CAPITAL REGION BUS LANE FEASIBILITY STUDY

PREVIOUS PLAN AND PEER REVIEW

CONTENTS

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1. PLAN REVIEW TASK PURPOSE

The purpose of this task is to identify, review, and summarize all relevant local planning and policy documents related to or impacting the implementation of bus lanes and bus priority within the study area. Additional peer planning studies and resources are also included to build upon lessons learned to apply to this project. The input from previous plans and national examples will assist in planning a feasible and implementable network of transit-supportive streets in the study area.

Beyond highlighting recent relevant studies and recommendations, this review is an important step towards coordinating the various regional planning initiatives to optimize the effectiveness and minimize duplication of efforts. This review aims to identify key planning challenges and opportunities, including relevant information for this study, lessons learned, and best practices. This document is structured into three sections as a quick reference resource to inform subsequent tasks and help drive decision-making. The first section is comprised of a summary table with local planning and policy documents' major elements, recommendations, and key information of relevance to the Bus Lane Study. The second section highlights lessons learned and performance data of non-local bus priority projects across the country. Finally, the third section includes key tables, maps, and graphics from the reviewed plans.

2. LOCAL PLANS REVIEW SUMMARY

Table 1: Local Plan Review Summary

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
CDTA Transit Development Report (2014) ■ Report	■ CDTA's strategic plan ■ Service standards ■ Capital projects	■ After implementing Washington-Western and the River Corridor, CDTA will look at bus-only lanes in downtown Albany again. ■ Two BRT lines along with trunk and neighborhood routes now share the same corridor along Washington Avenue and State Street between Lark Street and South Pearl Street. The amount of service and length of this segment will have a substantial impact on travel times while increasing transit ridership. ■ TSP installed on 45 NY 5 intersections; queue-jump lanes along three stretches of NY 5 Corridor (p 36, 37). ■ Additional potential queue-jump locations are listed on p. 85. ■ Defines CDTA standards for BRT corridor/stations: a corridor should have >2 million annual riders on existing services; a pair of stops should have >100 boardings per weekday (after applying an assumed 20% increase to the number of existing boardings) on p. 51. ■ Click here to jump to key graphics and maps from this plan.	■ The plan defines a Transit Priority Network (distinct from but overlapping with CDTC's network of the same name) on p. 67, with individual segments listed on p. 118-119. ■ Other recommendations include: – Continue to implement elements or amenities that reduce travel times, increase service, improve customer convenience, and attract more riders to existing BusPlus – Implement a system-wide fare collection upgrade and expansion of BusPlus ITS elements.	■ Bus Only Lanes / Exclusive Lanes are the most effective means of reducing travel time for BRT service. ■ Implementing Bus Only Lanes / Exclusive Lanes throughout the region requires taking space away from other lanes, parking, sidewalks, and/or private property, so exclusive lanes can only be included in areas with numerous bus routes, very high ridership, and broad street widths.
CDTC's New Visions 2040 (2015) ■ Executive Summary ■ Report	■ Local Transit Services ■ Traffic Congestion Management ■ Complete Streets ■ Travel Reliability	■ New Visions is a long-range 25-year regional transportation plan. ■ New Visions 2040 is an update to the New Visions 2035 plan, amended in 2016 to incorporate additional freight movement considerations. ■ New Visions 2040 Plan includes a set of principles to guide transportation planning and investment in the region for the coming years.	■ Continue to seek funding for CDTC to fund existing and small-scale new infrastructure and explore the use of new funding sources. ■ Increase funding for transit. ■ Investigate new funding mechanisms to support CDTA transit operations. ■ Expand BusPlus BRT and promote bus/transit-only travel lanes.	■ The plan recommendations indicate that funding sources and mechanisms are an area needing reform.

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
CDTC New Visions 2050 Transit White Paper (2020) ■ White Paper	■ Local Transit Services ■ Performance Measures ■ New Visions 2040 Recommendations Status ■ Transit Capital Projects ■ Transit Service and Operational Changes ■ Transit Planning Funding ■ Trends and Forecasts ■ New Visions 2050 Scenarios ■ Transit Principle with Strategies and Actions	■ On p. 17, reviews New Visions 2040 recommendations—some progress made toward recommendation 4 (to promote bus-only lanes beyond the Washington/Western Corridor, "particularly in BusPlus corridors"). Training on NACTO's Street Design Guide was held in 2018. ■ Capital projects table p. 22. ■ Briefly describes CDTC's Transit Priority Network (based on but slightly extending CDTA's from 2014) (p. 35). ■ Prioritizes the completion of the Washington/Western and River Corridor BRT projects (p. 57). ■ It also says "CDTA should plan" to update basic BRT to enhanced BRT, including off-board fare collection, articulated buses, queue-jumpers, level boarding stations, increased frequency, and bus-only lanes (p. 57). ■ CDTA's Transit Priority Network to be revised before next TIP update (p. 60). ■ Bus lane feasibility study "should consider bus-only lanes, shared bus/parking lanes and shared bus/bike lanes in BRT corridors and other high ridership transit corridors" (p. 57). ■ References previous proposals for bus-only lanes on State Street. ■ Various CDTA service measures were described starting on p. 64 (headway ranges for different service types, routes meeting headway thresholds, typical spans of service by service type, BRT ridership, and performance). ■ Click here to jump to key graphics and maps from this plan.	■ Promote Bus/Transit Only Travel Lanes. ■ Provide high-quality fixed-route transit in core areas of the region. ■ Complete and Upgrade 40 Miles of Bus Rapid Transit - increased service frequency and bus-only lanes. ■ Study the Feasibility of Bus Lanes and Future BRT Lines - The feasibility study. ■ Should consider bus-only lanes, shared bus/parking lanes, and shared bus/bike lanes in BRT corridors and other high ridership transit corridors. ■ Develop and Monitor Transit Related Pilot Programs - CDTA should pursue pilot projects that support transit such as bus lanes, mobility hubs at transit stops, shared transportation services, scooters (if legalized in New York State), automated transit vehicles, and other options not yet imagined. Pilot projects offer the benefit of testing an idea in real-time with a focused public process.	

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
CDTC's New Visions 2050 (2020) ■ Website ■ Executive Summary ■ Maps	■ Planning and Investment Principles ■ System Performance Report ■ Transit White Paper ■ Financial Plan	■ The New Visions 2050 is a minor update to the New Visions plan released in 2015. New Visions does not contain a list of projects that CDTC expects to undertake over the next 20 years. This Plan is a statement of principles, strategies, and budgetary emphasis to guide more detailed project decisions as the region invests in a next-generation transportation system. ■ Since New Visions 2040 was adopted in 2015, 17 miles of Bus Rapid Transit were constructed, and alternatives for I-787 were evaluated in the I-787/Hudson Waterfront Corridor Study. ■ Click here for the ITS Priority Network as defined in the plan, which highlights the Bus Rapid Transit (BRT) priority corridors and the Transit Priority Network.	■ Regional Operations and Travel Reliability: Any congestion management actions must recognize the importance of and balance of pedestrians, bicyclists, and transit users' needs and access. Key recommendations: – Right-size existing roadways. ■ Transit and Human Services: Expansion of BRT and the addition of mobility hubs, on-demand services, and integrated technologies (i.e., smartphone app) allowing users to purchase transportation when needed and seamlessly transfer between travel options is desired. Key recommendations: – Complete and upgrade 40 miles of BRT – Study the feasibility of bus lanes and future BRT – Explore conversion of enhanced BRT to light rail – Revise CDTC Transit Priority Network and TIP merit score methodology.	■ The plan contemplates four scenarios and examines the impacts on transit as follows: – Status Quo (Scenario A): assumes gradual adoption of connected and automated vehicles and more availability of shared mobility services – Sprawl Development (Scenario B): Transit service declines, transit viability is threatened, and overall fewer transportation choices are available – Concentrated Development (Scenario C): Transit services more people and has a strong market share. Overall, there are more transportation choices – Concentrated Development with Financial Incentives (Scenario D): Transit service is highly attractive and competitive, reaches higher market share and provides more transportation choices.
RPA Albany Transit Supportive Development Case Study (2009) ■ Website ■ Case Study Report	■ Bus Access to Convention Centers ■ Bus Rapid Transit (BRT) ■ Site and Program Analysis ■ Design Propositions ■ From Bus Station to Mixed-Use Multimodal Center ■ District-wide Land Use and Pedestrian Network ■ State Street as a BRT Boulevard ■ Next Steps	■ Description of existing conditions and proposal for State Street between Broadway and Eagle streets starts (p. 16). ■ Recommended median rather than curbside bus lanes to improve travel time reliability, maximize parking availability, and avoid conflicts with loading/unloading vehicles. ■ Re-imagine State Street as a BRT corridor with bus-only lanes located in the median, which allows for faster, more reliable bus travel times; maximizes the number of on-street parking spaces and loading areas; improves the streetscape of this major downtown artery (p. 4) ■ Alternative 2: Center Bus Lanes – It maintains convenient loading-unloading and parking at the curbside of the traffic lanes – It also allows for easy access to the hotel site adjacent to the corridor – Bus passengers would cross the traffic lanes at signalized pedestrian crossings reducing conflicts with drivers (p. 17) – Overall crossing distances will remain the same.	■ Reimagine State Street as a BRT Boulevard – High number and proportion of buses – Increased reliability and speed of bus service – Increased productivity of bus service for the operators – Increased safety – Increased visibility of public transit for users – Increased ridership and reduced air pollution. ■ The median bus lane is preferred to the bus lane at the outer edges of the street since it would further enhance the reliability of bus travel times, increase the number of parking spaces available, including two valet spaces for the hotel site, and allow relatively convenient loading-unloading at the curbs.	Better street design overall that accommodates all users regardless of mode.

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
CDTA River Corridor Alternatives Analysis (2015) ■ Report	■ Corridor Transportation Conditions ■ Alternatives Development ■ Alternatives Evaluation ■ Implementation and Finance Plans	■ Purpose - The purpose of the project is to provide faster, more direct, more frequent, and more reliable north-south transit service connecting the major activity centers along the River Corridor at a reasonable cost and schedule (p. 17). ■ Transit Signal Priority (p. 35). ■ Queue Jump (p.36). ■ Bus Lanes - Bus lanes in this area are generally not needed to get around traffic congestion but rather to influence land development and as building blocks toward LRT. Bus lanes also ensure that travel times will remain consistent as traffic volumes grow along with increased economic development (p. 40). ■ Some sections of bus lanes are more physically feasible than others and require further study and buy-in from users, agencies, and the public (p. 40-41).	■ Recommended Alternative for this study is Alternative 2 Broadway – Best potential to support economic development and transit-oriented development – Best integration of existing local services without vast increases in resources required for the overall system – Best integration of transit priority infrastructure and connectivity to important transit-dependent neighborhoods and destinations – Best combination of travel time savings and connectivity.	■ The plan highlights the opportunity to reduce the need for parking and for better land-use decision-making. ■ Contraflow bus lanes present challenges for on-street parking and intersection signals. ■ Implementation of bus lanes may impact on-street parking, roadway widening, bicycle accommodations, traffic operations, and other right-of-way impacts. ■ Challenge with the timeline for rollout: These investments will require time to coordinate project development, design, and community input that may prolong the schedule for service rollout.
Washington/Western BRT Conceptual Design Study (2014) ■ Project Summary ■ Alternatives Analysis Report	Bus Rapid Transit (BRT)	■ Proposal for a new BRT line connecting Downtown Albany and Crossgates Mall along Washington and Western Avenues. ■ The eastern end of the proposed BRT would overlap with the existing NY5 BusPlus service and would intersect with the River Corridor BRT (the blue line) in downtown Albany.	■ The proposed route runs along Washington Avenue until the Lark-Amory station, before serving Western Avenue until it diverts to serve UAlbany directly, terminating at Crossgates Commons and Crossgates Mall. ■ Queue jump lanes, transit signal priority, and enhanced stations along the alignment. ■ An exclusive busway through the Harriman State Office Campus and the University of Albany Uptown Campus.	Opportunity to provide a direct east-west connection between several major activity centers/trip generators.

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
CDTC/CDTA Conceptual Design of NY 5 BRT Priority Measures (2004) ■ Report	■ Service Concept ■ Conceptual Design of main roadway treatments and priority elements ■ Additional concepts considered	■ Queue jumpers - A preliminary evaluation of the Route 5 corridor was made to determine which intersections would be considered good candidates for the implementation of queue jumpers—short exclusive bus lanes leading up to intersections combined with transit signal priority (p. 7). ■ Transit Signal Priority - By giving signal priority to transit buses, transit travel times and delay times are shortened, translating into more convenience to the passengers and cost savings for the agency. It has also been shown that transit signal priority can allow the agency to reduce the number of trips on a route without affecting its level of service. Furthermore, signal priority can reduce or eliminate “bunching” (p. 10). ■ Downtown Albany Bus Lanes - The concept of a bus lane is to provide an exclusive lane for transit use. Several different types of bus lanes exist, including curbside lanes, interior lanes, and median lanes, each with its own advantages and disadvantages (p. 13). – A qualitative evaluation that considered five criteria was conducted to analyze the trade-offs of the alternatives under consideration. The five criteria selected for the evaluation were: 1) impact to traffic; 2) impact to parking; 3) transit improvement; 4) impact to the pedestrian environment; and 5) complexity or constructability. (p. 14). ■ Bus Lanes between Fuller Road and Route 155 – Concept - Provide bus lanes in both directions along this section either by repositioning the curbs or removing the flush median. (p. 14).	■ Queue jumpers at several key locations – The evaluation concluded that the Wolf Road and New Karner Road intersections, in the westbound direction, are strong candidates for queue jump consideration because of the delays and queues experienced at these locations and the ability for a queue-jump lane to be constructed and complement the proposed BRT stations. ■ Transit Signal Priority ■ This review concluded that the implementation of unconditional TSP at most of the signalized intersections in the Route 5 corridor should have little or no impact on side street traffic.	■ Opportunities to realize transit time travel savings with various transit priority treatments ■ Implementation of queue jumps may run into issues with property owners.

Agency / Study Name / Date	Major Elements	Key Relevance to Bus Lane Study	Recommendations	Challenges / Opportunities / Best Practices / Lessons Learned
City of Albany Complete Streets Policy & Design Manual (2016) ■ Report	■ Street Typologies ■ Process and Implementation ■ Trending City-wide Design Considerations ■ Design Guidelines for Streetscapes, Sidewalks, and Streets ■ Design Guidelines for Intersections	■ Complete streets provide accessible bus stops while allowing buses to move through traffic with greater ease, further encouraging ridership while reducing dependence on private transportation services (p. 4-2). ■ Shared transit bicycle lanes are designated for use by public transit buses, bicycles, and generally for right-turning vehicles. The primary purpose of these lanes is to provide a time advantage to public transit by taking the buses out of the general traffic flow and into a designated lane (p. 4-2). ■ Road Diets - Generally, a road diet includes removing travel lanes from a roadway (p. 4-5). ■ Design Guidelines - A Transit Lane is for public transit. This dedicated lane has the potential to enhance the frequency, efficiency, and reliability of transit service along corridors throughout the City (p. 5-18). ■ Lane striping and pavement markings convey messages to roadway users. Use of lane striping and pavement markings can indicate which part of the road is designated for which user to create a safer, more accessible roadway network for all users (p. 5-20). ■ Dedicated transit lanes are lanes used by transit vehicles only along enhanced transit corridors (p. 5-22). ■ Enhanced transit lanes or corridors incorporate dedicated transit lanes and other transit amenities such as bus shelters located in buffer zones or bus bulbs (p. 5-22).	■ Provides recommended transit lane widths for all street typologies. ■ Dedicated or enhanced transit lanes are recommended for wide downtown streets, wide community mixed-use streets, and wide community commercial streets.	Opportunities for better coordination of different agencies.
Albany Parking Authority Downtown Albany Parking Facility Feasibility Study (2017) ■ Website ■ Report	■ Analysis of Existing Parking Conditions ■ Projection of Future Parking Needs ■ Site Evaluation and Concept Parking Plans ■ Financial Feasibility	■ As presented in Table 5 on the following page, the on-street parking in the Quackenbush/Riverfront and State Street zones is barely adequate based on the effective parking supply (p. 10). ■ Although there are currently parking “hot spots” in each of the three zones where parking demand exceeds the effective parking supply, the results of the parking occupancy surveys indicate there is adequate parking within the three analysis zones and the study area overall presently, and the development of more parking is not warranted until there is additional demand generated by future development and/or the absorption of currently vacant space (p. 15). ■ The Albany Convention Center Authority and the Capital District Transportation Authority (CDTA) are teaming to develop a proposed intermodal transportation center to replace the current bus station in the Green-Hudson area (p. 22).	■ The study did not recommend an additional downtown parking garage. ■ On-street paid parking should be considered in the developing Warehouse District.	■ Opportunity for transit connections to Capital District Gondola should it proceed forward. ■ Challenge to maintain adequate parking supply without overbuilding parking facilities. ■ Consider how bus lanes could help flow into and out of the CDTA Intermodal Center.

3. PEER BUS LANE EXPERIENCE SUMMARY

Table 2: Non-Local Plans Summary

Agency/ Study Name	Lessons Learned	Performance Data	Picture
LA Metro, Flower Street Bus Lane, 2019	■ Optimal volume of buses per hour is essential for maximum bus lane performance ■ Enforcement and compliance is critical to keeping bus-only lanes clear of violators and other obstructions ■ Relocate bus stop from traffic turning movements ■ Bus lanes need to be as continuous as possible to avoid diminished lane performance ■ A previous bus lane deployment created a lot of angst with community members, so it required a lot of extra outreach to ensure this pilot went smoothly. ■ Active enforcement by police was extremely costly, equivalent to $750k annually.	■ 1.8 mile peak period bus lane pilot, June 2019 ■ Up to 80 buses/hr. ■ Person throughput increased 37% ■ Travel time improved 30% ■ 2/3rd of riders and operators reported time savings ■ Bus speeds increased by 14% ■ Limited impact on private vehicles	

Agency/ Study Name	Lessons Learned	Performance Data	Picture
Portland, TriMet, Rose Lanes, 2020	■ The project is still in the implementation phase, and lessons learned have not been determined at this time	■ Network approach: target locations with the highest delay – Increase service as enhancements implemented – Variety of tactical strategies ■ Reduced travel times from 1 to 7 minutes depending on the treatment type ■ 24% gain in job access within 45 minutes by bus on average citywide	
Boston, MBTA, Everett Bus Lane Pilot, 2019	■ You won't always see big increases in ridership, some lines already saturated, but you can make the service more reliable and faster and save people a lot of time ■ Pilot projects can be tested and made permanent in a relatively quick amount of time	■ City of Everett, MA, pilot began in 2016 ■ 1 mile inbound in AM peak ■ Travel time savings between 8 – 11 minutes during peak times ■ On average, passengers saved 24 hours per weekday morning; on bad days, they saved 65 hours ■ 4% increase in ridership	

Agency/ Study Name	Lessons Learned	Performance Data	Picture
San Francisco, MUNI, Red Transit Lanes, 2017	■ Red paint treatment had a positive impact on dedicated lane enforcement. ■ In all three study corridors during both the AM and PM peak periods, the transit travel time to traffic travel time ratio decreased following the implementation of red treatments, indicating that the treatments have been effective at insulating transit travel times from the effects of increased traffic congestion.	■ Church Street — Average travel time savings of 14% (1 minute) — Reduced travel time variability by 27% — 50% reduction in drivers violating red transit lanes — No significant impact on traffic — Police reported collisions decreased by 16% — Striping and red paint cost $280k/mile.	
Seattle, King County Metro, Rapid Ride, 2014	■ 15 to 20 % of riders said they would have driven alone if not for better RapidRide bus service. ■ While the overall performance of each route has improved in terms of reliability and travel time, safety on board buses and at stops has not.	■ Network of BRT Lite ■ Many strategies in concert, including bus lanes ■ On average, 87% ridership increase since launching RapidRide; carrying more than 43,000 riders per weekday ■ 11% speed increase for travel times ■ The number of on-time trips has improved to 84%	

Agency/ Study Name	Lessons Learned	Performance Data	Picture
Baltimore, MDOT MTA, Dedicated Bus Lanes, 2019	■ Lanes that are not painted red and peak time only do not perform as well as full-time painted red lanes. ■ When the operators were asked how the dedicated lanes affected bus operations, the following four factors were identified almost equally (46%): — Increased speed through downtown — Improved ability to pull in and pull out from bus stops — Reduced conflicts with other vehicles — Easier to maintain the schedule ■ Enforcement was an issue, clear roles/responsibilities for agencies is critical. A Task Force recently decided to implement fixed cameras.	■ Network of bus lanes in the downtown core ■ Travel time savings with an average benefit of 9.3% per corridor. ■ Reduced number of buses involved crashes by nearly 12% ■ Bus lanes are most successful when they are in effect full-time (not just during peak periods) and are very clearly marked (painted red)	
New York City, NYC DOT, Select Bus Service, 14th Street Busway, 2019	■ Cameras mounted on buses help with bus lane enforcement ■ Bike ridership increased in the project area	■ Pilot 2019, permanent 2020 ■ 24% improvement in travel times averaging 2.9 minutes faster ■ Weekday ridership increased by 14% ■ 42% reduction in crashes involving injuries ■ Vehicle travel times impacted less than 1 minute	

Agency/ Study Name	Lessons Learned	Performance Data	Picture
Washington DC, DDOT, Bus Lanes, 2019	■ Enforcement and deliveries were issues – Created loading zones on the opposite side of the street – Signal sequencing and operations updated to accommodate right-turning vehicles – Bus layover spaces moved outside the bus lane corridor ■ Pilot offered opportunity for roadway owner and operator to implement and problem solve together in an iterative fashion.	■ 2019: Peak period pilot bus lanes in the downtown core (70 buses per hour and 20% of all riders in District) – One mph increase in bus speeds – Made permanent in November 2019 – Now operate from 7:00 a.m. and 7:00 p.m. Monday through Saturday ■ The pilot provided invaluable experience for roadway owner and bus operator ■ 2020: Three bus lane corridors implemented during COVID ■ Two major bus corridors have bus lanes under construction ■ Bus Priority Plan: – 25-miles of additional bus priority by 2025 – TSP, queue jumps, bus lanes, stop consolidation, etc. – Testing automated enforcement	

Table 3: List of Additional US Cities with Bus Lanes

City, State
Albuquerque, NM
Alexandria - Arlington, VA
Arlington, MA
Austin, TX

City, State
Berkeley, CA
Cambridge, MA
Chicago, IL
Cincinnati, OH
Cleveland, OH
Columbus, OH
Denver, CO
El Paso, TX
Eugene, OR
Everett, MA
Fort Collins, CO
Grand Rapids, MI
Honolulu, HI
Houston, TX
Indianapolis, IN
Jacksonville, FL
Kansas City, MO
Las Vegas, NV
Miami-Dade, FL
Minneapolis, MN
New Britain-Hartford, CT
Oakland, CA
Orlando, FL
Pittsburg, PA
Richmond, VA
San Bernardino, CA
Santa Monica, CA

4. KEY MAPS AND GRAPHICS

2014 CDTA Transit Development Plan

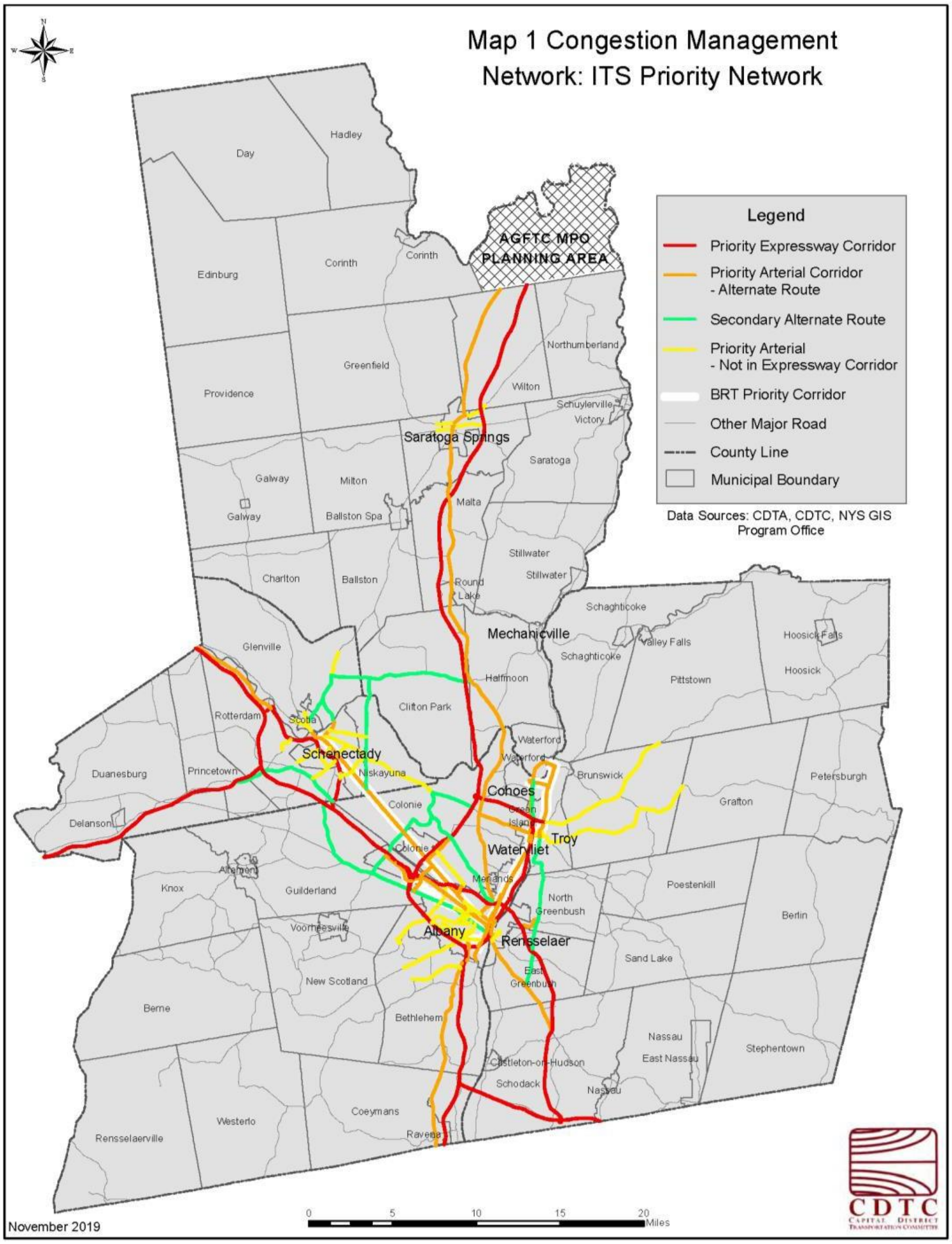
Figure 1: Capital Region BRT Corridors

Capital Region Bus Rapid Transit Corridors

Corridor Name	Description	Municipalities	Trunk Routes	Corridor Length	Annual Ridership	Status
NY Route 5	Central Avenue and State Street from downtown Albany to downtown Schenectady	Albany, Colonie (Village), Colonie (Town), Niskayuna, Schenectady	#905-BusPlus, #1	17 miles	3.7 million	Operations began in April 2011 with final stations constructed in summer 2013. Additional service rolled out fall 2013.
Washington - Western	Washington and Western Avenues from downtown Albany to Crossgates Mall	Albany, Guilderland	#10, #11, #12	8 miles	3.3 million	Planning completed; Undergoing Environmental clearance and Engineering / Design
River Corridor	Pearl Street and Broadway (NY 32) & 2nd and 5th Avenues (NY 4)	Albany, Menands, Watervliet, Troy, Cohoes, Waterford	#6, #7, #22, #80, #85	15 miles	2.5 million	Conceptual Design Study to be completed in 2014

New Visions 2050

Figure 2: Congestion Management Network: ITS Priority Network



New Visions 2050 Transit White Paper

Figure 3: Transit Priority Network, 2019

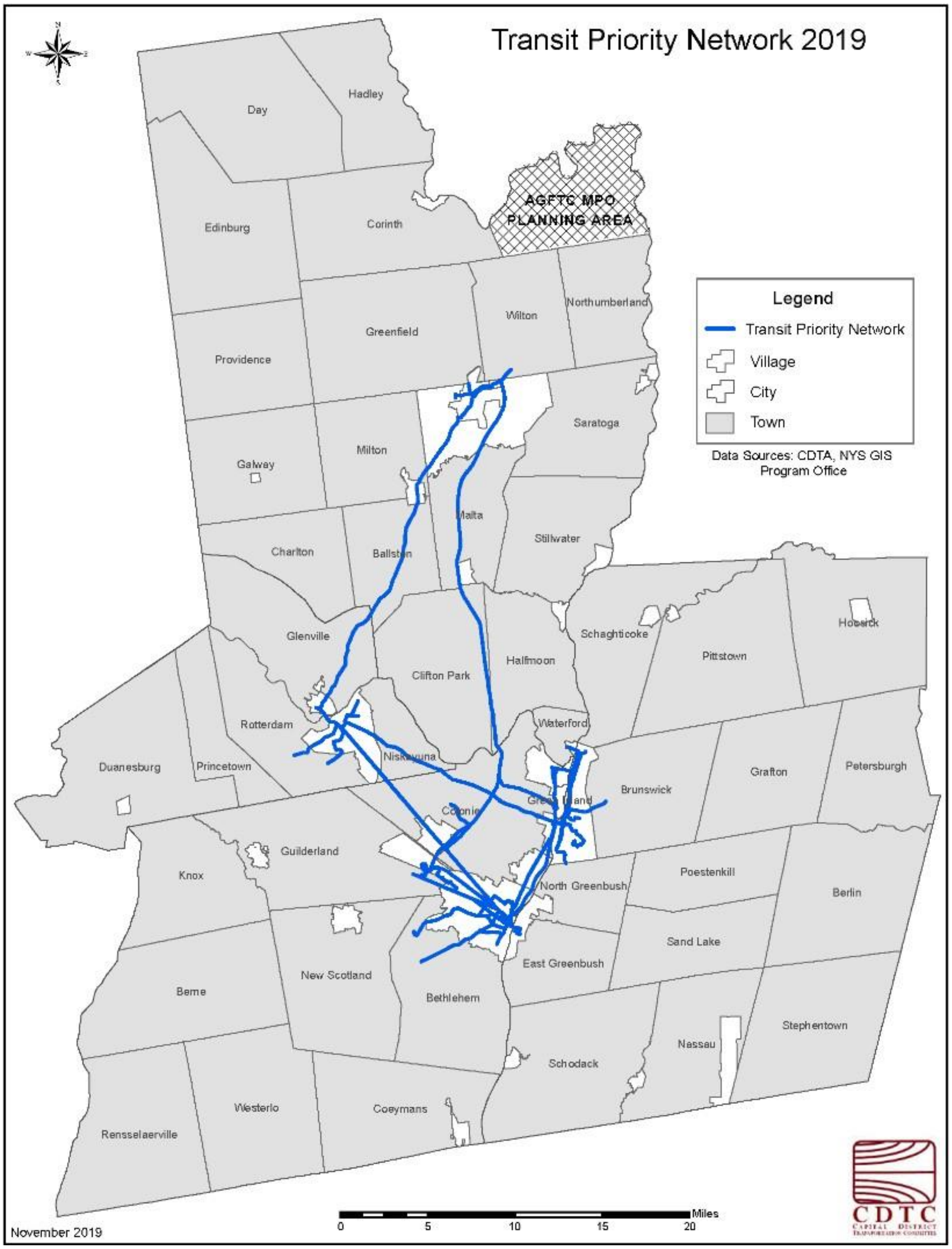
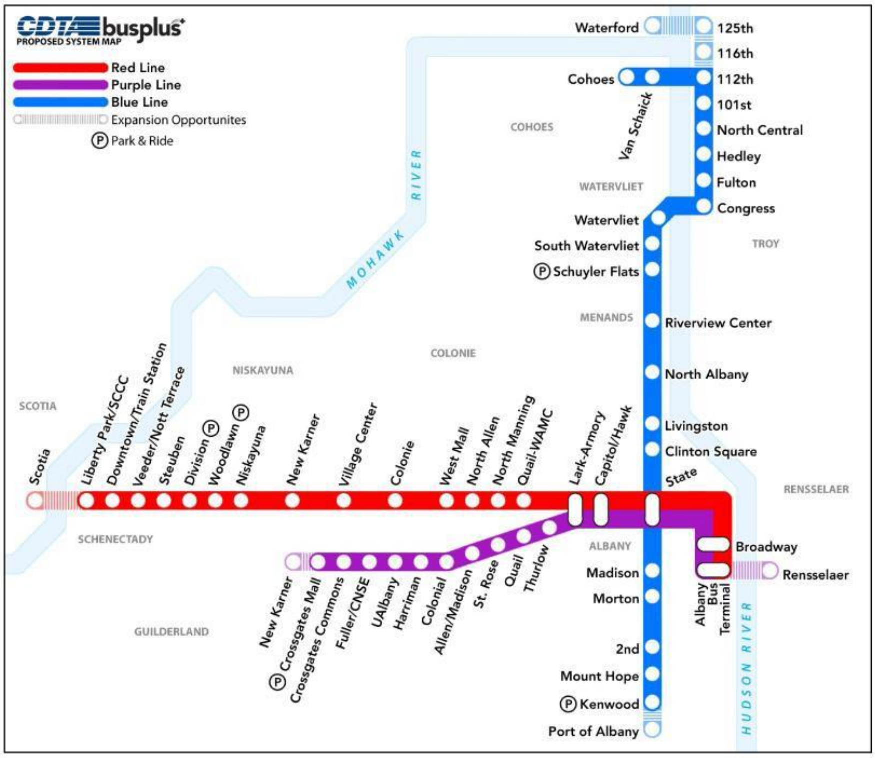


Figure 4: CDTA BusPlus



Albany Transit Supportive Development Case Study

Figure 5: Proposed State Street median bus lanes

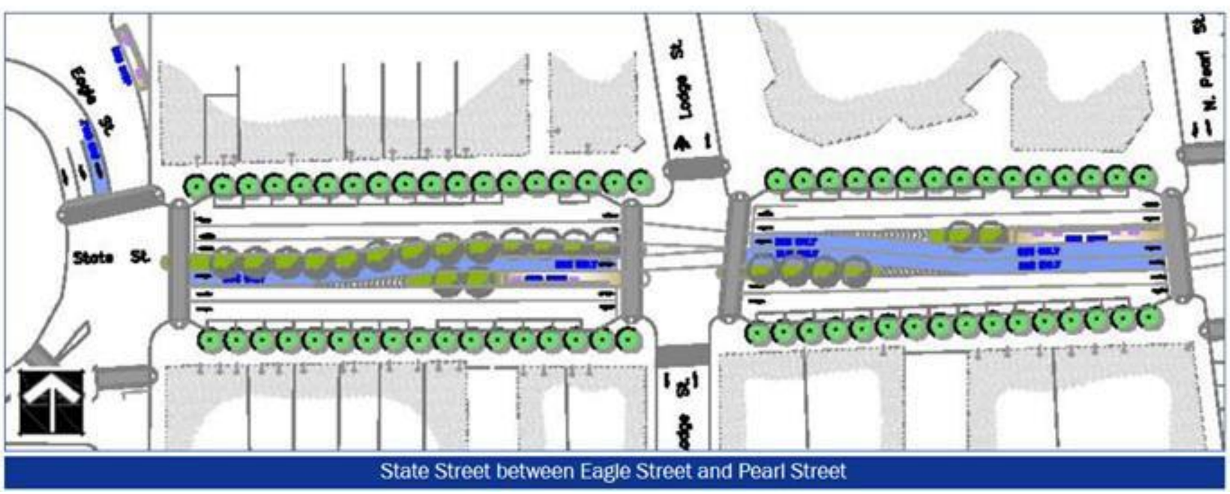


Figure 6: State Street Lanes

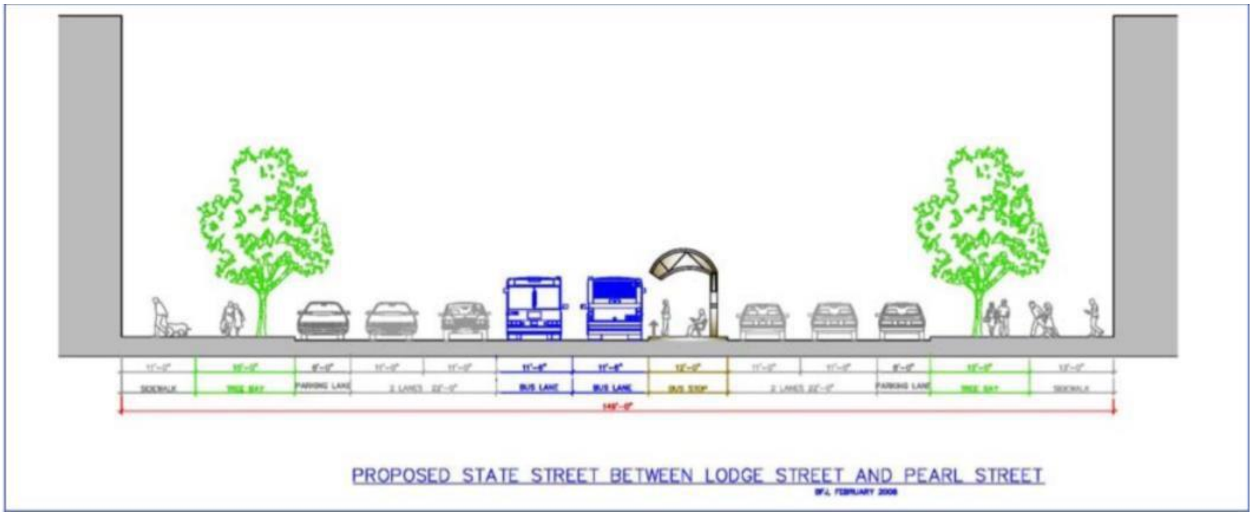


Figure 7: State Steet Lanes 2

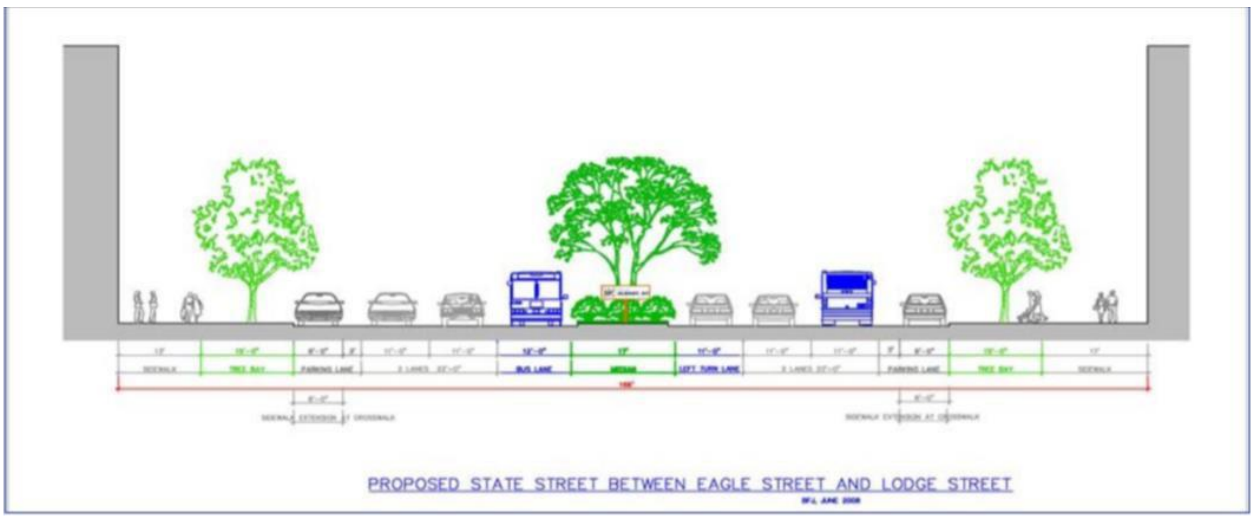
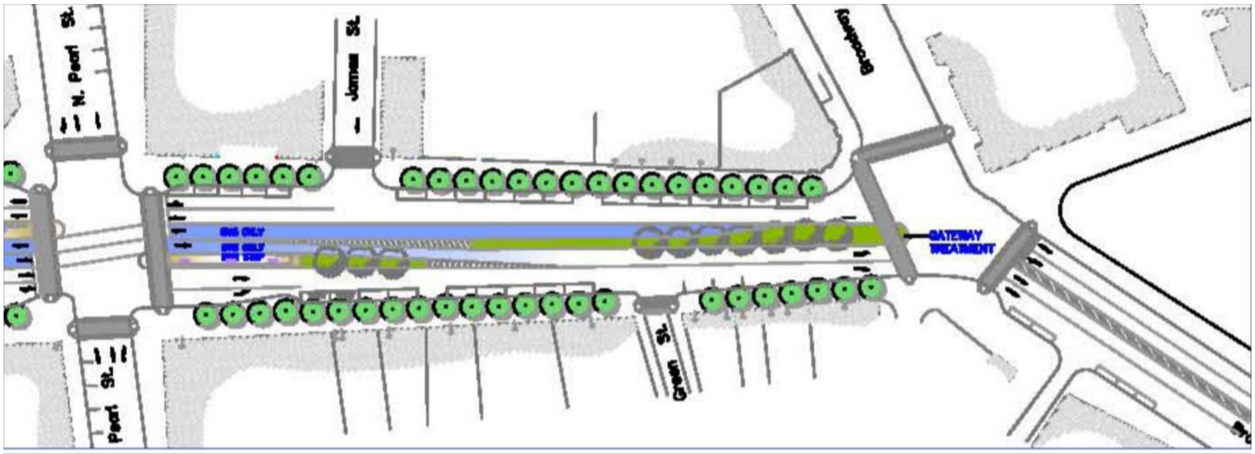


Figure 8: State Street Median Bus Lanes



State Street between Pearl Street and Broadway

River Corridor Alternative Analysis

Figure 9: CDTA River Corridor Simplified Alternatives

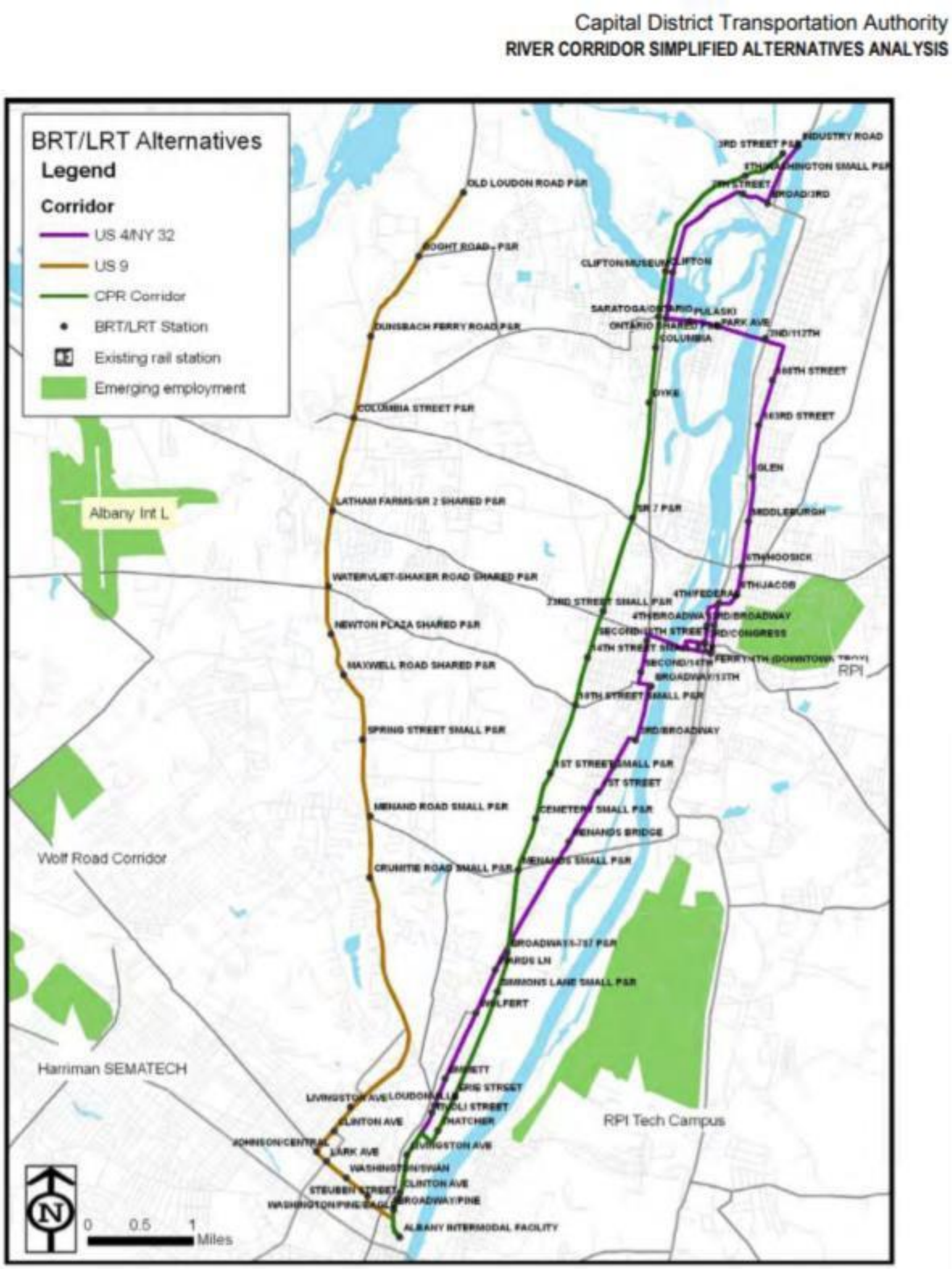


Figure 10: River Corridor Alternative 1 – Broadway (NYS 32) between Clinton Avenue and 1st Street

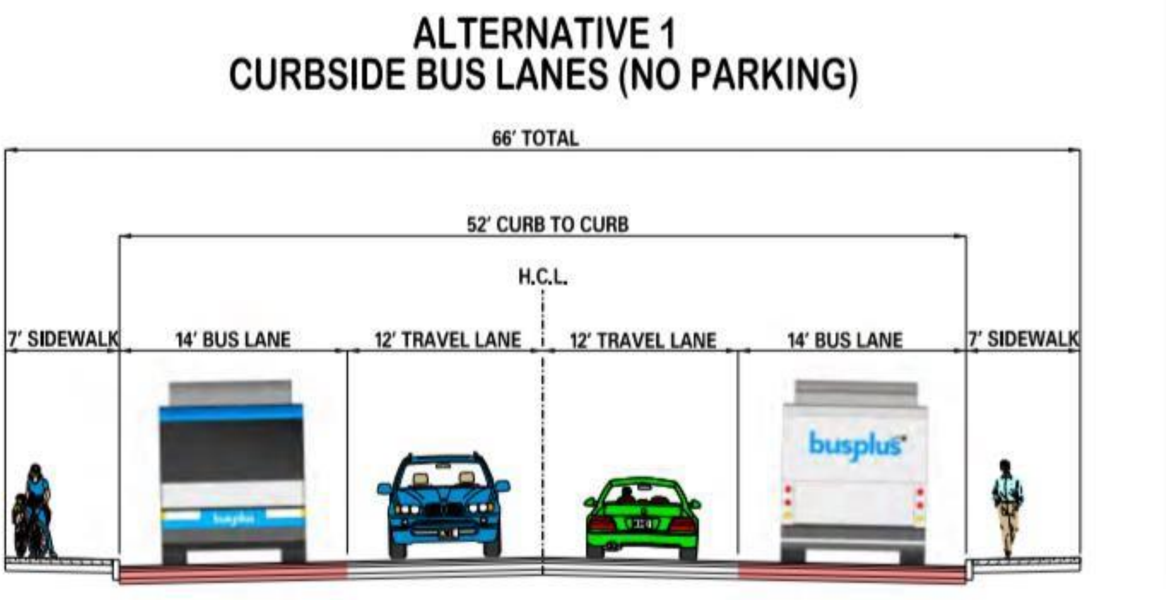


Figure 11: River Corridor Alternative 2 – Broadway (NYS 32) between Clinton Avenue and 1st Street

