achieve the transit and physical improvements recommended for Bailey Avenue.

OPERATING COSTS - BRT

Operating cost is an important indicator of the practicality and sustainability of a particular transit project. Annual operating cost was estimated for each of the three alternatives for Bailey Avenue as well as for the existing transit service in the corridor. This provided a base for comparison of the alternatives and whether they are worth implementing given their benefit in terms of more frequent service, reduced travel time, and travel convenience and comfort.

The estimated baseline operating cost of existing service is $3,958,000. Alternative A is estimated to cost $4,645,000 annually to operate, or 17% more than the baseline. Alternative B is estimated to cost $4,969,000 or 26% more and Alternative C is estimated to cost $5,308,000 or 34% more. The number of vehicles required to provide the service for each of the Alternatives stayed relatively constant, varying between 9 and 10 vehicles. This is because as service levels increased running times decreased, effectively balancing each other out.

Each of the alternatives provided a reasonable level of improvements in frequency and travel time for the estimated annual operating cost incurred.

ANNUAL OPERATING COSTS

BASELINE COST OF EXISTING SERVICE	$3,958,000
ALTERNATIVE A	$4,645,000
Increase from Baseline Cost	+ $687,000
ALTERNATIVE B	$4,969,000
Increase from Baseline Cost	+ $1,011,000
ALTERNATIVE C	$5,308,000
Increase from Baseline Cost	+ $1,350,000

A detailed breakdown of operating costs is provided in Appendix B.

SMART TECHNOLOGY ESTIMATED INSTALLATION COSTS

Costs for smart technology installation along the Bailey Avenue corridor has been estimated. These costs should be considered preliminary and may need to be modified during the final design process.

TSP CONTROLLERS	QUANTITY	UNIT PRICE	TOTAL
Remove + Replace Controllers and Cabinets (with infrastructure changes)	2	$20,000	$40,000
Remove + Replace Controllers and Cabinets (with no infrastructure changes)	11	$14,000	$154,000
Remove + Replace Controllers only	14	$3,000	$42,000
Install Opticom	23	$10,000	$230,000
Miovision Traffic Link	10	$19,000	$190,000
Miovision Video Detection	10	$14,000	$140,000
		TOTAL	$796,000