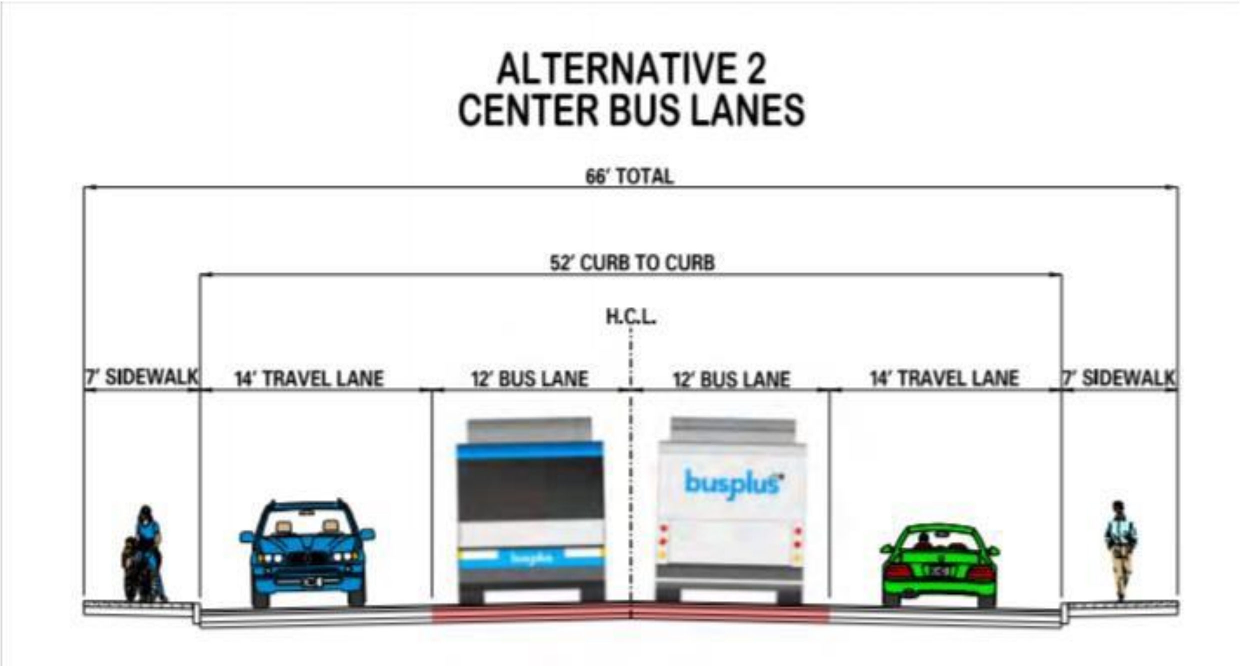
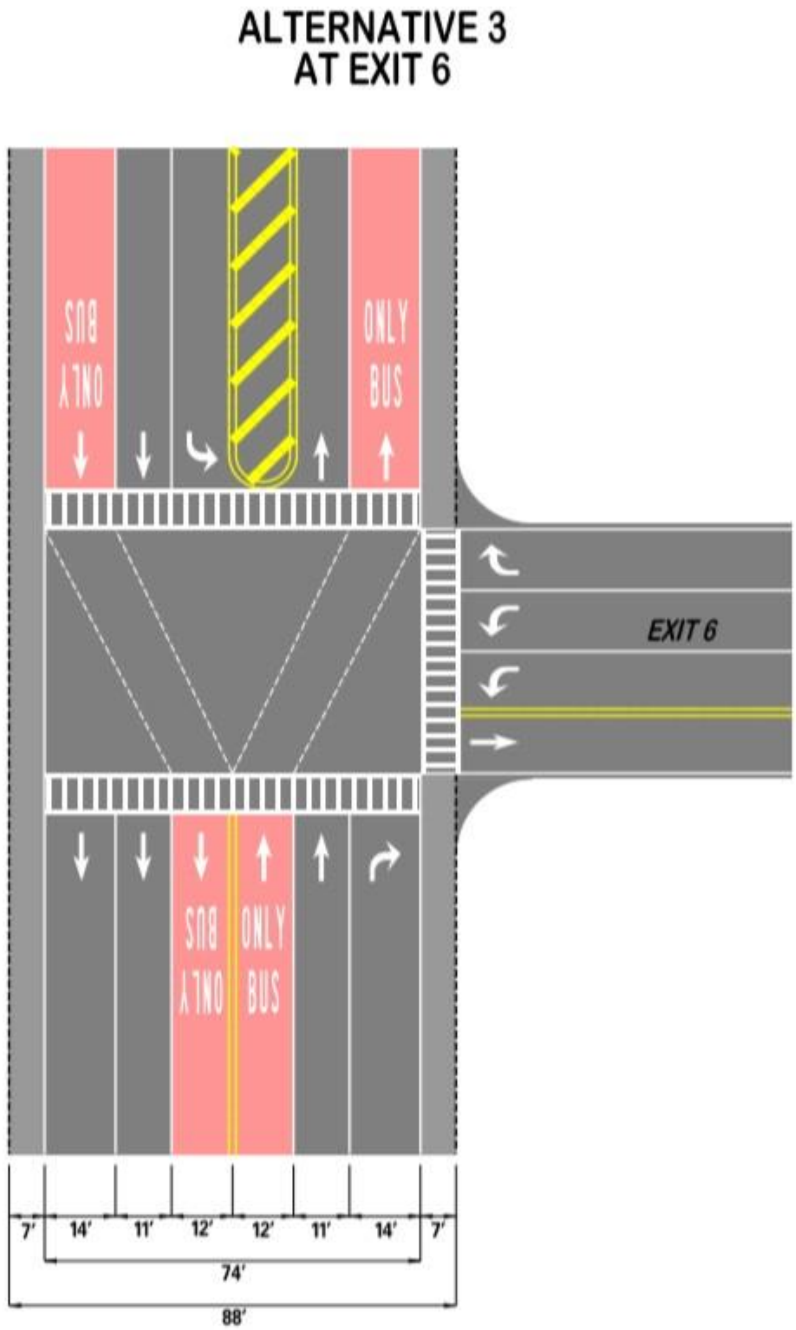


Figure 12: River Corridor Alternative 3 – Broadway (NYS 32) between Clinton Avenue and 1st Street



2014 CDTA Transit Development Plan

Figure 13: Tri City Transit Priority Corridors

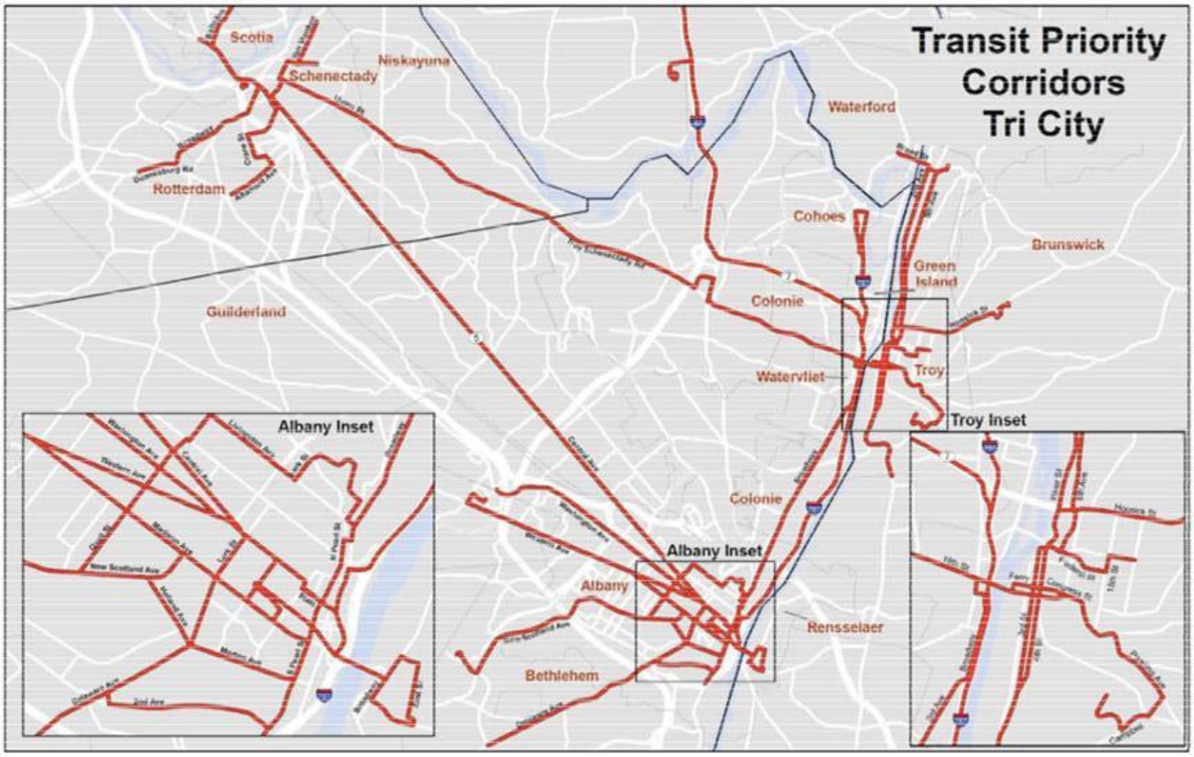


Figure 14: Transit Priority Corridors in Saratoga County

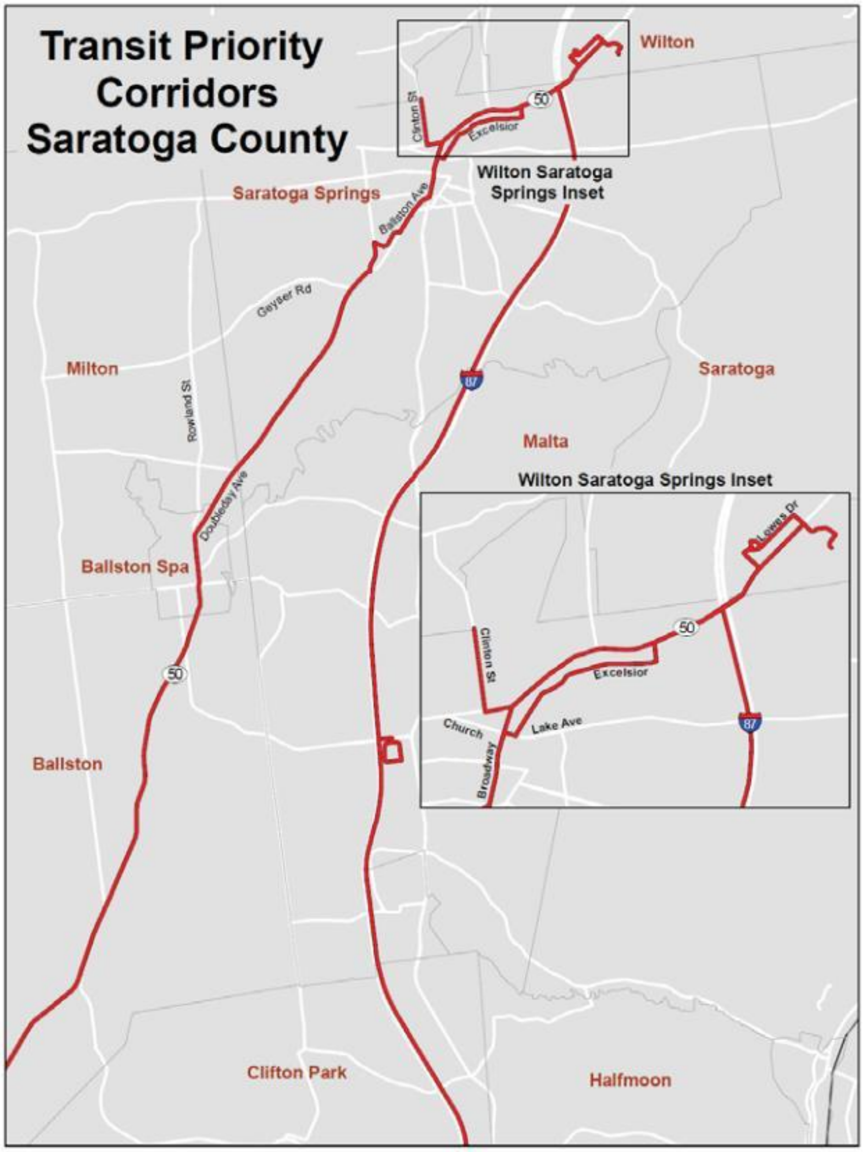
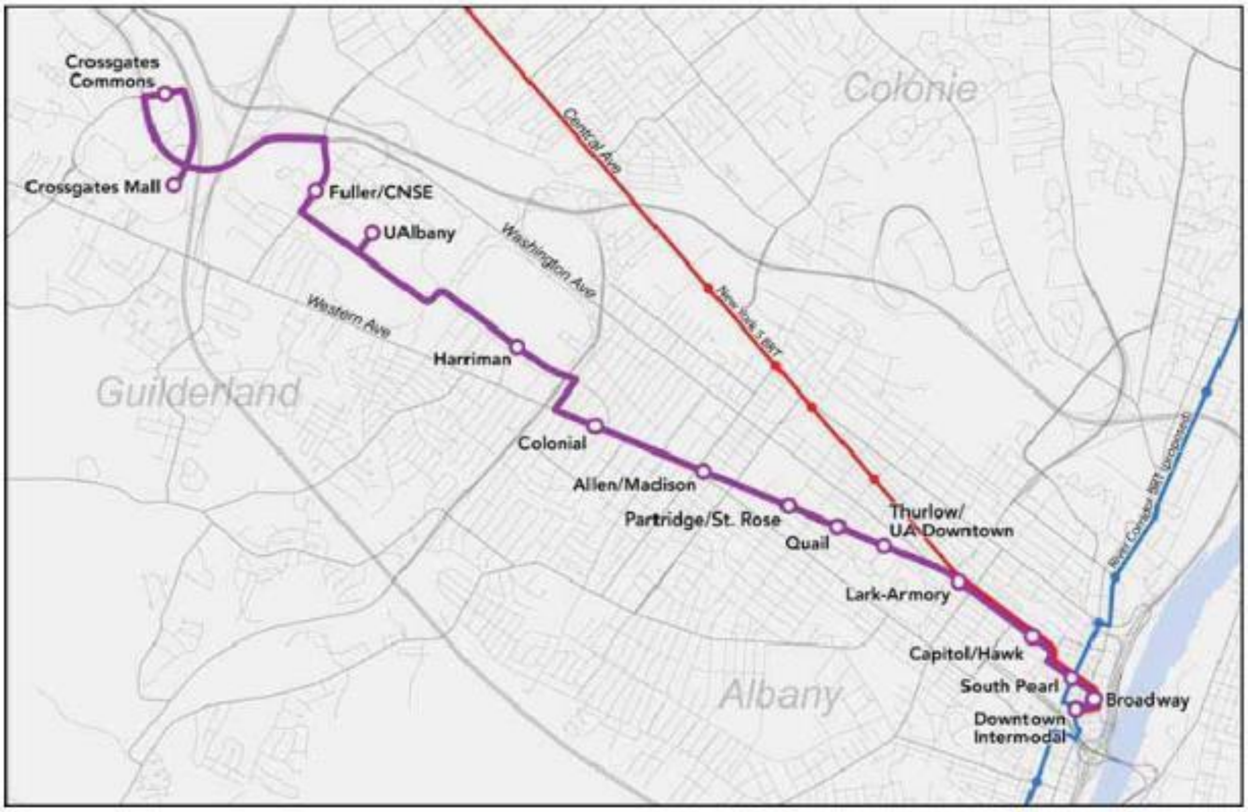
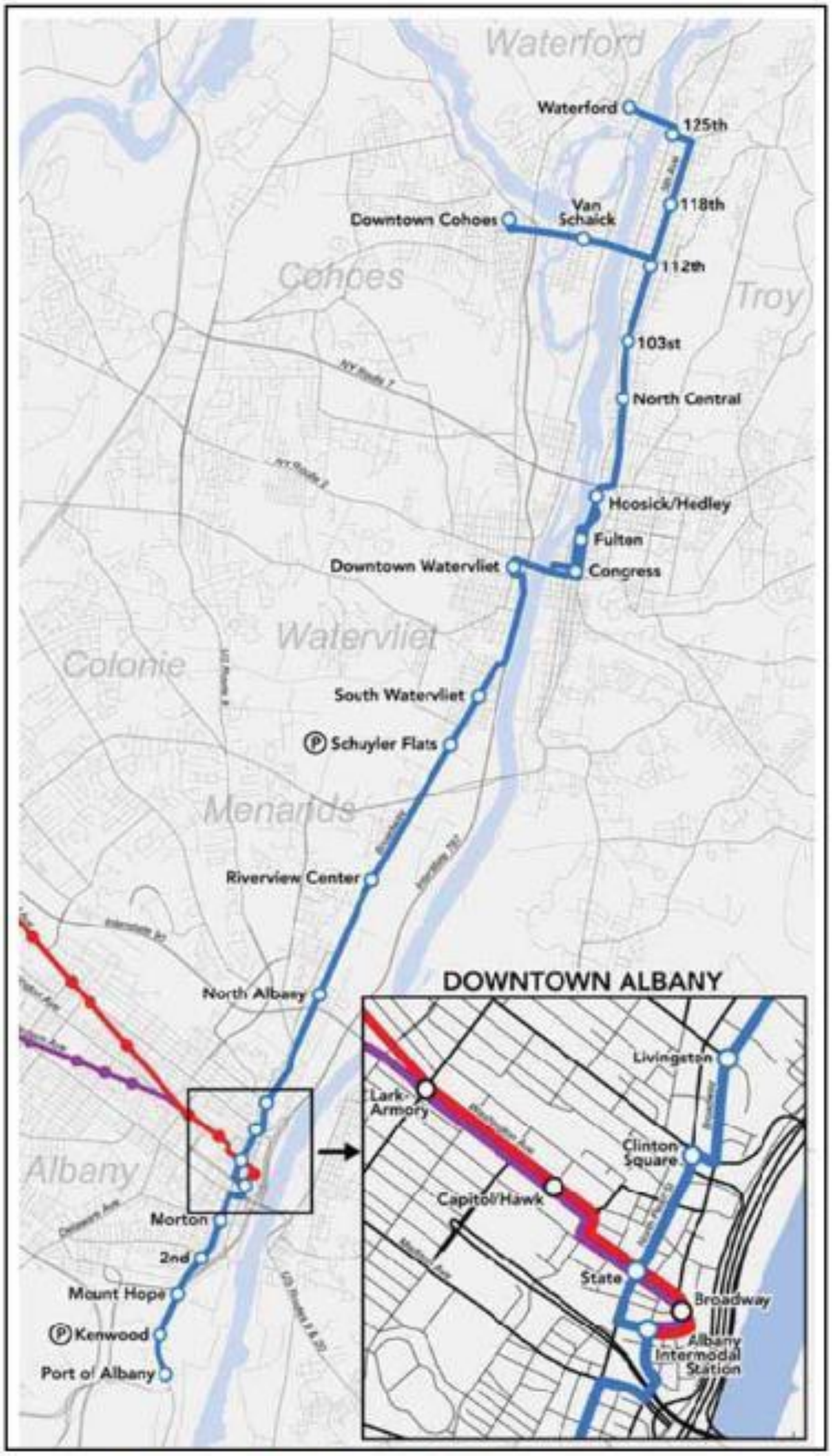


Figure 15: Washington/Western BRT Route (proposed as of 2014)



Washington-Western BRT with Proposed Station Locations

Figure 16: River Corridor BRT (proposed as of 2014)



River Corridor BRT Conceptual Routing and Station Locations

Figure 17: CDTA Transit Priority Corridors (page 1 of 2)

Segment	End Points	Municipality
Albany County		
State Street	Eagle Street – Broadway	Albany
Washington Avenue	Eagle Street – Crossgates Mall	Albany, Guilderland
Western Avenue	Washington Avenue – Crossgates Mall	Albany, Guilderland
Central Avenue and State Street (NY Rte 5)	Lark Street – Schenectady County Community College	Albany, Colonie (Village and Town), Niskayuna, Schenectady
New Scotland Avenue	Madison Avenue – Vista Technology Park	Albany, Bethlehem
Lark Street and Delaware Avenue	Washington Avenue – Cherry Avenue	Albany, Bethlehem
South Pearl Street (NY Rte 32)	State Street – Mount Hope Drive	Albany
Broadway and 3rd Avenue (NY Rte 32)	Madison Avenue – 15th Street	Albany, Menands, Watervliet
Second Avenue	South Pearl Street – Delaware Avenue	Albany
North Pearl Street (NY Rte 32)	State Street – Lark Drive	Albany
Quail Street	Livingston Avenue – New Scotland Avenue	Albany
Livingston Avenue and Lark Drive	North Pearl Street – Quail Street	Albany
Morton Avenue and Holland Avenue	New Scotland Avenue – South Pearl Street	Albany
Second Avenue	Delaware Avenue – South Pearl Street	Albany
Madison Avenue	Allen Street – North Pearl Street	Albany
South Swan Street	Washington Avenue – Madison Avenue	Albany
19th Street, Troy-Schenectady Road, and Union St (NY Rte 2 & 7)	Congress Street Bridge – Nott Terrace	Watervliet, Colonie, Niskayuna, Schenectady
South Mall Arterial, Interstate 787, and NY Rte 787	Empire State Plaza – Rte 32	Albany, Menands, Watervliet, Colonie, Cohoes
Alternate Rte 7 and Interstate 87	Interstate 787 – Mohawk River	Colonie
Remsen Street and Main Street	Rte 32 – Cayuga Street	Cohoes
Rensselaer County		
Dunn Memorial Bridge, Broadway, 3rd Avenue, East Street, & Herrick Street	Hudson River – Rensselaer Rail Station	Rensselaer

Figure 18: CDTA Transit Priority Corridors (page 2 of 2)

Ferry St & Congress Street	Congress Street Bridge to Pawling Avenue	Troy
Pawling Avenue	Congress Street – Myrtle Avenue	Troy
Maple / Myrtle Avenues, & Project Road / Madison Avenue	Pawling Avenue – Griswold Heights	Troy
Federal Street, Sage Avenue, 15th Street, and People's Avenue	River Street – Burdett Avenue	Troy
River Street and 2nd Avenue (Rte 4)	Fulton Street – 126th Street	Troy
5th Avenue and 6th Avenue	Federal Street – 125th Street	Troy
Northern Dr and 8th Avenue	5th Avenue – Corliss Park	Troy
3rd / 4th Avenue, Mill Street, and Vandenburgh Avenue (Rte 4)	Fulton Street – Hudson Valley Community College	Troy
Hoosick Street	6th Avenue – Brunswick Walmart	Troy, Brunswick

Schenectady County		
Altamont Avenue	Curry Road – Chrisler Avenue	Schenectady, Rotterdam
Ballston Road (Rte 50)	Mohawk Avenue – County Line	Glenville, Scotia
Broadway and Duanesburg Road	State Street to Rotterdam Industrial Park	Schenectady, Rotterdam
Crane Street and Chrisler Avenue	Altamont Avenue – Main Avenue	Schenectady
Main Avenue and Craig Street	Chrisler Avenue – Albany Street	Schenectady
Nott Street	Seward Place – Rosa Road (Ellis Hospital)	Schenectady
Nott Terrace, Seward Place, and Van Vranken Avenue	State Street – Wood Avenue	Schenectady
State Street and Mohawk Ave (Rte 5)	County Line – Sacandaga Road	Schenectady, Niskayuna, Scotia
Saratoga County		
Broad St (Rte 4)	Hudson River – 6th Street	Waterford (Village)
Northway (Interstate 87) *and roadways leading to park & rides*	Mohawk River – Exit 15	Clifton Park, Halfmoon, Malta, Saratoga Springs
Rte 50	County Line – Wilton Mall	Saratoga Springs, Wilton
Clinton Street & Church Street	Broadway – Skidmore College	Saratoga Springs

Conceptual Design of NY 5 BRT Priority Measures (2004)

Figure 19: Route 5 Station Locations

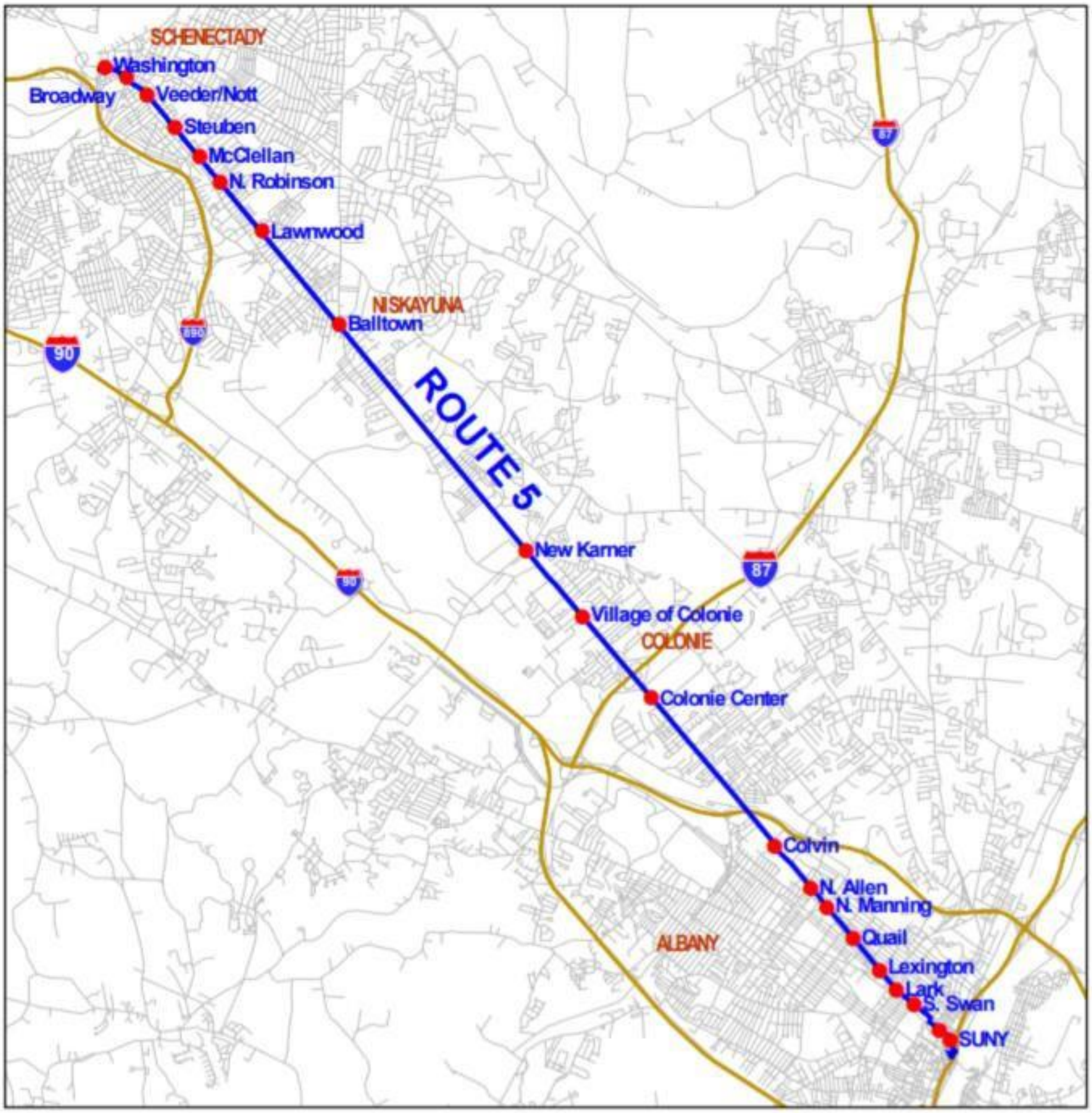


Figure 1.2 Preliminary location of BRT stations

City of Albany Complete Streets Policy and Design Manual

Figure 20: Albany Complete Streets Typologies

Table 2.1: Existing Land Use/Street Typology Characteristics

Land Use/Street Typology	Functional Classification	Modal Hierarchy	Example Elements	Existing Building Setback Range (feet)[a]	Existing ROW Width Range (feet)[b]	Existing Pavement Width Range (feet)[c]
Downtown	Principal Arterial Minor Arterial Local Road	Pedestrian Bicyclist Transit User Motorist	Sidewalks, Crosswalks, Curb Ramps Bike Racks, Shared Lanes Bus Shelters, Bus Bulbs Marked Lanes, On-Street Parking	0	48 - 152	23 - 90
Neighborhood Mixed Use	Principal Arterial Minor Arterial Major Collector	Pedestrian Bicyclist Motorist Transit User	Pedestrian Crossing Signals, Sidewalks, Benches Bike Racks, Bike Lanes, Signage Marked Lanes, On-Street Parking Bus Shelters, Bus Bulbs	0 - 20	76 - 102	45 - 59
Neighborhood Residential	Minor Arterial Major Collector Local Road	Pedestrian Bicyclist Motorist	Pedestrian-scaled Lighting, Sidewalks, Curb Ramps Share the Road Signage Minimal Obstructions, On-street Parking	20 - 25	37 - 50	18 - 28
Community Mixed Use	Principal Arterial Minor Arterial Major Collector	Motorist Transit User Pedestrian Bicyclist	Designated Turning Lanes, On-Street Parking Bus Shelters, Bus Bulbs Sidewalks, Crosswalks, Curb Ramps Bike Racks	0 - 20	98 - 103	52 - 58
Community Commercial	Principal Arterial Minor Arterial Major Collector	Motorist Transit User Pedestrian Bicyclist	Designated Turning Lanes Bus Shelters, Curb Extensions Pedestrian-scaled Lighting, Sidewalks, Curb Ramps Shared Lanes, Bike Racks	0 - 40	98 - 104	60 - 70
Industrial	Major Collector Local Road	Motorist Transit User Bicyclist Pedestrian	Dedicated Turn Lanes Bus Shelters Shared Lanes Sidewalks, Crosswalks, Curb Ramps	0 - 20	41 - 85	23 - 34

[a] *The building setback ranges are front setback minimums. These ranges are estimates and do not reflect specific requirements of the City of Albany zoning ordinance.*
[b] *The ROW width ranges reflect estimated field observations from roadways.*
[c] *The pavement width ranges reflect estimated field observations from roadways.*

Figure 21: Albany Complete Streets Preferred Design Guidelines

Table 5.2: Preferred Design Guidelines for Streets

PLEASE NOTE THAT THIS GRAPHIC IS FOR ILLUSTRATIVE PURPOSES ONLY.

Street Typology	FHWA Functional Classification [a]	Transit Lane (ft) [b]	Travel Lane (ft) [c]	Turn Lane (ft) [d]	Bicycle Lane (ft) [e]	Parking Lane (ft) [f]
Downtown	Principal Arterial / Minor Arterial / Major Collector / Local Road	11 – 14	10 – 12	10 – 12	5 – 7	7 – 8
Neighborhood Mixed Use	Principal Arterial / Minor Arterial / Major Collector	11 – 14	10 – 12	10 – 12	5 – 7	7 – 8
Neighborhood Residential	Minor Arterial / Major Collector / Local Road	N / A	9 – 12	9 – 12	5 – 7	7 – 8
Community Mixed Use	Principal Arterial / Minor Arterial / Major Collector	11 – 14	10 – 12	10 – 12	5 – 7	7 – 8
Community Commercial	Principal Arterial / Minor Arterial / Major Collector	11 – 14	10 – 12	10 – 12	5 – 7	7 – 8
Industrial	Major Collector / Local Road	11 – 14	9 – 12	9 – 12	5 – 7	7 – 8

[a] Principal Arterials serve major centers of metropolitan areas, provide a high degree of mobility, providing access to abutting land uses. Minor Arterials serve geographic areas that are smaller than Principal Arterials, while offering connectivity to the higher Arterial system. Major Collectors serve a critical role in the roadway network by gathering traffic from Local Roads and funneling them to the Arterial network. Local Roads provide direct access to adjacent land, while providing access to higher systems and carrying no through traffic.

[b] A minimum lane width of 11 feet is required on signed CDTA bus routes. However, lane width may be as wide as 14 feet to accommodate bicycles where it is not possible to create a bicycle facility at minimum widths for travel, turning, and bicycle lanes and where it is not possible to create a shoulder for bicycle use. (See AASHTO Guide for the Development of Bicycle Facilities section 4.3.1/document incorporated into NYSDOT HDM 17.4.3. Also FHWA Incorporating On-Road Bicycle Networks into Resurfacing Projects pg 19.)

[c] Travel lane widths may vary due to traffic speed, traffic type, pavement constraints and/or right-of-way constraints. Projects located on NYSDOT Designated Qualifying Highways require a minimum lane width of 12 feet. Projects located on Designated Access Highways require a minimum lane width of 10 feet. All routes located within one mile of Qualifying Highways require a minimum travel lane width of 10 feet.

[d] Turn lane widths may vary due to traffic speed, traffic type, pavement constraints and/or right-of-way constraints. Projects located on NYSDOT Designated Qualifying Highways require a minimum lane width of 12 feet. Projects located on Designated Access Highways require a minimum lane width of 10 feet. All routes located within one mile of Qualifying Highways require a minimum travel lane width of 10 feet.

[e] Bicycle lane widths, as recommended by the AASHTO's 2012 Guide for Development of Bicycle Facilities 4th Edition and the City of Albany Bicycle Master Plan, should be at least 5 feet. AASHTO guidelines also recommend that a bicycle lane should be 7 feet wide when adjacent to an 8 foot wide or less parking lane typical of high rates of turnover. In areas with high bicycle volumes, no on-street parking, and high vehicle speeds and volumes, lane widths are recommended to be between 6 feet and 8 feet. The wider lane creates more room for potential avoidance maneuvers.

[f] Parking lane widths may vary due to potential future uses, such as becoming a travel or turn lane. According to Chapter 2 of the NYSDOT Highway Design Manual, the minimum parking lane width is 7 feet which is typically seen along residential corridors.

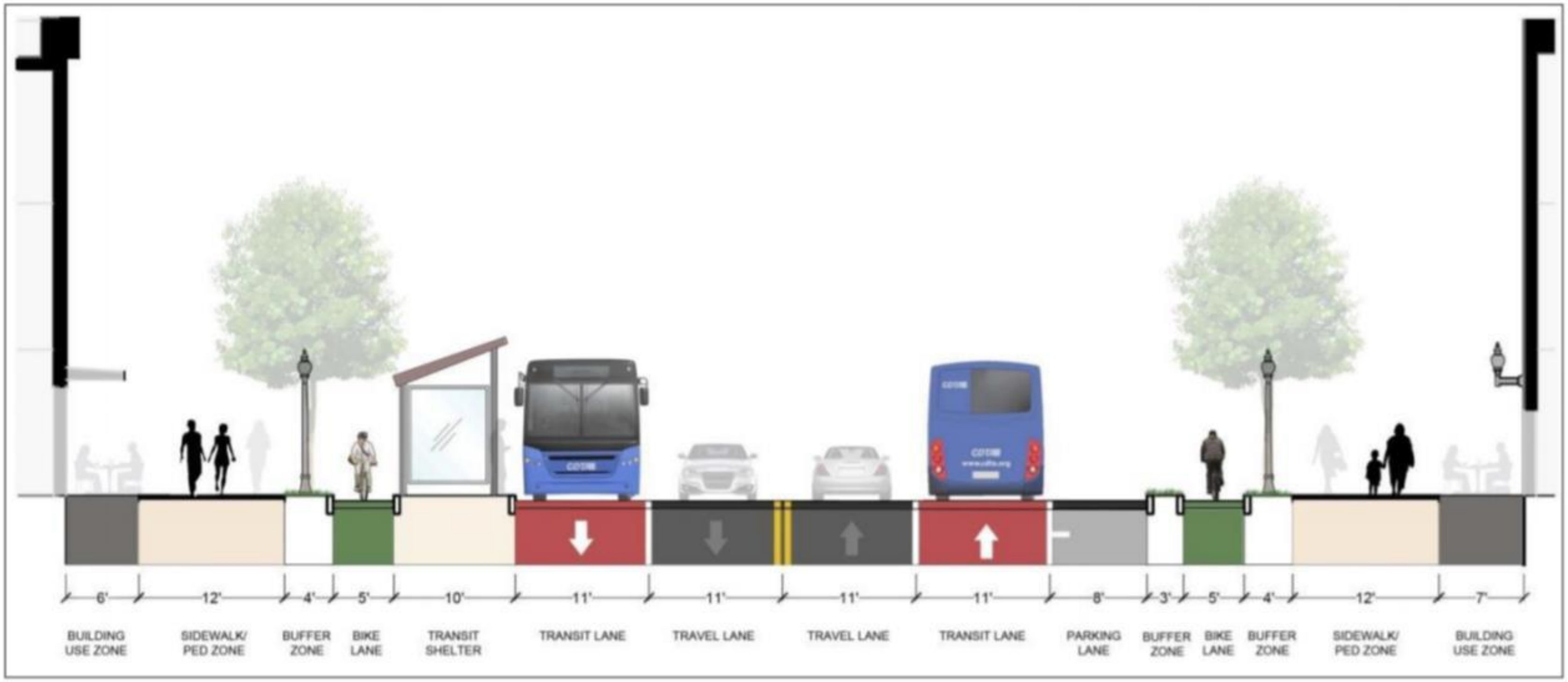
Figure 22: Albany Complete Streets Lane Widths

Complete Street Elements	Downtown		Neighborhood Mixed Use		Neighborhood Residential		Community Mixed Use		Community Commercial		Industrial	
	Wide	Narrow	Wide	Narrow	Wide	Narrow	Wide	Narrow	Wide	Narrow	Wide	Narrow
2-Lane Travelway	•	•	•	•	•	•	•	•	•	•	•	•
3-Lane Travelway	•	•	•	•			•	•	•	•	•	
4-Lane Travelway	•						•		•	•		
5-Lane Travelway	•								•		•	
Bicycle Boulevard		•			•	•						•
Buffered Bicycle Lane	•	•	•				•	•	•	•	•	
Contra-Flow Bicycle Lanes	•	•				•						
Dedicated Transit Lane	•						•		•			
Enhanced Transit Lane[a]	•						•		•			
Median	•		•		•				•		•	
One-Way Separated Bicycle Lane	•						•		•		•	
One-Way Street	•	•		•		•						
On-Street Parking (1-Way Street)	•	•		•		•						
On-Street Parking (2-Way Street)	•	•	•	•	•	•	•	•	•	•	•	
Shared Transit/Bicycle Lane	•	•					•	•		•		
Shared Use Lane Markings		•	•	•				•			•	•
Striped Bicycle Lane	•	•	•	•				•		•	•	•
Two-Way Separated Bicycle Lane	•						•		•			
Two-Way Side Path							•		•		•	

[a] *As BRT routes continue to be developed throughout the City, opportunities may arise for enhanced transit to appear in land use/street typologies not selected within this table.*

Figure 23: Albany Complete Streets Wide Right of Way

Figure 5.7 Downtown Sample: Wide Right-of-Way Street



Potential Downtown Wide ROW Travelway Elements per Table 5.3:

Figure 24: Albany Complete Streets Overview

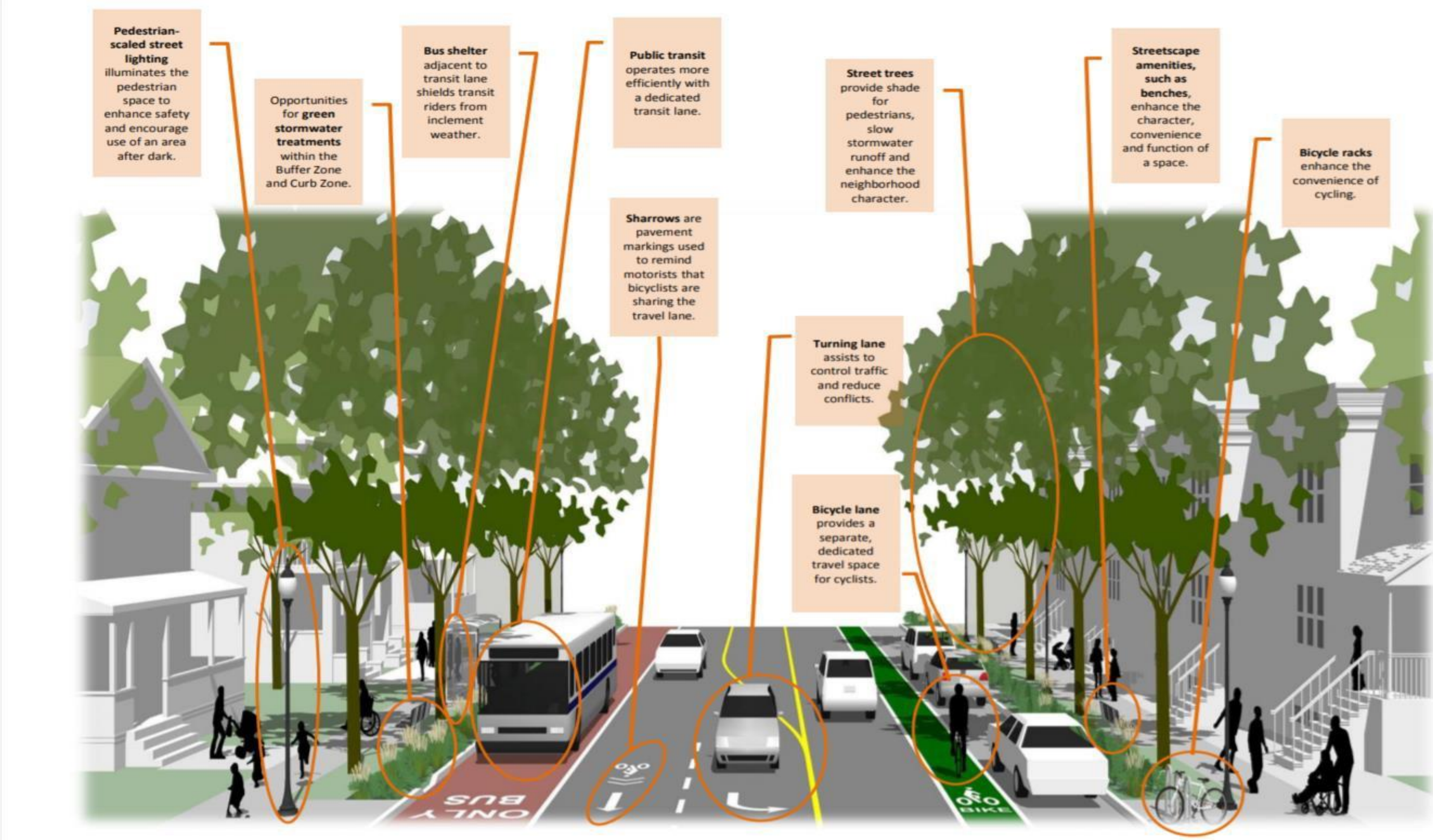


Figure 25: Albany Complete Street Plan View

Downtown Albany Parking Facility Feasibility Study

Figure 26: Parking Zones

Figure 27: Parking Deficits

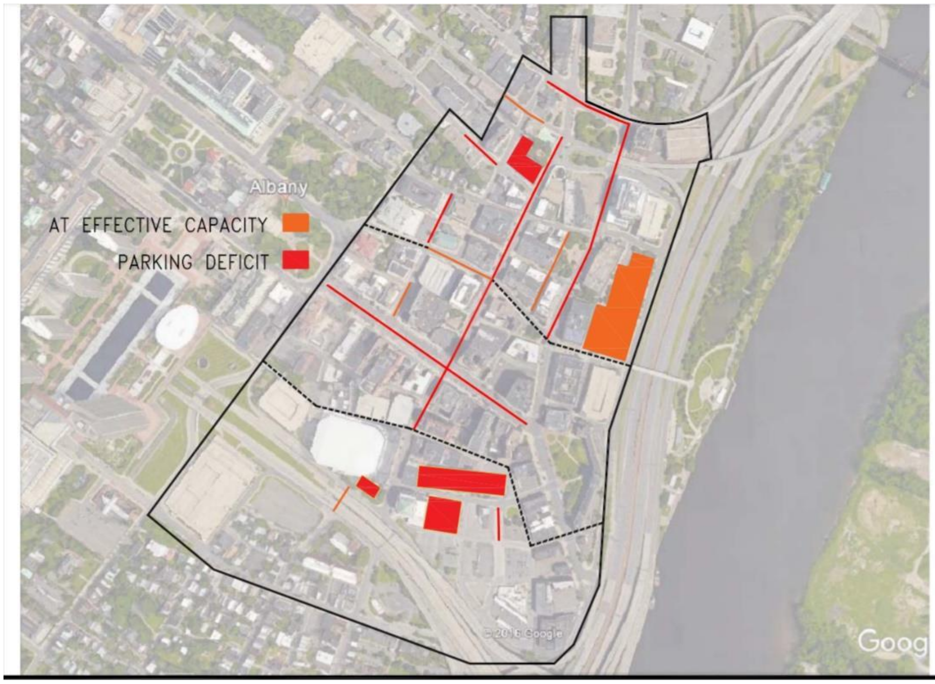


Figure 28: Downtown Albany On Street Parking

Table 5.
Existing Weekday On-Street Parking Adequacy

QUACKENBUSH/RIVERFRONT

Street/Ave.	Type	Spaces	Effective Supply	Spaces Occupied	Surplus/ Deficit
Broadway	Meters	52	44	45	(1)
Clinton Ave.	Meters	11	9	11	(2)
Columbia St.	Meters/Reserved	49	42	40	2
Eagle St.	Meters	6	5	4	1
James St.	Meters	16	14	14	0
Lodge St.	Meters	9	8	9	(1)
Monroe St.	Meters	11	9	3	6
Orange St.	Meters/Reserved	14	12	12	0
Pearl St.	Meters	36	31	32	(1)
Pine St.	Meters	7	6	6	0
Sheridan Ave.	Meters	13	11	12	(1)
Steuben St.	Meters	12	10	8	2
Total:		236	201	196	5

STATE STREET

Street/Ave.	Type	Spaces	Effective Supply	Spaces Occupied	Surplus/ Deficit
Beaver St.	Meters	14	12	10	2
Broadway	Meters/Reserved	52	44	30	14
Green St.	Meters	9	8	4	4
Howard St.	Meters	14	12	7	5
James St.	Meters	12	10	8	2
Lodge St.	Meters/Reserved	15	13	13	0
Pearl St.	Meters	30	26	32	(6)
Pine St.	Meters/Reserved	36	31	29	2
State St.	Meters	112	95	112	(17)
Total:		294	251	245	6

GREEN-HUDSON

Street/Ave.	Type	Spaces	Effective Supply	Spaces Occupied	Surplus/ Deficit
Broadway	Meters	15	13	0	13
Dallius St.	Meters	4	3	4	(1)
Grand St.	Meters	13	11	11	0
Green St.	Meters	25	21	1	20
Hamilton St.	Meters/Reserved	7	6	4	2
Hudson St.	Meters	19	16	9	7
Liberty St.	Meters	15	13	1	12
Madison Ave.	Meters	71	60	6	54
Pearl St.	Meters	25	21	15	6
Total:		194	164	51	113

TOTAL:		724	616	492	124

Figure 29: CDTA Intermodal Center

Figure 5.
CDTA Intermodal Center

CAPITAL REGION BUS LANE FEASIBILITY STUDY

BASELINE CORRIDOR ASSESSMENT AND PRIORITIZATION

CONTENTS

CDTC Capital District Transportation Committee

FIGURES

TABLES

1. INTRODUCTION

The purpose of this technical memorandum is to summarize the process by which the potential bus lane corridors were identified, screened, and ranked. Potential corridors are those that may warrant dedicated bus lanes or other priority treatments to improve service and realize operational cost savings.

Throughout the Capital Region, potential corridors for bus lanes were identified using a variety of inputs. Building upon a review of previous plans, corridors with the following aspects were focused on:

- Relatively high bus density and/or congestion
- Lower transit speeds
- Higher value to the network based on transfer opportunities to other routes
- Identified for growth and/or redevelopment with higher concentrations of equity populations.

A screening methodology and criteria were developed in order to narrow down the list of potential corridors. The methodology focused those with the highest potential benefits for reducing passenger and bus delay and serving the most people now and in the future with the implementation of bus priority implementation.

A bus priority toolbox was also developed with various bus priority treatments to improve speed and reliability, as well as supporting strategies and amenities. This memo includes the results of each step of the analysis and includes the bus priority toolbox as **Appendix E: Bus and Bike Priority Toolbox**.

2. EXISTING CONDITIONS ASSESSMENT

The Capital Region is made up of the cities and surrounding areas of Albany, Troy, Schenectady, and Saratoga Springs. For this study, the region is defined as the core four counties of Albany, Rensselaer, Saratoga and Schenectady with a population of 850,000 over 2,250 square miles. The Capital District Transportation Authority (CDTA) is the mobility company serving the Capital Region with an annual ridership of 15.3 million, a fleet of 248 buses, and 50 routes. In May 2022, Montgomery County was added to the core four counties CDTA serves but was not included in this assessment due to the type of services being offered. CDTA's premier services in the core counties include two current BRT routes in operation, the BusPlus Red Line and the BusPlus Blue Line, and the BusPlus Purple Line expected to open in early 2023.

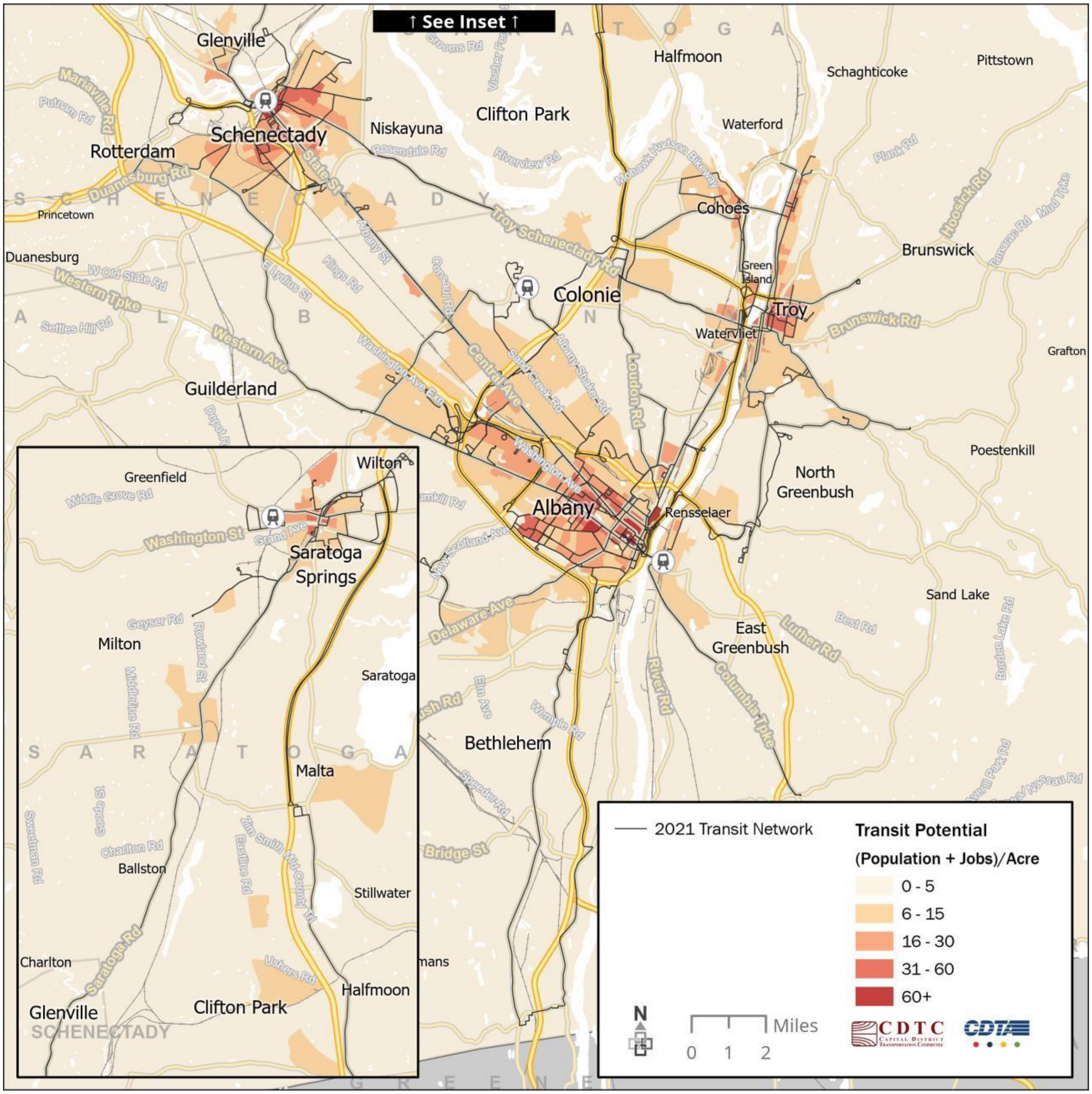
An existing conditions assessment was conducted to identify potential corridors for dedicated bus lanes or other priority treatments. The existing conditions assessment began with an analysis of transit potential, looking at both population and employment densities in 2020 and 2030, and transit need that focuses on transit reliant populations. Transit potential and transit need will be used as primary metrics to screen and prioritize the potential corridors.

Transit potential, or density of both people and jobs, is shown in **Figure 1**. Higher transit potential is found in the following areas:

- Albany
  - Arbor Hill and West Hill neighborhoods
  - Downtown east of Swan Street and north of Madison Avenue
  - Neighborhoods west of Washington Park
  - Community around Russell Sage College
  - Community around Maria College.
- Troy
  - Neighborhoods and downtown Troy bounded by Hoosick Street to the north, 8th street to the east, and Division Street to the south
  - Communities around Rensselaer Polytechnic Institute.
- Schenectady
  - Neighborhoods downtown south of Broadway and north of Nott Terrace
  - Communities surrounding Union College
  - Mount Pleasant neighborhood west of I-890.
- Saratoga Springs
  - Downtown west of Broadway, south of Van Dam Street, and north of Lincoln Avenue
  - Downtown east of Broadway, south of Lake Avenue, and north of Congress Park.
- Watervliet
  - Neighborhood north of 21st Street, east of 5th Avenue, and south of 24th Street.
- Cohoes

– Neighborhood southeast of Ontario Street.

Figure 1: Transit Potential

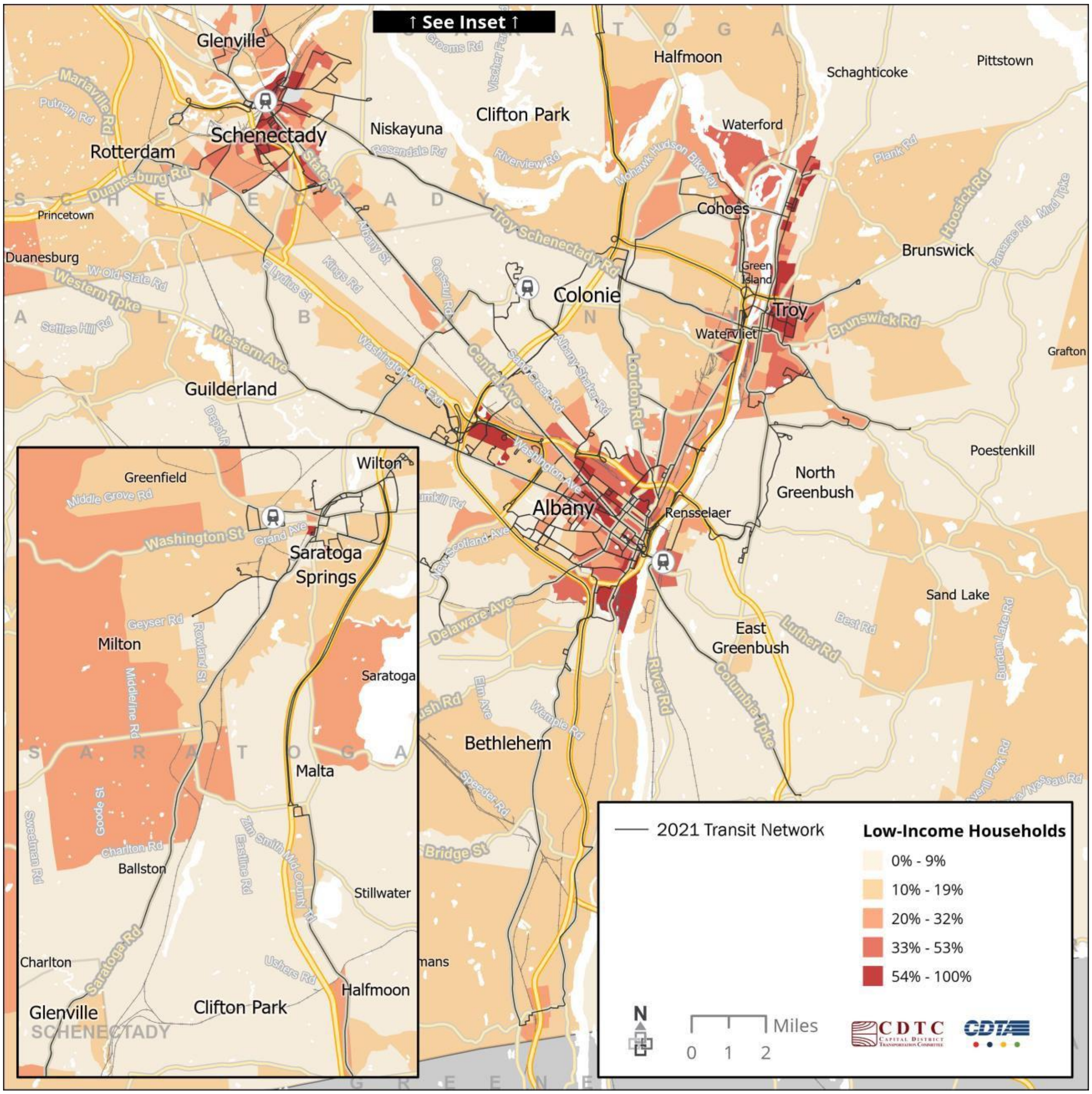


Equity Analysis

LOW-INCOME HOUSEHOLDS

Figure 2 shows the density of low-income households—those that have an annual household income less than 150 percent of the federal poverty line—in the region. Higher densities of low-income households in Albany can be found in the Mount Hope neighborhood south of I-787, the Arbor Hill neighborhood in the northeast corner of the city, and the community west of SUNY Albany. In Troy, the communities around Rensselaer Polytechnic Institute and the communities north of Hoosick Street have the highest densities of low-income households, and in Schenectady, the neighborhoods around Union College have the highest low-income household density.

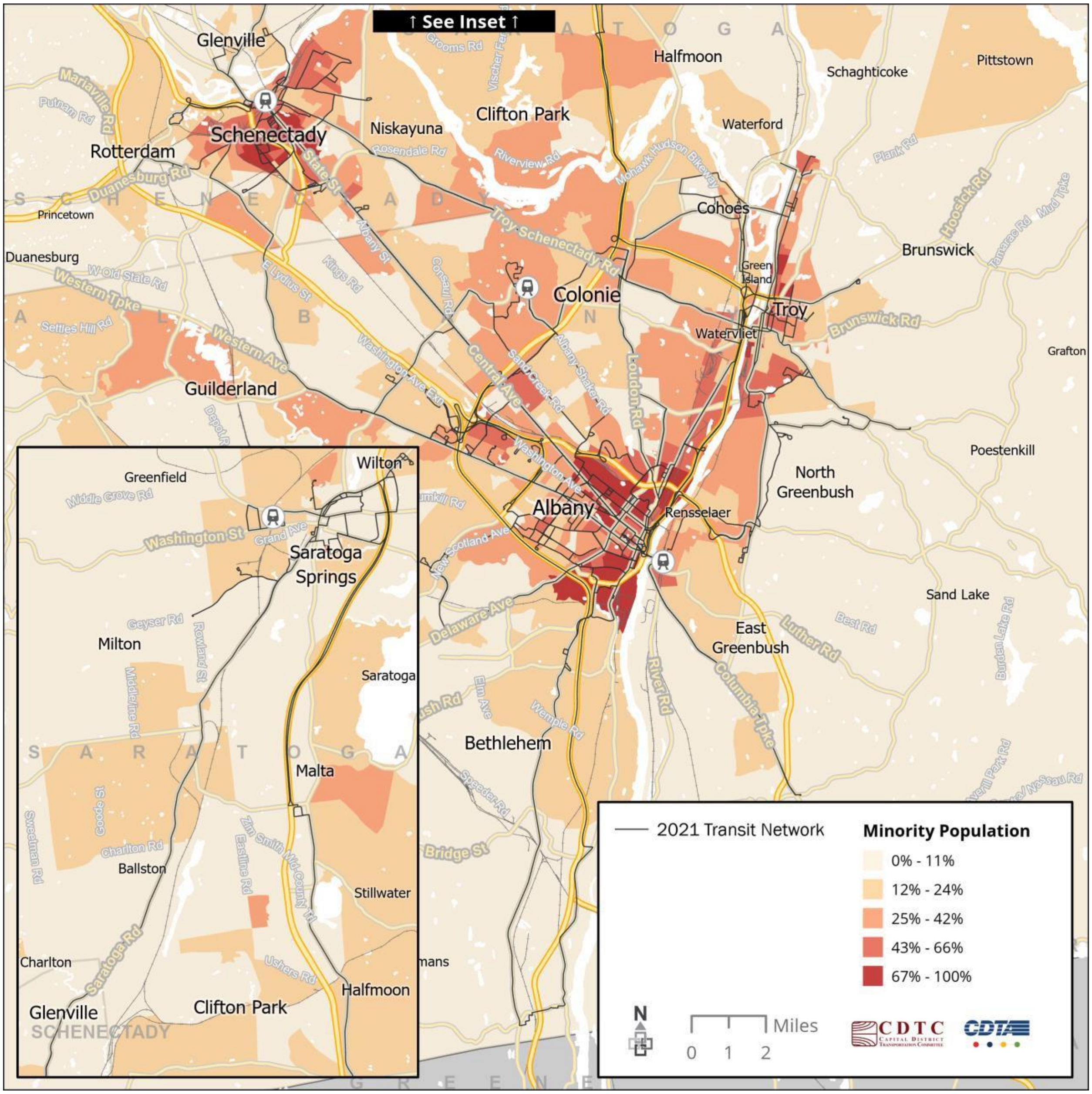
Figure 2: Low-Income Households



MINORITY POPULATIONS

The minority population density is shown in **Figure 3**. The areas with the highest density of minorities are in Albany in the Mount Hope neighborhood south of I-787 and the West Hill and Arbor Hill neighborhoods north of Central Avenue. In Troy, the neighborhoods with the highest density of minorities are those north of Hoosick Street, and in Schenectady, south of Nott Terrace.

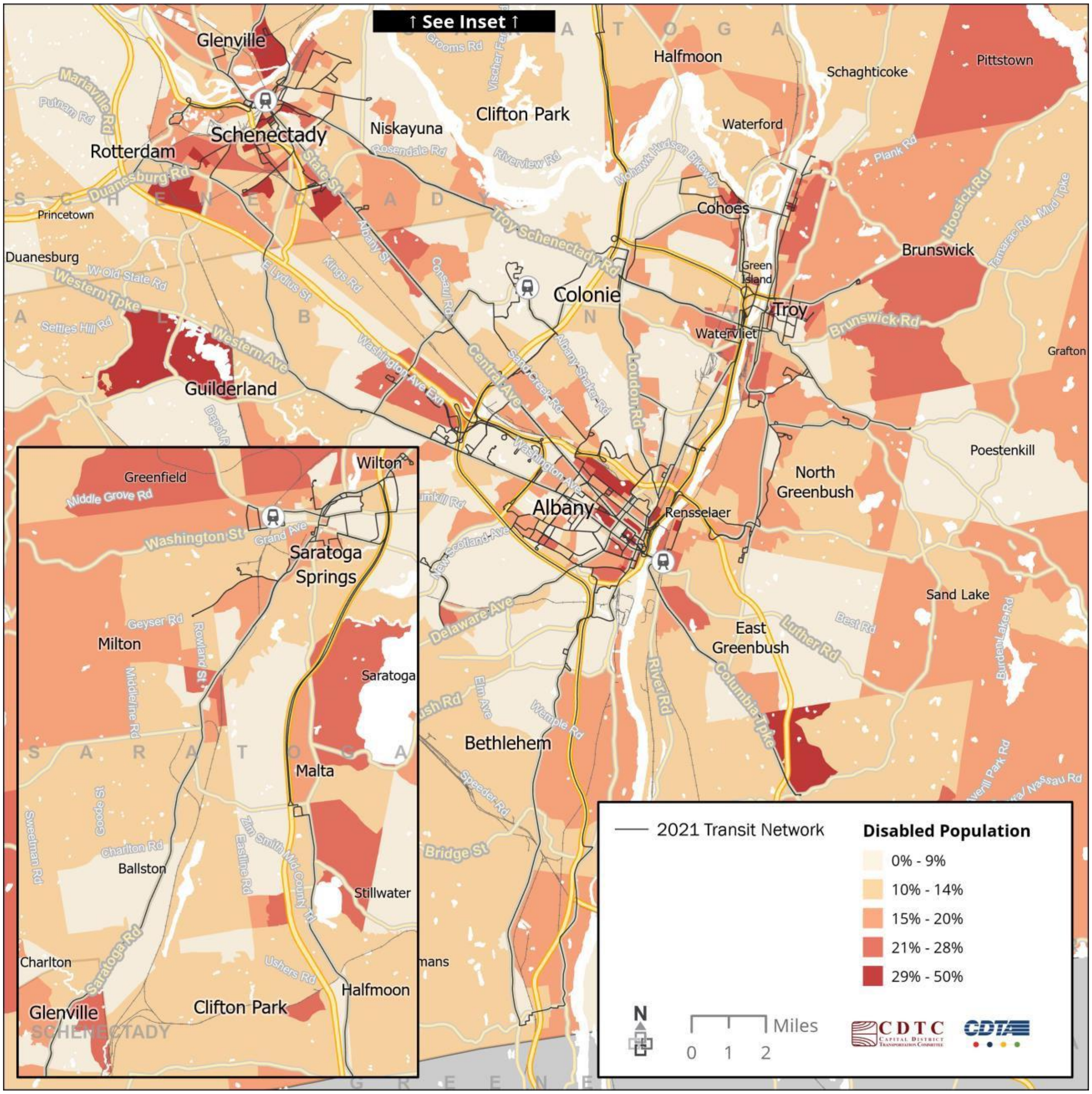
Figure 3: Minority Populations



DISABLED POPULATIONS

The disabled population density in the region is shown in **Figure 4**. The areas with the highest densities of disabled persons are found in Guilderland; Schodack Center; and outside of Schenectady in the communities southwest of Rotterdam, around Stadium Golf Club, and south of the Schenectady County Airport.

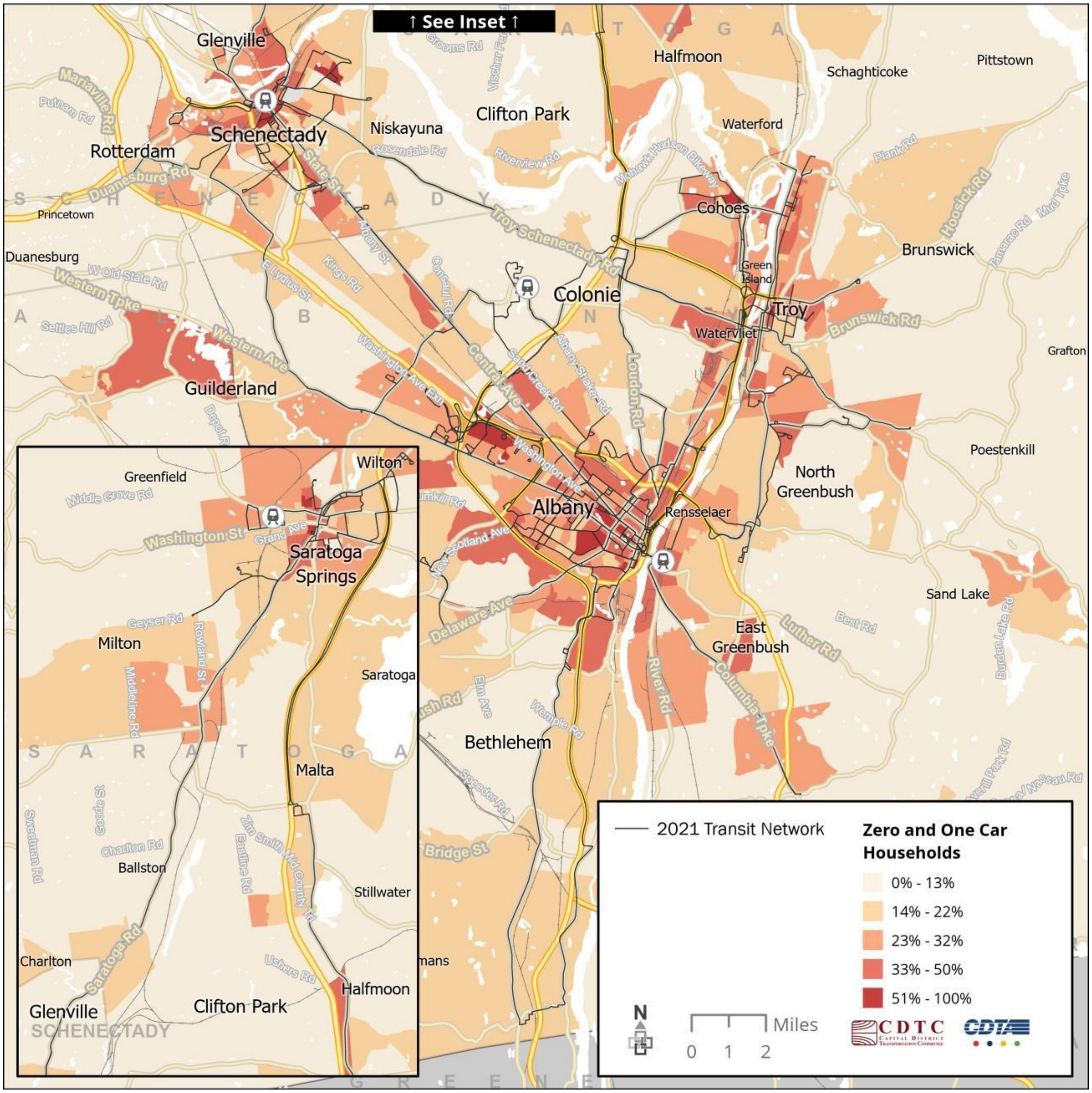
Figure 4: Disabled Populations



ZERO AND ONE CAR HOUSEHOLDS

Figure 5 shows the density of zero and one car households in the region. The highest concentrations of zero or one car households are found in Albany in the communities around Russell Sage College and Albany Medical Center and the communities around the University at Albany.

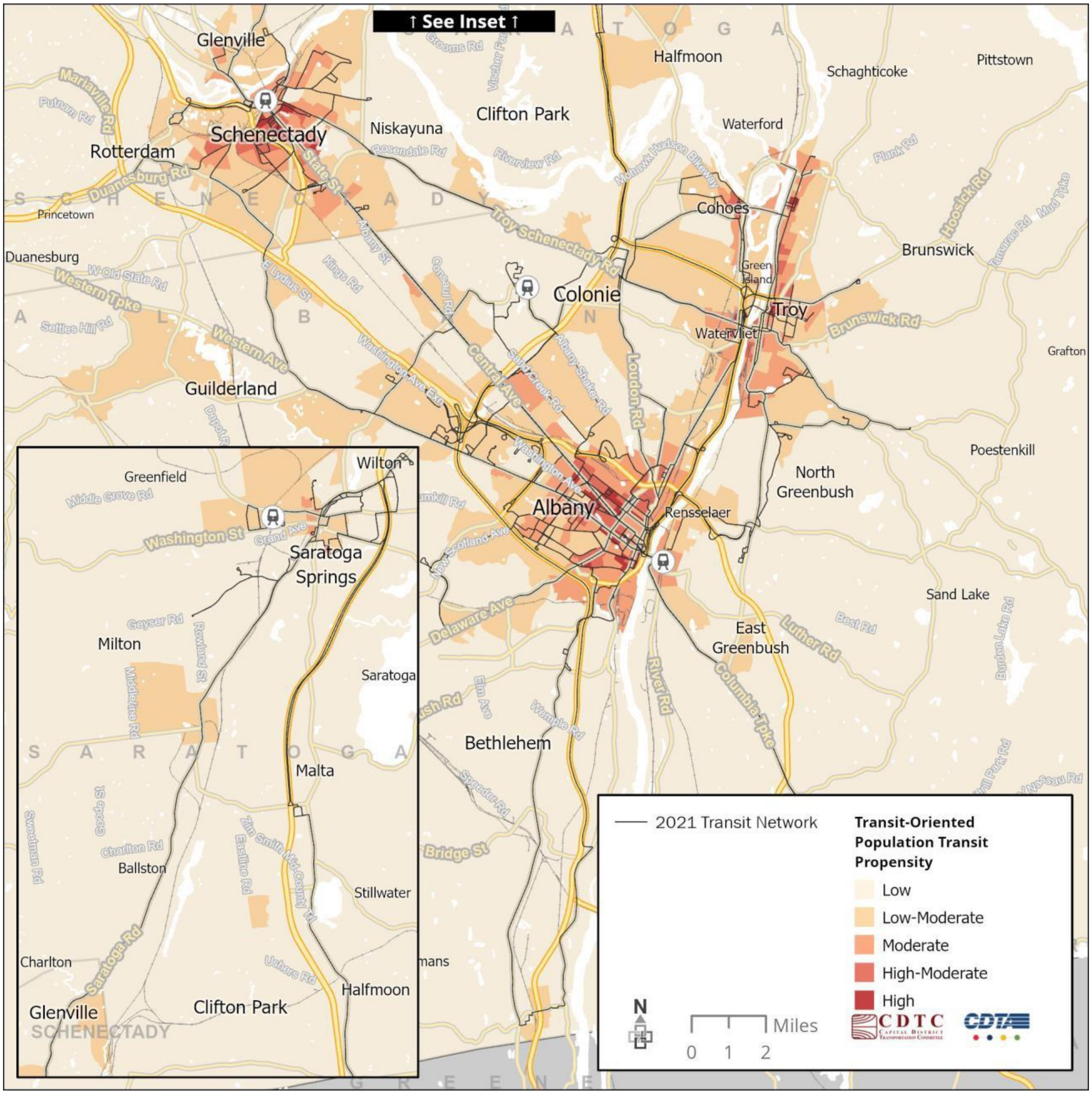
Figure 5: Zero and One Car Households



TRANSIT-ORIENTED POPULATION PROPENSITY INDEX

Figure 6 shows the composite of the equity variables into a single transit-oriented population propensity index. This combined index shows the highest propensity in the region's denser urban cores (Albany, Troy, and Schenectady) with moderate propensity scores extending out along major transportation arteries (such as Central Avenue and the Hudson River).

Figure 6: Transit Oriented Population Transit Propensity



Existing System

As part of the process to identify potential bus lane corridors, the existing system was analyzed to understand which corridors would benefit the most from priority treatments. The data used to produce the following maps are from 2021. Transit across the country was impacted by the COVID-19 pandemic in both 2020 and 2021. While ridership started to rebound in late 2020 and 2021, the Delta and Omicron variants and the nationwide operator shortage affected transit operations and ridership.

Effective headway, speed, schedule deviation, ridership activity, and throughput were analyzed in order to evaluate existing conditions, which corridors have the highest ridership, and which corridors experience the most delays due to congestion. These metrics are mapped for the AM Peak and Midday periods because those periods are most reflective of the trends in the region.

The existing CDTA system is shown in **Figure 7**. CDTA operates 50 routes, including two current BRT routes and one future BRT route, shown in **Figure 8**. The BusPlus system includes the Red Line, a 17-mile route between Downtown Albany and Downtown Schenectady; the Blue Line, a 16-mile route in the Hudson River communities of Albany, Menands, Watervliet, Troy, Cohoes and Waterford; and the Purple Line, an eight-mile route from Downtown Albany to Crossgates Mall, expected to open in early 2023. **Figure 9** shows the existing bus priority treatments. The existing queue jumps and transit signal priority treatments are along the Red and Blue BusPlus routes.

Figure 7: 2021 CDTA System Map

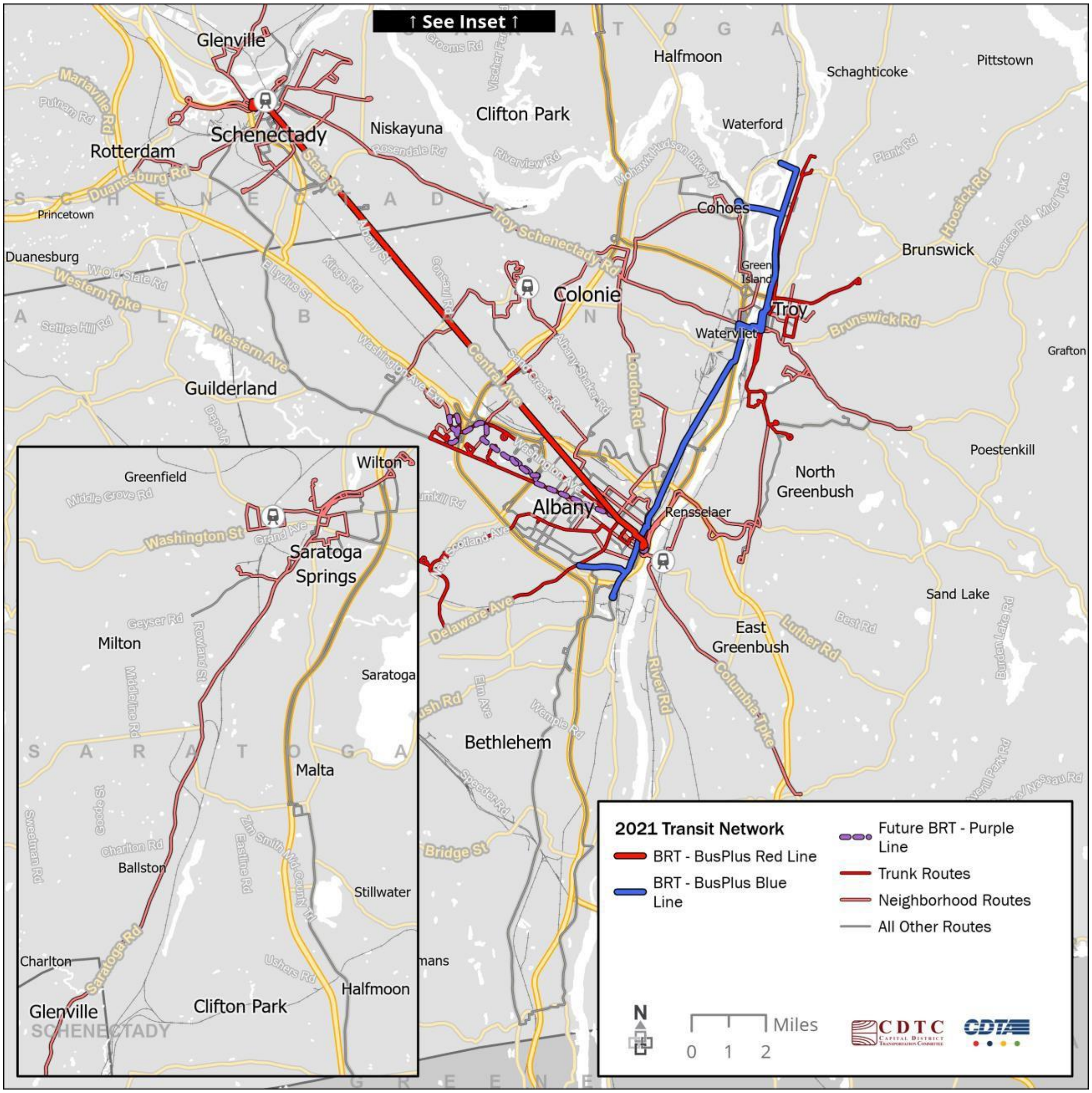


Figure 8: CDTA BRT Routes

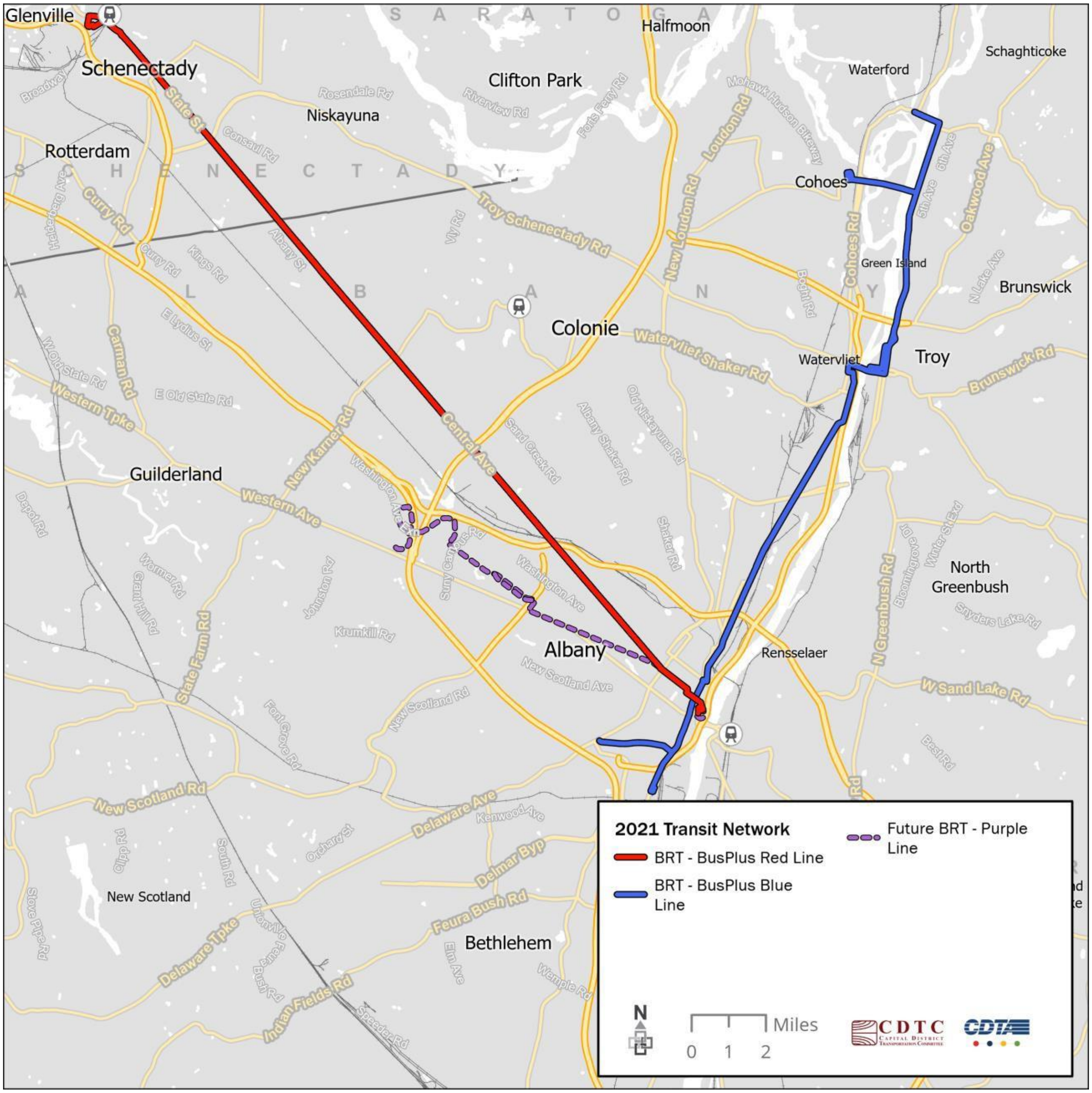
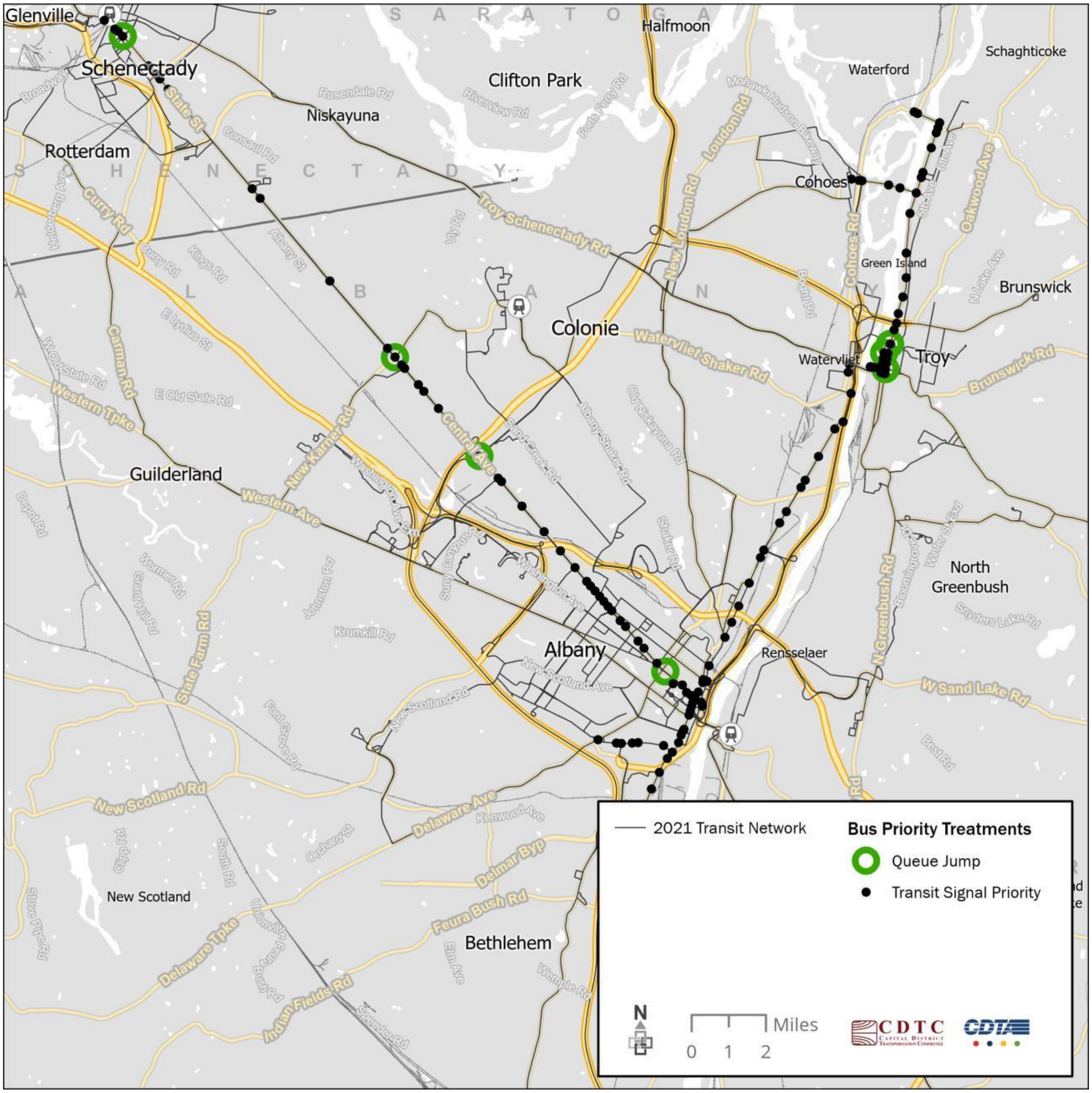


Figure 9: Existing Priority Treatments



HEADWAY

Effective headways along each corridor measure which corridors have the most frequent bus service. Headways during the AM peak period in 2021 are shown in **Figure 10**. The areas with the most frequent bus service, with effective headways of 30 minutes or less, are those along the following major corridors:

- Albany
  - Washington Avenue
  - Central Avenue
  - Pearl Street
  - Broadway
  - Madison Avenue
  - Western Avenue
  - Quail Street
  - Henry Johnson Boulevard
  - New Scotland Avenue
  - Allen Street
  - Whitehall Road
  - Delaware Avenue
  - Mount Hope Drive.
- Troy
  - Broadway
  - 3rd Street
  - 4th Street
  - 6th Avenue
  - Burdett Avenue
  - Hoosick Street.
- Schenectady
  - Altamont Avenue west of Chrisler Avenue
  - Main Avenue
  - Craig Street
  - Nott Terrace.

Figure 11 shows the headways of bus service during the midday period in 2021. The midday headways are similar to the AM peak headways with shorter headways in downtown Troy and longer headways on Columbia Turnpike southeast of Albany and Loudon Road between Albany and Colonie.

Figure 10: 2021 AM Peak Effective Headway

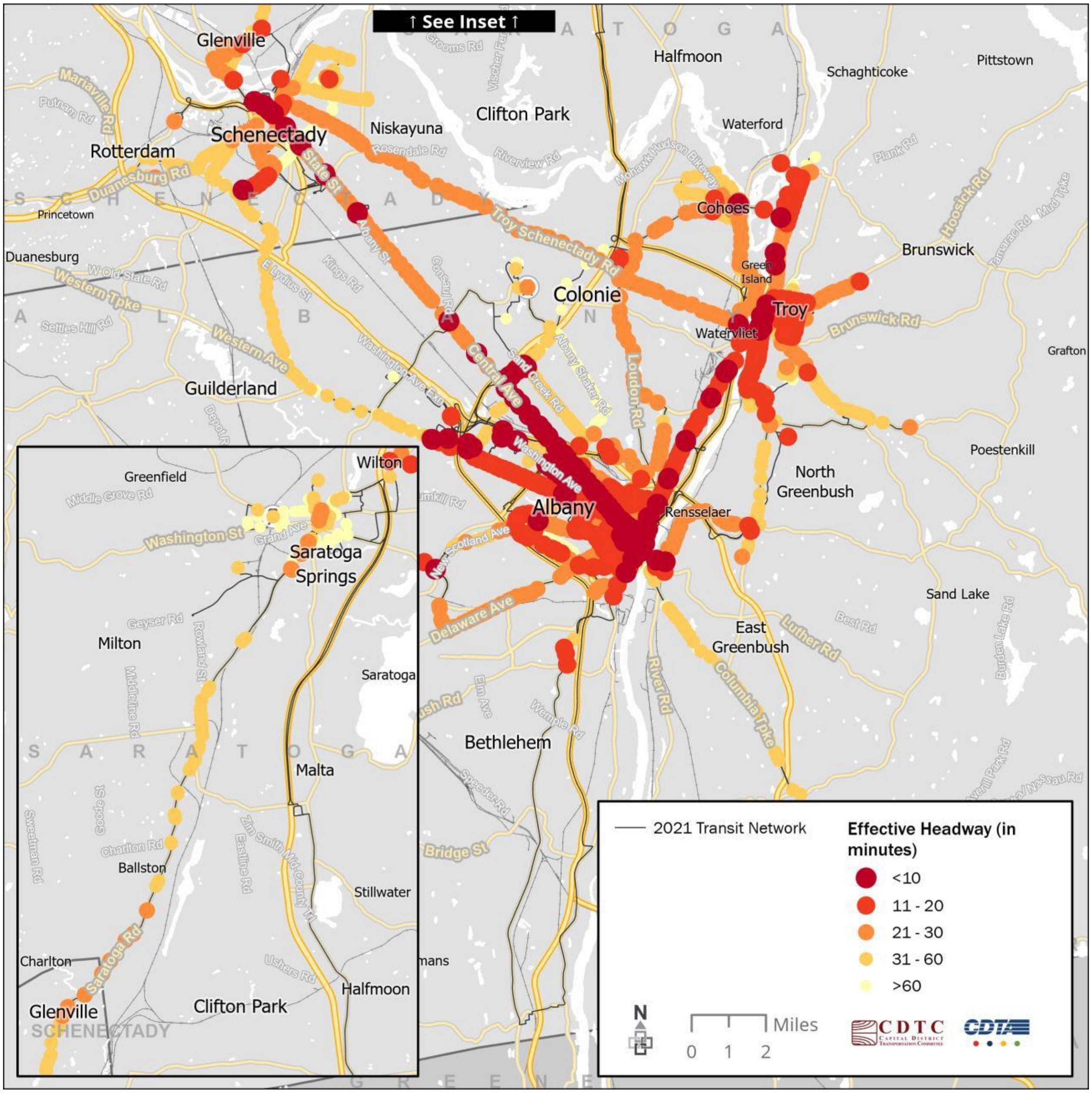
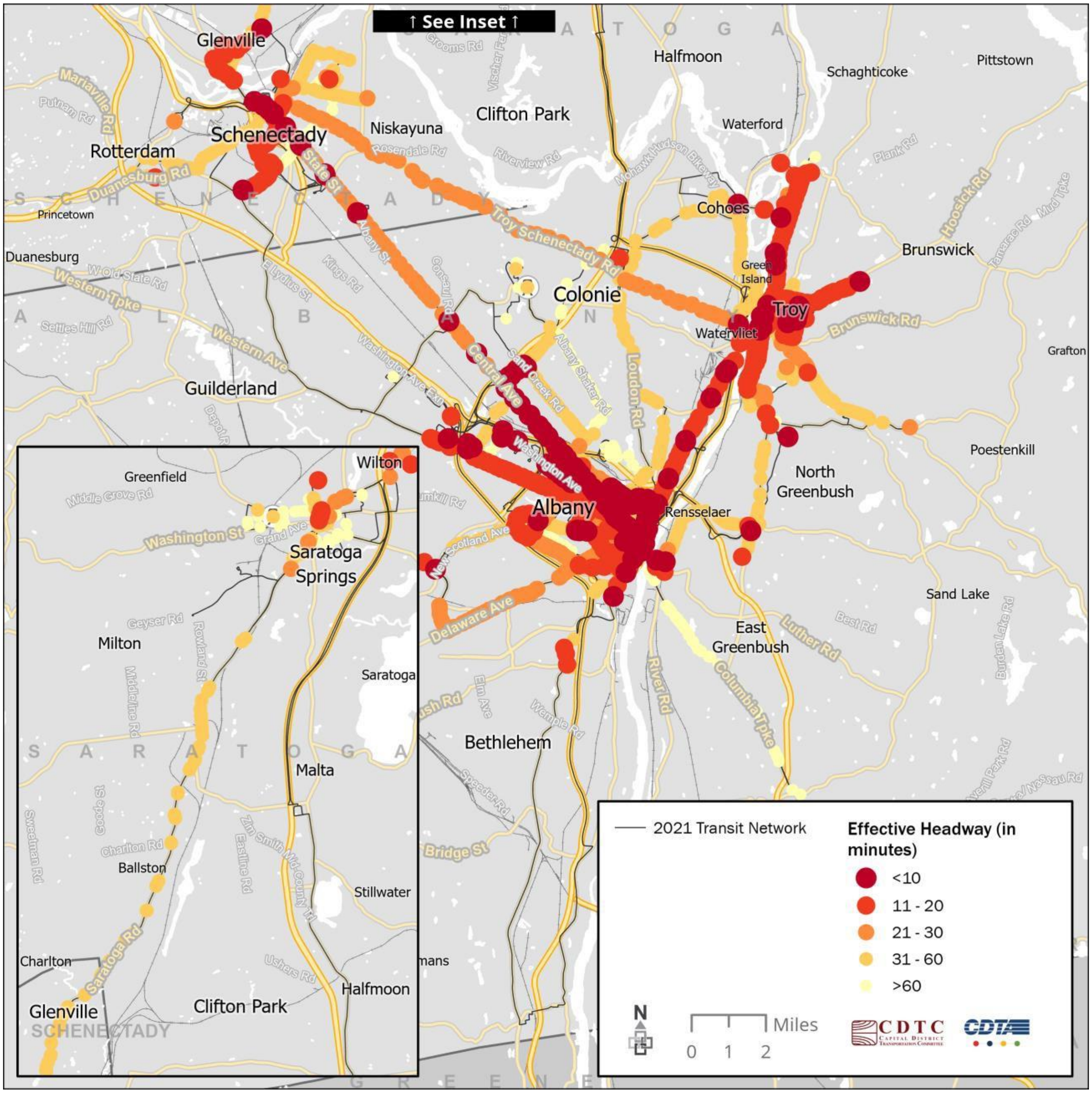


Figure 11: 2021 Midday Effective Headway



SPEEDS

Speed data is an effective measure of where buses and single occupancy vehicles alike might be experiencing delay based upon congestion of the roadway network. **Figure 12** shows average bus speeds, in miles per hour, during the AM peak period in 2021. Buses move the slowest, under 15 miles per hour, in the downtown areas of Albany, Troy, Schenectady, and Saratoga Springs. During the midday period, shown in **Figure 13**, the average speeds are similar to the AM peak period. In some cases, the average speed is lower in the midday period on roads outside of the urban cores, such as Central Avenue between Albany and Schenectady, Troy Schenectady Road between Troy and Schenectady, and Columbia Turnpike southeast of Albany.

Figure 12: 2021 AM Peak Speeds

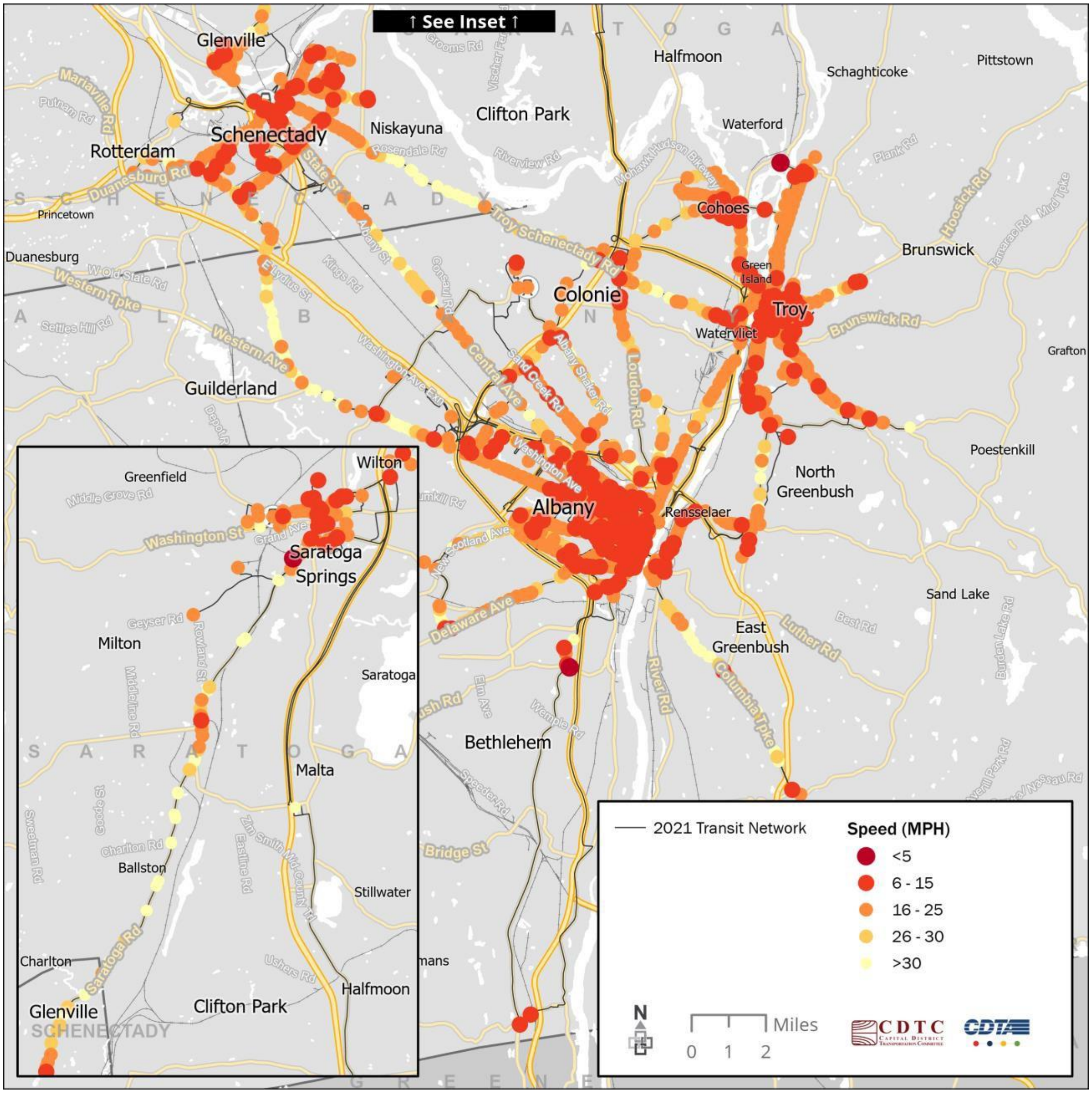
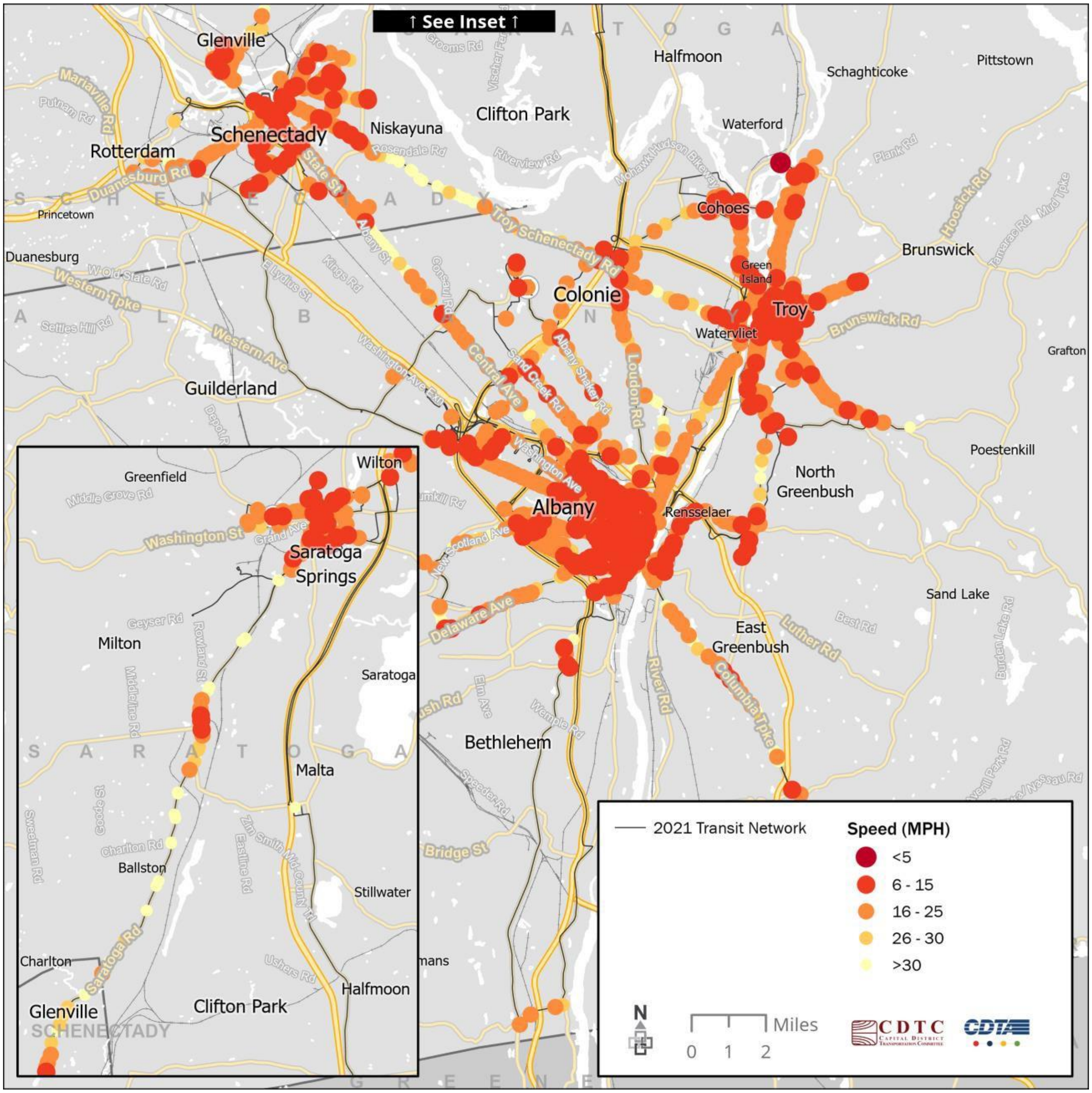


Figure 13: 2021 Midday Speeds



SCHEDULE DEVIATION

Schedule deviation is a measure of reliability of CDTA along each corridor. Schedule deviation, in minutes, during the AM peak period in 2021 is shown in **Figure 14**. The largest schedule deviations occur in the downtown areas of Troy, Albany, and Saratoga Springs. The areas with the lowest schedule deviations are the corridors connecting the cities, including Western Avenue and Carman Road between Albany and Schenectady; Central Avenue and State Street between Albany and Schenectady; Troy Schenectady Road between Troy and Schenectady; and Columbia Turnpike southeast of Albany. The 2021 midday schedule deviations, shown in **Figure 15**, are similar to those in the AM peak period, with higher deviations in Schenectady, Cohoes, and Ravena.