*Design and contingency costs are not included

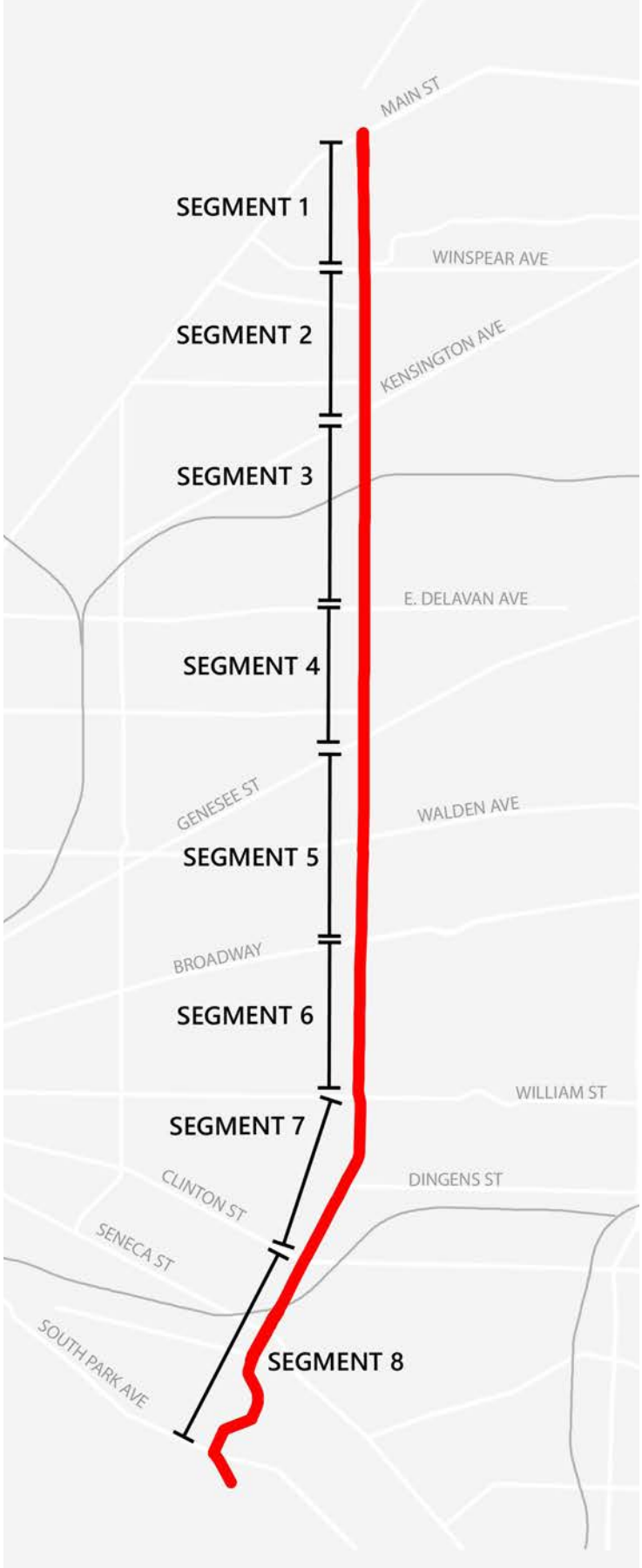
CAPITAL COSTS - STREETSCAPE IMPROVEMENTS

Recommended capital improvement costs have been segmented based on location in order to facilitate more manageable implementation. These cost estimates include improvements recommended along the Bailey Avenue corridor including intersection and streetscape enhancements. Encompassing improvements include sidewalk construction, curb ramps, street tree planting, lighting, as well as streetscape features (bus shelters, benches, bike racks, trash receptacles, planters, and kiosks). Streetscape estimates also include budget for placement of future conduit to support utility expansion, if needed.

TABLE 14: ESTIMATED CAPITAL COSTS BY SEGMENT

SEGMENT	ESTIMATED COST
Segment 1: Main Street to Winspear Avenue	$4,000,000
Segment 2: Winspear Avenue to Kensington Avenue	$8,500,000
Segment 3: Kensington Avenue to E. Delavan Avenue	$9,500,000
Segment 4: E. Delavan Avenue to Genesee Street	$5,500,000
Segment 5: Genesee Street to Broadway	$8,400,000
Segment 6: Broadway to William Street	$5,800,000
Segment 7: William Street to Clinton Street	$5,700,000
Segment 8: Clinton Street to South Park Avenue	$6,000,000
TOTAL	**$53.4 M**

Capital cost estimates include design and construction contingency costs. A detailed breakdown of itemized costs is provided in Appendix C.



FUNDING AND FINANCIAL PLAN

To facilitate implementation of the transit alternatives and streetscape improvements presented, a funding and financial plan has been developed. This plan contains a number of state and federal funding programs that can be utilized to implement transit and transportation enhancements along Bailey Avenue. Implementing these improvements will require coordination between multiple agencies and organizations, including the City of Buffalo, New York State Department of Transportation and NFTA. It should be noted that there is revenue generation potential if and when improvements are implemented via an increased tax base over the next several years.

Capital improvements, such as streetscape enhancements, can be implemented separate from transit improvements, if necessary.

SMART CORRIDOR FUNDING OPPORTUNITY

NITTEC and NYSDOT were recently awarded a $7.8 million Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) program grant from the USDOT Federal Highway Administration. The grant is aimed at reducing traffic at the border crossing and key corridors within the City of Buffalo by deploying new technologies and promoting "Smart Mobility" within the region.

NITTEC is currently undertaking a planning study to develop systems engineering planning documents, Concept Design, and contract documents to implement a regional, multi-jurisdictional, multi-modal, smart system to enhance safety and mobility across the region through fulfillment of balancing multi-modal demand through active demand management; improving freight operations through freight operator-targeted traveler information, including development of vehicle-to-infrastructure (V2I) applications supporting in-vehicle dissemination of alerts and advisories; and enabling the benefits of integrated regional mobility by extending existing integrated corridor management (ICM) activities; moving toward an integrated and smart region by creating the opportunity for agencies to share information and collaborate in real-time.