Figure 14: 2021 AM Peak Schedule Deviation

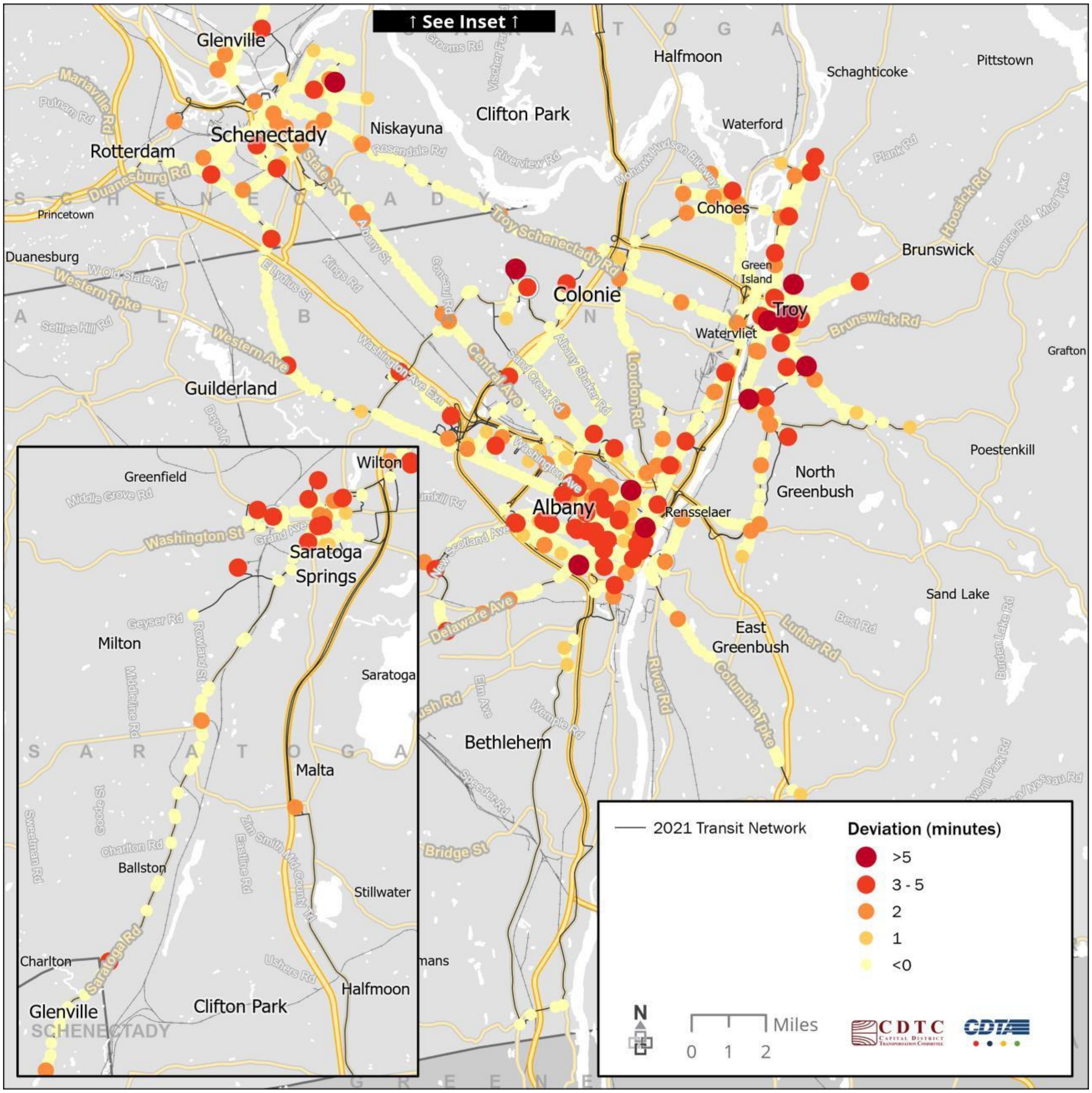
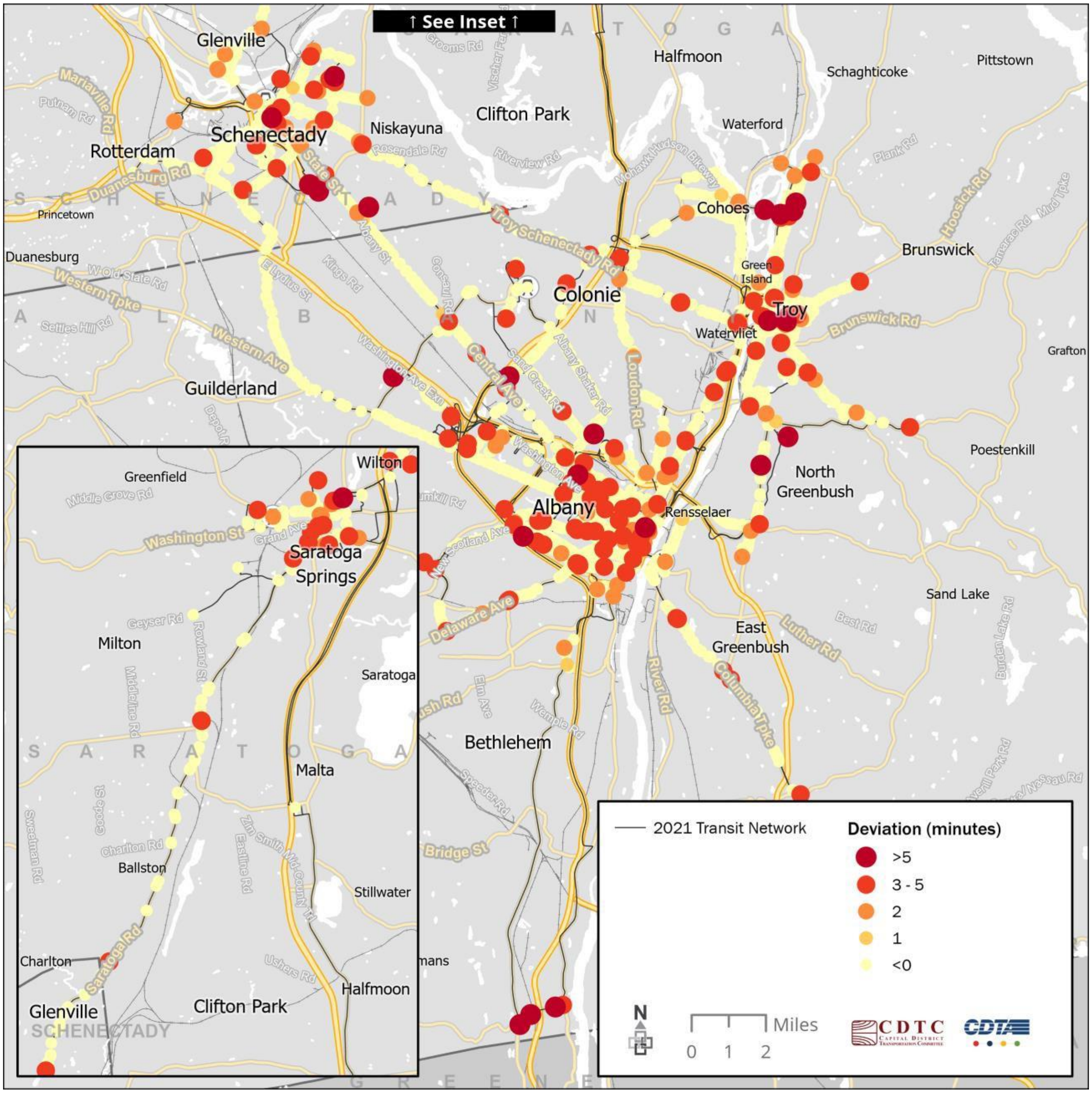


Figure 15: 2021 Midday Schedule Deviation



RIDERSHIP ACTIVITY

Boardings and alightings during the AM peak period in 2021 is shown in **Figure 16**. The highest ridership areas are in downtown Albany, primarily around the State Street and Pearl Street intersection, Central Avenue southeast of Manning Boulevard, and stops near I-87; Downtown Troy, and Downtown Schenectady. The midday ridership activity in 2021 is shown in **Figure 17**. While midday ridership appears much higher than AM peak ridership on the map, the AM peak period is measuring ridership over three hours, 6:00 a.m. to 9:00 a.m., while the midday period is six hours, 9:00 a.m. to 3:00 p.m. The highest ridership areas are similar to those in the AM peak period, with the addition of increased activity in Saratoga Springs and the Town of Wilton.

Figure 16: 2021 AM Peak Ridership Activity

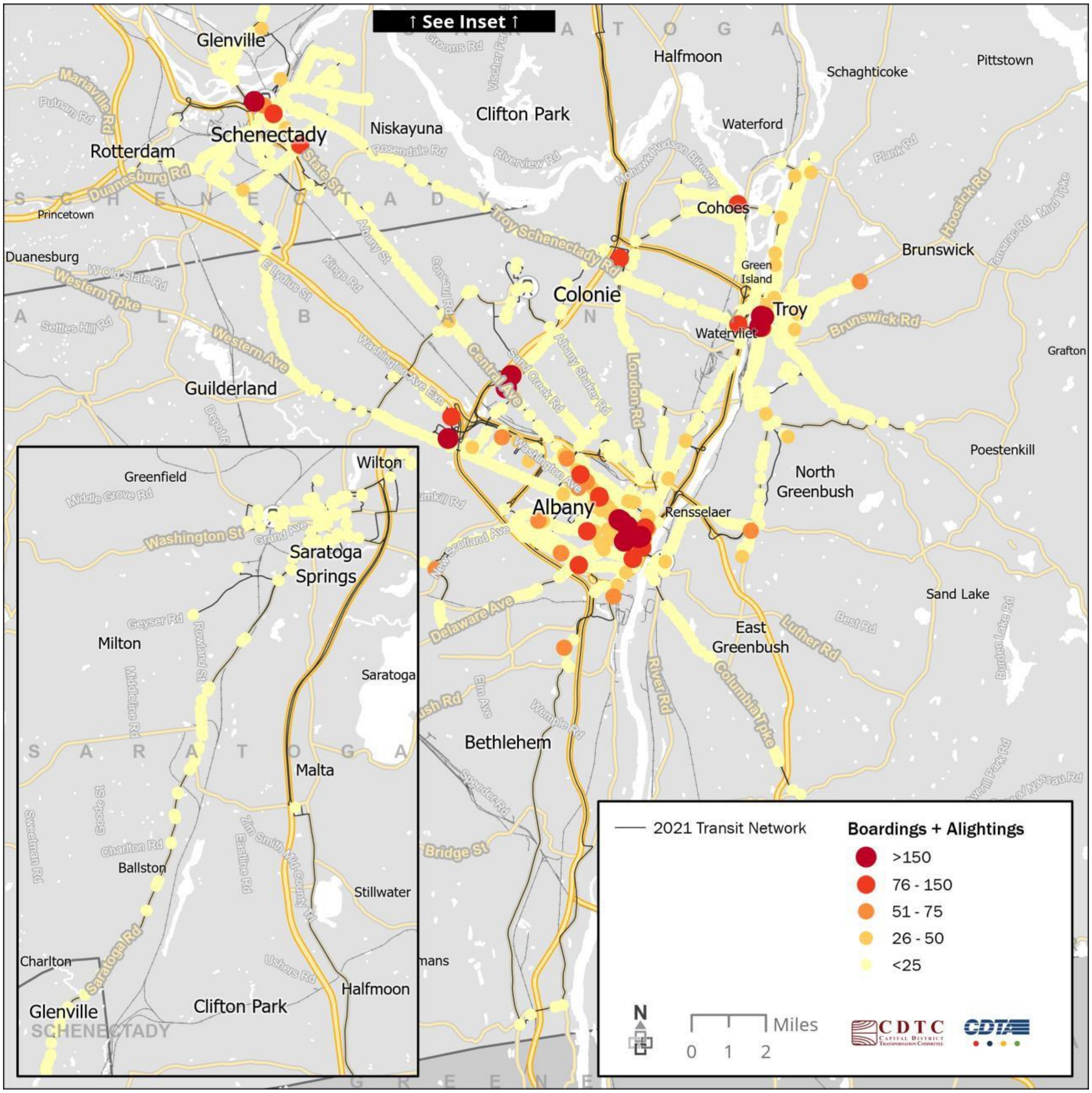
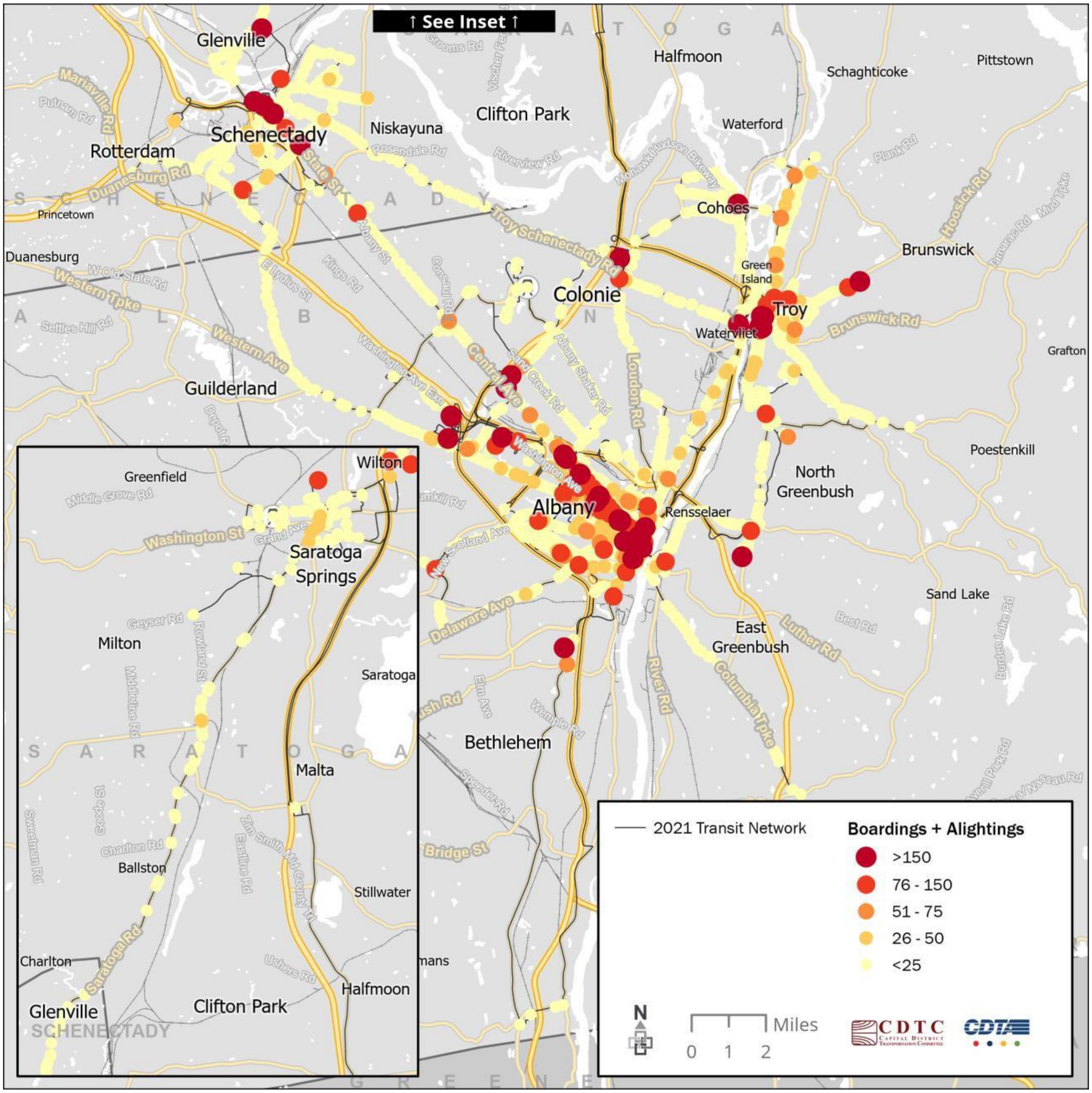


Figure 17: 2021 Midday Ridership Activity



THROUGHPUT

Throughput measures the number of riders using each segment of a bus route regardless of where they enter the system. As shown in **Figure 18**, the corridors with the highest hourly throughput in the AM peak period in 2021 include Central Avenue in Albany, Washington Avenue in Albany, and the full stretch of Broadway between Albany and Troy. Western Avenue in Albany and State Street in Schenectady have a moderate hourly throughput. **Figure 19** shows midday hourly throughput in 2021. The midday hourly throughput is similar to that of the AM peak period with a higher hourly throughput on Central Avenue and a lower hourly throughput on State Street and Broadway. In 2020, the hourly throughput was higher in both the AM peak and midday periods. In 2020, Western Avenue, Washington Avenue, Central Avenue, and Broadway in Albany and State Street in Schenectady had the highest hourly throughputs, followed by Quail Street in Albany; 3rd Street, 4th Street, River Street, 6th Avenue, and 19th Street in Troy; Garner

Street and Simmons Avenue in Cohoes; and the full stretch of Central Avenue from Albany to Schenectady.

Figure 18: 2021 AM Peak Throughput

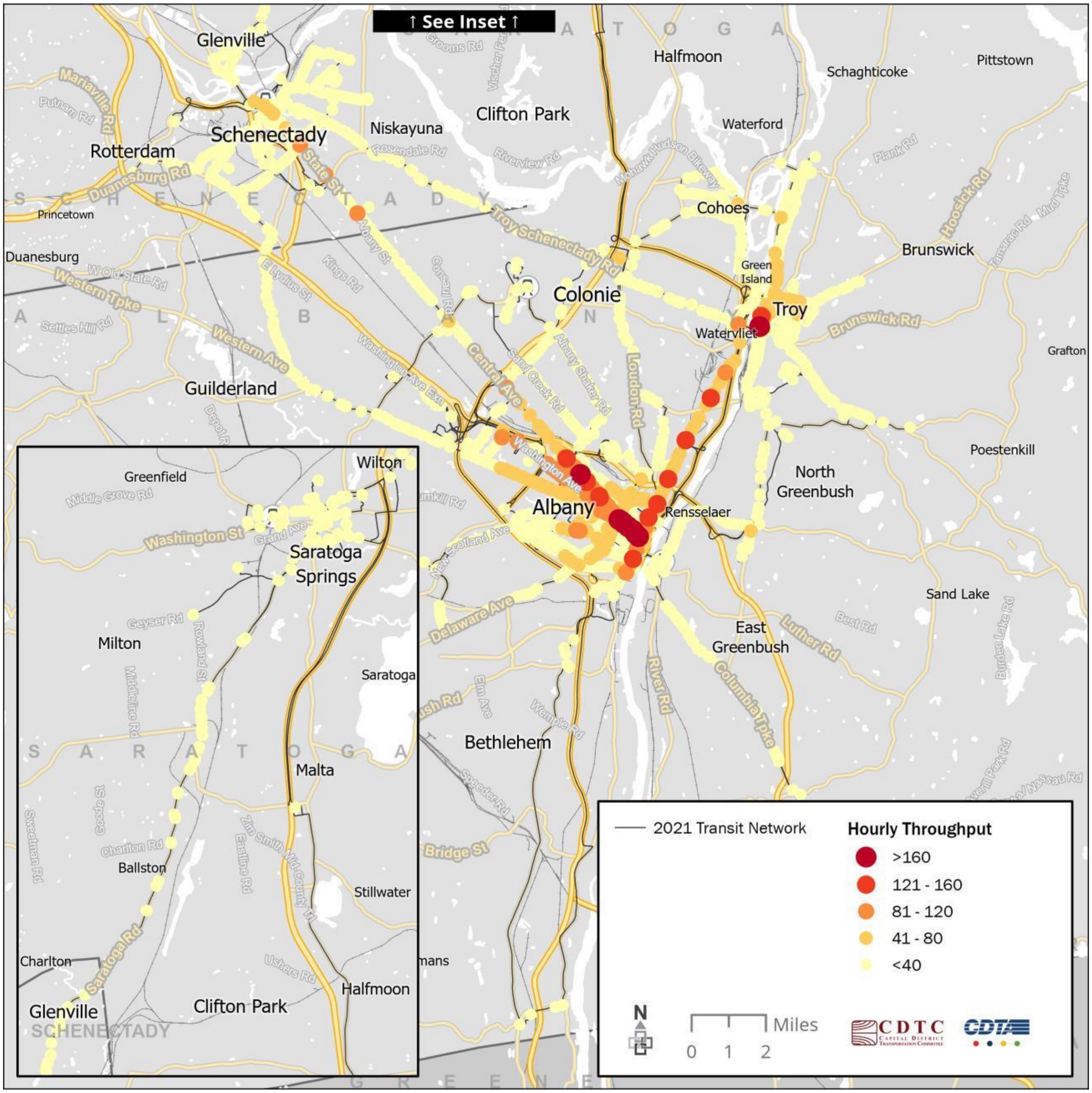
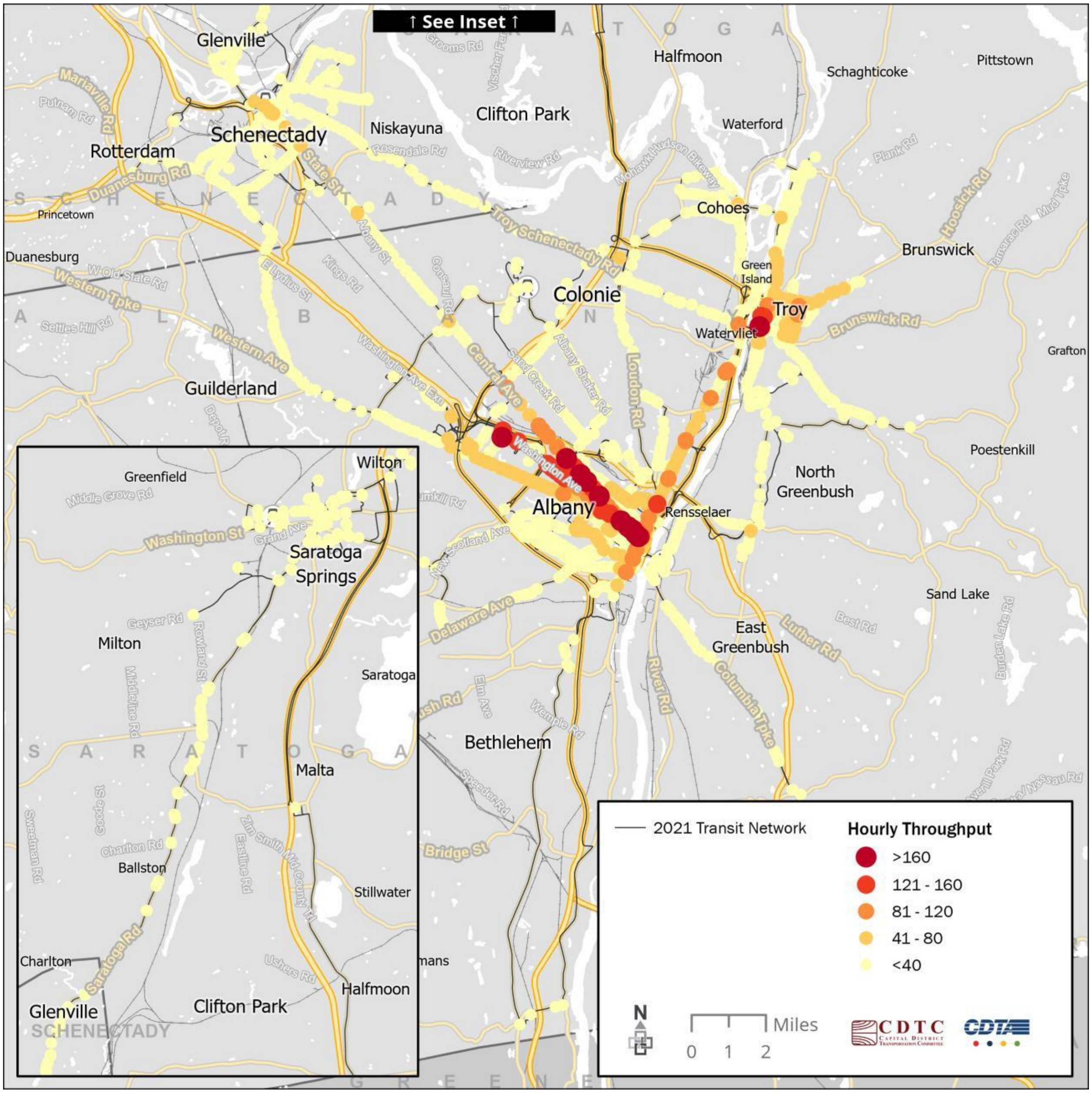


Figure 19: 2021 Midday Throughput



3. SCREENING PROCESS

Priority Corridors

Based on the analysis described in the previous section, the corridors with more than four buses per hour, relatively low speeds, and relatively high throughput were identified as potential candidates for bus lanes and priority treatments. The number of routes the corridor serves, land use and roadway cross section, and a comparison between pre-COVID and current data was also considered.

The potential priority corridors are shown in **Figure 20**, with detailed views in **Figure 21**, **Figure 22**, and **Figure 23**. These corridors are:

- A: State Street between Veeder Avenue and Division Street
- B: Central Avenue between New Karner Road and Woollard Avenue
- C: Central Avenue between Sand Creek Road and Colvin Avenue
- D: Washington Avenue between SUNY Albany and Sprague Place
- E: Western Avenue between Hillcrest Avenue and Sprague Place
- F: Central Avenue between Colvin Avenue and Lark Street
- G: Washington Avenue / State Street between Sprague Place and Broadway
- H: Pearl Street between Clinton Avenue and McCarty Avenue
- I: Broadway between Clinton Avenue and Riverview Center
- J: 3rd Avenue / Broadway between Harts Lane and 16th Street
- K: 3rd Street / 4th Street between Grand Street and Congress Street / Ferry Street
- L: Downtown Broadway between Clinton Avenue and Hudson Avenue.

Figure 20: Potential Priority Corridors

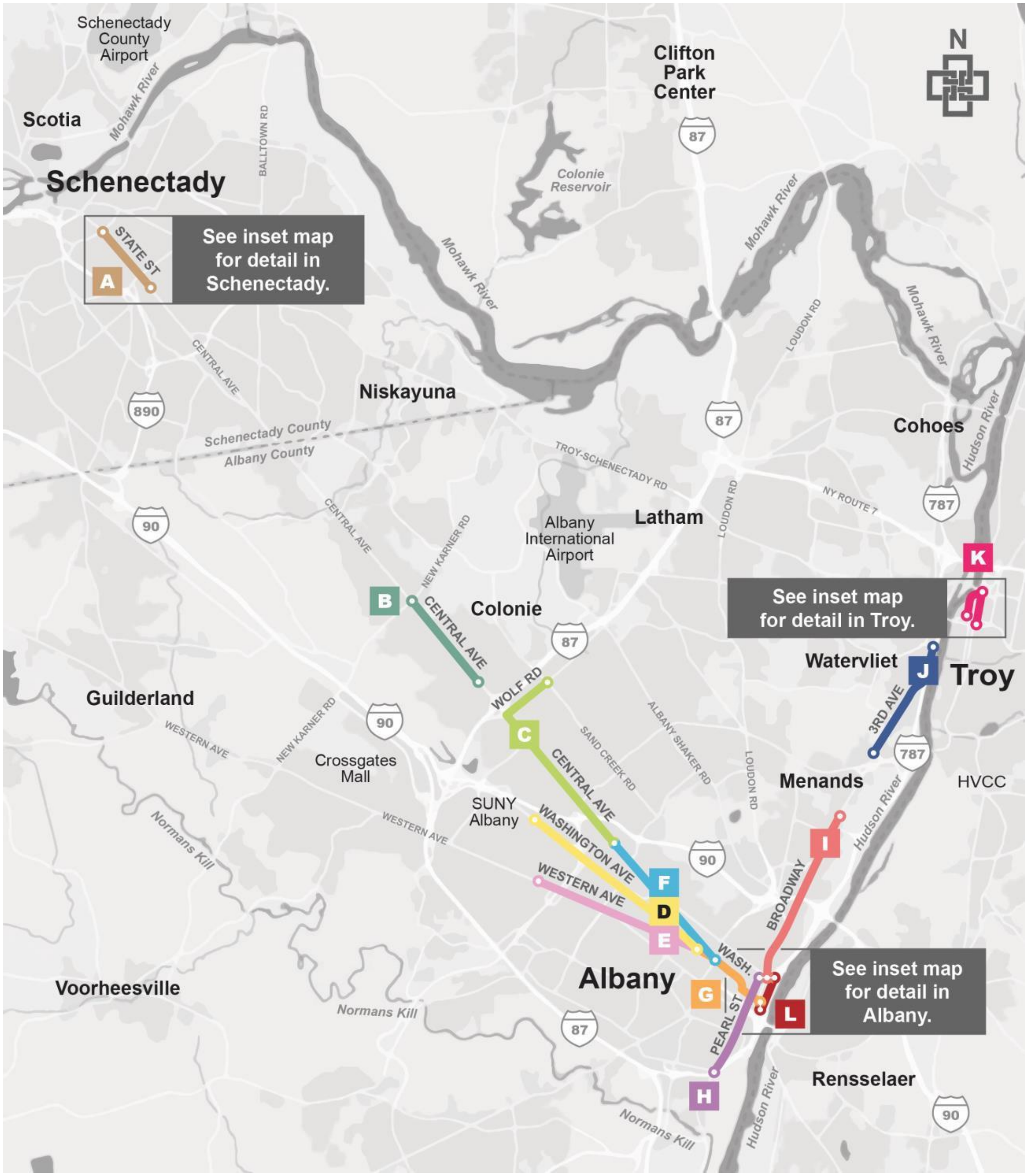


Figure 21: Detailed View of Albany Potential Priority Corridors

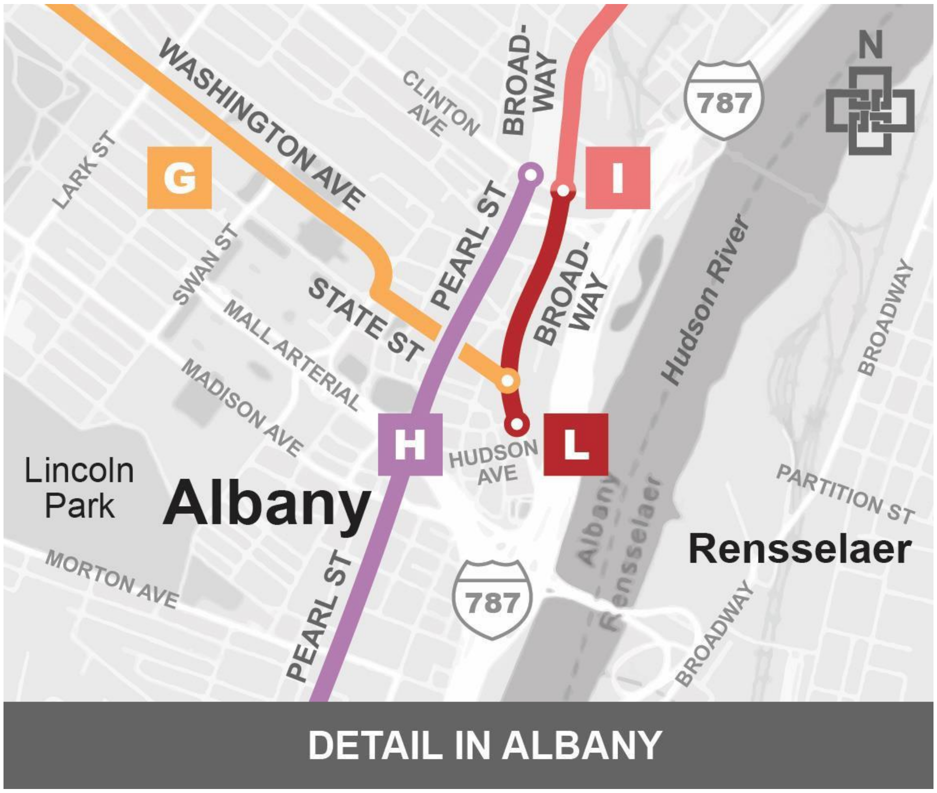
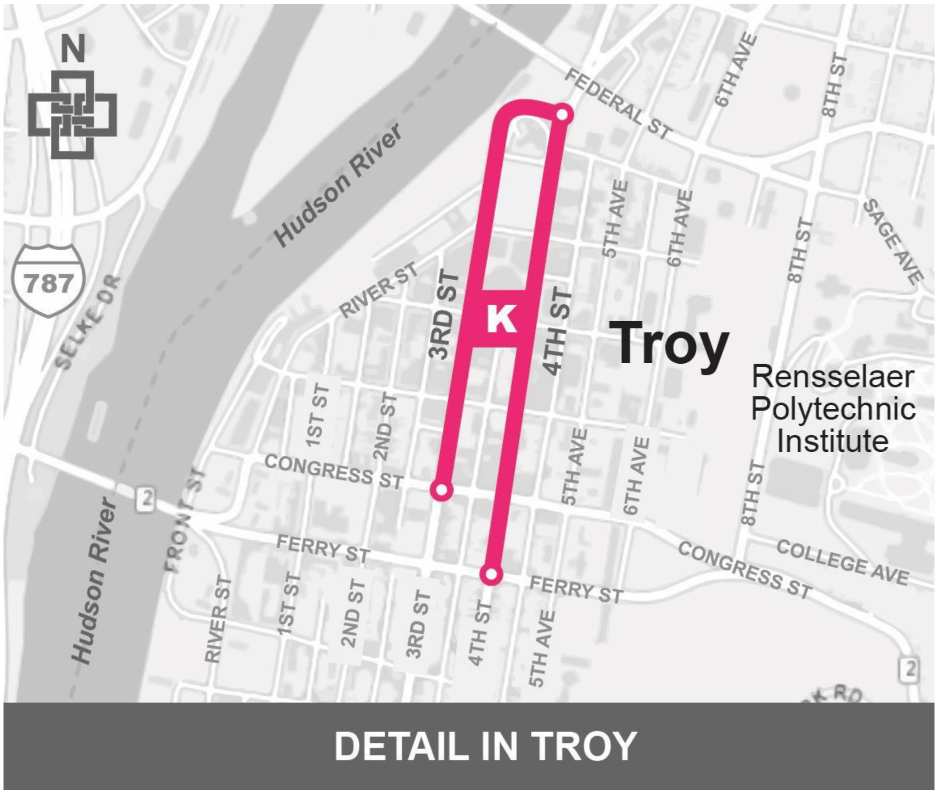


Figure 22: Detailed View of Schenectady Potential Priority Corridor

Figure 23: Detailed View of Troy Potential Priority Corridor



Prioritization Methodology

This section describes the proposed evaluation metrics for potential bus lanes and other priority improvements on the 12 identified corridors in the CDTA/CDTC service area. These metrics were used to identify the corridors to be retained and further analyzed in the evaluation and ranking process. The goal of the methodology is to produce a ranking of the corridors, and, after stakeholder engagement, screen the corridors down to those with the highest potential for bus priority implementation.

The following metrics (divided into the following scores) were used for the evaluation and ranking:

- Transit Score[1]
  - Passenger Delay
  - Bus Delay
- Equity Score
  - Densities within a ¼ mile of the corridor of:
    - Persons with Disabilities
    - Minority Populations
    - Low-income Households
    - Low-wage Jobs
    - Zero-car Households
    - Renter-occupied Households

[1] Bus speed, ridership (person throughput), and bus volume (trips) are inputs for passenger delay and bus delay. These metrics may be used to assist in decision making.

- Land Use Score
  - Current population and employment density within a ¼ mile of the corridor
  - Future population and employment density within a ¼ mile of the corridor (*2030 from MPO model at TAZ level*)
- Commuter Score
  - Number of Park & Ride locations within a ¼ mile of the corridor
  - Total External Commuter Trips to Corridor
  - Total Internal Commuter Trips on Corridor
- Existing Investment Score
  - Serves current or future BRT route
  - Overlap Length of BRT on corridor
  - Number of priority treatments per corridor mile
- Qualitative Assessments
  - "Feasibility filter" after ranking the corridors based on need
    - Traffic volumes (average AADT)
    - Roadway width
    - Number of lanes
    - Parking
    - Intersection design
  - Geographic diversity that incorporates other issues/typologies/regional pilots
  - Public/stakeholder/public input

The transit score will identify where bus priority treatments can provide the most benefit to operations, users, and to the public transit network. The equity score ensures that vulnerable populations are equitably recognized and served in final prioritization of corridors. The land use score provides insight on where improving bus service can provide the greatest additional benefit to residents and workers. The commuter score helps ensure that new bus priority treatments enhance movement throughout the region. The existing investment score will identify corridors with existing priority treatment, such as transit signal priority and queue jumps, or existing bus rapid transit services and will help leverage existing investments in transit.

METRICS

Transit Score

To understand where the passengers on all buses experience the most congestion and delay, information from speed and person throughput was utilized to calculate the total passenger delay by corridor mile. To understand where buses are most delayed by traffic, speed and bus volumes were used to calculate the total bus delay per corridor mile. This was provided for peak (sum of AM and PM Peak periods) and off-peak (sum of all other periods) and summed to together to create an all-day estimate for each corridor. The passenger/bus delay inputs are further detailed below:

- **Bus Speeds** were evaluated as an input to passenger and bus delay and to identify where some of the greatest operational challenges exist within the system. Average bus speeds were visualized on all corridors by stop. The average speed for each corridor is based on speeds calculated on timepoint segments assigned to stops on the same segment. CDTA Automated Passenger Counter (APC)[2] /

[2] A device which records boarding and alighting data on transit vehicles.

Automatic Vehicle Location (AVL)[3] data was used to assign speeds.

- **Person Throughput** was used as an input to passenger delay, to understand where the greatest potential benefit to riders exists. Person throughput miles combined vehicle load information (number of riders on the bus) with the distance between stops to provide information on how many transit riders are using a given corridor at a given time. This metric is a good indication of how each corridor is being used in its entirety by calculating the total miles a passenger will be using the corridor. It was normalized based upon the length of the corridor. CDTA APC/AVL data was used for this effort.
- **Bus Volumes** were used as an input to bus delay, to understand where the greatest benefit operationally and financially to the transit network in the system would be. The max hourly bus volumes were calculated for each corridor. This was done by aggregating the total number of trips per period, and then dividing by the total number of service hours during that period. CDTA APC/AVL data and CDTA General Transit Feed Specification (GTFS)[4] data was used for this effort.

Passenger delay is reported as daily (weekday) minutes of delay per corridor mile. Bus delay is reported as daily (weekday) minutes of delay per corridor mile. To calculate passenger delay per mile the CDTA APC/AVL data was used in the following manner (**Equation 1**):

- Find the average runtime on each route, direction, and stop segment for the overnight period. Subtract the overnight average runtime from the observed segment runtimes and then average this difference by period. This provides the average delay along a given segment for every period.
- Multiply this “average delay” by the person throughput observed on each route, direction, and stop segment by period.
- Sum person delay for each corridor and divide by the roundtrip corridor length.

Bus delay per mile is calculated in the same manner except the number of trips on each route, direction, and stop segment by period is used in place of person throughput (**Equation 2**).

Equation 1: Passenger Delay Per Mile

$$Passenger\ Delay\ Per\ Corridor\ Mile = Sum_{Corridor}((SegmentRuntime_{Period} - SegmentRuntime_{Fastest\ Period}) \times SegmentPersonThroughput_{Period}) \div Roundtrip\ Length_{Corridor}$$

Equation 2: Bus Delay Per Mile

$$Bus\ Delay\ Per\ Mile = Sum_{Corridor}((SegmentRuntime_{Period} - SegmentRuntime_{Fastest\ Period}) \times SegmentTrips_{Period}) \div Roundtrip\ Length_{Corridor}$$

Equity Score

In order to ensure that improvements are prioritized to serve transit dependent and under-resourced populations, the density of the following groups were included: minority[5] and persons with disabilities populations[6], low-income households[7] and low-wage jobs[8], all of which are a subset of activity (the

[3] A device used to track vehicle locations along a transit route
[4] Data specification that allows public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications.
[5] All groups identified by the Census, except white non-Hispanic or Latino
[6] Identified by the Census as living with a disability
[7] Households making less than 150 percent of poverty level, identified by the Census
[8] 2019 LEHD, jobs paying under $3333 / month ($39,996 / year; $19.23 / hour).

general population and job opportunities). The density of these groups was calculated within a ¼-mile buffer of each corridor.

Land Use Score

To understand the population and employment activity that a potential bus priority corridor will serve, baseline and forecasted population and employment data was utilized. Future population, job estimates and growth rates for both were used to ensure that corridor prioritization includes anticipated growth in the region.

Commuter Score

To ensure that improvements meet commuting patterns and demand, the commuter score looks at the proximity of Park & Ride locations, along with existing commuter travel trends. The presence of existing commuter trips was assessed by evaluating the percentage of external commuter trips that end along the corridor, and therefore would benefit the most from the Park & Ride connection, as well as commuter trips that start and end along the corridor providing a direct connection between home and work locations.

Existing Investment Score

To ensure that priority is given to corridors that have already been invested in, this metric measures the number of priority treatments per corridor mile and whether a corridor is being served by a bus rapid transit route.

METRIC SCORING

For each metric, every corridor was assigned a percentile score based on their value compared to the maximum value (**Equation 3**).

Equation 3: Percentile Score

$$Corridor\ Score = (Value_{Corridor} \div MaxValue_{AllCorridors}) * 100$$

4. SCREENING RESULTS

Five different scenarios were analyzed using different weighting of the metrics described above. Also considered were parking, intersections and turns, and other factors that could affect implementation of bus lanes. For example, irregular intersections, narrow roadways, and high parking demand can make it more difficult to construct and implement bus lanes. As these factors were adjusted and compared across the five different scenarios described in the Scenarios section, the priority corridors were narrowed down from twelve to five.

Scenarios

TRANSIT PERFORMANCE PRIORITIZATION

This scenario prioritizes transit performance and doesn't take commuter or existing investment scores into account. **Table 1** shows the weighting for this scenario and **Table 2** shows the results.

Table 1: Transit Performance Prioritization Weights

Metric	Weighting
Transit Score	60%
Land Use Score	20%
Equity Score	20%
Commuter Score	0%
Existing Investment Score	0%

Table 2: Transit Performance Prioritization Results

Rank	Corridor	Segment ID	Score
1	Washington Avenue / State Street	G	88
2	Central Avenue (between Colvin Avenue and Lark Street)	F	61
3	3rd Street / 4th Street	K	58
4	Downtown Broadway	L	53
5	Pearl Street	H	49

EQUITY PRIORITIZATION

This scenario prioritizes equity score and doesn't take commuter or existing investment scores into account. **Table 3** shows the weighting for this scenario and **Table 4** shows the results.

Table 3: Equity Prioritization Weights

Metric	Weighting
Transit Score	10%
Land Use Score	10%
Equity Score	80%
Commuter Score	0%
Existing Investment Score	0%

Table 4: Equity Prioritization Results

Rank	Corridor	Segment ID	Score
1	Central Avenue (between Colvin Avenue and Lark Street)	F	78
2	Washington Avenue / State Street	G	77
3	3rd Street / 4th Street	K	73
4	State Street	A	60
5	Western Avenue	E	53

CURRENT AND FUTURE LAND USE PRIORITIZATION

This scenario prioritizes land use score and doesn't take commuter or existing investment scores into account. **Table 5** shows the weighting for this scenario and

Table 6 shows the results.

Table 5: Current and Future Land Use Prioritization Weights

Metric	Weighting
Transit Score	20%
Land Use Score	60%
Equity Score	20%
Commuter Score	0%
Existing Investment Score	0%

Table 6: Current and Future Land Use Prioritization Results

Rank	Corridor	Segment ID	Score
1	Washington Avenue / State Street	G	75
2	3rd Street / 4th Street	K	61
3	Central Avenue (between Colvin Avenue and Lark Street)	F	61
4	Downtown Broadway	L	59
5	State Street	A	50

EQUAL PRIORITIZATOIN

This scenario equally prioritizes transit, land use, and equity scores and doesn't take commuter or existing scores into account. **Table 7** shows the weighting for this scenario and **Table 8** shows the results.

Table 7: Equal Prioritization Weights

Metric	Weighting
Transit Score	34%
Land Use Score	33%
Equity Score	33%
Commuter Score	0%
Existing Investment Score	0%

Table 8: Equal Prioritization Results

Rank	Corridor	Segment ID	Score
1	Washington Avenue / State Street	G	81
2	Central Avenue (between Colvin Avenue and Lark Street)	F	65
3	3rd Street / 4th Street	K	62
4	Downtown Broadway	L	54
5	State Street	A	49

ALL METRICS

This scenario considers all metrics, but gives priority to transit, land use, and equity scores. The top five corridors in this scenario were Washington Avenue / State Street in Albany; Central Avenue (between

Colvin Avenue and Lark Street) in Albany; 3rd Street / 4th Street in Troy; State Street in Schenectady; and Pearl Street in Albany. **Table 9** shows the weighting for this scenario and **Table 10** shows the results.

Table 9: All Metrics Weights

Metric	Weighting
Transit Score	25%
Land Use Score	25%
Equity Score	25%
Commuter Score	13%
Existing Investment Score	13%

Table 10: All Metrics Results

Rank	Corridor	Segment ID	Score
1	Washington Avenue / State Street	G	72
2	Central Avenue (between Colvin Avenue and Lark Street)	F	60
3	3rd Street / 4th Street	K	56
4	State Street	A	49
5	Pearl Street	H	49

Results

To determine the five corridors to move forward in the conceptual design process, multiple rounds of stakeholder engagement and field work were conducted. These touchpoints were used to educate participants on the data assessed in determining top priority corridors and to gain additional insight into the feasibility of each priority corridor for implementation based upon roadway conditions and future community projects.

Key discussion points heard within each group that fed into the final five corridors selected were as follows:

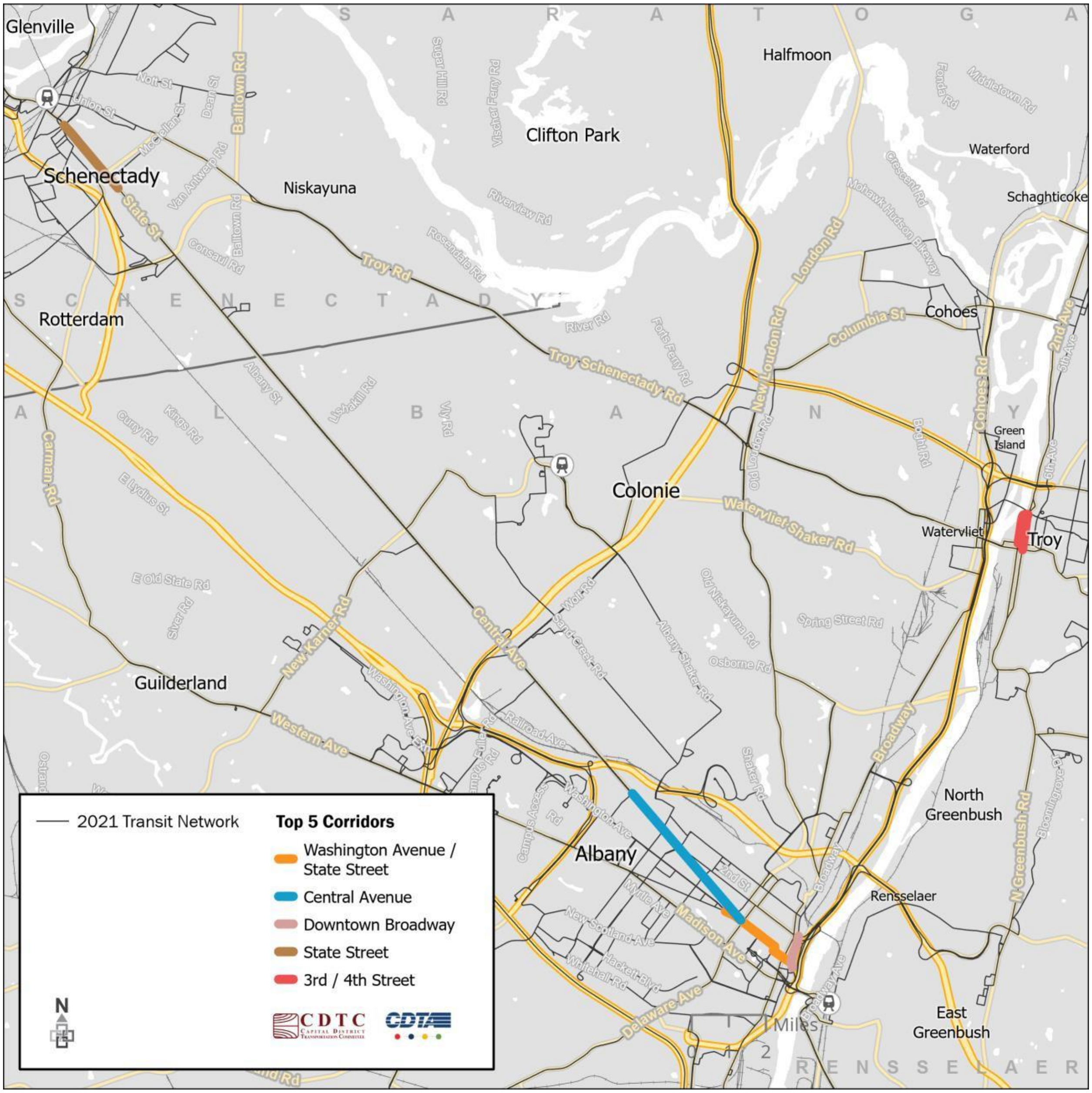
- **CDTC and CDTA Working Group** –
  - Central Avenue in Albany is currently proposed for inclusion in the 2022-2027 Transportation Improvement Program (scheduled for approval in September 2022) with a road-diet project that scored highly. Pedestrian safety is the highest priority along this corridor.
  - Pearl Street in Albany, while it scored highly, is very narrow and has many events throughout the year that result in road closures.
  - Western Avenue in Albany is narrow, with lots of traffic and street parking. This corridor is already slated for queue jump and TSP priority treatments, between Allen and Quail, for the proposed new BRT line.

  - 3rd / 4th Street in Troy has some feasibility issues related to on-street parking, peak period bus lanes could be an option.
  - Other types of treatments where bus lane may not be feasible should be considered. Within Albany, a majority of congestion is caused by traffic signals which may provide an opportunity where bus lanes don't fit.
- **Stakeholder Advisory Committee (SAC)** –
  - Interested in seeing how the concept on 3rd / 4th Street in Troy would be designed. CDTC has a study going on just north of this area (Federal Street Corridor Study).
  - State Street in Schenectady has a potential TIP project, Nott Terrace to Hulett Street, the timing of this project could work well with that.
  - Albany is prioritizing enhanced pedestrian safety, so road diet on Central Avenue is in the immediate future.
  - Washington Avenue in Albany is having general transit service reduced because of the soon-to-be implemented BRT increasing service on Western Avenue.
- **Field Visit –**
  - Along State Street and Washington Avenue in Albany parking seemed to be a major concern.
  - Central Avenue in Albany:
    - Routes 905 & 1 are frequent, but perhaps not enough issues in this corridor to get the space.
    - There is potential to look at queue jumps at intersections.
  - Downtown Broadway in Albany:
    - South of State Street there is approximately 60' of right-of-way, with two travel lanes in each direction plus parking in southbound direction.
    - Currently half of the buses go left at State Street and the rest go right, if Albany intermodal is built all buses will go right on State Street.
    - North of State Street might not make sense long-term if routes change, but there is adequate width between State Street and Maiden Lane to accommodate bus only lanes.
  - State Street in Schenectady:
    - East of Brandywine Avenue could be difficult for bus lane implementation.
    - There is less frequent service in this corridor and lots of pedestrian safety issues.
  - 3rd / 4th Street in Troy –
    - Would need to consider this as part of larger curbside/parking management study.
    - Where there is less right-of-way, it will be easier to move forward with peak period only bus lanes.

Based upon the results of the corridor evaluation, the stakeholder engagement, and the field work, the five following corridors were moved forward for preliminary concept design (**Figure 24**):

- Washington Avenue / State Street - Albany
- Central Avenue (between Colvin Avenue and Lark Street) - Albany
- Downtown Broadway - Albany
- State Street - Schenectady
- 3rd Street / 4th Street - Troy

Figure 24: Top Five Bus Priority Corridors



CDTC
CAPITAL DISTRICT TRANSPORTATION COMMITTEE

CDTA

CAPITAL REGION BUS LANE FEASIBILITY STUDY

Phase I Public Engagement MetroQuest Survey Results

CONTENTS

FIGURES

TABLES

1. ABOUT THE SURVEY

The Bus Lane Study will determine the feasibility of bus lanes throughout the region that will allow buses to operate faster and more reliably, improving service to thousands of riders daily. This survey was created to gather input from community members including transit riders, motorists, residents, business owners, and other stakeholders to better understand opportunities and challenges as well as tradeoffs related to bus lanes in the region. The survey results will be used to inform the project team's work to determine the feasibility of bus lanes in the Capital Region.

The survey opened on October 18, 2021 and closed on November, 21, 2021. The survey was built in the MetroQuest platform and made available in English and Spanish. The survey was highly graphical and interactive in nature. Links to the demonstration versions of the surveys are provided in **Table 1**, and **Figure 1** shows an image of one of the pages of the survey. The Metroquest survey is not accessible to the visually impaired so a phone number was provided to connect them with consultant staff to allow them to perform the survey via a phone conversation.

CDTC staff and the project team used a variety of methods to inform people about the survey and encourage them to take it.

Pop-Up Events

The project team held four pop-up events to speak with members of the community and encourage participation in the survey. A summary of the pop-up events is in the **Appendi**.

- 7am to 9am on October 20, 2021: Bus stops at corner of State St and Pearl St in downtown Albany.
- 11am to 1pm on October 20, 2021: Bus stop in front of Albany Public Library.
- 12pm to 3pm on October 22, 2021: Riverfront Station in Troy.
- 11am to 2pm on October 27, 2021: Gateway Plaza in Schenectady.

Webinars

The project team held a virtual workshop, available during two separate sessions, on October 20, 2021. The webinar featured several interactive polls and a question-and-answer session. The webinar detailed an overview of the project, the benefits of bus lanes, and a screen-by-screen preview of the survey. A recording of the webinar is available on the project website.

Website

The project website was set up to provide members of the public with one location to find information and stay updated on the Bus Lane Feasibility Study. The website has a list of events; information on potential bus lane corridors, including an interactive online map; a project documents tab with stakeholder presentations, project documents, and press releases. The website includes a button in the top corner that allows a user to switch the language to Spanish.

Press Release

A press release was distributed on October 12, 2021 that gave an overview of the study and promoted the survey. A second press release was distributed to newspapers one week prior to survey end, including Spectrum Local News, WNYT, CBS6 Albany, Times Union, CW Albany, and Albany Business Review.

Social Media

CDTA, CDTC, and MJ Engineering and Land Surveying, P.C. posted about the survey on their respective Facebook, Twitter, and Instagram pages. The largest single day increases in survey activity came after social media activity from CDTA and the Mayor of Albany. A direct email from the City of Troy also resulted in significant survey activity.

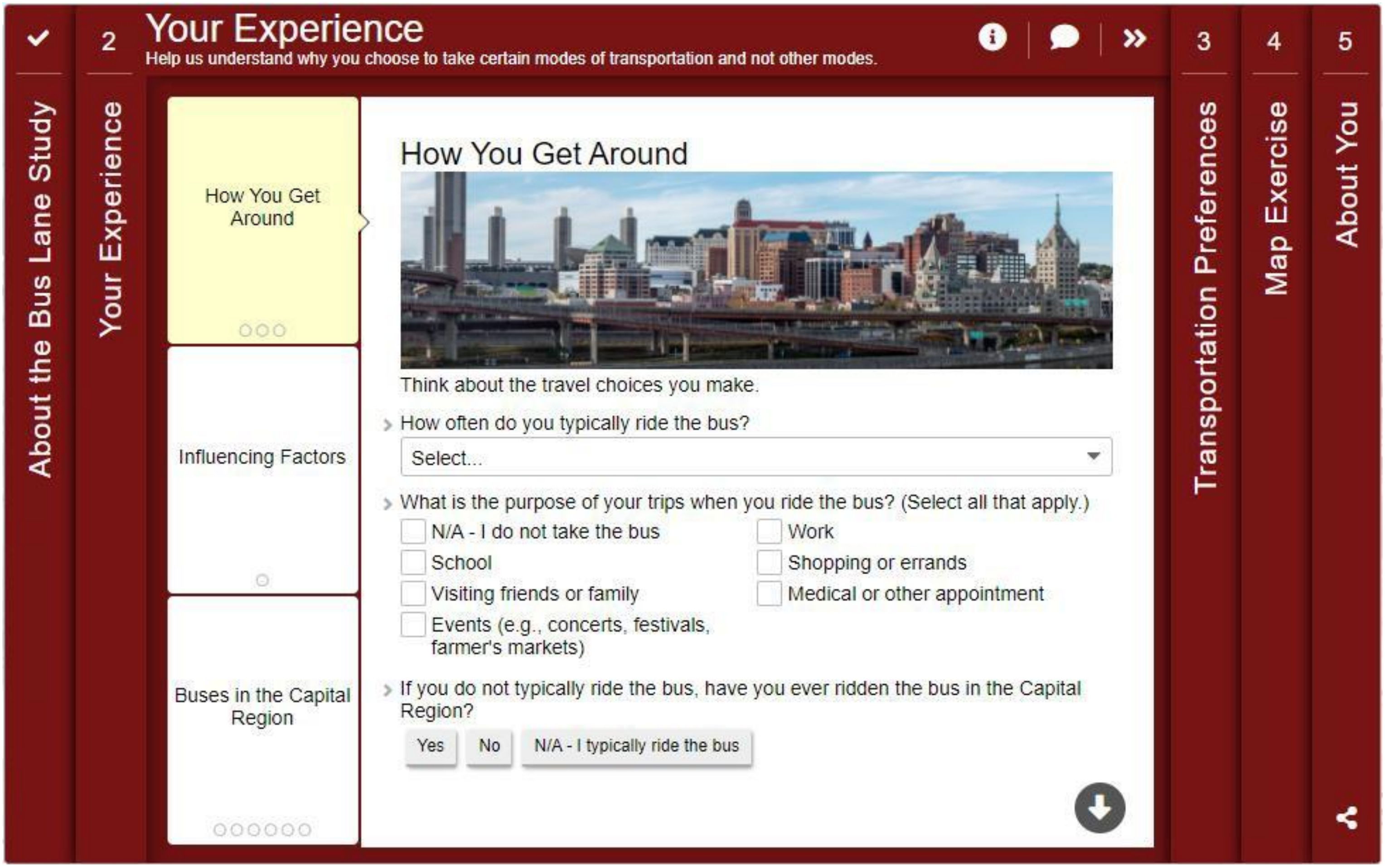
Stakeholders Outreach

Stakeholder outreach was conducted through a series of emails and online meetings, including a workshop on October 22nd, 2021. Several emails were sent to stakeholders to solicit input on the potential study corridors, and to request assistance in promoting the survey.

Table 1: Links to Demonstration Versions of the Surveys

Language	Link to Demo
English	http://demo.metroquestsurvey.com/zy5a5c
Spanish	http://demo.metroquestsurvey.com/ne6q6b

Figure 1: Image from the CDTC Survey



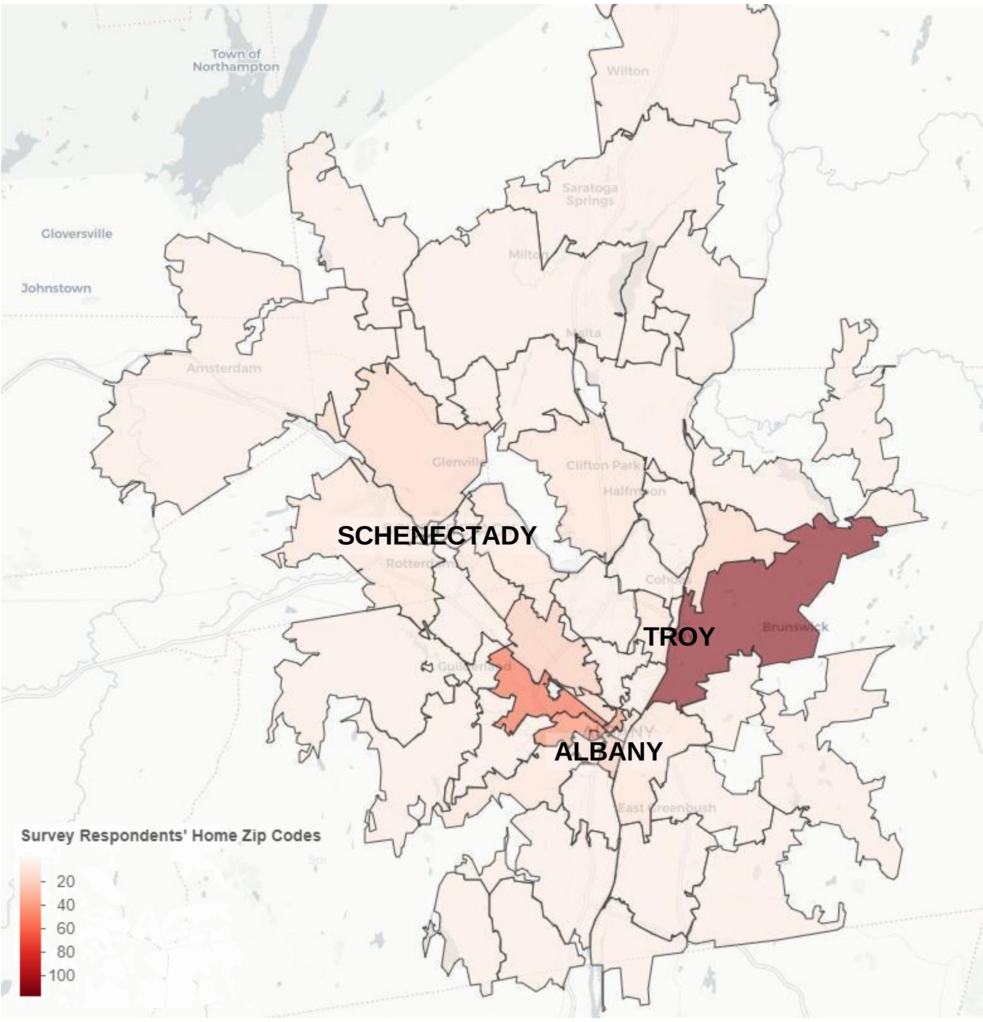
2. ABOUT THE RESPONDENTS

There were 836 survey respondents: 833 respondents to the English survey and three respondents to the Spanish survey. The following sections summarize the survey sample by geographic location, income, race, age, gender, and disability status. All of the results in this section include only those respondents who answered the optional demographic questions.

Geographic Location

Figure 2 is a map showing the distribution of home zip codes of survey respondents. The project team received responses from most of the zip codes within CDTA's service area, with a large number of respondents from Troy (due in large part to a direct email sent to Troy residents).

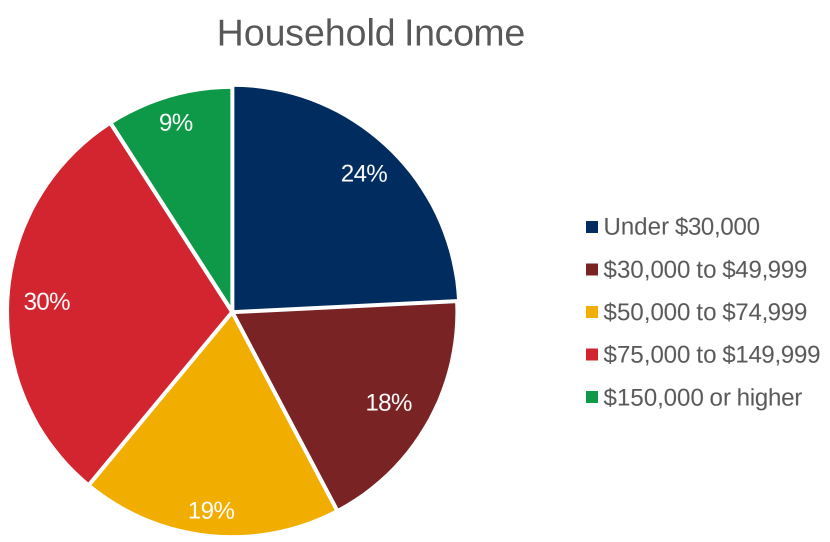
Figure 2: Map of Home Zip Codes of Survey Respondents



Income

The household incomes of survey respondents are shown in **Figure 3**, with the largest group of respondents reporting an annual household income of $75,000-$149,999, followed by the under $30,000 category. Of the 549 survey respondents who answered the question regarding household income, 24 percent had an annual household income under $30,000; 18 percent between $30,000 and $49,999; 19 percent between $50,000 and $74,999; 30 percent between $75,000 and $149,000; and nine percent had an annual household income higher than $150,000. The household income breakdown of survey respondents is similar to that of the Capital Region population: 17 percent of the population have an annual household income between $50,000 and $74,999; 32 percent between $75,000 and $149,999; and 15 percent have an annual household income higher than $150,000.[1]

Figure 3: Breakdown of Survey Respondents by Household Income

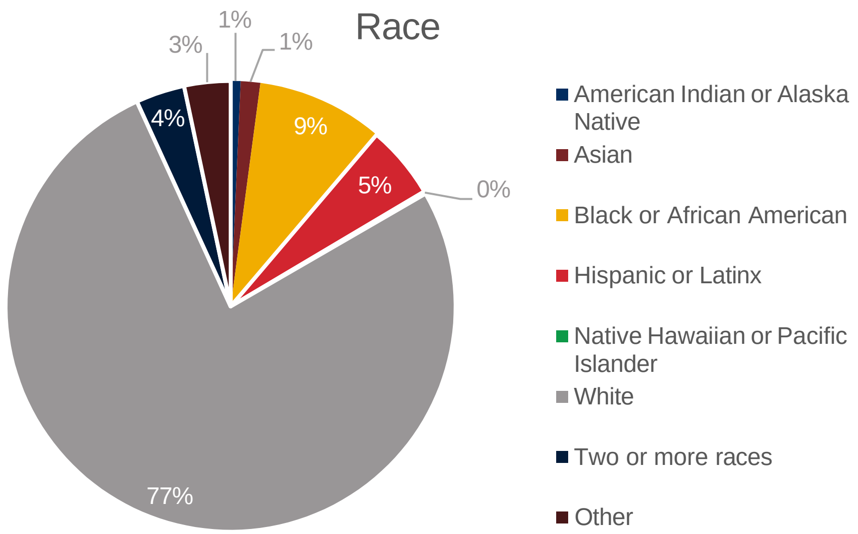


Race

Figure 4 shows the racial breakdown of survey respondents. Of the 570 respondents who chose to report their race, over three-quarters (77 percent) identified as white. The next two largest racial groups were Black/African American and Hispanic/Latinx at nine percent and five percent, respectively. Four percent of respondents identified as two or more races and three percent identified as Other. One percent of respondents identified as Asian, one percent identified as American Indian / Alaska Native, and less than one percent identified as Native Hawaiian / Pacific Islander. The racial breakdown of survey respondents is similar to the racial breakdown of the Capital Region population: in the Capital Region, 80 percent of the population identifies as non-Hispanic white, eight percent identify as Black/African American, five percent identify as Hispanic/Latinx, five percent identify as Asian, one percent identify as American Indian / Alaska Native, less than one percent identify as Native Hawaiian / Pacific Islander, four percent identify as two or more races, and two percent identify as Other.

[1] All Capital Region demographic statistics in this section come from the American Community Survey 2019 5-year estimates for the Albany-Schenectady-Troy metropolitan statistical area. Data for under $49,999 is not available from the Census in the same intervals used in the survey.

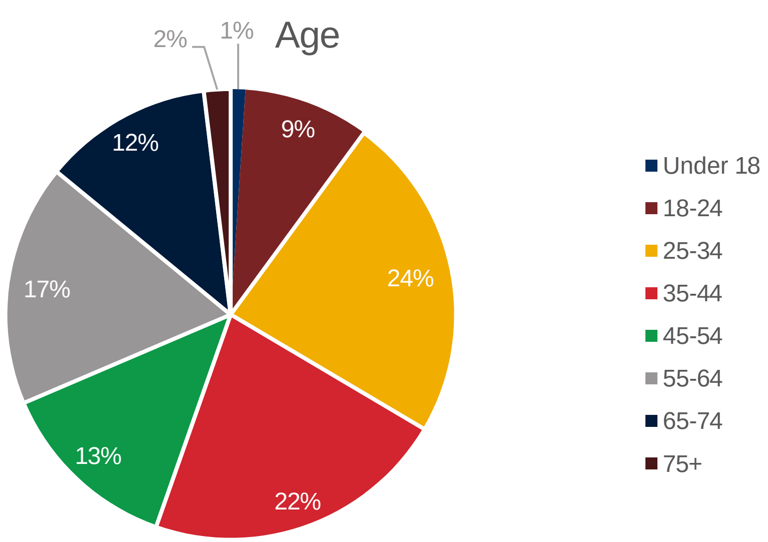
Figure 4: Breakdown of Survey Respondents by Race



Age

Figure 5 shows that of the 576 survey respondents who reported their age, the two largest age groups were 25-34 (24 percent) and 35-44 (22 percent), representing a combined total of 46 percent of the respondents. Following those two groups, 17 percent were aged 55-64, followed by 13 percent aged 45-54 and 12 percent aged 65-74. Of the remaining, nine percent were between the ages of 18-24, two percent were over 75 years old, and one percent were under 18. Some age groups overrepresented in the survey with respect to the age of the population: 13 percent of the population is aged 25-34, which represents 24 percent of survey respondents, and 12 percent of the population is aged 35-44, which represents 22 percent of survey respondents. Additionally, while only one percent of respondents were under 18, 20 percent of the population is under 18.

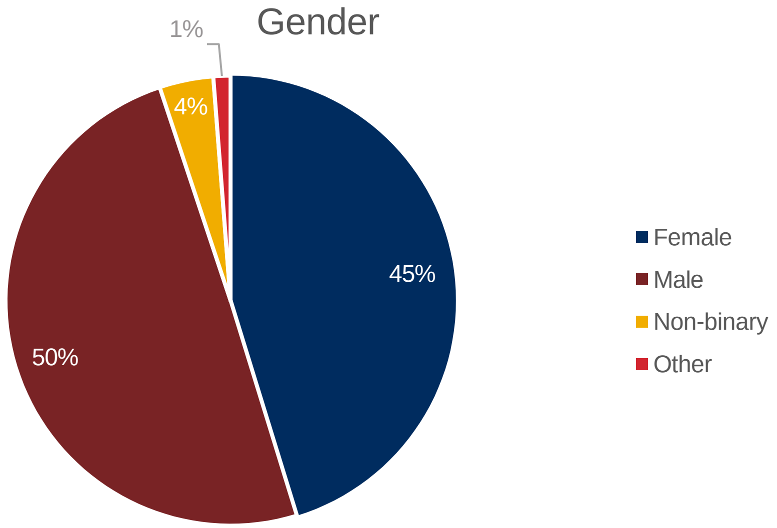
Figure 5: Breakdown of Survey Respondents by Age



Gender

Figure 6 shows that of the 568 survey respondents who reported their gender, 50 percent identified as male and 45 percent identified as female. Of the remaining five percent, four percent identified as non-binary and one percent identified as Other. While the Census does not collect data on gender identity, according to the data on sex, 49 percent of the region is male and 51 percent is female.

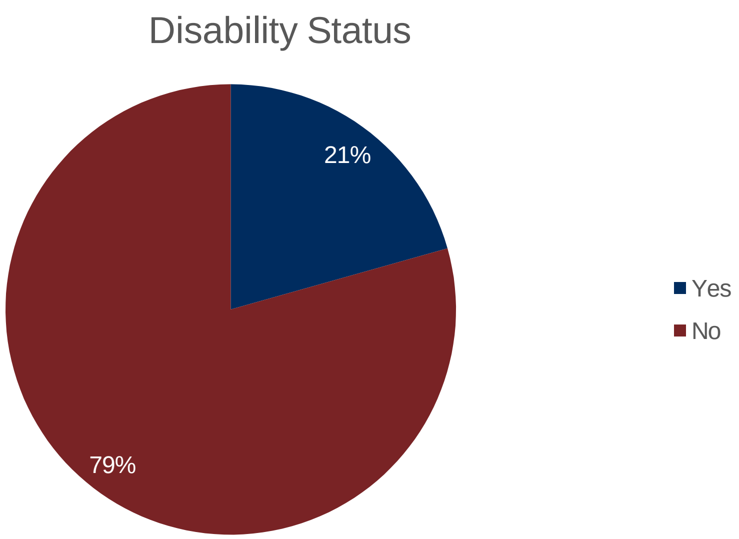
Figure 6: Breakdown of Survey Respondents by Gender Identity



Disability Status

Figure 7 shows that of the 577 survey respondents who reported their disability status, just over one-fifth (21 percent) identified as living with a disability while the remainder (79 percent) do not. This is similar to the disability status of the Capital Region with 26 percent of the population has a disability.

Figure 7: Breakdown of Survey Respondents by Disability Status



3. HOW RESPONDENTS TRAVEL

In the first section of the survey, respondents were asked to provide information about how often they typically ride the bus, the purpose of those bus trips, and the factors that influence their decision to drive or take the bus.

Frequency of Bus Trips

Figure 8: Frequency of Bus Trips

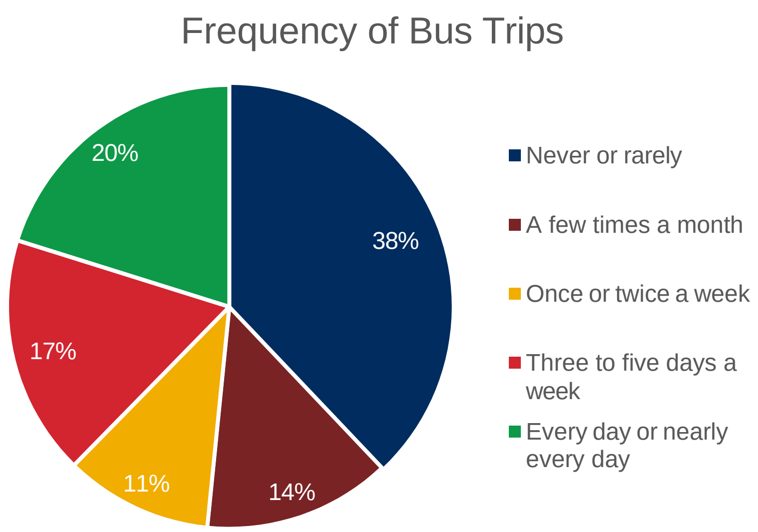
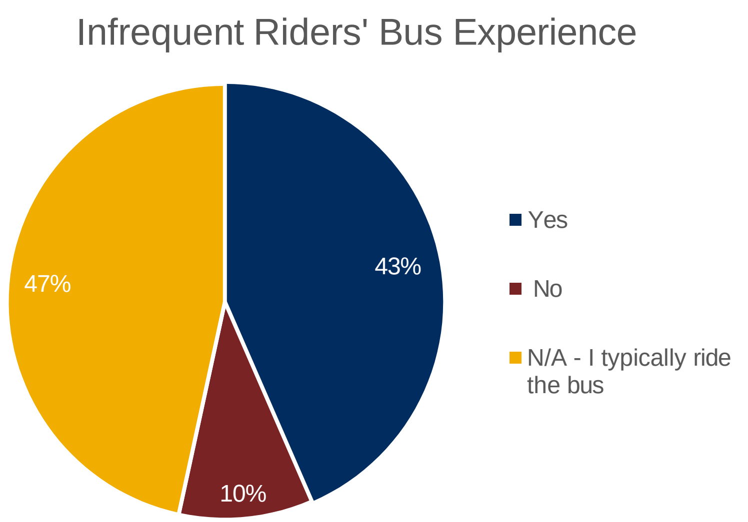


Figure 9: Infrequent Riders' Bus Experience



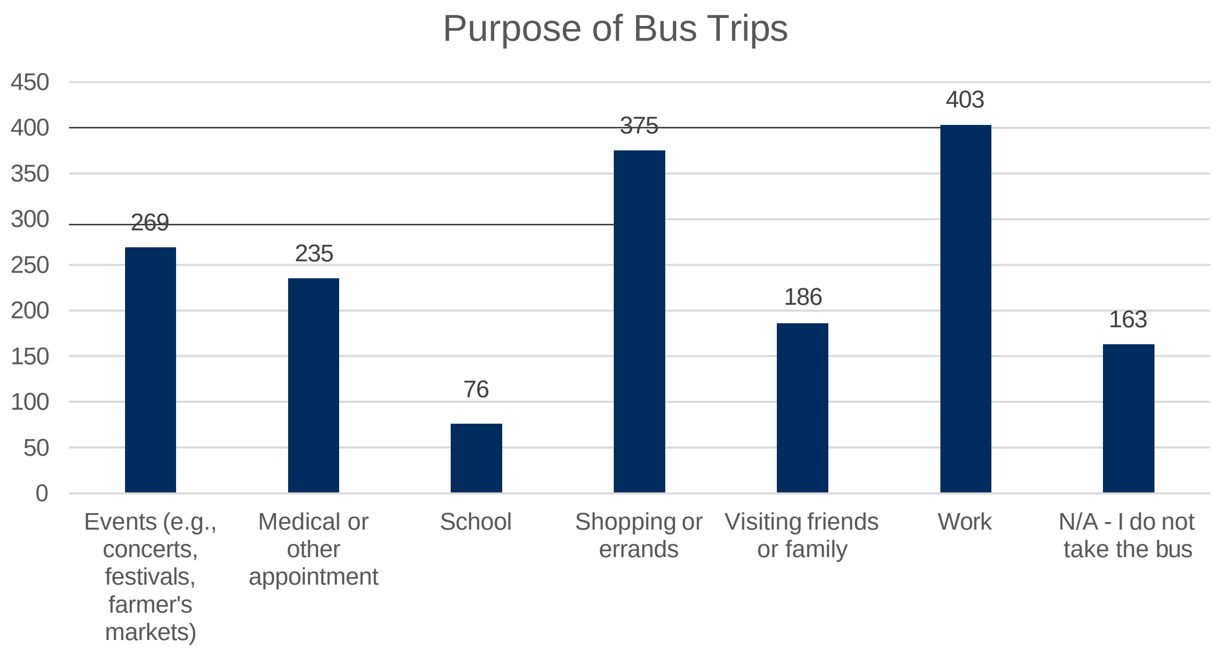
When asked how frequently they ride the bus, as shown in **Figure 8**, 48 percent of respondents said they ride the bus at least once a week: 20 percent ride the bus every day or nearly every day, 17 percent ride the bus three to five days a week, and 11 percent ride the bus once or twice a week. Fourteen percent of respondents ride the bus a few times a month, and 38 percent never or rarely ride the bus.

Respondents who do not typically ride the bus were asked if they have ever ridden the bus in the Capital Region. As shown in **Figure 9**, of respondents who do not typically ride the bus, 10 percent have never taken the bus, while 43 percent have. Forty-seven (47) percent of respondents said they typically ride the bus.

Purpose of Bus Trips

Respondents were asked the purpose of their trips when they ride the bus. As shown in **Figure 10**, the most common purpose is work. Of the 800 people who responded to this question, 403, or 50 percent, selected work as a purpose for bus trips. Other commonly selected purposes include shopping or errands (47 percent of respondents), events (34 percent), and medical or other appointment (29 percent). The purposes selected the least are school (one percent) and visiting friends or family (23 percent). Twenty percent of respondents reported that they do not take the bus.

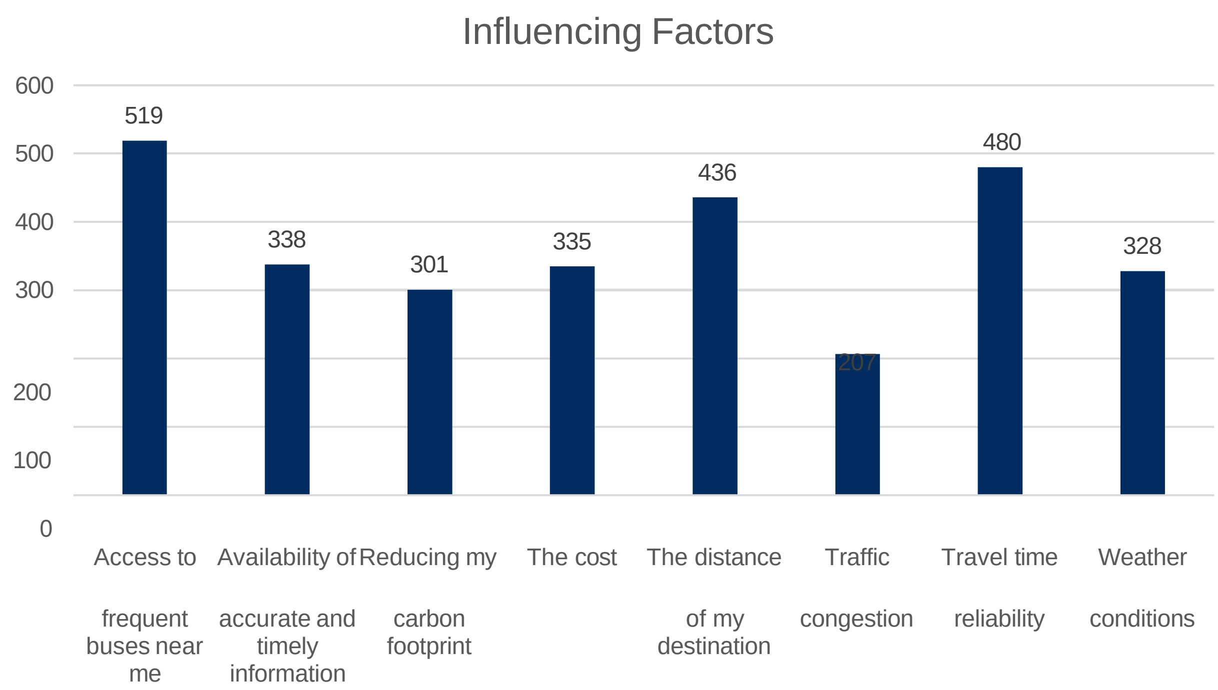
Figure 10: Purpose of Bus Trips



Influencing Factors

Respondents were asked what factors influence their decision to drive or take the bus. As shown in **Figure 11**, the most commonly selected factor was "access to frequent buses near me." Of the 746 people who answered, this question, 519, or 70 percent, cited access to frequent buses as a factor that will influence their decision to take transit. Other commonly selected factors include travel time reliability (64 percent of respondents) and distance of their destination (58 percent). The factors that will least influence respondents' decisions to take transit include traffic congestion (28 percent) and reducing their carbon footprint (40 percent).

Figure 11: Factors That Influence Decision to Take Transit

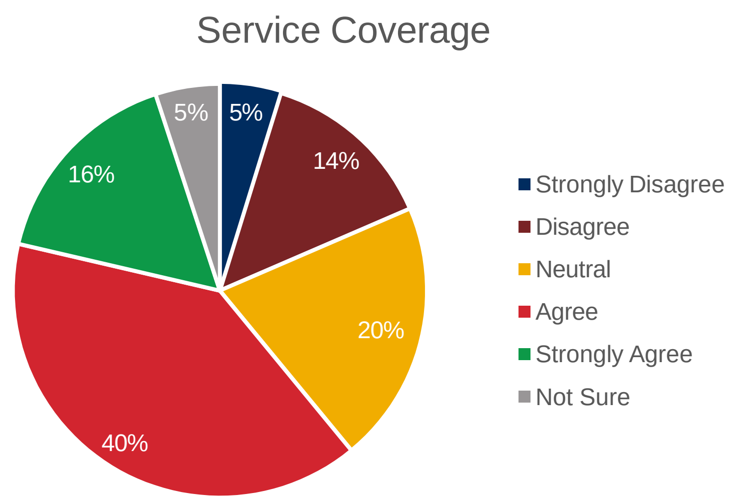


4. BUSES IN THE CAPITAL REGION

Respondents were asked to share their thoughts on current bus service in the Capital Region by selecting whether they strongly disagree, disagree, neutral, agree, strongly agree, or are not sure about each statement.

Service Coverage

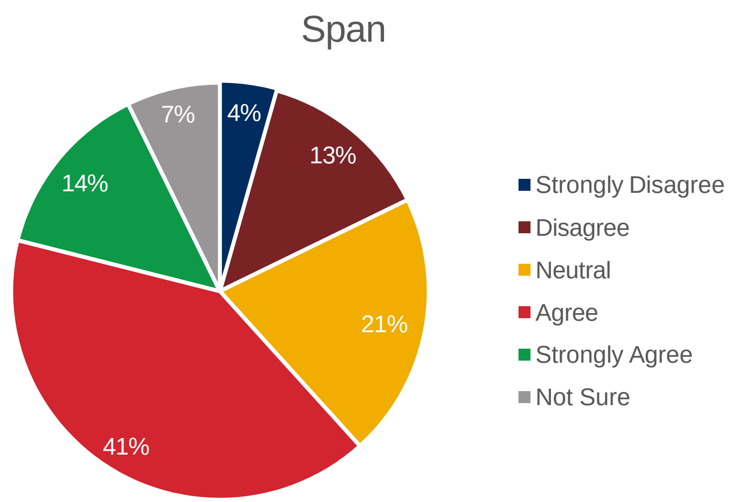
Figure 12: Buses Go Where I Need Them to Go



Respondents were given the statement “buses go where I need them to go.” As shown in **Figure 12**, of the 735 people who answered this question, a majority of respondents, 40 percent, agree with the statement, and 16 percent strongly agree. Twenty (20) percent are neutral, 14 percent disagree, and five percent of respondents strongly disagree.

Span

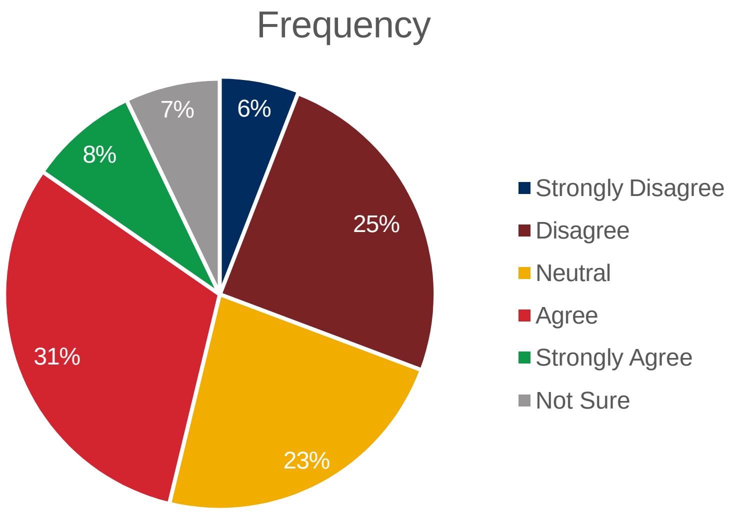
Figure 13: Buses Operate on the Times/Days I Need Them



Respondents were given the statement “buses operate on the times/days I need them.” As shown in **Figure 13**, of the 731 people who answered this question, 41 percent agree with the statement and 14 percent strongly agree. Twenty-one (21) percent are neutral, 13 percent disagree, and four percent of respondents strongly disagree.

Frequency

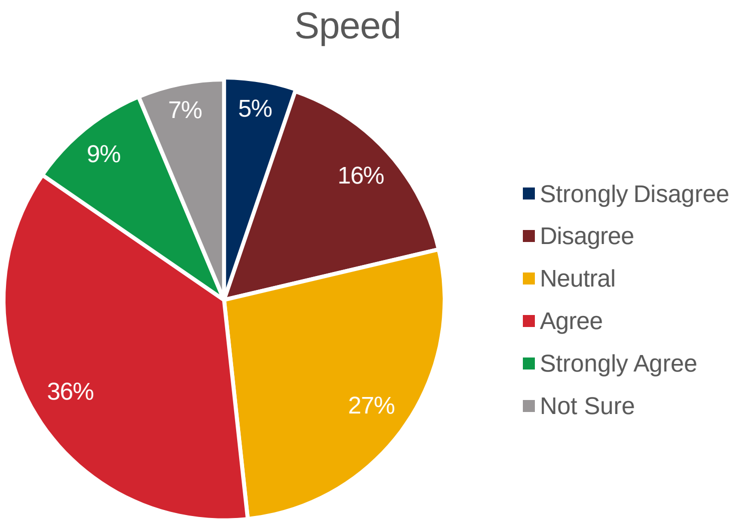
Figure 14: Buses Come Frequently Enough



Respondents were given the statement “buses come frequently enough.” As shown in **Figure 14**, of the 729 people who answered this question, 31 percent agree with the statement and eight percent strongly agree. Six percent of respondents strongly disagree and 25 percent disagree. Of all the statements in this section, this has the largest percentage (31 percent) of respondents who disagree or strongly disagree.

Speed

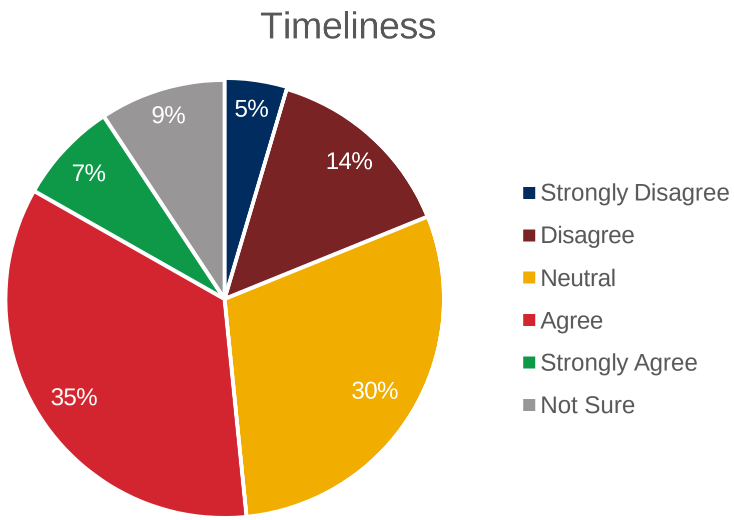
Figure 15: Buses Get Me to My Destination Quickly



Respondents were given the statement “buses get me to my destination quickly.” As shown in **Figure 15**, of the 727 people who responded to this question, 36 percent agree with the statement and nine percent strongly agree. Twenty-seven (27) percent are neutral, 16 percent disagree, and five percent strongly disagree.

Timeliness

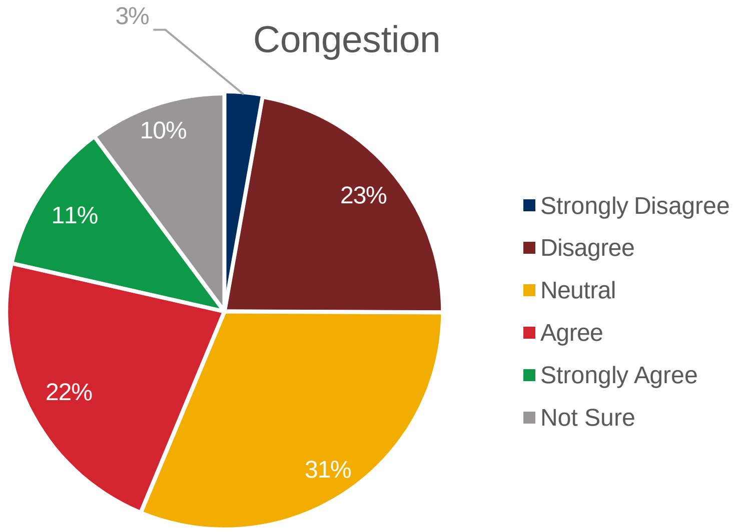
Figure 16: Buses Arrive On-Time



In response to the statement "buses arrive on-time," as shown in **Figure 16**, 35 percent of the 721 people who responded to this question agree and seven percent strongly agree. Thirty (30) percent are neutral, 14 percent disagree, and five percent strongly disagree.

Congestion

Figure 17: Buses are Frequently Stuck in Congestion



In response to the statement "buses are frequently stuck in congestion," as shown in **Figure 17**, 22 percent of the 718 people who responded to this question agree and 11 percent strongly agree. Thirty-one (31) percent are neutral, 23 percent disagree, and three percent strongly disagree.

5. TRANSPORTATION PREFERENCES

Respondents were asked to choose which tradeoffs they prefer for four categories: intersections, road priorities, spending, and transit. Each screen showed a large arrow with single or double angle brackets to designate how strongly the respondent preferred a certain option. **Figure 18** shows the arrow used on each screen and **Figure 19** shows a sample tradeoff tab of the survey. The graphs in the following sections have labels “far left,” “left,” “neutral,” “right,” and “far right,” which refer to the respective angle brackets. For example, “left” refers to the single angle bracket on the left of the “neutral” choice. In the written summary, “prefer” refers to the single angle brackets and “strongly prefer” refers to the double angle brackets.

Figure 18: Tradeoff Arrows

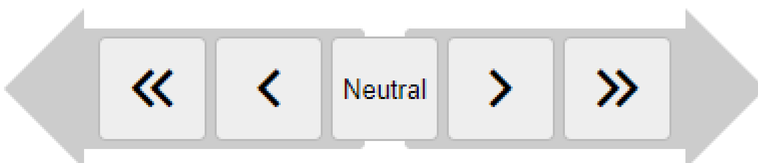
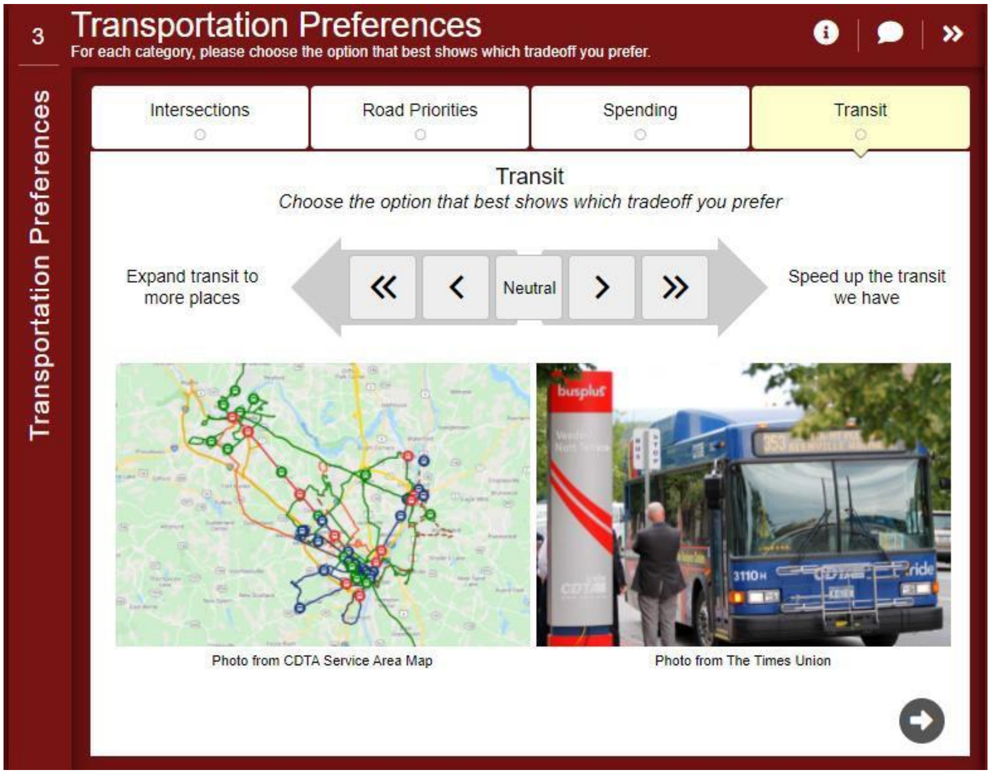


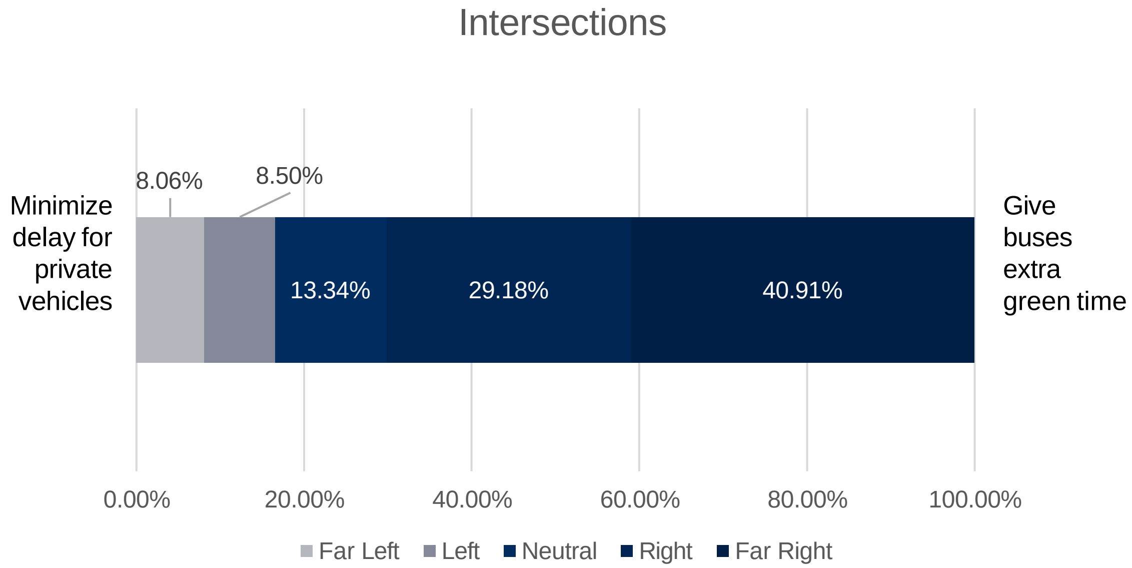
Figure 19: Sample Tradeoff Tab on Survey



Intersections

Respondents were asked to choose between "minimize delay for private vehicles" on the left and "give buses extra green time" on the right. As shown in **Figure 20**, a majority of respondents prefer (29 percent) or strongly prefer (41 percent) giving buses extra green time.