Phase II of the project will seek pilot projects to test the deployment of these Smart City elements and gain performance measures to build upon. The Bailey Avenue corridor could fall under one of the key corridors to be considered for pilot projects as many of the objectives of the grant line up with the essentials of Bailey Avenue Smart Corridor project.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/ CONDITIONS
Transit State Dedicated Fund (SDF) Program	Provides funds for capital projects dedicated to improvements of the systems and providing funds for innovative capital projects.	Local transit sponsors and designated recipients of funding from the Federal Transit Administration (FTA) - other than the MTA. Generally, eligible recipients include: Counties, Cities; and Upstate Regional Transportation Authorities (NFTA; RGRTA; CNYRTA; CDTA).	Eligible projects include: • Replacement buses • Facilities/ garage modernization • Transit related equipment (bus washers, service vehicles) • Other federally eligible projects	New initiatives (e.g., expansion of service) are not included in the distribution of funds process because of the high level of unmet base needs.
Statewide Mass Transportation Operating Assistance (STOA) and Mass Transportation Trust Fund	Provides funding to all transit systems outside the 12-county metropolitan transportation commuter district. The Mass Transportation Trust Fund was created in SFY 1993-94 (Section 89-c of the State Finance Law). The fund is financed from the share of Petroleum Business Tax (PBT) revenues allocated to transit as part of the State Dedicated Transportation Trust Fund (a separate fund from the MTOA fund used to finance STOA)	All participants must be public transportation systems.	Bus and rapid transit operations are eligible under STOA.	https://www.dot.ny.gov/divisions/policy-and-strategy/public-trans-respository/stoarr.pdf
Public Transportation Modernization and Enhancement Program	Apportions $41 million in State funding to counties, cities, and regional authorities to upgrade and enhance public transportation services	Counties, cities, and regional authorities.	Program sponsors may submit a program of eligible capital projects that in combination have a minimum service of no less than 10 years. Eligible activities include any Federal Transit Administration (FTA) activity, meeting the minimum service life threshold, including vehicle rehabilitation and/or replacement, fleet enhancement, deployment of new technologies and passenger amenities and maintenance facilities.	Funds must be obligated within three-years of an executed grant agreement unless the project sponsor has received written approval by the Department to deviate from this schedule. Sponsors who have not obligated funds within three-years of an executed grant or have not received approval from NYSDOT to bank funds towards a future project may have their funding distributed during the next allocation process.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/ CONDITIONS
NEW YORK STATE DEPARTMENT OF TRANSPORTATION	Accelerated Transit Capital (ATC) program	Provides $20 million in State capital funding for upstate public transportation sponsors to rehabilitate, restore and modernize public transit assets.	NFTA	Program sponsors may submit a program of eligible capital projects that, in combination, have a minimum service life of no less than ten (10) years. Eligible projects include Federal Transit Administration (FTA) activities, meeting the minimum service life threshold, including vehicle rehabilitation and/or replacement, fleet enhancement, deployment of new technologies, passenger amenities and maintenance facilities.	Sponsors must demonstrate that reassigned capital funds were used directly to enhance operating support of current year services. Project sponsors are required to document all funding sources in addition to describing how funds will be used. Funds must be obligated within three years of an executed grant agreement unless there is written approval from the Department that states otherwise.
	State Omnibus and Transit Purpose Appropriations	Omnibus appropriations made by the State Assembly. The Omnibus and Transit Appropriation is authorized every five years as part of the New York State multi-year plan for capital funding for transportation.	Available to transit systems other than the MTA eligible to receive federal funds.	May be used for transit capital projects.	State match provides 50% of the non-federal share (not to exceed 10% of the project cost) of transit capital projects financed in part through apportioned federal-aid programs. Local sponsors are required to provide the remaining 10% share.
EMPIRE STATE DEVELOPMENT	Buffalo Billion II East Side Corridor Economic Development Fund	As part of the Buffalo Billion II placemaking strategy, $65 million was dedicated to revitalization efforts on the City's East Side through investments in stabilizing neighborhoods and ensuring opportunities for homeownership; strengthening commercial corridors by promoting mixed use, walkable districts; improving regionally significant historical and natural assets; expanding opportunities for workforce connections; and supporting and growing entrepreneurship. Bailey Avenue falls within the study area and is one of the corridors of focus, incorporating three distinct investment areas in Kensington/ Bailey, Bailey Green (near Genesee Street), and Clinton/Bailey.	Eligible applicants include: • City of Buffalo • NFTA • Community and Neighborhood Services Not-for-Profits • Businesses and for-profit establishments	Amongst the priorities identified by the community, funding should be directed to projects that address: • Road safety for pedestrians and bicyclists • Public transportation • Streetscape enhancements • Housing affordability and diversity • Public safety • Neighborhood businesses • Senior services • Historic preservation	Preference on projects that are located in focus areas, leverage other investment/ funding, and expand public/ private investment in the community. There are various funds within the East Side Corridor Economic Development Fund for specified uses that are aimed to leverage capital grants.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/ CONDITIONS
Transit Oriented Development (TOD)	Grant and revolving loan fund for gap financing administered under the Better Buffalo Fund for adaptive reuse or infill capital projects.	While a single primary applicant is required, stakeholder organization partnerships are strongly encouraged and receive priority. Eligible applicants include: • City of Buffalo • Development Corporations • Community and Neighborhood Services Not-for-Profits • Businesses and for-profit establishments	Funds are allocated to projects that: • Promote dense development (housing, employment, retail) in proximity to transit. • Encourage the use of multi-modal transportation. • Stimulate pedestrian activity through retail and neighborhood-oriented businesses and services, quality public spaces, and accessible walkways.	TOD funds are eligible for use on Bailey Avenue. Applicants must demonstrate ownership or site control of all real estate considered.