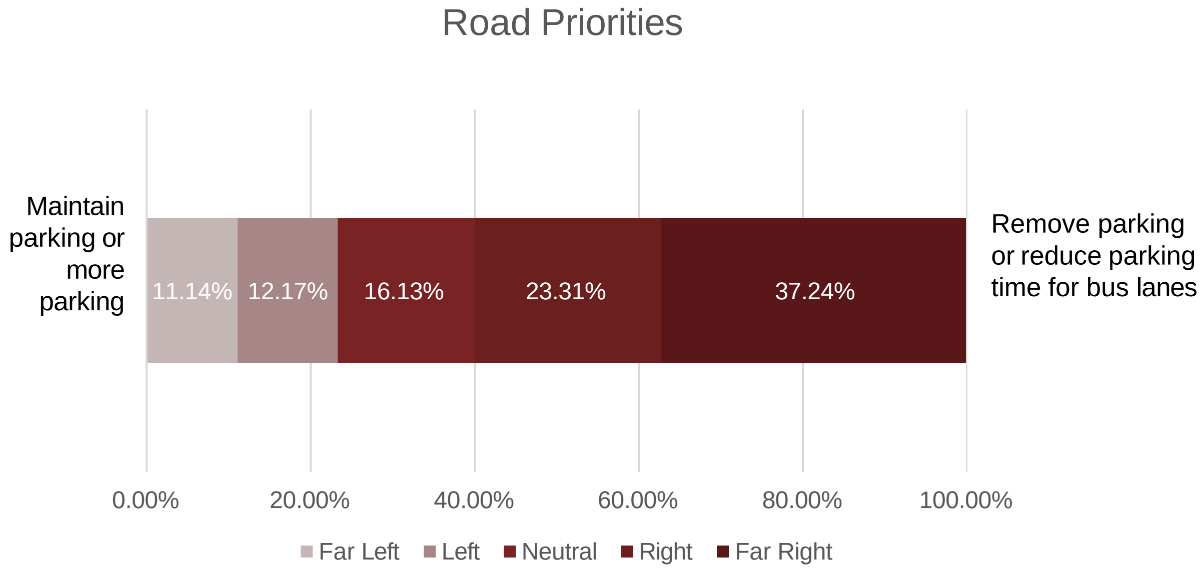
Figure 20: Intersection Tradeoff Preferences



Road Priorities

Respondents were asked to choose between "maintain parking or more parking" on the left and "remove parking or reduce parking time for bus lanes" on the right. As shown in **Figure 21**, a majority of respondents prefer (24 percent) or strongly prefer (37 percent) removing parking or reducing parking time for bus lanes.

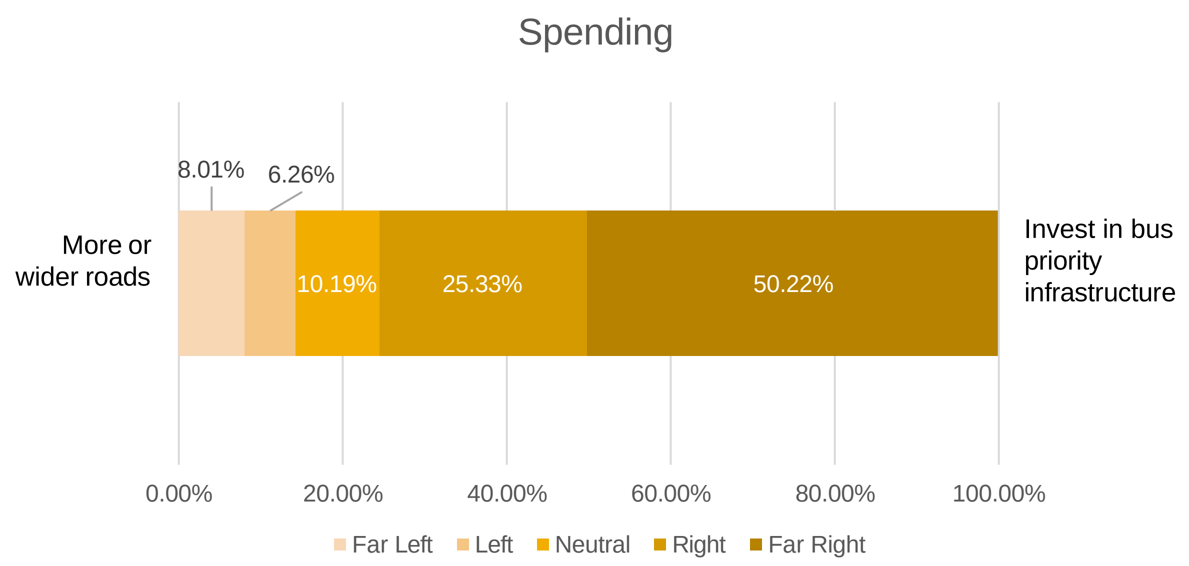
Figure 21: Road Priorities Tradeoff Preferences



Spending

Respondents were asked to choose between "more or wider roads" on the left and "invest in bus priority infrastructure" on the right. As shown in **Figure 22**, a majority of respondents prefer (26 percent) or strongly prefer (50 percent) investing in bus priority infrastructure.

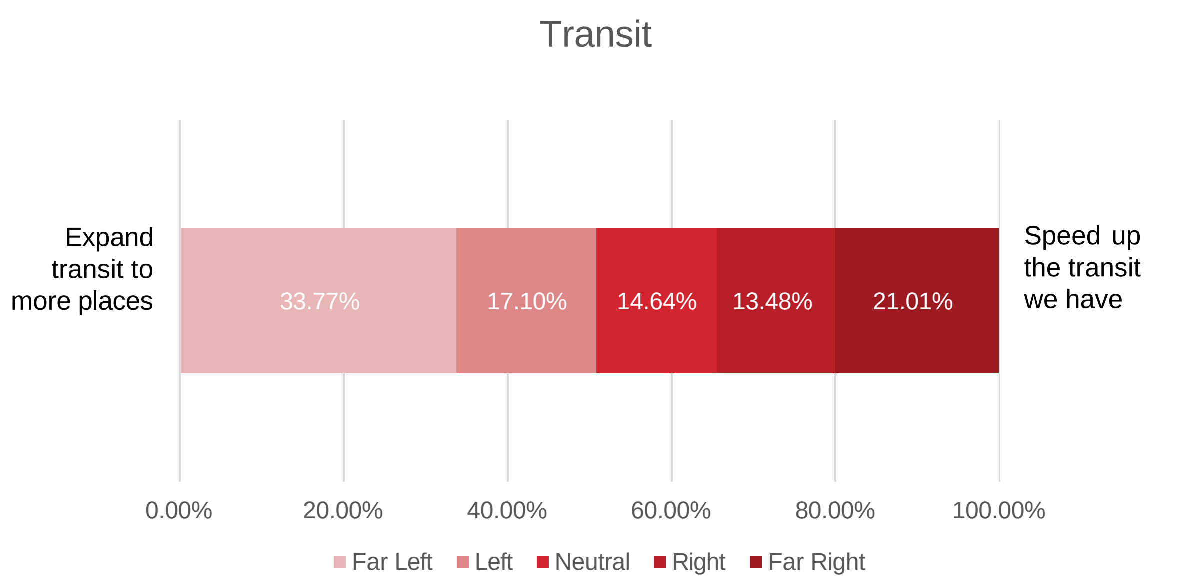
Figure 22: Spending Tradeoff Preferences



Transit

Respondents were asked to choose between "expand transit to more places" on the left and "speed up the transit we have" on the right. As shown in **Figure 23**, a majority of respondents, 51 percent, prefer expanding transit to more places: 17 percent prefer this option and 34 percent strongly prefer it. Thirty-four (34) percent of respondents prefer (13 percent) or strongly prefer (21 percent) expanding transit to more places.

Figure 23: Transit Tradeoff Preferences

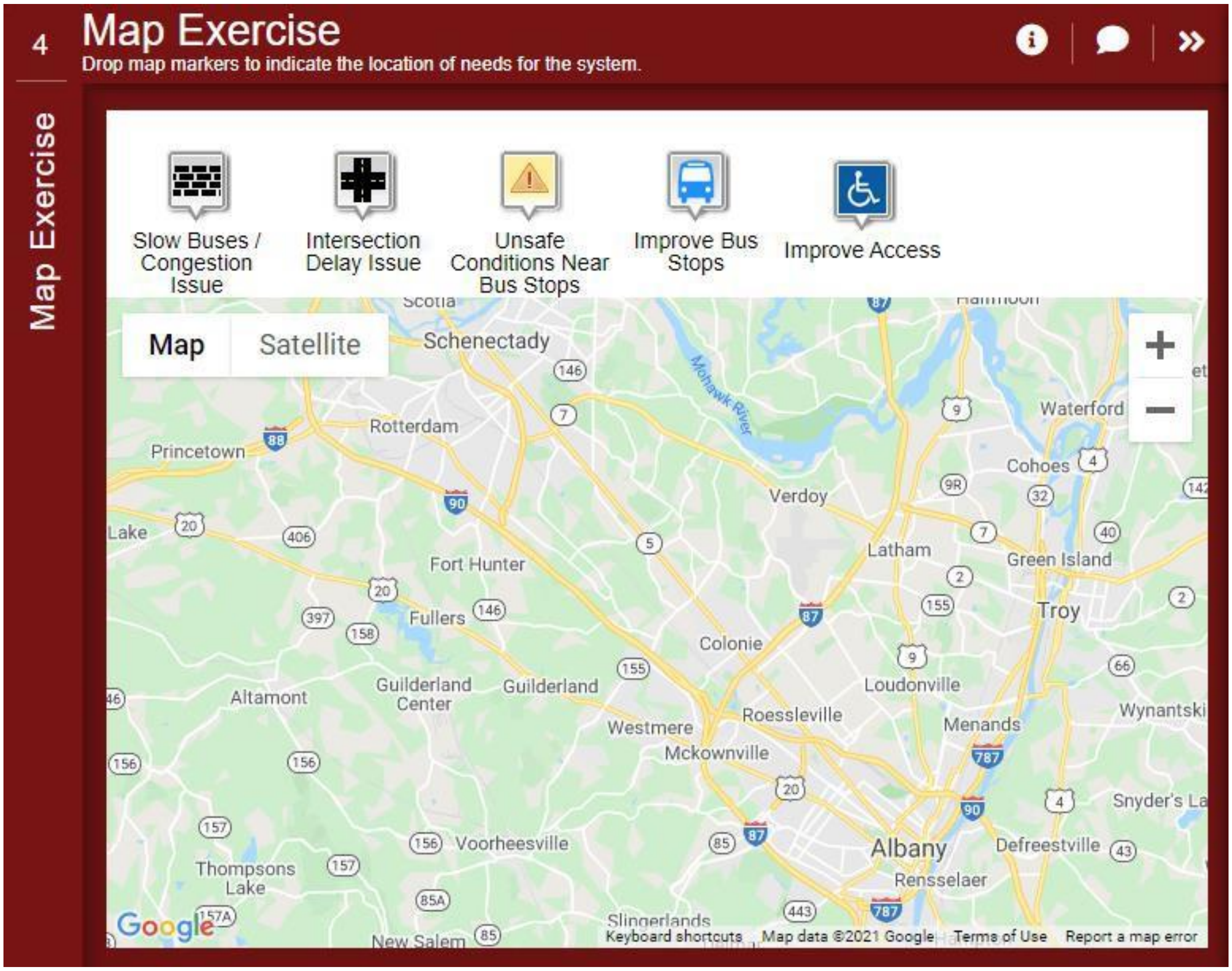


6. LOCATION OF NEEDS

Respondents were asked to drop map markers to indicate the location of needs for the bus system. The default map was zoomed out to show the full Capital Region in the window, and respondents were able to zoom in. The map exercise tab on the survey is shown in **Figure 24**.The map markers were:

- Slow buses / congestion issue
- Intersection delay issue
- Unsafe conditions near bus stops
- Improve bus stops
- Improve access.

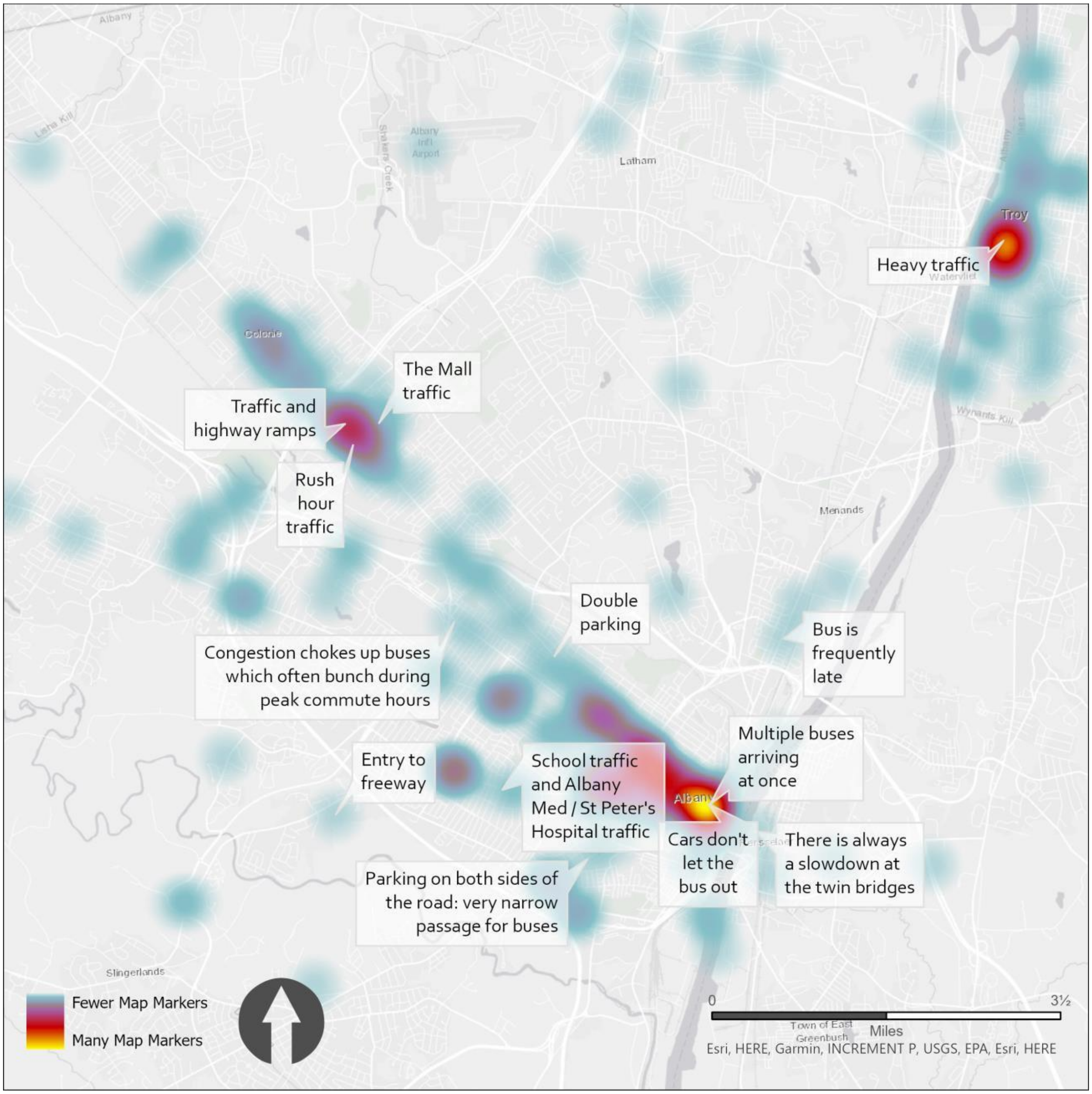
Figure 24: Map Exercise Tab on Survey



Slow Buses / Congestion Issue

Respondents placed 298 Slow Buses / Congestion Issue map markers and left 136 comments to describe what causes congestion at their selected point. A heat map of the markers is shown in **Figure 25**, along with a selection of comments, edited for clarity.

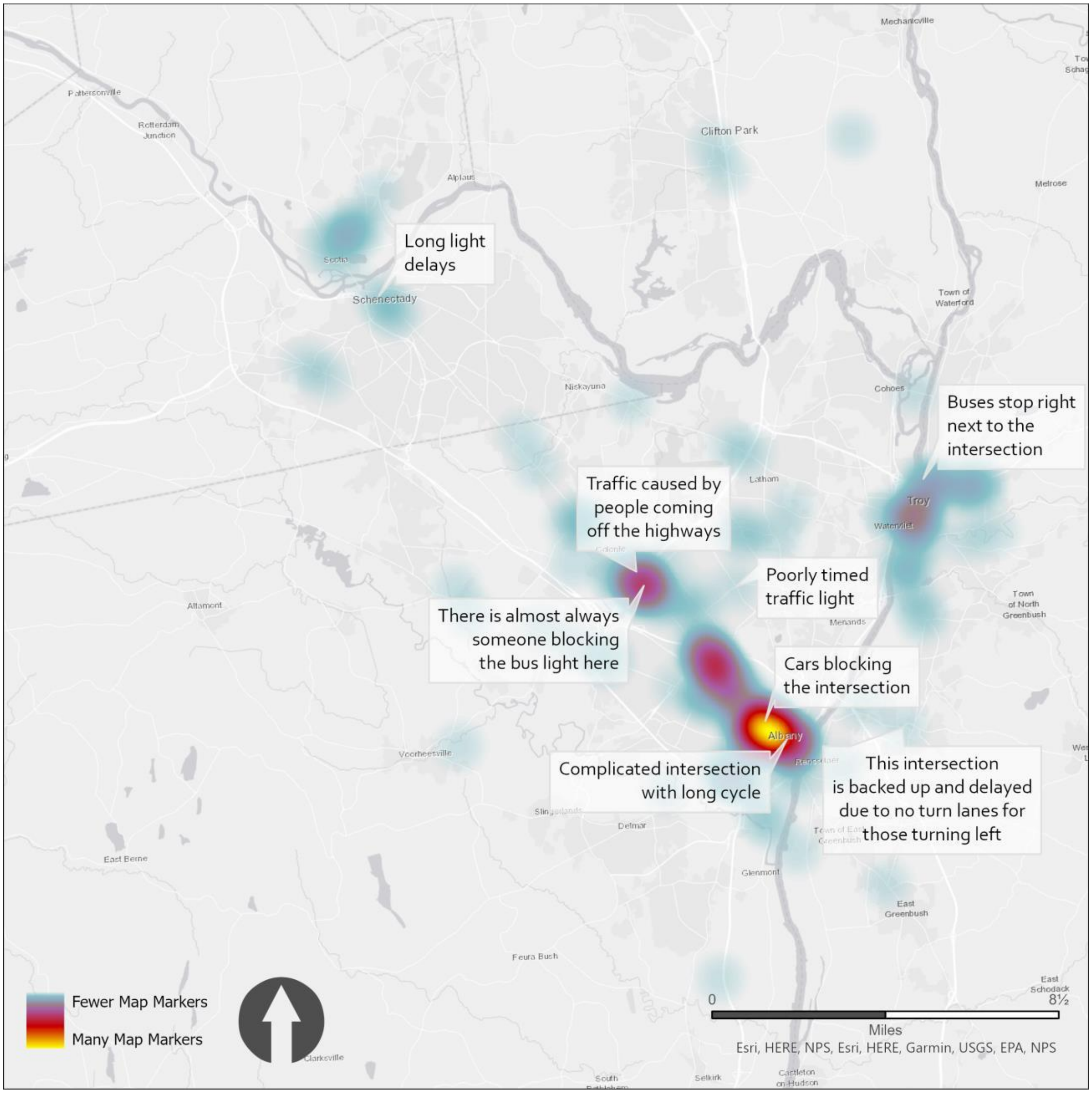
Figure 25**: Slow Buses / Congestion Issue Map Markers**



Intersection Delay Issue

Respondents placed 193 Intersection Delay Issue map markers and left 81 comments to describe what causes the delay at their selected point. A heat map of the markers is shown in **Figure 26**, along with a selection of comments, edited for clarity.

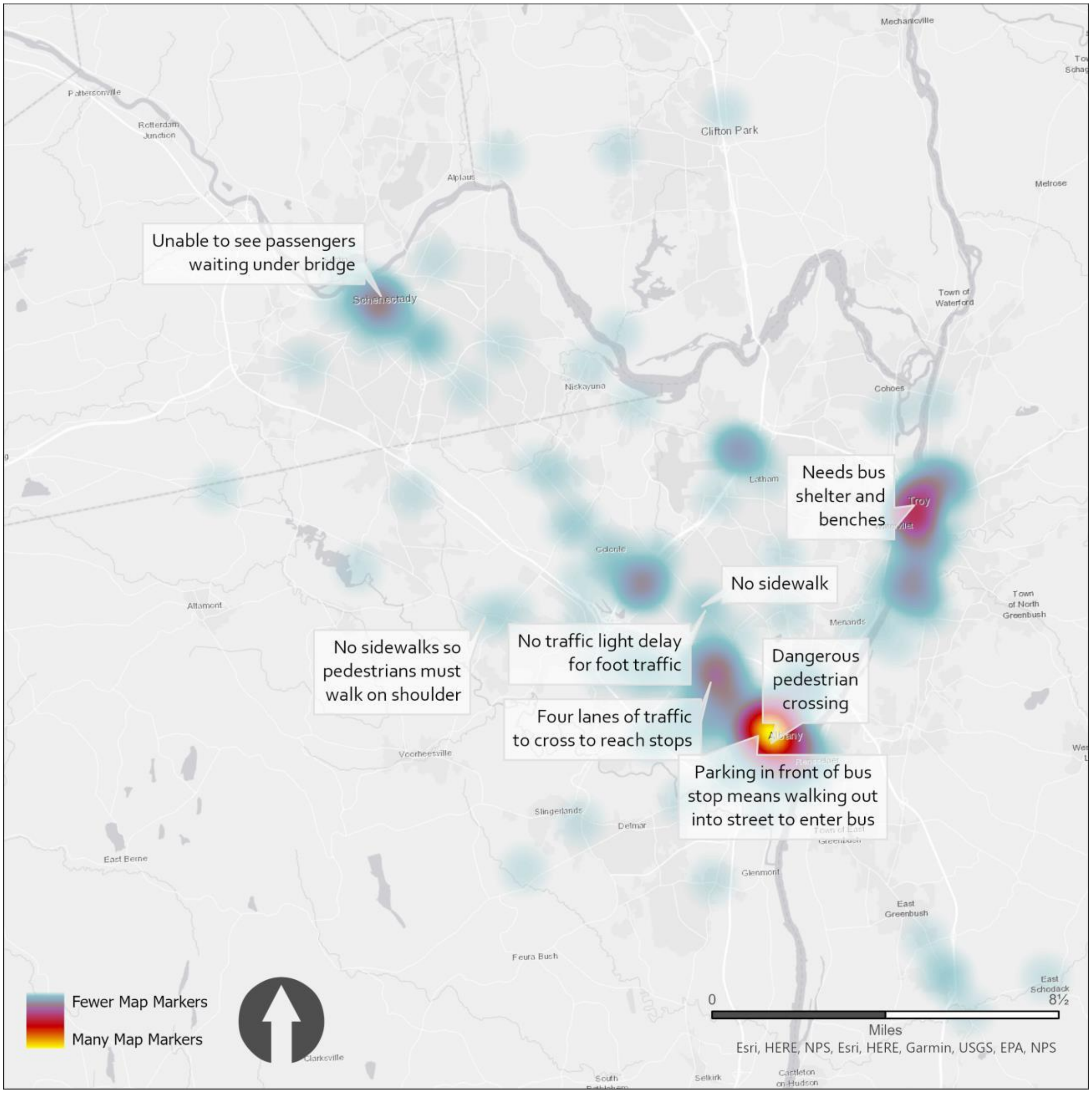
Figure 26: Intersection Delay Issue Map Markers



Unsafe Conditions Near Bus Stops

Respondents placed 219 Unsafe Conditions Near Bus Stops map markers and left 136 comments to describe what is unsafe at their selected point. A heat map of the markers is shown in **Figure 27**, along with a selection of comments, edited for clarity.

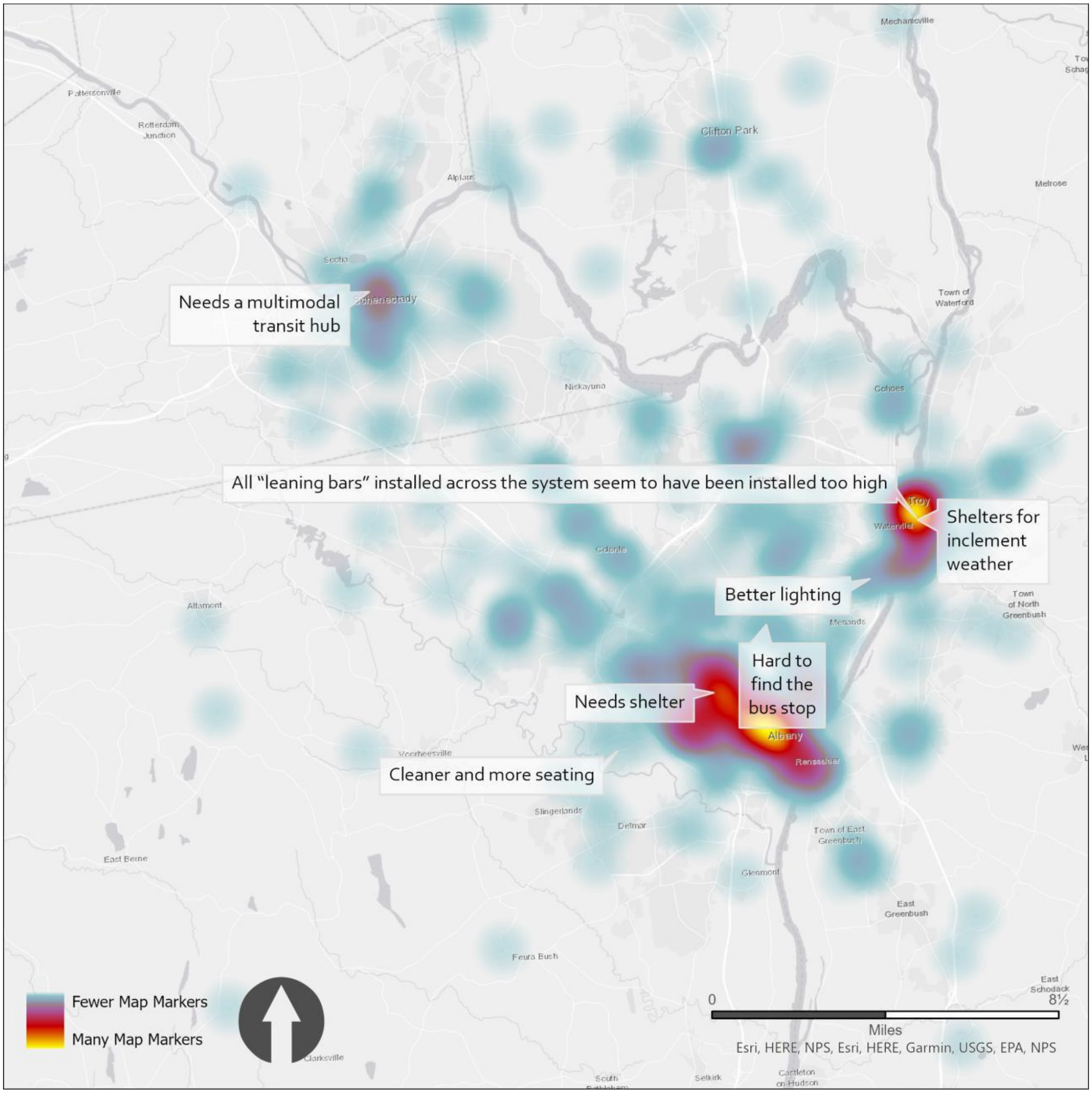
Figure 27: Unsafe Conditions Near Bus Stops Map Markers



Improve Bus Stops

Respondents placed 426 Improve Bus Stops map markers and left 234 comments to describe what needs improvement at their selected point. A heat map of the markers is shown in **Figure 28**, along with a selection of comments, edited for clarity.

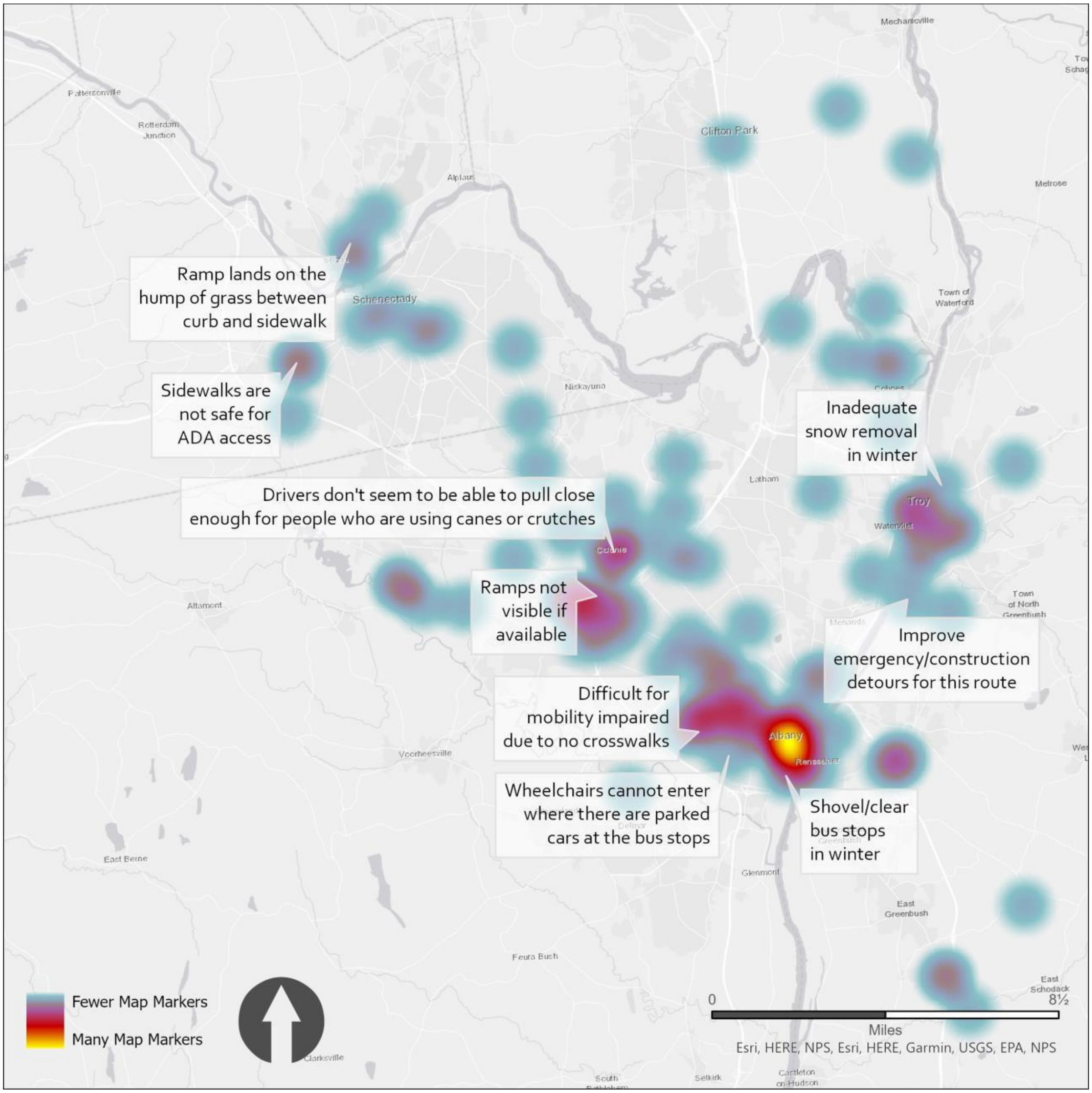
Figure 28: Improve Bus Stops Map Markers



Improve Access

Respondents placed 117 Improve Access map markers and left 48 comments to describe how access can be improved at their selected point. A heat map of the markers is shown in **Figure 29**, along with a selection of comments, edited for clarity.

Figure 29**: Improve Access Map Markers**



7. KEY FINDINGS

The survey results indicate that respondents would generally support bus lanes. The most commonly selected factors that influence respondents' decision to drive or take the bus are access to frequent buses near them and travel time reliability, both of which would improve with bus lanes. Respondent's answers to the following themes show that they find congestion to be an issue and prefer bus lanes and bus priority policies and investments over those that favor private vehicles.

Congestion

- **33 percent** of respondents agree that buses are frequently stuck in congestion.
- The Slow Buses / Congestion Issues map marker received the **second-most responses.**

Bus Priority Infrastructure

- **70 percent** of respondents prefer giving buses extra green time.
- **76 percent** prefer investing in bus priority infrastructure.
- **61 percent** prefer removing parking or reducing parking time for bus lanes.

Congestion

More respondents agree or strongly agree (33 percent) rather than disagree or strongly disagree (26 percent) that buses are frequently stuck in congestion. Additionally, in the mapping activity, the "Slow Buses / Congestion Issues" map marker received the second-most responses after "Improve Bus Stops," indicating riders have more issues with congestion than accessibility, safety conditions near bus stops, and intersection delay issues.

Bus Priority Infrastructure

The tradeoff exercise offered support for bus lanes. Seventy (70) percent of respondents strongly prefer or prefer giving buses extra green time over maintaining delay for private vehicles, and 76 percent strongly prefer or prefer investing in bus priority infrastructure over investing in more or wider roads. Additionally, 61 percent of respondents strongly prefer or prefer removing parking or reducing parking time for bus lanes over maintaining parking or more parking.

8. APPENDICES

Pop-Up Summary

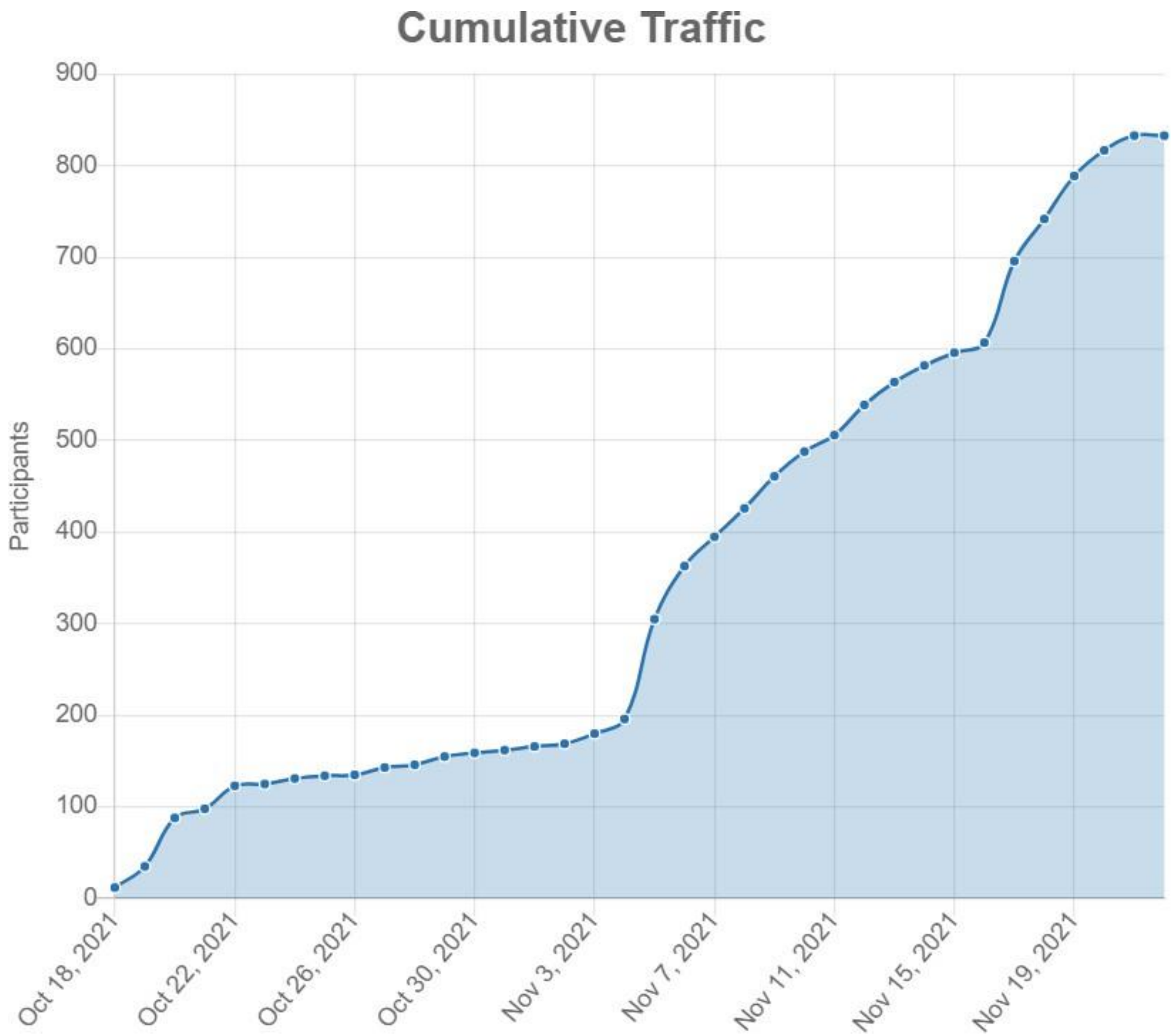
Purpose:	Inform Public About the Project, Distribute Survey Cards and Virtual Webinar Notice
Date, Times, and Locations:	October 21, 2021, #1 7:00am-9:00am and #2 11:00am to 1:00pm. #1: Bus stops at corner of State St and Pearl St in downtown Albany, 90 State St, Albany, NY 12207 #2: Bus stop in front of Albany Public Library and at corner of Washington Ave and Route 9W
Number of survey cards distributed during the day.	■ Approximately 465
Number of project flyers distributed	■ Approximately 25-30
Key observations about what worked well, what was challenging, any lessons learned to keep in mind for hosting a future event at this location, and any extenuating circumstances that impacted the event success (e.g., weather conditions, many non-English speakers, etc.).	■ The weather conditions were perfect for event. ■ The morning was busier and more materials were distributed than the afternoon session. ■ At the library location, important to be in front of the bus stop, not the library. ■ The survey cards were easier to distribute and more readily picked up as opposed to the flyers. ■ The swag items were great, and people loved them. ■ The MJ group did not encounter any non-English speakers. ■ The morning transit riders moved much quicker than the afternoon crowd who seemed to have more time between buses and wanted to chat. ■ Table locations were very good – visible but out of the way for riders getting in and out of the buses.

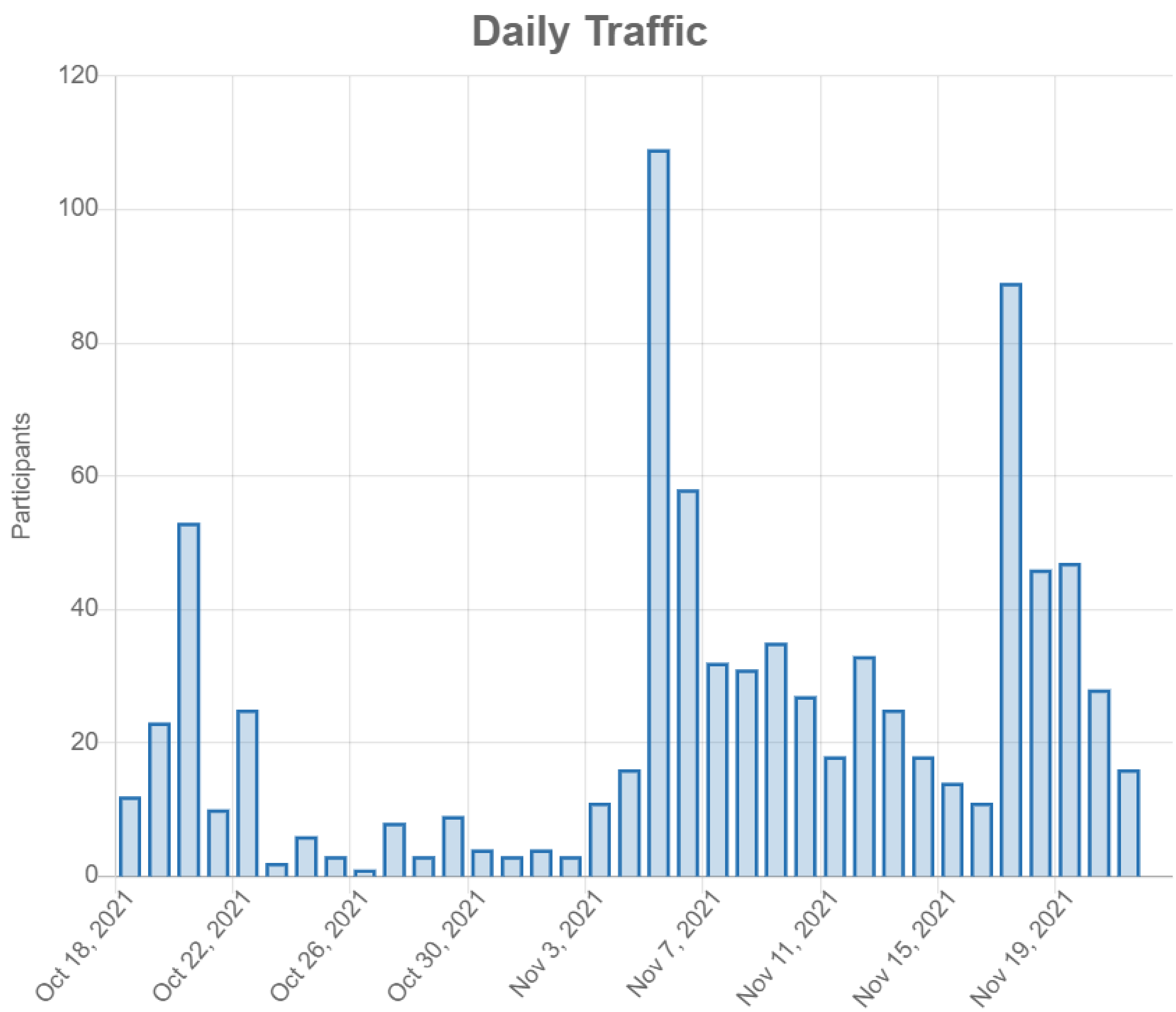
Conversation topic highlights	■ Comments from riders: – Support for the bus lanes and said there could be improvements in dependability, speed, and frequency of buses – Lack of confidence from folks that changes will be made – Focus on certain routes, not bus lane project specific – Described issues with transfers, not having enough time between buses (e.g., from Pearl to State) – Positive feedback on bus service in general – Positive feedback regarding the quality of bus drivers ■ Bus drivers: – Need more drivers – Feel like they do not have a voice
Photos taken at the event	Link to photos

Purpose:	Inform Public About the Project, Distribute Survey Cards and Virtual Webinar Notice
Date, Times, and Locations:	October 27, 2021, 11:00am to 2:00pm. Gateway Plaza: 12 State St, Schenectady, NY 12305
Number of survey cards distributed during the day.	■ English: 84 ■ Spanish: 0 ■ Mandarin: 0
Conversation topic highlights	■ Have the 450 stop at the casino ■ Don't have an issue with the 905/10 running slow – passengers slow it down ■ 905 and 353 weekend service should be same as weekday service. Can't get to work on Sundays by bus. ■ Consider bus priority signal at State + McClelland and State + Brandywine ■ Slow in Albany: Central + Lake and Central + Hannford ■ Service to Wilton Mall + Wolf Rd Colonie Center ■ Washington Ave: Crossings to the Commons is complicated transfer ■ Difficult to add cash to bus card as there are not enough locations ■ Oscar is an exceptional driver on the 353 ■ Try and have a route from Troy to Saratoga: maybe up route 32 or 9 ■ Bus cards are hard to load for seniors who live alone and there are not enough locations when paying with cash ■ The 353 needs to be slowed on Altamont Avenue: it jostles grocery bags and backpack ■ The Albany street area at Veeder and Georgetta Dix has an intersection problem related to the signal and the bus stops

Purpose:	Inform Public About the Project, Distribute Survey Cards and Virtual Webinar Notice
Date, Times, and Locations:	October 22, 2021, 12:00pm to 3:00pm. Riverfront Station in Troy
Number of survey cards distributed during the day.	▪ Not documented
Conversation topic highlights	▪ Not documented

Measuring Success




Daily Traffic
Participants
120
100
80
60
40
20
0
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Oct 22, 2021
Oct 26, 2021
Oct 30, 2021
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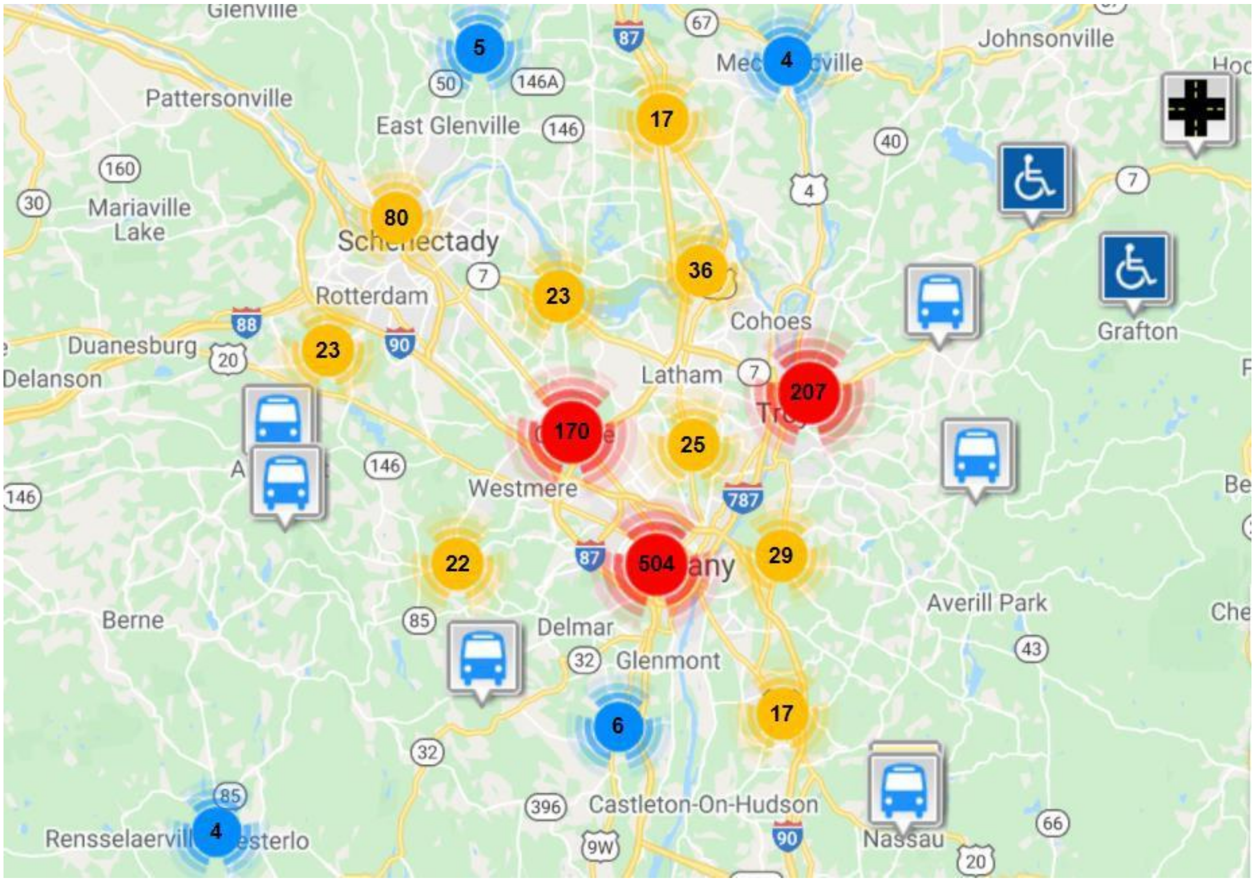
Nov 7, 2021
Nov 11, 2021
Nov 15, 2021
Nov 19, 2021


Glenville
Johnsonville
Pattersonville
East Glenville
Mariaville Lake
Rotterdam
Cohoes
Duanesburg
Delanson
Grafton
Latham
Westmere
Averill Park
Berne
Delmar
Glenmont
Castleton-On-Hudson
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36
23
170
207
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22
504
29
6
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4

CAPITAL REGION BUS LANE FEASIBILITY STUDY

Phase II Public Engagement MetroQuest Survey Results

CONTENTS

FIGURES

1. RESPONDENT DEMOGRAPHICS

Geographic Distribution

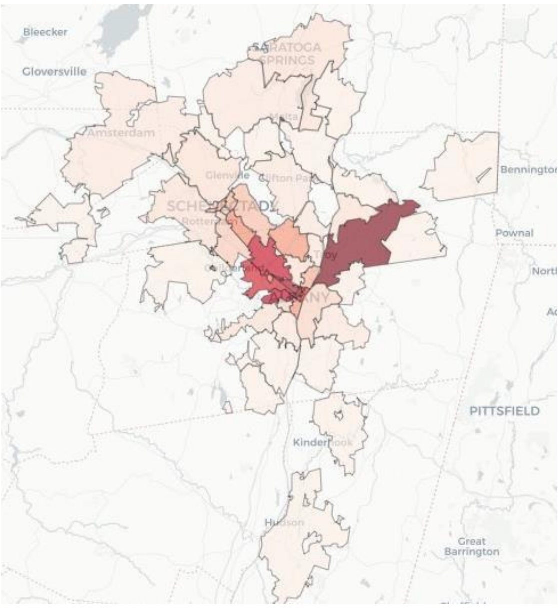


Figure 1: Work/School Zip Code

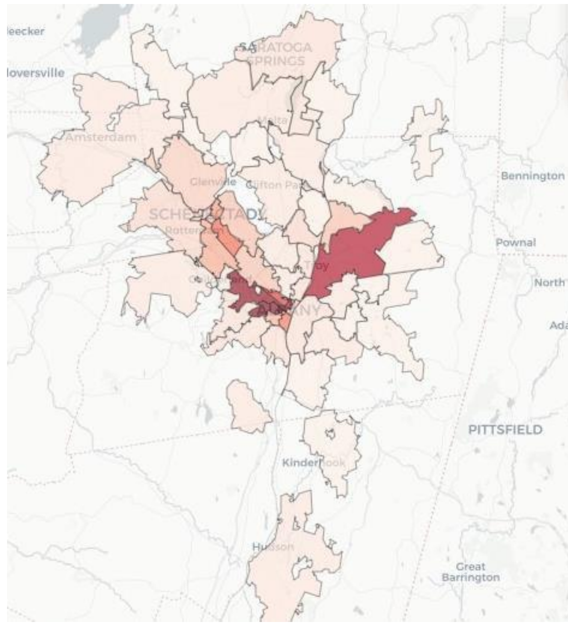


Figure 2: Home Zip Code

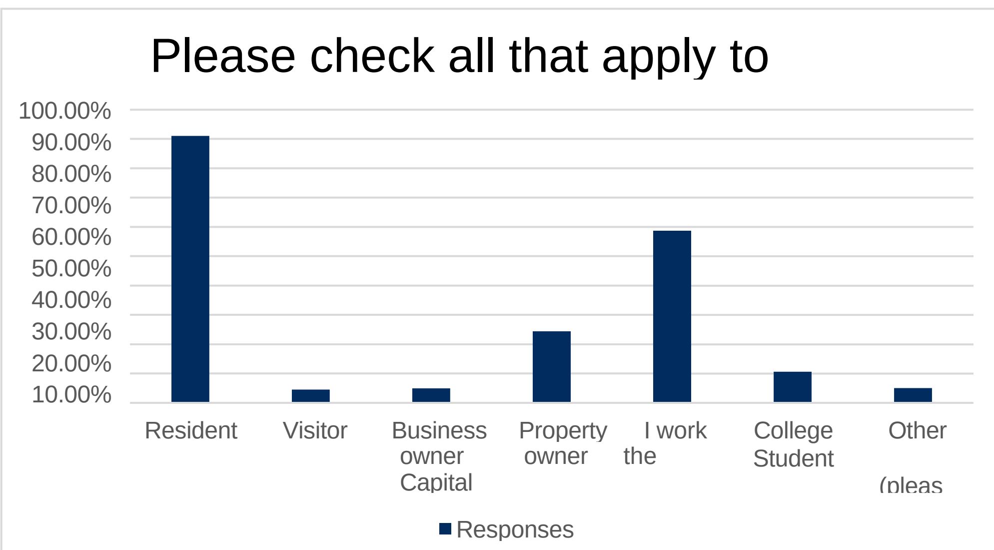


Figure 3: Respondent Residency

Age

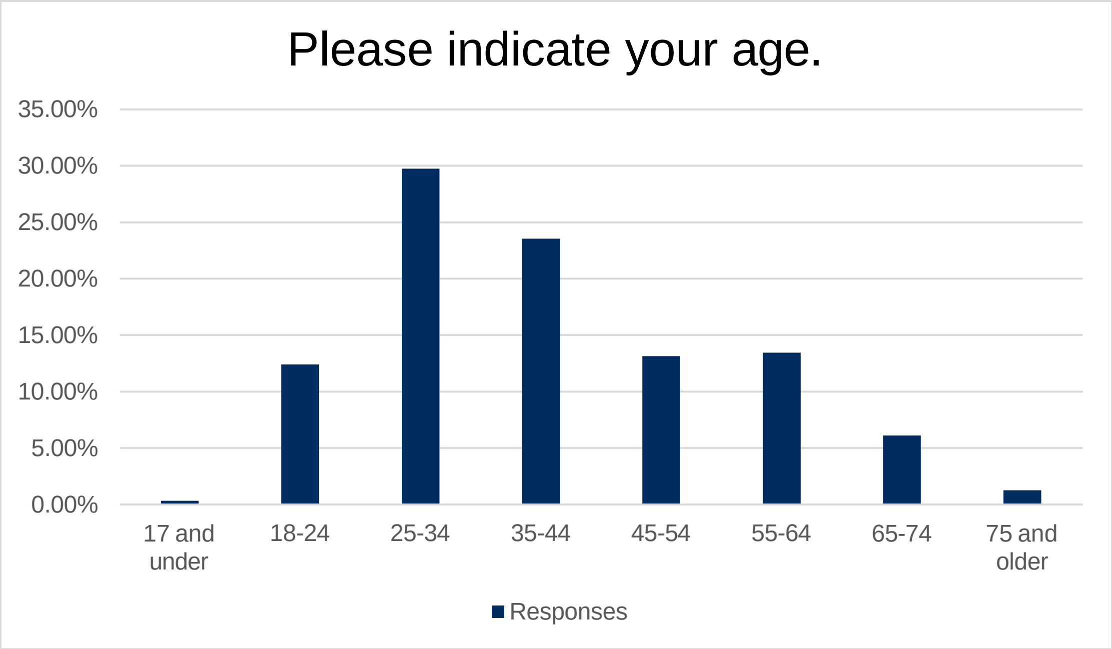


Figure 4: Respondent Age Distribution

Household Income

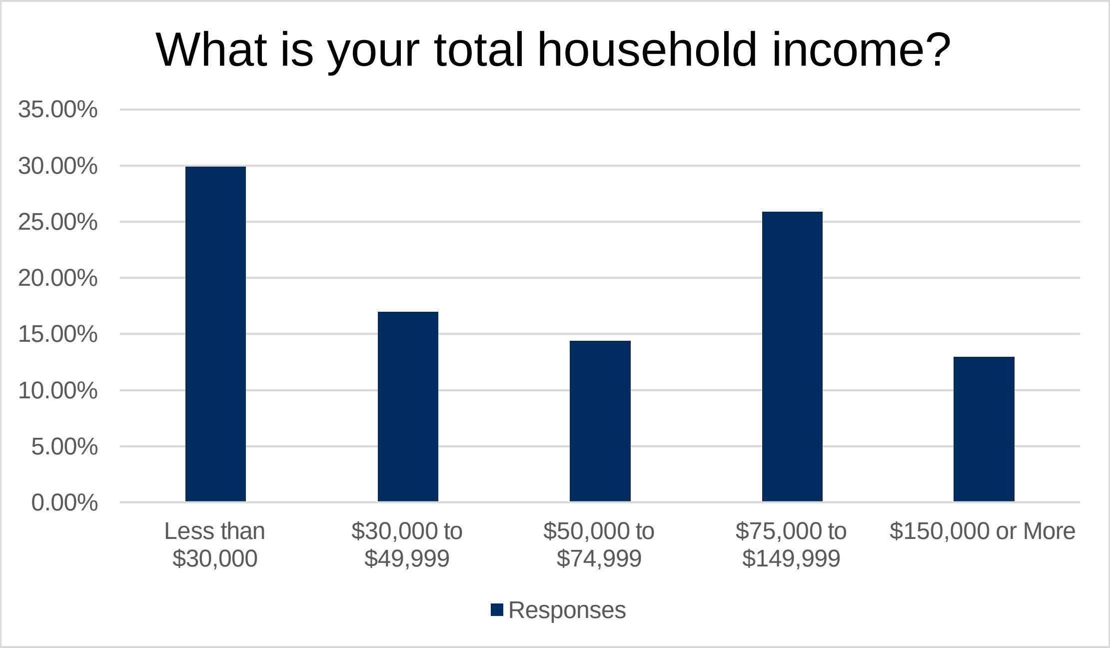


Figure 5: Respondent Income Distribution

Disability

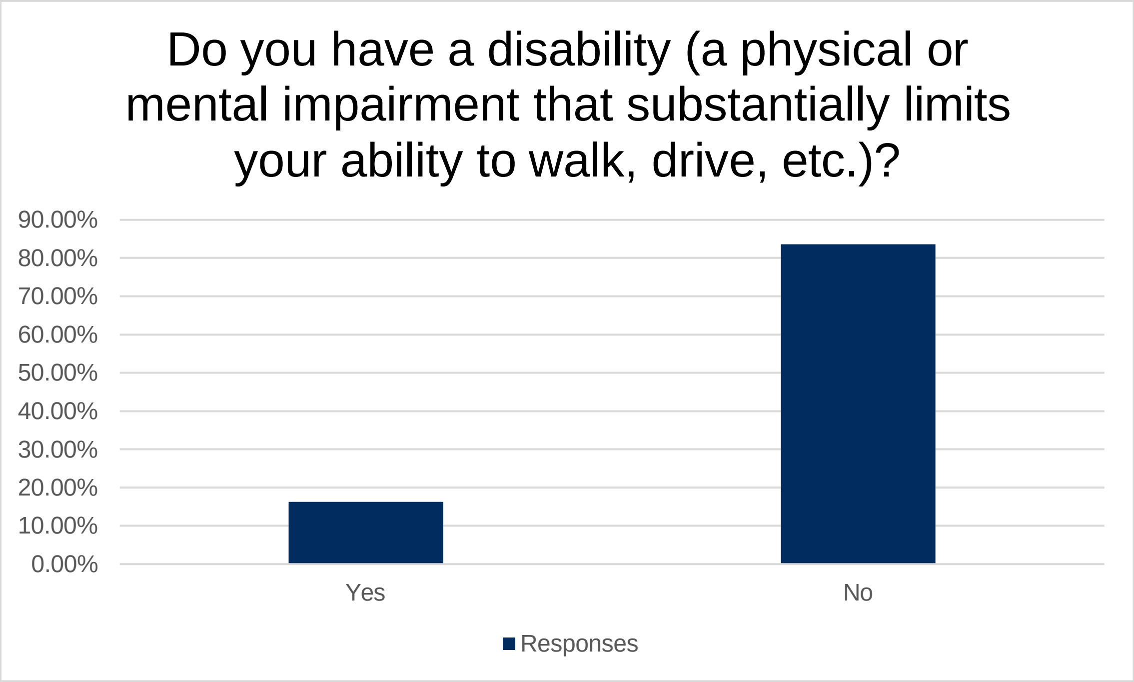


Figure 6: Respondent Disability

2. BUS RIDERSHIP

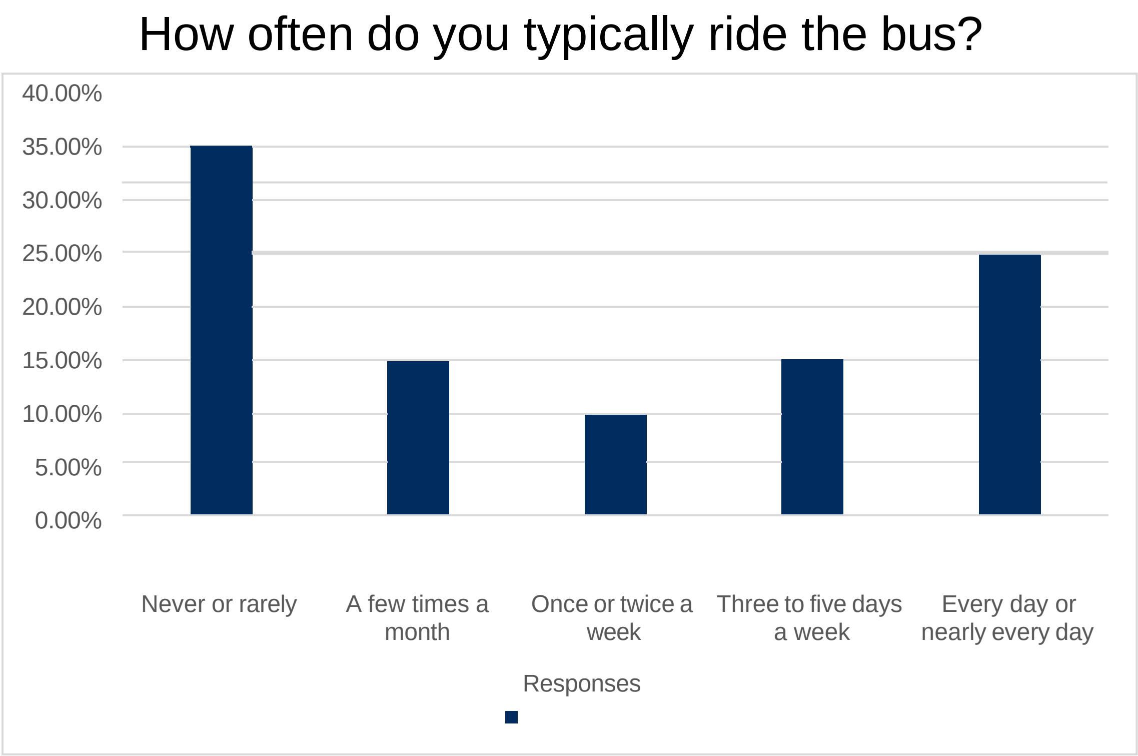


Figure 7: Respondent Bus Ridership

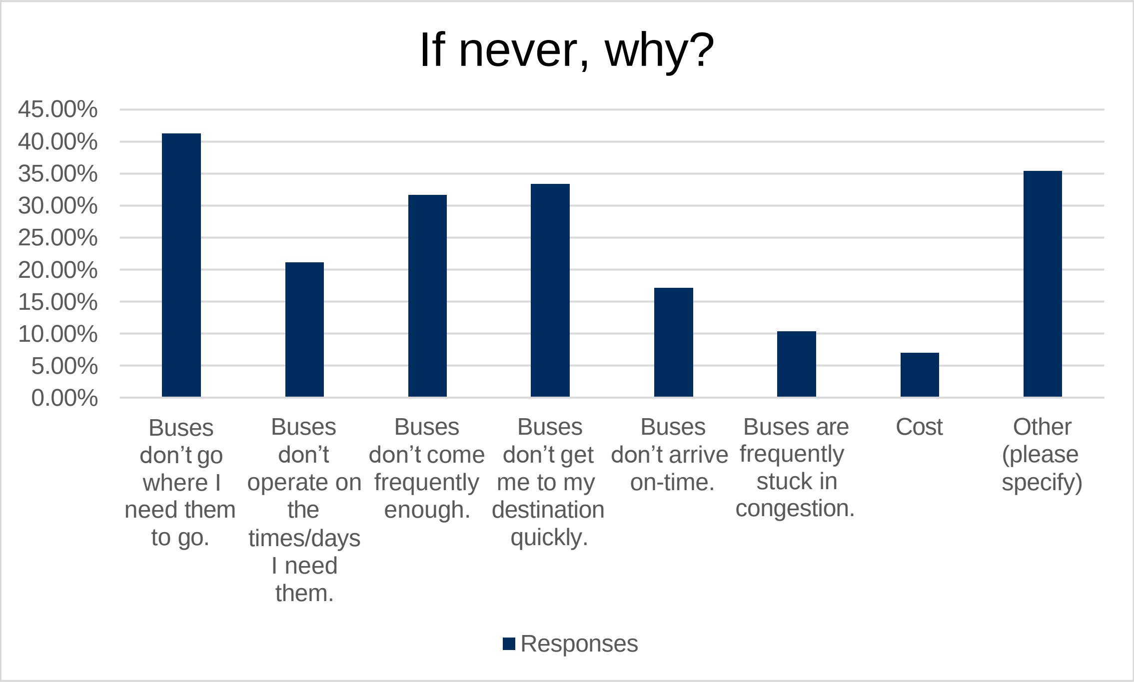


Figure 8: Respondent Bus Concerns

3. CORRIDOR PRIORITY MODES

Washington/State Street

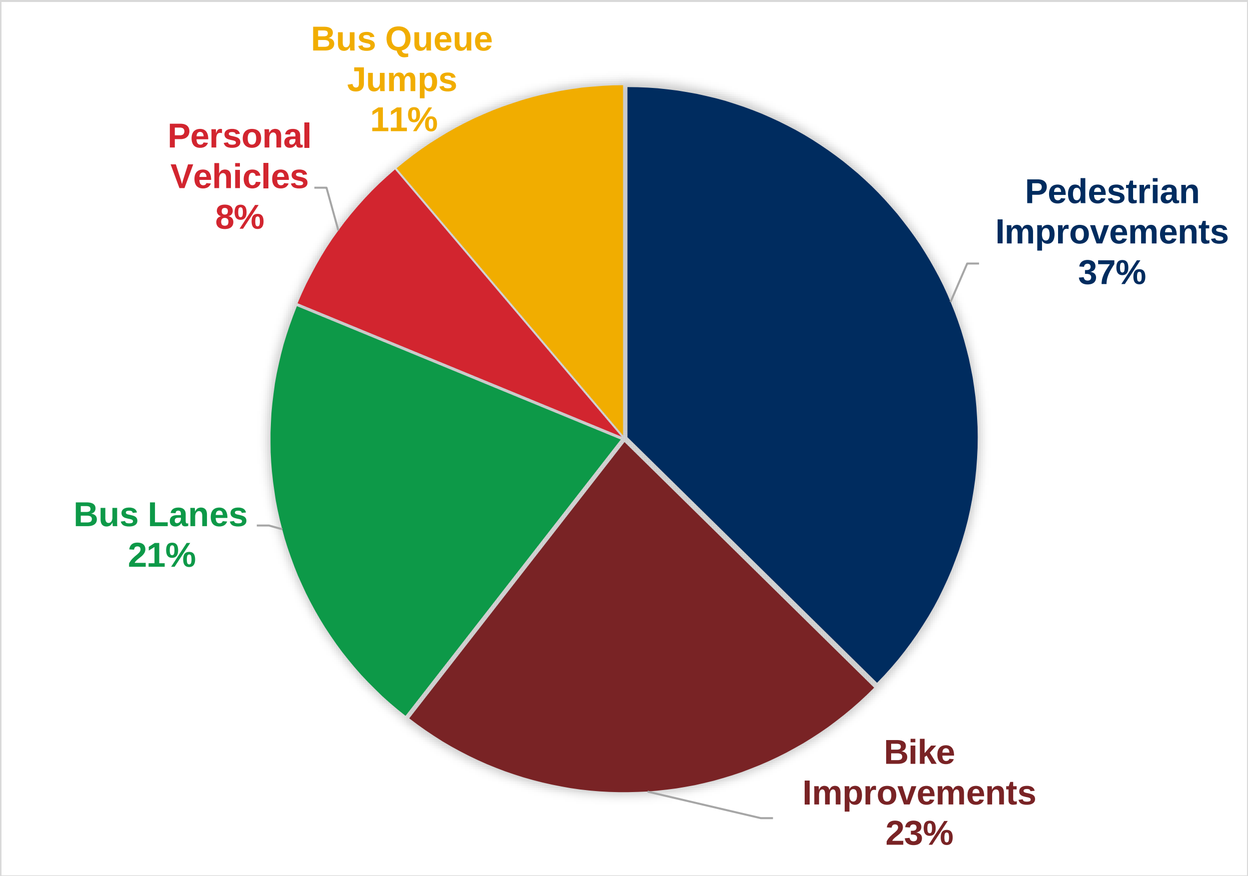


Figure 9: Washington/State Street - Distribution of First Place Rankings

Central Avenue

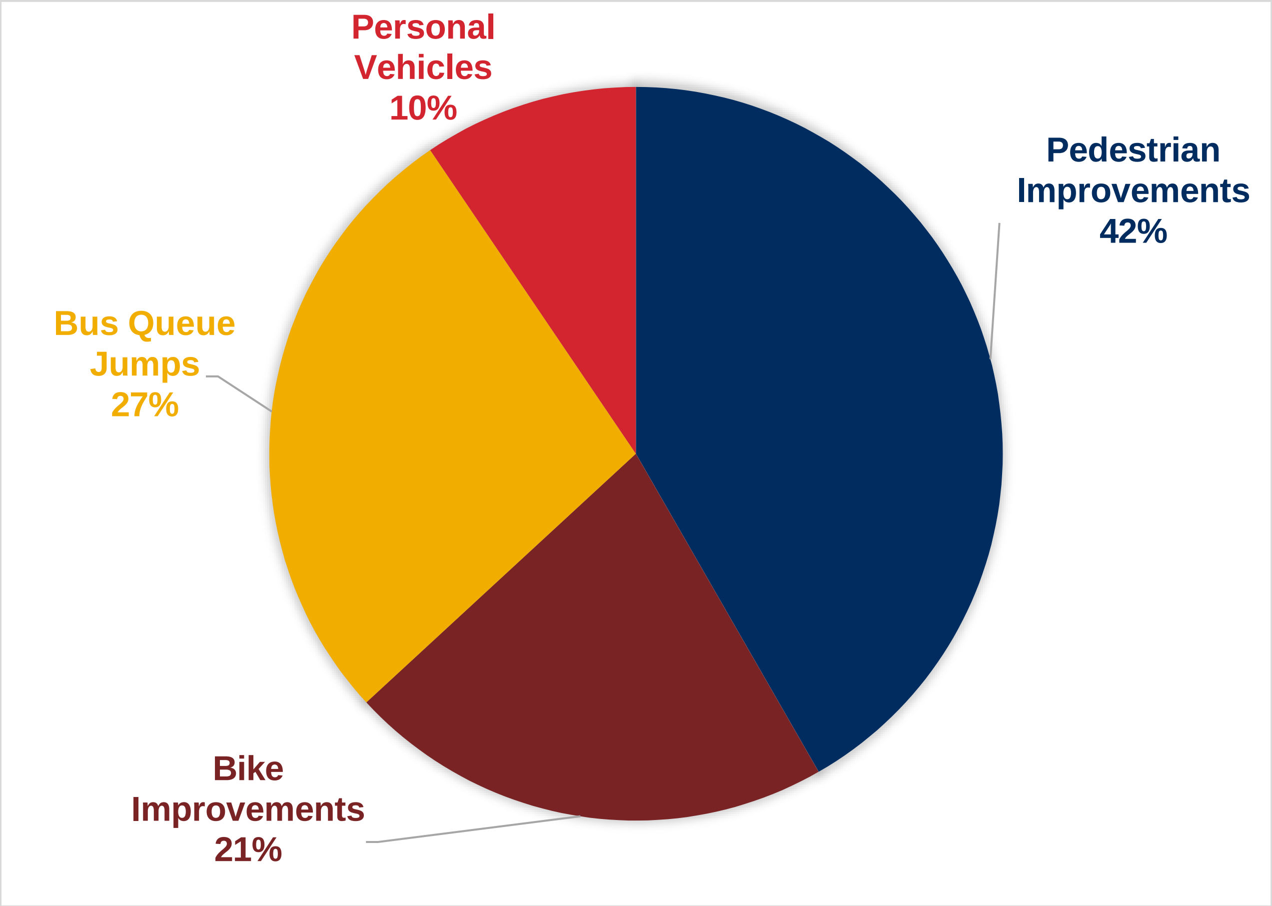


Figure 10: Central Avenue - Distribution of First Place Rankings

3rd/4th Street

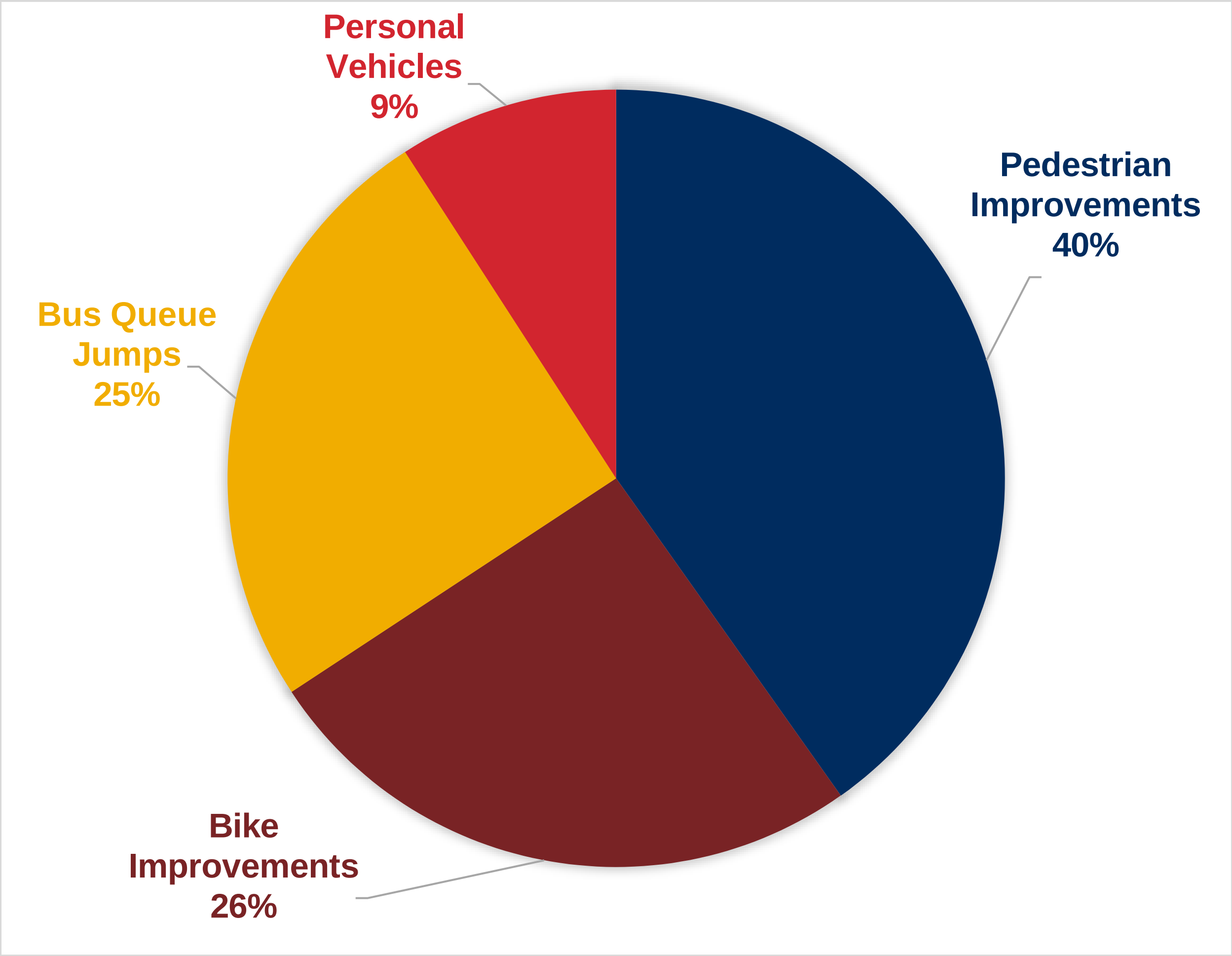


Figure 11: 3rd/4th Street - Distribution of First Place Rankings

Schenectady State Street

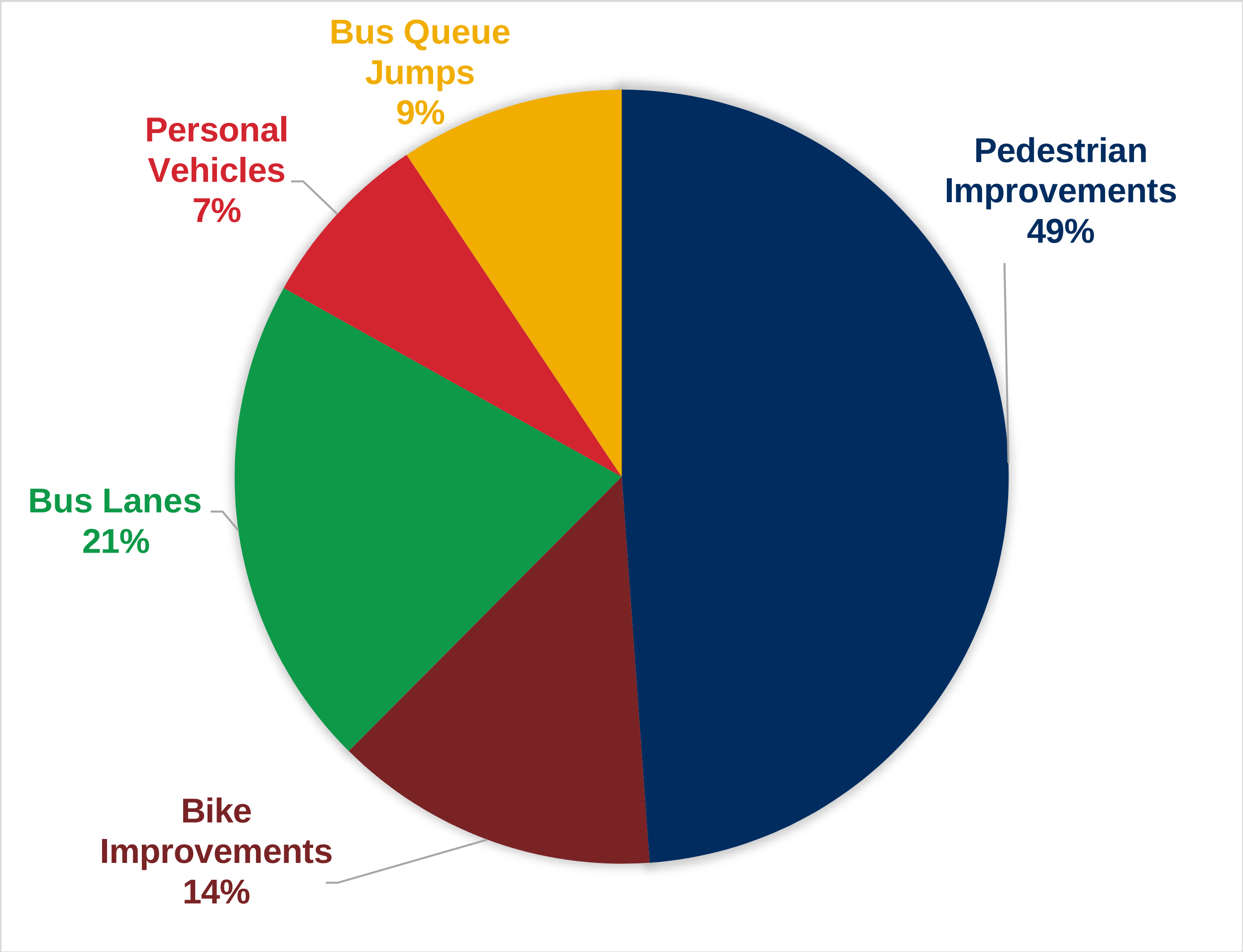


Figure 12: Schenectady State Street - Distribution of First Place Rankings

4. QUEUE JUMPS

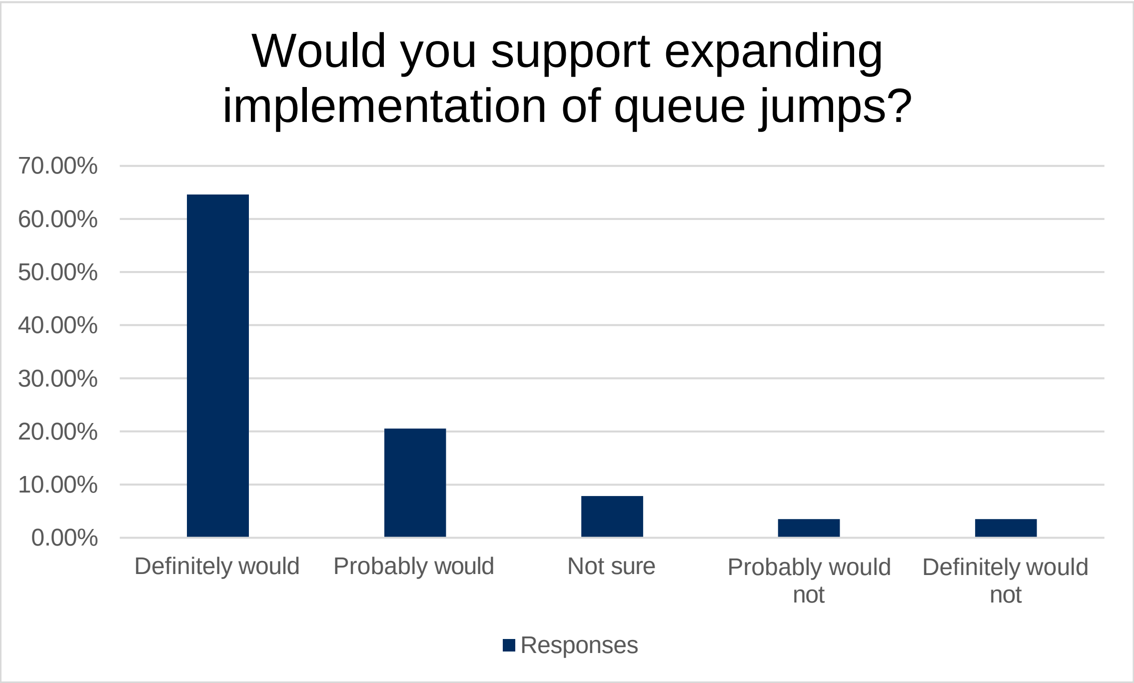


Figure 13: Respondent Queue Jump Support

CDTC
CAPITAL DISTRICT
TRANSPORTATION COMMITTEE

CDTA

CAPITAL REGION BUS LANE FEASIBILITY STUDY

Phase III Public Engagement Results

CONTENTS

1. SUPPORTIVE COMMENTS

“In the Draft Final Report, specifically pages 32-33, when articulating Final Recommendations, I want to reemphasize support for Queue jumps. In my use of CDTA where queue jumps are present, it has made significant difference in getting the bus ahead of the “congested” traffic pack. I believe this is the low hanging fruit that can really energize several routes that provide excellent frequency, but get bogged down in congestion, especially the notion of installing queue jumps along multiple blocks serving as tactical bus lanes (while outside the scope of this study, I believe Route 106 and 13 could really benefit from this tactical approach, where when using these routes during rush hour, they get tied up at the many intersections they touch). Systemwide, there are many instances where the bus I’m on has pulled into a stop at an intersection, but is boxed in by a long line of traffic and struggles to get back into line, and queue jumps would be a critical game changer towards solving this issue.”

“Fully support, please anything to make the bus system reliable. Albany is a marvelous city but we MUST do everything we can about the connectivity blight.”

“I ride CDTA Buses along Washington and Central every day to work and to pick up my daughter from school and congestion and slow speeds are a huge problem along these routes, leading to bus bunching, service delays, and unreliable trip times. I advocate for implementing these bus lanes as soon as possible to improve travel times on buses and provide more mobility options to everyone.”

“I fully support the expansion of bus lanes throughout the capital region. Additionally, the creation of protected bike lanes is essential for safe bike travel. They should be created by the CDTA across the region as well.”

“I live in Albany and am speaking to those recommendations. I am in favor of lane reductions and pedestrian improvements and am heartened to see the recommendations for Washington/State, Central, and Broadway. Please make these recommendations and help the city of Albany to implement them!”

“Beautiful work”

“The study was great, everything they changed is great”

“I think that the bus and bike lanes are a positive thing.”

“The temporary floating bus stops which transition into permanent floating stops with a dedicated, PHYSICALLY PROTECTED, bike lane seems to be the best option to improve both bus rider and bike rider comfort and safety. As a taxpayer, I would approve of this plan.”

“Good work done on this final report that only need the best way of implication”

“We really need bus lanes, especially where the entrances to I90/87 are. These entrances cause the biggest backups and the biggest delays in the entire CDTA network. Especially around Central Ave near West Mall Station, and Central Ave & Wolf Road. Que jumps and pedestrian improvements are welcome additions throughout the rest of the system.”

“I think it's great to do a study of lane feasibility as there are many. Riders who ride the CDTA bus and we all want to be safe it's good to have bus lanes where there is not a lot of traffic nearby so customers can board the bus safe and get off safe without worries about traffic. Also there always should be a bike lane near the bus stops so bikers can be safe and the people with walkers and canes should be able to board the bus first and the drivers should pull all the way up to the curb for boarding. I had a mishap while boarding a CDTA bus. I had bags and the driver was not close to the curb and I fell on the bus and nothing broke so this is an important factor. Also keeping the bus stops clean from snow and ice so passengers can board the bus safely. Hope this will help your study and many times buses are not on schedule especially on the weekends then you see two buses coming at once.”

“Plan looks very good in general. IMO bus only lanes make most sense where there are many bus trips per hour. For example, Albany State St. off peak, and/or outside busiest stretches, bus lanes could be shared with bicycles and increasingly popular e-bikes.”

2. CONSTRUCTIVE COMMENTS

"In reading this report there are many good points about the necessity of these corridors. However, the two transit points that are conspicuously absent in the report are the airport and the train station. That you have people unable to get to the two biggest transit points in an easy regular manner is a shame for visitors as well as residents. Why do we have to rely on Ubers in a town with an otherwise robust transit system."

"How are bikes going to be accommodated? Especially on central Ave where a street diet was planned, I would expect bike lanes to still be a part of this concept. In all cases, the bus Lane should be a shared bus and bike lane, with accommodations for cyclists through intersections or at bus stops where conflict may occur."

"The downtown State St. corridor should be expanded to include the Rensselaer Rail Station, a fertile source of potential bus passengers entering the area each day without automobiles. Better service to the rail station would benefit rail passengers and bus passengers in the underserved Rensselaer area by justifying more frequent service. CDTA runs the train station -- it should do more to capture potential bus passengers using the station."

"Hello, I am a frequent rider and would like to see shade trees planted at as many bus stops as possible. Shelters are awful in the summer. They do not provide adequate shade, but they do cut off the breeze. It is the worst possible situation on days without rain. I have health conditions that require careful maintenance of my body temperature and so am sensitive to this issue. I have also found that service on the 13 and 18 lines have made it difficult for me to arrive on time at medical appointments. Some days, there seems little correlation between the schedule and the arrival times of the buses. Finally, there is very little service to the Albany Memorial Hospital complex and to Corporate Woods, where again, I go and have gone, respectively, for medical appointments. As a person trained in the study of complex systems, I know that the fact that the poor service toward Delmar, Slingerlands, and Loudonville correlates with few people who want to ride the bus in those directions, so service is poor, making ridership decline further, and so on. Thank you for all you are doing. I am a great fan of our bus system and wish more people used it, so that service would expand. I applaud your efforts to achieve this."

"I hope that the CDTA can find a way to work with the city on parking enforcement and not make the illegal behavior of motorists a priority over public transit."

"I think improved CDTA access to Albany Airport either through the Wolf Road corridor or Rt. 155 is important for serving the public. The transit options for the airport are limited. I would like to see a NX style bus service which would run between Schenectady to Albany via 890 and 90."

“Looking for how friendly to pedestrians and bus riders this study is”

“Troy study corridor should have included bus travel on Rt. 7. This is a very congested corridor.”

“We also need bus route from Russell Road at western avenue to Suny Albany please extend the bus number 11”

“As this project progresses, I encourage you to give less deference to preserving on-street parking. This appears to be a main consideration (despite being lowest community priority) in knocking the bus improvements down to a minimum. Compared to the number of people served by transit, the number of people served by street parking are miniscule. Remember you are building for a future where taking the bus/biking are the best transportation options, you're not building to maintain the status quo. Thanks for doing this though, I like the protected bike infrastructure.”

“I fully support the improvements included in the proposal but was disappointed not to see CDTA try to push for more, especially dedicated bus-only lanes. This was a bus lane feasibility study that found that lanes would be justified but didn't ask to implement them where they would be most beneficial.”

“Connect the urban areas via the bus — don’t create three distinct, separate service areas”

“The bus stops by the Atrium are very well set up to handle, but I believe that we need the busses to be more attentive to individual stops.”

“Public transit is an essential element of all vibrant, sustainable, and economically prosperous cities. High quality transit reduces traffic, carbon emissions and air pollution, saves workers money on transportation costs compared to costly car expenses, and makes streets safer by reducing automobile use, which is 70 times deadlier than riding the bus.

CDTA provides an essential service for our community, with more frequent service than other cities of Albany’s size, and a growing network of fast and frequent Bus Plus routes. However, to build true Bus Rapid Transit (BRT) that provides world class service, buses need road priority over less efficient single occupant vehicles. CDTA’s existing Bus Plus routes often provide little time savings over local service because of car traffic, with buses bunching and arriving at stops simultaneously instead of adhering to strict schedules and providing consistent headways.

We were glad to hear of the BLFS and have provided input through the community engagement phase. However, we were disappointed to read the final report and discover that bus lanes were not recommended along Washington/State/Broadway and Central Ave in lieu of much less beneficial queue jumps, with on street parking concerns being a primary factor in the decision to not recommend bus lanes.

Queue jumps provide only small time savings of 2-7 seconds per intersection while curbside bus lanes can provide between 5-15% reduction in total travel time. Median bus lanes provide the greatest time savings by restricting right turns and illegal parking that is a problem with curbside bus lanes, although they also require the greatest capital outlay. Median bus lanes are appropriate for corridors which have over 12 buses per hour, and the Washington/State/Broadway study segment has a bus approximately every minute at peak hours.

Considering these facts, we advocate for median bus lanes along the Downtown study segment and curbside bus lanes along Central Ave to deliver high quality transit that provides the greatest mobility to all users and is competitive with driving for travel times.

Building bus lanes on these busy segments is absolutely essential for Albany to improve our environment, provide equitable access to transportation, promote economic growth, and save time and money for residents. Albany must invest in a better future by prioritizing moving people over on-street parking to provide fast and reliable transit that reduces driving and improves the quality of life for all."

"I would have liked to see some corridors selected where there is transit service--typically slow and unreliable-- that would greatly benefit from priority. No attempt to speed the long trips from the north and east by exploring bus-on-shoulder concepts. I guess one must start somewhere, but to ignore everywhere and everyone outside of the primary business districts seems like a missed opportunity."

"It's disappointing to see the New Scotland Ave and Whitehall corridors left out of this study and others. They may not currently represent the highest ridership areas, but there is a lot of potential untapped ridership that can be captured with roadway improvements, particularly on New Scotland. Traffic around the hospitals is very high during peak times. Bus prioritization and more N-S connections to the routes on Western, Washington, and Central could improve the area. Thank you."

"It is apparent that CDTA will not expand outside the Capital District areas to areas 20+ miles south of Albany. Thank you for your time"

3. UNSUPPORTIVE COMMENTS

“Proposed areas are busy enough with the two lanes provided this is going to ruin travel times for car drivers.”

“This is going to clog up traffic and people are going to just drive illegally in the bus lane.”

“The number of passenger vehicles compared to buses makes it unclear why busses get their own lane. Traffic is bad enough, we need commuter lanes just as badly.”

Why would you make it worse for everyone else for bus riders? The proposed areas are busy enough with the two lanes provided and you want to take that away? This is the dumbest idea ever and it's going to ruin travel times for car drivers. Apparently since we don't take the bus how it impacts us is irrelevant, this is a terrible idea.

Environmental Justice

Introduction

Per federal requirements, the Capital District Transportation Committee (CDTC) undertakes an analysis of Environmental Justice in all Community and Transportation Linkage Planning Program (Linkage Program) initiatives to evaluate if transportation concepts and recommendations impact Environmental Justice populations. Impacts may be defined as those that are positive, potentially negative and neutral as described in CDTC's Environmental Justice Analysis document, dated March 2020. The goal of this analysis is to ensure that both the positive and negative impacts of transportation planning conducted by CDTC and its member agencies are fairly distributed and that defined Environmental Justice populations do not bear disproportionately high and adverse effects.

This goal has been set to:

• Ensure CDTC's compliance with Title VI of the Civil Rights Act of 1964, which states that "no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance,"

• Assist the United State Department of Transportation's agencies in complying with Executive Order 12898 stating, "Each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

• Address FTA C 4702.1B TITLE VI REQUIREMENTS AND GUIDELINES FOR FEDERAL TRANSIT ADMINISTRATION RECIPIENTS, which includes requirements for MPOs that are some form of a recipient of FTA, which CDTC is not.

Data and Analysis

CDTC staff created demographic parameters using data from the 2013-2017 American Community Survey (ACS). Threshold values were assigned at the census tract level to identify geographic areas with significant populations of minority or low-income persons. Tracts with higher than the regional average percentage of low-income or minority residents are identified as Environmental Justice populations. Minority residents are defined as those who identify themselves as anything but white only, not Hispanic or Latino. Low-income residents are defined as those whose household income falls below the poverty line.

The transportation patterns by race/ethnicity, income, age, English ability, disability status, and sex in CDTC's planning area are depicted in table III-2 through III-7, using the commute to work as a proxy for all travel. The greatest difference between the defined minority and non-minority population is in the Drive Alone and Transit categories: The minority population is almost 20% less likely to drive alone, 11% more likely to take transit, and is also more likely to walk and carpool. The defined low-income population and the non-low-income population follow the same trend, with the low-income population 20% less likely to drive alone, 10% more likely to commute via transit, and more likely to walk and carpool. Other categories showed a lesser difference.

Table 1: Commute Mode by Race/Ethnicity

By Race/Ethnicity	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
All Workers (16+)	80.0%	7.6%	3.7%	1.2%	3.4%	4.1%
White Alone Not Hispanic or Latino	83.3%	6.9%	1.8%	1.0%	2.7%	4.2%
Minority	**63.8%**	11.0%	**12.9%**	2.0%	7.0%	3.3%

Table 2: Commute Mode by Income

By Income	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
At/Above 100% Poverty Level	81.8%	7.4%	3.2%	1.1%	2.6%	3.9%
Below 100% Poverty Level	**61.3%**	11.3%	**13.2%**	2.4%	8.8%	3.0%

Table 3: Commute Mode By Age

By Age	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
16-19 Years	**59.9%**	**16.2%**	4.3%	2.9%	**13.0%**	3.8%
20-64 Years	80.8%	7.4%	3.7%	1.1%	3.1%	3.9%
65+ years	80.7%	5.0%	2.9%	1.3%	2.5%	7.6%

Table 4: Commute Mode by English Ability

By English Ability	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
Speak English Very Well	70.3%	11.7%	4.8%	1.8%	7.0%	4.4%
Speak English Less than Very Well	65.6%	14.3%	8.3%	1.2%	7.4%	3.2%

Table 5: Commute Mode by Disability

By Disability Status*	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
Without any Disability	80.7%	7.4%	3.5%	1.1%	3.4%	4.0%
With a Disability	**71.1%**	11.2%	6.7%	2.4%	4.3%	4.3%

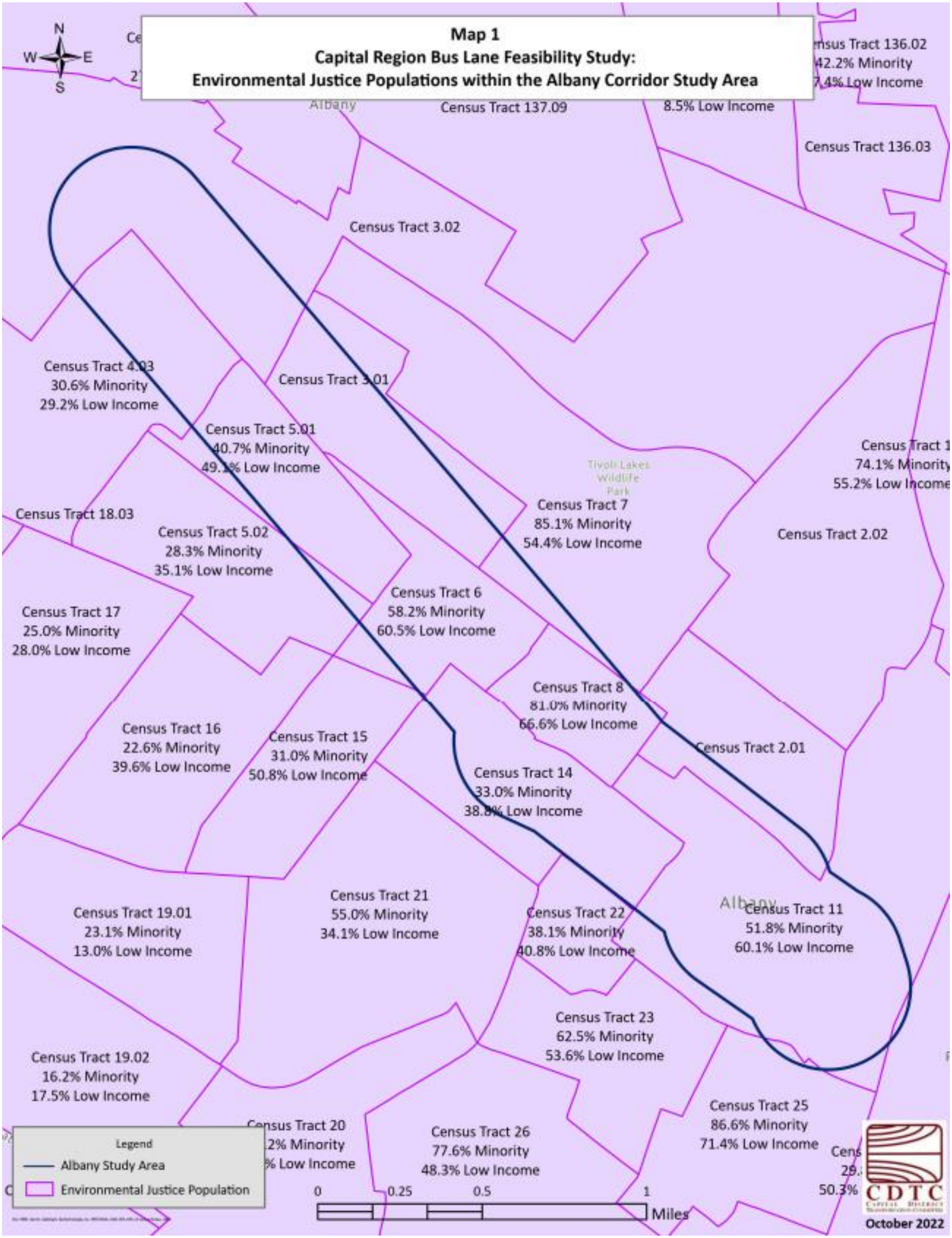
Table 6: Commute Mode by Sex

By Sex*	Drive Alone	Carpool	Transit	Other	Walk	Work at Home
Male	80.1%	7.5%	3.4%	1.5%	3.7%	3.9%
Female	80.2%	7.8%	3.9%	0.9%	3.1%	4.3%

Data is from the American Community Survey 2017 5-year estimates, tables S0802, B08105H, B08101, B08122, S0801, B08113, and S1811. Other includes taxi, motorcycle, and bicycle. *Data for sex and disability status include all people in Albany, Rensselaer, Saratoga, and Schenectady Counties.