Buffalo Main Streets Initiative	Grants administered under the Better Buffalo Fund to help revitalize historic downtowns and mixed-use neighborhood commercial districts.	While a single primary applicant is required, stakeholder organization partnerships are strongly encouraged and receive priority. Eligible applicants include NYS incorporated Not-for-Profits.	Funds can be used for building renovations and public space enhancements in mixed-use target areas with coordination from community non-profits.	Funds under this program are not eligible for use on Bailey Avenue (only TOD funds) but can be used on intersecting streets with addresses on East Delavan, Lovejoy, and South Park.
WNY Regional Economic Development Council	The creation of the Regional Economic Development Councils brings together state grants into a Consolidated Funding Application (CFA) that allows applicants to be considered for multiple sources of funding for a project by filling out a single application.	Eligible applicants include: • City of Buffalo • NFTA • Community and Neighborhood Services Not-for-Profits • Businesses and for-profit establishments	Intended for construction-ready transportation projects but can also fund planning activities.	Various guidelines depending on the type of grant funds sought.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/CONDITIONS
U.S. DOT	Better Utilizing Investments to Leverage Development (BUILD)	The BUILD Transportation Discretionary Grant program provides a unique opportunity for the DOT to invest in road, rail, transit and port projects that promise to achieve national objectives.	Eligible Applicants for BUILD Transportation grants are State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.	Intended for construction-ready transportation projects but can also fund planning activities.	Pursuant to the FY 2020 Appropriations Act, no more than 10 percent of the funds made available for BUILD Transportation grants (or $100 million) may be awarded to projects in a single State. The Act also directs that not more than 50 percent of the funds provided for BUILD Transportation grants (or $500 million) shall be awarded to projects located in rural areas (as defined in section C.4.(a)) and directs that not more than 50 percent of the funds provided for BUILD Transportation grants (or $500 million) shall be awarded to projects located in urbanized areas (as defined in section C.4.(a)). Further, DOT must take measures to ensure an equitable geographic distribution of grant funds, an appropriate balance in addressing the needs of urban and rural areas, and investment in a variety of transportation modes.
FHWA / EPA	Congestion Mitigation and Air Quality (CMAQ) Improvement Program	CMAQ provides funding to areas in non-attainment or maintenance for ozone, carbon monoxide, and/or particulate matter. Funds may be used for any transit capital expenditures otherwise eligible for FTA funding as long as they have an air quality benefit.	State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.	May be used for transit capital projects or procurements for fleet that reduce emissions, etc.	CMAQ funds must be invested in a State's non-attainment or maintenance areas, on projects that reduce ozone (O3) precursors - volatile organic compounds (VOCs) and nitrogen oxides (NOx) - carbon monoxide (CO), or particulate matter (both PM10 and PM2.5) and the applicable precursors from transportation sources. A State without a non-attainment or maintenance area may use its CMAQ funds for projects eligible under CMAQ or the Surface Transportation Program (STP). All CMAQ projects must come from a transportation plan and Transportation Improvement Program (TIP) The State DOT is responsible for distributing CMAQ funds. All projects must conform to established CMAQ guidance. The Federal share for most CMAQ-eligibl=e projects is 80 percent, but certain safety projects that include an air quality or congestion relief component (e.g., carpool/vanpool projects), may have a Federal share of 100 percent. The CMAQ program operates on a reimbursement basis, so funds are not provided until work is completed.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/CONDITIONS
	Transportation Infrastructure Finance and Innovation Act (TIFIA) Program	The Transportation Infrastructure Finance and Innovation Act (TIFIA) program provides Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance.	State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.	Many surface transportation projects - highway, transit, railroad, intermodal freight, and port access - are eligible for assistance.	An eligible project must be included in the applicable State Transportation Improvement Program. Major requirements include a capital cost of at least $50 million (or 33.3 percent of a state's annual apportionment of Federal-aid funds, whichever is less) or $15 million in the case of ITS. TIFIA credit assistance is limited to a maximum of 33 percent of the total eligible project costs.
FHWA / EPA	Surface Transportation Block Grant (STBG)	The FAST Act eliminates the MAP-21 Transportation Alternatives Program (TAP) and replaces it with a set-aside of Surface Transportation Block Grant (STBG) program funding for transportation alternatives (TA). These set-aside funds include all projects and activities that were previously eligible under Transportation Alternatives Program (TAP), encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity.	Eligible applicants include all entities that were eligible to apply for TAP funds. FAST Act also allows nonprofit entities responsible for the administration of local transportation safety programs to apply.	STBG activities must relate to surface transportation, and must fall within one of ten statutorily defined categories, including the following: • Construction, planning, and design of on-road and off-road trails for pedestrians and bicycles • Construction, planning, and design of infrastructure-related projects and systems providing safe routes for non-drivers Additionally, funds under this program can be used to plan, design, or construct comprehensive streetscapes that incorporate trees, plants, and cool pavements to create more pedestrian-friendly (and cooler) streets if they result in safer streets for non-drivers, and of recreational trails.	For most projects, TAP requires a 20 percent funding match from non-federal sources.

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/CONDITIONS
U.S. DEPARTMENT OF COMMERCE	EDA Public Works Program	Provides funds for distressed communities to revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies, and generate or retain private sector jobs and investment. This program enables communities to attract new industry; encourage business expansion; diversify local economies; and generate or retain long-term, private-sector jobs and investment through the acquisition or development of land and infrastructure improvements needed for the establishment or expansion of industrial or commercial enterprises.	Eligible applicants include: • City of Buffalo • NFTA • Community and Neighborhood Services Not-for-Profits • Businesses and for-profit establishments	Investments to facilitate the transition of communities from being distressed to becoming competitive by developing key public infrastructure, such as technology-based facilities that utilize distance learning networks, smart rooms, and smart buildings; multitenant manufacturing and other facilities; business and industrial parks with fiber optic cable; and telecommunications and development facilities. In addition, EDA invests in traditional public works projects, including water and sewer systems improvements, industrial parks, business incubator facilities, skill-training facilities, and brownfields redevelopment.	Alignment with at least one of EDA's current investment priorities. The project's potential to increase the capacity of the community or region to promote job creation and private investment in the regional economy. The likelihood that the project will achieve its projected outcomes. Ability of the applicant to successfully implement the proposed project, including the applicant's financial and management capacity and the applicant's capacity to secure the support of key public and private sector stakeholders.
FEDERAL TRANSIT ADMINISTRATION	Section 5309 Capital Investment Grant (CIG) – "New Starts or Small Starts"	Provides funding through a multi-year competitive process for transit capital investments, including heavy rail, commuter rail, light rail, streetcars, and bus rapid transit. Federal transit law requires transit agencies seeking CIG funding to complete a series of steps over several years to be eligible for funding.	State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.	New Starts: • Total project cost is equal to or greater than $300 million or total New Starts funding sought equals or exceeds $100 million • New fixed guideway system (light rail, commuter rail etc.) • Extension to existing system • Fixed guideway BRT system Small Starts: • Total project cost less than $300 million and total Small Starts funding sought less than $100 million • New fixed guideway systems (light rail, commuter rail etc.) • Extension to existing system • Fixed guideway or corridor-based BRT system	FTA's decision to recommend a project for funding in the President's Budget is driven by a number of factors, including: • The "readiness" of the project for capital funding • The project's overall rating • Geographic equity • The amount of available funds versus the number and size of the projects in the pipeline To receive a construction grant agreement a project must: • Complete the Planning, Project Development, and Environmental Review Processes • Meet Project Readiness Requirements (technical capacity, firm and final cost estimate, all funding committed) • Receive a "medium" or higher overall rating • Meet all other federal requirements

TABLE 15: STATE AND FEDERAL INFRASTRUCTURE (PLANNING + CONSTRUCTION) FUNDING PROGRAMS (CONT)

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/ CONDITIONS
FEDERAL TRANSIT ADMINISTRATION	Section 5339 Grants for Buses and Bus Facilities Program	Makes federal resources available to states and direct recipients to replace, rehabilitate and purchase buses and related equipment and to construct bus-related facilities including technological changes or innovations to modify low or no emission vehicles or facilities.	Eligible applicants include designated recipients that allocate funds to fixed route bus operators, states or local governmental entities that operate fixed route bus service, and Indian tribes.	Capital projects to replace, rehabilitate and purchase buses, vans, and related equipment, and to construct bus-related facilities, including technological changes or innovations to modify low or no emission vehicles or facilities.	The Federal share of eligible capital costs is 80 percent of the net capital project cost, unless the grant recipient requests a lower percentage. The Federal share may exceed 80 percent for certain projects related to the ADA, the Clean Air Act (CAA), and certain bicycle projects.
	Section 5339 (c) Low or No Emission Vehicle Program	The Low or No Emission competitive program provides funding to state and local governmental authorities for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities.	Eligible applicants include direct recipients of FTA grants under Section 5307 Urbanized Area Formula and states.	The program can be used to: • Purchase or lease low- or no-emission buses. • Acquiring low- or no-emission buses with a leased power source • Constructing or leasing facilities and related equipment (including ITS and software) for low- or no-emission buses • Constructing new public transportation facilities to accommodate low- or no-emission buses • Rehabilitating or improving existing public transportation facilities to accommodate low- or no-emission buses	The Federal share of the cost of purchasing or leasing buses shall not exceed 85 percent of the total bus cost. The Federal share of the cost of acquiring or leasing low- or no-emission bus-related equipment and facilities is 90 percent of the net project cost.
	Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD)	Established to make competitive grants for the development of model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment.	Eligible applicants: • State or local government or political subdivision thereof, • Transit agency, • Metropolitan planning organization (MPO) representing a population of more than 200,000, • Multi-jurisdictional group made up of the above eligible applicants, with a signed agreement to implement the initiative across jurisdictional boundaries, and • Consortium of research or academic institutions.	The program can be used for: • Advanced traveler information systems; • Advanced transportation management technologies; • Infrastructure maintenance, monitoring, and condition assessment; • Advanced public transport systems; • Transportation system data collection, analysis; • Advanced safety systems; • Technologies associated with autonomous vehicles using cellular technology; • Integration of ITS with the Smart Grid and energy distribution and charging systems; • Electronic pricing and payment systems; or • Advanced mobility and access technologies.	Requires each grant recipient to report annually to the Secretary on the costs and benefits of the project and how the project has met the expectations described in the recipient's application. Beginning 3 years after the first grant award the Secretary will post on the DOT web site a report on the effectiveness of the grant recipients in meeting their projected deployment plans.

TABLE 16: STATE AND FEDERAL STREETSCAPE FUNDING OPPORTUNITIES

	PROGRAM	DESCRIPTION	APPLICANT	USES	TERMS/CONDITIONS
NITTEC	Revolving Loan Fund	Established to support and enhance innovation and development of ITS and transportation operations solutions that improve mobility in the region.	Member agency sponsored organizations	Funds regional ITS, operations, and mobility projects in the region.	N/A
	Main Street Revitalization Program	Provides matching grants to municipal and non-profit development corporations undertaking efforts to revitalize critical commercial corridors.	Eligible applicants include: • City of Buffalo • Not-for-Profit Development Corporations • Developers	Priority projects will be sustainable and demonstrate use of green infrastructure, be located in an underutilized commercial area, demonstrate job creation, and demonstrate the ability to stimulate ancillary public and private investment.	Program funds can only be used to offset 50% of costs (funding match required).
	Charge NY	This program offers electric vehicle charging station implementation and finance services to local and state government agencies.	• Municipalities • State government	Provides funding for the development and installation of electric vehicle charging stations throughout New York State.	There are three avenues offered: • Competitive solicitation; • Self-install option; and • Five year loans with low interest rates.
UTILITIES	Electric Transportation and Charging Program	Provides funding for the installation of new electric vehicle Level 2 or direct current fast charging stations (DCFC).	• Private • Municipalities	Funds a site assessment, including the number and location of charging stations, and installation costs.	• Recipient is responsible for maintenance of the stations and electricity costs.
	PILOT Increment Financing (PIF)	PIF is a value capture tool, which captures a portion of the increased value of property to fund public infrastructure or transit projects. PIF is used in New York in place of Tax Increment Financing (TIF). PIF uses the difference between the current amount of PILOT payment that is paid to the Affected Tax Jurisdiction under a PILOT agreement and the amount of taxes that would have been paid if the property were on the tax rolls prior to improvements made to the property. This difference is known as property tax revenue "Increment".	In the City of Buffalo, PIFs are administered by the Buffalo Urban Development Corporation (BUDC). The Erie County Industrial Development Authority (ECIDA) can also be a partner.	A PIF is used by taking some or the entire amount of the property tax revenue "increment" collected by a jurisdiction to retire the debt incurred by financing certain public improvements or costs that are essential to increasing the value of the property. PIFs are used to fund streetscape and public realm improvements, and enhanced transit and mobility service.	Term are agreed upon in each individual PIF. PIFs can be negotiated with individual property owners (i.e. minimum lot size or minimum along a corridor or can be accomplished through a PIF District.

TABLE 16: STATE AND FEDERAL STREETSCAPE FUNDING OPPORTUNITIES

	PROGRAM	DESCRIPTION	APPLICANT	USES
	Transportation Alternatives Program (TAP)	Funds from this source are used to support bicycle, pedestrian, multi-use path and non-motorized transportation-related projects. Projects must be related to surface transportation. *Federally-funded, state administered.	Applications may be developed by any municipality or non-profit incorporated group, but must be sponsored by a municipality, state agency or public authority eligible to administer federal TAP transportation funds.	Construction of pedestrian and bicycle facilities, recreational trails, and safe routes to schools, to community improvements such as historic preservation and projects that reduce congestion and gas emissions.
NEW YORK STATE	Green Innovation Grant Program (GIGP)	The Green Innovation Grant Program (GIGP) provides grants on a competitive basis to projects that improve water quality and implement green infrastructure in New York State. GIGP provides up to $15 million to cover a minimum of 40% up to a maximum 90% of the total eligible project costs. A match from state or local funds is required.	Eligible applicants include municipalities, private entities, state agencies, and soil and water conservation districts.	GIGP funds a range of green infrastructure-focused installation projects, including the installation of permeable pavements and stormwater street trees.
NEW YORK STATE	New York Main Street Program (NYMS)	This program is administered through the Office of Community Renewal. New York Main Street provides funds to stimulate reinvestment in properties located within mixed-use commercial districts located in urban, small town and rural areas of NYS. NYMS is a comprehensive grant program that provides funding for local revitalization efforts and technical assistance to help communities build the capacity required to grow the downtown or neighborhood retail district.	Applicants must be either a unit of local government or an organization incorporated under the NYS Not-for-Profit Corporation Law.	Funds can be used to implement streetscape enhancements, such as planting trees; installing street furniture and trash receptacles; providing appropriate signs in accordance with a local signage plan.
FEDERAL	Consolidated Local Street and Highway Improvement Program (CHIPS)	Funds support the construction and repair of highways, bridges and highway railroad crossings, and other facilities not in the State highway system.	Municipal governments	Funds can be used for resurfacing, shoulder improvements, new drainage systems, sidewalk improvements, traffic calming installations, and bus shelters.
FEDERAL	Highway Safety Improvement Program (HSIP)	The Highway Safety Improvement Program (HSIP) to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance.	Municipal governments	HSIP funds may be used for safety projects that are consistent with the State's strategic highway safety plan (SHSP) and that correct or improve a hazardous road location or feature or address a highway safety problem. Funds can be used for the installation of vehicle-to-infrastructure communication equipment, pedestrian hybrid beacons, roadway improvements that provide separation between pedestrians and motor vehicles, including medians and pedestrian crossing islands, and other physical infrastructure projects not specifically enumerated in the list of eligible projects.

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