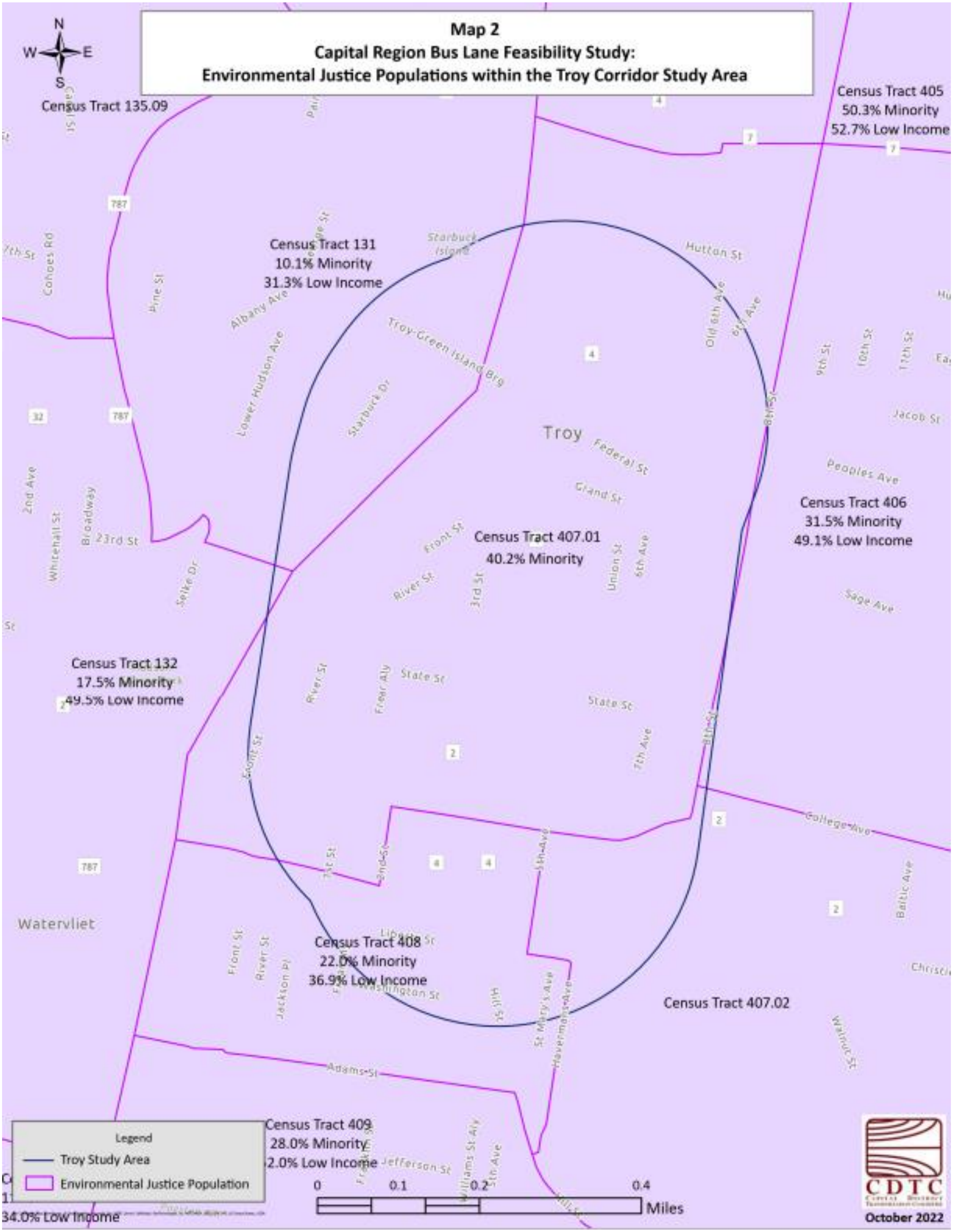
Map 1 provides an overview of the Capital Region Bus Lane Feasibility Albany Corridor study area. The Albany study area is included in the Environmental Justice area based on the study area Census Tracts having a higher than regional average percentage of minority and low-income residents.

The Capital Region Indicators website, maintained by the Capital District Regional Planning Commission (CDRPC), provides information by race and ethnicity (White, Black or African American, Asian, and Hispanic or Latino) that may be useful to further understand the population within a study area. Since this document is a regional analysis performed at the census tract level, small scale populations may be overlooked. It therefore may still be useful to scan the project area, particularly if the project area is small, as minority or low-income populations may form a significant portion of the study area residents but not be reflected in the larger census tract areas. In addition, the project should look for worksites and other generators where minority and/or low-income people are over-represented, as the data only captures the residential population.

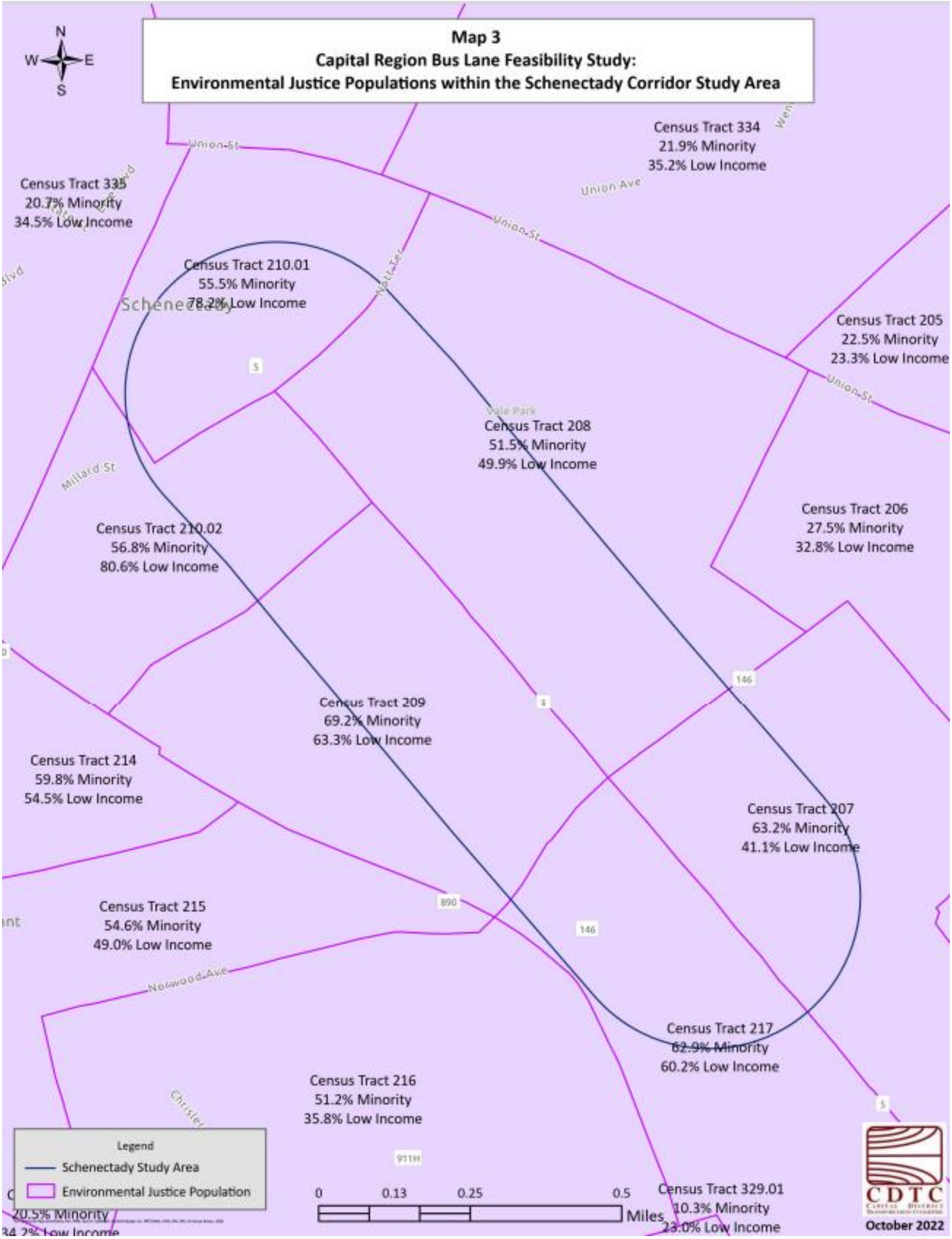

Map 1
Capital Region Bus Lane Feasibility Study:
Environmental Justice Populations within the Albany Corridor Study Area
N
S
E
W
Census Tract 136.02
42.2% Minority
7.4% Low Income
8.5% Low Income
Census Tract 137.09
Albany
Census Tract 136.03
Census Tract 3.02
Census Tract 4.03
30.6% Minority
29.2% Low Income
Census Tract 3.01
Census Tract 5.01
40.7% Minority
49.1% Low Income
Tivoli Lakes Wildlife Park
74.1% Minority
55.2% Low Income
Census Tract 7
85.1% Minority
54.4% Low Income
Census Tract 18.03
Census Tract 5.02
28.3% Minority
35.1% Low Income
Census Tract 2.02
Census Tract 17
25.0% Minority
28.0% Low Income
Census Tract 6
58.2% Minority
60.5% Low Income
Census Tract 8
81.0% Minority
66.6% Low Income
Census Tract 16
22.6% Minority
39.6% Low Income
Census Tract 15
31.0% Minority
50.8% Low Income
Census Tract 2.01
Census Tract 14
33.0% Minority
38.8% Low Income
Census Tract 19.01
23.1% Minority
13.0% Low Income
Census Tract 21
55.0% Minority
34.1% Low Income
Census Tract 22
38.1% Minority
40.8% Low Income
Albany
Census Tract 11
51.8% Minority
60.1% Low Income
Census Tract 23
62.5% Minority
53.6% Low Income
Census Tract 19.02
16.2% Minority
17.5% Low Income
Census Tract 25
86.6% Minority
71.4% Low Income
Census Tract 20
Census Tract 26
77.6% Minority
48.3% Low Income
50.3%
Legend
Albany Study Area
Environmental Justice Population
0
0.25
0.5
1
Miles
CDTC
October 2022

Map 2 provides an overview of the Capital Region Bus Lane Feasibility Troy Corridor study area. The Troy study area is included in the Environmental Justice area based on the study area Census Tracts having a higher than regional average percentage of minority and low-income residents.

Map 2
Capital Region Bus Lane Feasibility Study:
Environmental Justice Populations within the Troy Corridor Study Area



Map 3 provides an overview of the Capital Region Bus Lane Feasibility Schenectady Corridor study area. The Schenectady study area is included in the Environmental Justice area based on the study area Census Tracts having a higher than regional average percentage of minority and low-income residents.


Map 3
Capital Region Bus Lane Feasibility Study:
Environmental Justice Populations within the Schenectady Corridor Study Area
N
W
E
S
Census Tract 334
21.9% Minority
35.2% Low Income
Census Tract 335
20.7% Minority
34.5% Low Income
Union St
Union Ave
Census Tract 210.01
55.5% Minority
78.2% Low Income
Schenectady
Nott Ter
Census Tract 205
22.5% Minority
23.3% Low Income
Vale Park
Census Tract 208
51.5% Minority
49.9% Low Income
Millard St
Census Tract 206
27.5% Minority
32.8% Low Income
Census Tract 210.02
56.8% Minority
80.6% Low Income
146
Census Tract 209
69.2% Minority
63.3% Low Income
Census Tract 214
59.8% Minority
54.5% Low Income
Census Tract 207
63.2% Minority
41.1% Low Income
890
Census Tract 215
54.6% Minority
49.0% Low Income
Norwood Ave
Census Tract 217
62.9% Minority
60.2% Low Income
Census Tract 216
51.2% Minority
35.8% Low Income
Legend
Schenectady Study Area
Environmental Justice Population
0
0.13
0.25
0.5
Miles
Census Tract 329.01
10.3% Minority
23.0% Low Income
20.5% Minority
34.2% Low Income
CDTC
October 2022

Consideration for including minority and low-income populations in the planning process was given in the following ways:

- A detailed demographic analysis was performed to identify corridors of interest and the density of minority and low-income populations were used to evaluate the and rank the corridors. These populations were given significant weight in determining the score and ranking.
- The Internet was used to display and advertise information about the study.
    - CDTC (https://www.cdtcmpo.org), CDTA (https://www.cdta.org), Project Website (www.buslanestudy.com)
- Social media was used to throughout the study to provide information and input opportunities including:
    - Facebook, Instagram, Twitter
    - Agency email distribution lists
- Three formal public participation phases were provided to gather public comment throughout the study process.
    - Phase I included:
        - 4 pop-up events at high ridership locations
        - Two webinars
        - Detailed public survey utilizing the Metroquest platform
            - 833 respondents
    - Phase II included:
        - 3 pop-up events at high community activity locations
        - Detailed public survey utilizing the SurveyMonkey platform
            - Paid advertisement using Facebook
            - 959 respondents
    - Phase III will include publishing the final report online and accepting public comments for 45 days.
- Final products will be posted to the following websites and promoted using social media and email:
    - CDTC (https://www.cdtcmpo.org), CDTA (https://www.cdta.org), Project Website (www.buslanestudy.com)

Conclusion

CDTC defines plans and projects with a primary or significant focus on transit, bicycling, walking, or carpool as being “positive”. As the primary purpose of the Capital Region Bus Lane Feasibility Study is to implement multimodal transportation improvements across all four corridors, that include neighborhoods with Environmental Justice populations, it has been determined that the Capital Region Bus Lane Feasibility Study will have a positive impact on the affected populations. The Study makes recommendations pedestrian- bicycle facilities and bus priority treatments that, if implemented, will provide positive benefits for Environmental Justice populations in the study area. These improvements will improve safety for bicyclists and pedestrians and increase the attractiveness of the transportation environment for these modes by providing enhances facilities and amenities. These improvements will improve bus speeds and reliability that will reduce delays for bus riders, of which Environmental Justice populations are a large component.

Limited English Proficiency

Introduction

Inclusive public participation is a priority consideration in CDTC-sponsored plans, studies, and programs. Understanding and involvement are encouraged throughout the process. CDTC encourages input from all stakeholders and ensures that all segments of the population, including those that do not speak English as their primary language and who have a limited ability to speak, read, write, or understand English, have the opportunity to be involved in the transportation planning process.

Executive Order 13166,"Improving Accessto Servicesfor Persons with Limited English Proficiency" (LEP) was signed in 2000 to improve access to federally assisted programs and activities for persons who, as a result of national origin, are limited in their English proficiency. To ensure that programs and activities normally provided in English are accessible to LEP persons and thus do not discriminate on the basis of national origin in violation of Title VI of the Civil Rights Act of 1964, recipients must take reasonable steps to ensure meaningful access to their programs and activities by LEP persons.

Data and Analysis

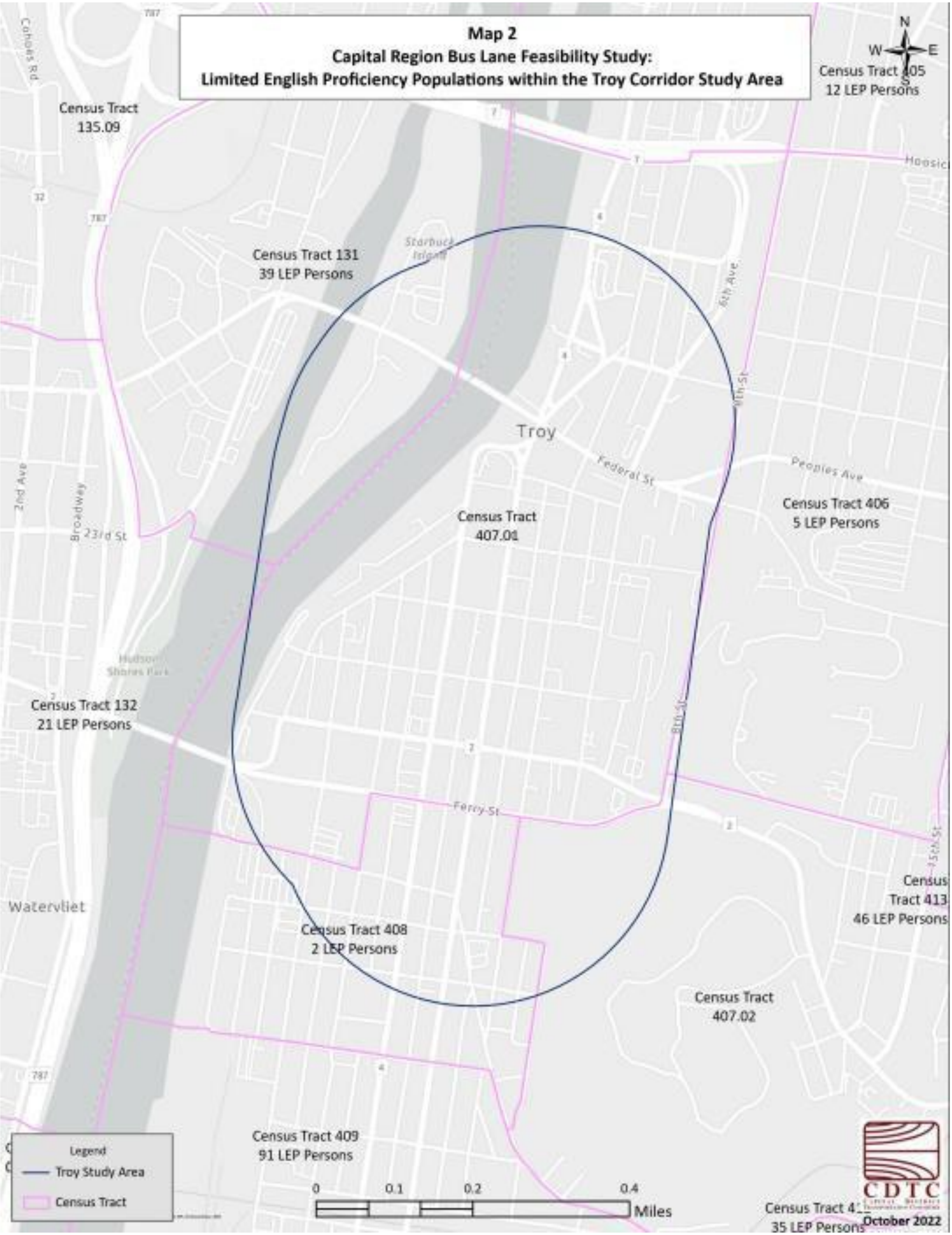
According to 2013-2017 data from the American Community Survey (ACS) table B16004, 3.2 percent of the region's population 5 years of age and older, or over 25,000 people, reported that they do not speak English "very well". USDOT guidance sets a written translation threshold at 5% eligible to be served or 1,000 people, whichever is less. Thus, any census tract with a rate of 5%orhigherofLEPpersonsor1,000LEPpersonsareidentified asLEP censustracts.

The CDTC project manager should seek further data sources or community knowledge to indicate which languages are present. If any of them constitute 1,000 people or 5% of the total study area population, whichever is less, key documents will be translated into those languages on request, and requested oral interpreting services will be provided when necessary and possible. In addition, initial outreach materials should be translated into languages meeting the above criteria.

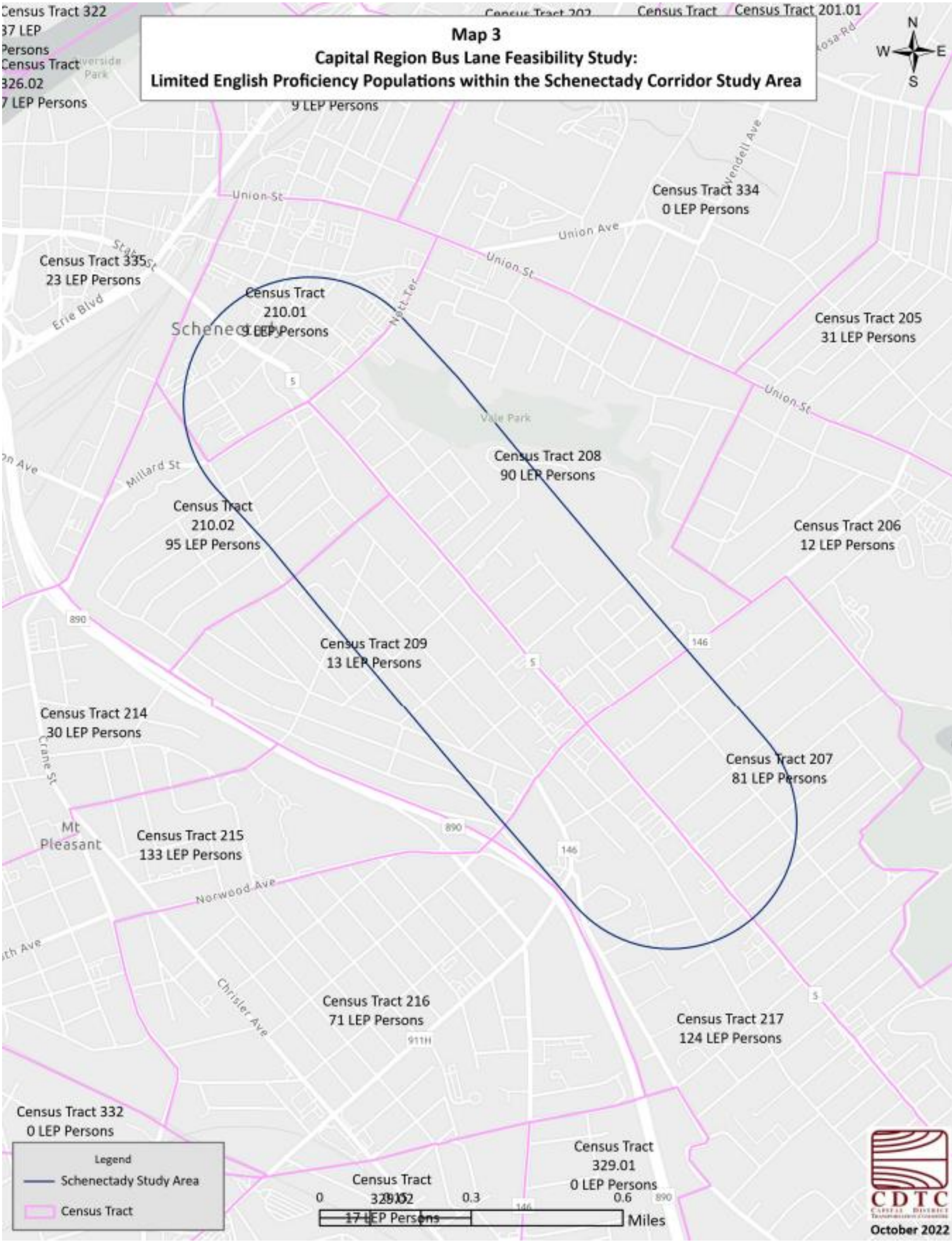
Map 1 provides an overview of the Capital Region Bus Lane Feasibility Albany Corridor Study area. The Albany study area is included in the Limited English Proficiency area based on the study Census Tracts having 5% of more or at least 1000 limited English proficient residents. If there are multiple census tracts within the study area, the LEP population numbers should be added together to see if they sum to 1000 or greater.


Map 1
Capital Region Bus Lane Feasibility Study:
Limited English Proficiency Populations within the Albany Corridor Study Area
N
W
E
S
Census Tract 136.02
25 LEP Persons
Census Tract 137.09
14 LEP Persons
West Albany
Census Tract 136.03
Census Tract 3.02
Census Tract 4.03
99 LEP Persons
Census Tract 3.01
Census Tract 5.01
115 LEP Persons
Tivoli Lakes Wildlife Park
25 LEP Persons
Census Tract 18.03
Census Tract 7
14 LEP Persons
Census Tract 2.02
Census Tract 5.02
26 LEP Persons
Census Tract 6
50 LEP Persons
Census Tract 17
54 LEP Persons
Census Tract 8
48 LEP Persons
Census Tract 16
12 LEP Persons
Census Tract 15
81 LEP Persons
Census Tract 2.01
Census Tract 14
27 LEP Persons
Census Tract 516.01
Census Tract 21
39 LEP Persons
Census Tract 22
45 LEP Persons
Albany
Census Tract 11
60 LEP Persons
Census Tract 19.01
18 LEP Persons
Census Tract 23
9 LEP Persons
Census Tract 19.02
0 LEP Persons
Census Tract 515
6
Census Tract 25
0 LEP Persons
Census Tract 20
64 LEP Persons
Census Tract 26
144 LEP Persons
Legend
Albany Study Area
Census Tract
0
0.25
0.5
1
Miles
CDTC
October 2022

Map 2 provides an overview of the Capital Region Bus Lane Feasibility Troy corridor study area. The Albany study area is included in the Limited English Proficiency area based on the study area Census Tracts having 5% or more or at least 1000 limited English proficient residents


Map 2
Capital Region Bus Lane Feasibility Study:
Limited English Proficiency Populations within the Troy Corridor Study Area
Census Tract 135.09
Census Tract 131
39 LEP Persons
Census Tract 405
12 LEP Persons
Troy
Census Tract 407.01
Census Tract 406
5 LEP Persons
Census Tract 132
21 LEP Persons
Census Tract 408
2 LEP Persons
Census Tract 413
46 LEP Persons
Census Tract 407.02
Census Tract 409
91 LEP Persons
35 LEP Persons
Watervliet
Federal St
Peoples Ave
Ferry St
8th St
6th Ave
2nd Ave
Broadway
23rd St
Hoosick
Legend
Troy Study Area
Census Tract
0 0.1 0.2 0.4 Miles
CDTC
October 2022

Map 3 provides an overview of the Capital Region Bus Lane Feasibility Schenectady corridor study area. The Schenectady study area is included in the Limited English Proficiency area based on the study area Census Tracts having 5% or more or at least 1000 limited English proficient residents.



Map 3
Capital Region Bus Lane Feasibility Study:
Limited English Proficiency Populations within the Schenectady Corridor Study Area
Census Tract 322
37 LEP Persons
Census Tract 326.02
7 LEP Persons
Census Tract 201.01
9 LEP Persons
Census Tract 334
0 LEP Persons
Census Tract 335
23 LEP Persons
Census Tract 210.01
9 LEP Persons
Census Tract 205
31 LEP Persons
Census Tract 208
90 LEP Persons
Census Tract 210.02
95 LEP Persons
Census Tract 206
12 LEP Persons
Census Tract 209
13 LEP Persons
Census Tract 214
30 LEP Persons
Census Tract 207
81 LEP Persons
Census Tract 215
133 LEP Persons
Census Tract 216
71 LEP Persons
Census Tract 217
124 LEP Persons
Census Tract 332
0 LEP Persons
Census Tract 329.01
0 LEP Persons
Census Tract 329.02
17 LEP Persons
Union St
Union Ave
Nott Ter
Erie Blvd
State St
Millard St
Vale Park
Wendell Ave
Norwood Ave
Crane St
Chrisler Ave
Mt Pleasant
Schenectady
Legend
Schenectady Study Area
Census Tract
0 0.15 0.3 0.6 Miles
CDTC
October 2022

If a language group meets the 5% or 1,000 people threshold, whichever is less, the following will apply. CDTC's Limited English Proficiency Plan can be viewed at: https://www.cdtcmpo.org/images/othercdtcproducts/2020_Limited_English_Proficiency_Plan.pdf

- Identifying Individuals who May Need Language Assistance: CDTC staff will use Language Identification Flashcards when encountering a LEP individual to identify that person's primary language. The Language Identification Flashcards are free and available online at http://www.lep.gov/ISpeakCards2004.pdf and will be made available at public meetings. Once a LEP person's primary language is identified by means of the flashcards, CDTC staff will assess the feasibility of providing translation and/or interpretation assistance.

- Language Assistance Measures: Language assistance will beprovided for LEP individuals speaking languages that meet the threshold through the translation of vital documents, as well as selected key documents on request, and oral interpreting when necessary and possible. Visitors to the website can utilize the website translate feature to view the website in different languages.

- Translation of Written Documents: Written executive summaries of studies conducted in geographic subareas where language groups within the population constitute 1,000 people or 5% of the subarea will be translated into those languages upon request and posted on-line.

CDTC staff will use a free online translation service for all other requests for translations of documents. The CDTC website may be translated into many different languages using free online translation services such as Google Translate. In this way, meeting agendas and minutes, notices of official actions, public comment requests, and other documents may be translated.

- Oral Interpretation: Upon at least one-week request of LEP individuals speaking languages that meet the threshold, CDTC will provide interpreting services at meetings, in person if possible. If formal interpretation is required and an interpreter is not available, CDTC staff will use the telephone interpreter service, Language Line, at 1-800-752-6096.

The Capital Region Indicators website, maintained by CDRPC, provides information on language spoken at home by ability to speak English that may be useful to further understand the population within a study area. Where the data shows a significant population speaking a broad language group, further investigation may be necessary. School districts maintain language data for attendees who do not speak English well and this information will generally reflect the children's families. There may be nearby religious institutions and local businesses that cater to people speaking a particular language or language group and could provide insight on the size of the population as well as appropriate ways to engage with them.

Since this document is a regional analysis performed at the census tract level, small scale populations may be overlooked. It therefore may still be useful to scan the project area, particularly if the project area is small, as people who don't speak English very well may form a significant portion of the study area residents but not be reflected in the larger census tract areas. In addition, the project should look for worksites and other generators where people who don't speak English very well are over-represented, as the data only captures the residential population.

EnvironmentalMitigation

Introduction

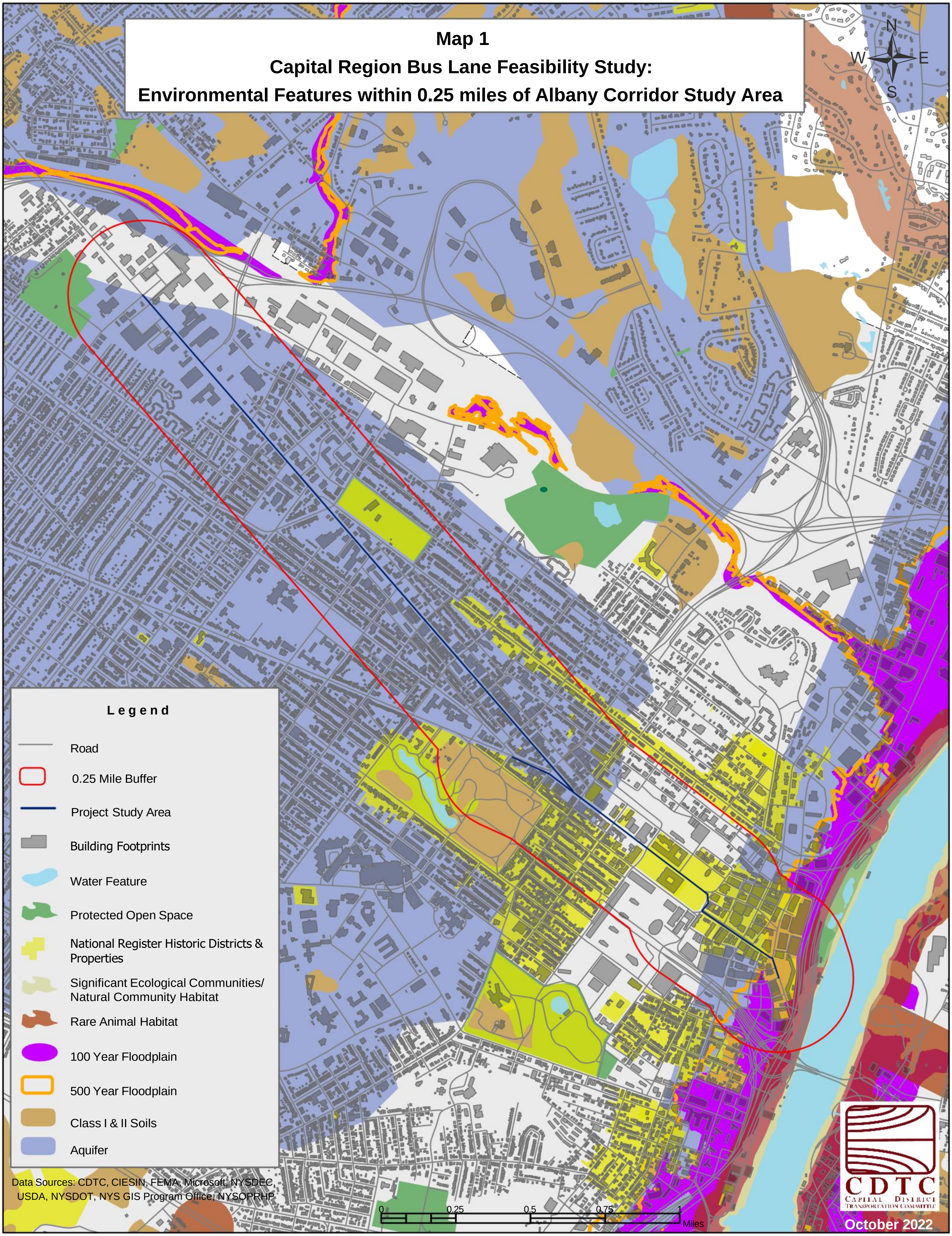
Per federal requirements, the Capital District Transportation Committee (CDTC) undertakes an Environmental Features Scan as part of its metropolitan transportation planning process. In our studies we encourage smart growth as well as investment and development in urban areas as a method to protect natural resources. Smart growth policies also help to protect rural character and open space, and protect quality of life in the Capital Region. The Environmental Features Scan identifies the location of environmentally sensitive features, both natural and cultural in relation to project study areas. Although the conceptual planning stage is too early in the transportation planning process to identify specific potential impacts to environmentally sensitive features, the early identification of environmentally sensitive features is an important part of the environmental mitigation process. It should also be noted here that as specific projects advance through the project development process, the applicable NEPA and SEQRA regulations requiring potential environmental impact identification, analysis and mitigation will be followed by the implementing agencies as required by federal and state law. CDTC is not an implementing agency.

Data and Analysis

CDTC staff relies on data from several state and federal agencies to maintain an updated map-based inventory of both natural and cultural resources. The following features are mapped and reviewed for their presence within each study area as well as within a quarter mile buffer of the defined study area boundary.

- sole source aquifers
- aquifers
- reservoirs
- water features (streams, lakes, rivers and ponds)
- wetlands
- watersheds
- 100 year flood plains
- rare animal populations
- rare plant populations
- significant ecological sites
- significant ecological communities
- state historic sites
- national historic sites
- national historic register districts
- national historic register properties
- federal parks and lands
- state parks and forests
- state unique areas
- state wildlife management areas
- county forests and preserves
- municipal parks and lands
- land trust sites
- NYS DEC lands
- Adirondack Park
- agricultural districts
- NY Protected Lands
- natural community habitats
- rare plant habitats
- Class I & II soils

Map 1 provides an overview of the environmentally sensitive (cultural and natural) features located within the Capital Region Bus Lane Feasibility Albany Corridor study area as well as within a quarter mile buffer of the defined study area boundary.


Map 1
Capital Region Bus Lane Feasibility Study:
Environmental Features within 0.25 miles of Albany Corridor Study Area
N
W
E
S
Legend
Road
0.25 Mile Buffer
Project Study Area
Building Footprints
Water Feature
Protected Open Space
National Register Historic Districts & Properties
Significant Ecological Communities/ Natural Community Habitat
Rare Animal Habitat
100 Year Floodplain
500 Year Floodplain
Class I & II Soils
Aquifer
Data Sources: CDTC, CIESIN, FEMA, Microsoft, NYSDEC, USDA, NYSDOT, NYS GIS Program Office, NYSOPRHP
0
0.25
0.5
0.75
1
Miles
CDTC
Capital District Transportation Committee
October 2022

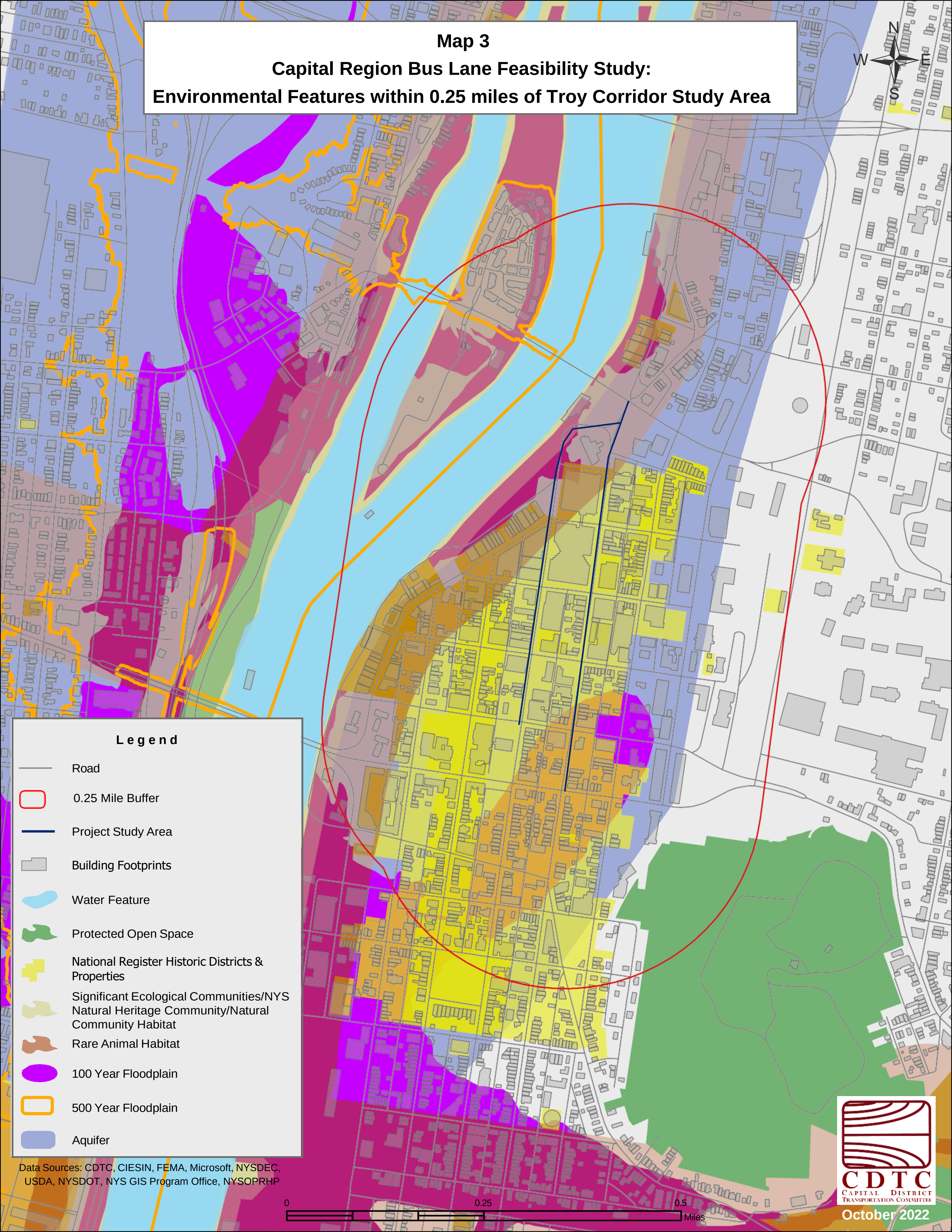
The following features occur within the study area or within a quarter mile of the Capital Region Bus Lane Feasibility Albany Corridor study area; hydrological features, protected open space, National Register Historic Districts & Properties, Significant Ecological Communities/Natural Community Habitats, Rare Animal Habitats, 100 Year Floodplain, 500 Year Floodplain, Class I & II Soils and Aquifers.

Map 2 provides an overview of the environmentally sensitive (cultural and natural) features located within the Capital Region Bus Lane Feasibility Schenectady Corridor study area as well as within a quarter mile buffer of the defined study area boundary.

Map 2
Capital Region Bus Lane Feasibility Study:
Environmental Features within 0.25 miles of Schenectady Corridor Study Area

The following features occur within the study area or within a quarter mile of the Capital Region Bus Lane Feasibility Schenectady Corridor study area; hydrological features, protected open space, National Register Historic Properties, and aquifers including the Schenectady/Niskayuna Sole Source Aquifer Boundary.

Map 3 provides an overview of the environmentally sensitive (cultural and natural) features located within the Capital Region Bus Lane Feasibility Troy Corridor study area as well as within a quarter mile buffer of the defined study area boundary.



Map 3
Capital Region Bus Lane Feasibility Study:
Environmental Features within 0.25 miles of Troy Corridor Study Area
N
W
E
S
Legend
Road
0.25 Mile Buffer
Project Study Area
Building Footprints
Water Feature
Protected Open Space
National Register Historic Districts & Properties
Significant Ecological Communities/NYS Natural Heritage Community/Natural Community Habitat
Rare Animal Habitat
100 Year Floodplain
500 Year Floodplain
Aquifer
Data Sources: CDTC, CIESIN, FEMA, Microsoft, NYSDEC, USDA, NYSDOT, NYS GIS Program Office, NYSOPRHP
0
0.25
0.5
Miles
CDTC
Capital District Transportation Committee
October 2022

The following features occur within the study area or within a quarter mile of the Capital Region Bus Lane Feasibility Troy Corridor study area; hydrological features, protected open space, National Register Historic Districts & Properties, Significant Ecological Communities/NYS Natural Heritage Community/Natural Community Habitats, Rare Animal Habitats, 100 Year Floodplain, 500 Year Floodplain, and Aquifers.

Conclusion

The Bus Lane Feasibility Study makes recommendations for transit improvements, streetscape improvements, and pedestrian-bicycle facilities which, if implemented, will have no known impact on the environmentally sensitive features in the study area.

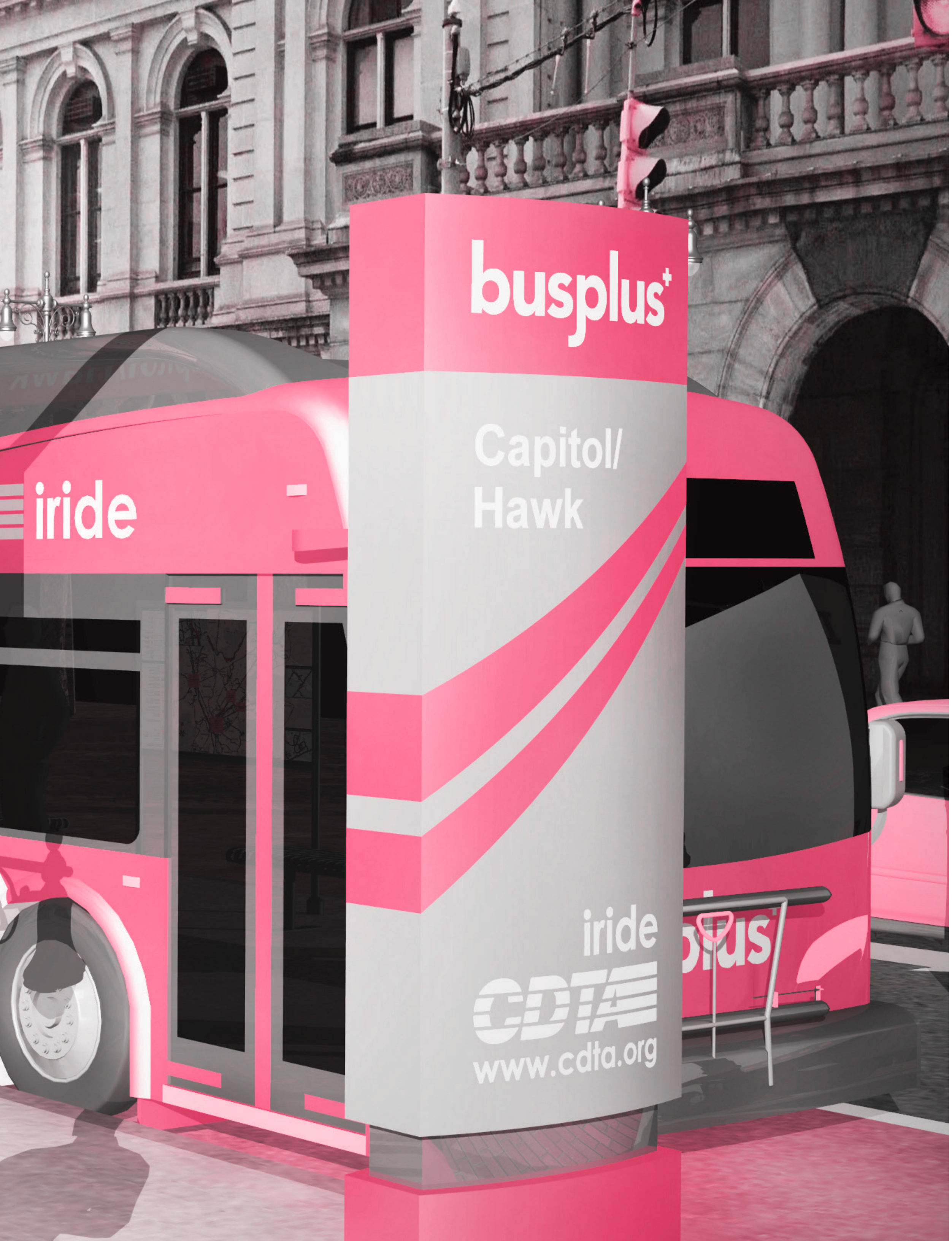
BUS AND BIKE PRIORITY TOOLBOX

A Joint Publication of CDTC and CDTA ▪ Fall 2022

CDTC
Capital District Transportation Committee

CDTA


Capitol/Hawk
905 Schenectady 3
10 Crossgates Mall 7
737 Airport 9
1 Colonie Center 13
busplus
CDTA
www.cdta.org



CONTENTS

BUS PRIORITY TOOLS

BUS STOP TOOLS

BIKE PRIORITY TOOLS

INTRODUCTION

The Capital District Transportation Committee (CDTC) and Capital District Transportation Authority (CDTA) have prepared this toolbox to introduce a variety of bus and bike priority tools that can improve the efficiency, accessibility, and safety of individual bus and bike routes as well as of the bus and bike networks in the Capital District as a whole.

The toolbox provides guidance for community activists, elected representatives, transportation planners, and engineers by showing how bus and bike priority tools can complement other improvements and investments in the Capital District's infrastructure.

The tools in this toolbox may not be practical in every location; more detailed analysis is often needed to determine where specific tools can and cannot be implemented. Implementation itself requires outreach and engagement to discuss the benefits for pedestrians, cyclists, bus riders, and bus service providers, as well as the potential impacts on vehicular traffic and parking.

By clearly illustrating the tradeoffs between benefits and potential impacts, this toolbox helps communities throughout the Capital District make better-informed decisions about how to prioritize travel for various roadway users in their communities. Each tool's description guides readers through the following process to determine if the tool may be appropriate in their community's context:

Benefits
Which bus or bike priority benefits does the tool offer?

Function
How does the tool work?

Applications
Where does the tool work best?

Cost Considerations
What elements affect how easily the tool can be implemented?

Guidelines
When will the tool fit, and are there other conditions the tool must meet?

BENEFITS AND GUIDELINES

Bus and bike priority benefits vary, and not every benefit applies to every bus or bike priority tool. On the pages that follow, any benefit below that applies to a given bus or bike priority tool is highlighted in blue, while any benefits that don't apply are grayed out.

Similarly, not every roadway can fit every bus or bike priority tool, and some tools may need to meet certain conditions to be effective. On the pages that follow, a guidelines sidebar is provided for each bus and bike priority tool, listing minimum and preferred dimensions, considerations, and approximate costs.

Bus Priority Benefits:

Reduces Travel Time

Reduces the time it takes for the bus to get from one end of the route to the other by speeding up travel.

Reduces Dwell Time

Reduces the time the bus spends at a bus stop waiting for riders to get on, get off, and pay fares.

Reduces Wait Time

Reduces the time the bus spends at an intersection waiting for a green light.

Improves Rider Access

Improves the ease and ability of all riders to get to the bus stop and onto the bus safely and comfortably.

Improves Rider Safety

Improves the safety and comfort of bus riders and other roadway users, including cyclists and drivers.

Bike Priority Benefits:

Reduces Pedestrian Conflicts

Reduces conflicts between pedestrians and cyclists by reducing the number of potential conflict points.

Reduces Vehicle Conflicts

Reduces conflicts between vehicles and cyclists by reducing the number of potential conflict points.

Improves Cyclist Visibility

Improves the visibility of and attention to cyclists among other roadway users, especially drivers.

Improves Cyclist Access

Improves the share of female, young, minority, and novice cyclists, making cycling more accessible to all.

Improves Cyclist Safety

Improves the safety and comfort of cyclists and other roadway users, including bus riders and drivers.

Guidelines:

Space:

- Minimum dimension(s)
- Preferred dimension(s)

Consider:

- List of conditions, thresholds, or other justifications that usually need to be met to implement the tool

Cost:

$ $ $

About the Guidelines

Approximate costs are represented by symbols: $ indicates a low-cost tool, $$ indicates a moderate-cost tool, and $$$ indicates a high-cost tool. Note that these approximate costs are *relative to each other.* Space and considerations information is sourced from the publications in the *References* section.

BUS PRIORITY TOOLS

A. CURBSIDE BUS LANE

Curbside bus lanes separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability.

Function

These lanes typically repurpose a curbside parking or general travel lane for dedicated bus use. They can be painted or dyed red to distinguish them from the parking and general travel lanes. They can also accommodate cyclists and emergency vehicles, allowing them to reach destinations faster.

Applications

These lanes are justified if the volume of buses on the roadway is a minimum of four buses per hour per direction — six or more buses per hour per direction is the industry standard — and if traffic congestion on the roadway is interfering with bus routes' speed and reliability.

Cost Considerations

The most cost-effective bus lane only requires restriping of existing roadway space; repaving is not typically necessary. Red paint increases the cost, but it is recommended since the paint improves driver compliance.

More costly repaving is recommended in locations with high bus volumes to increase the longevity of the lanes and to reduce maintenance costs. Red-dyed asphalt will last longer than red paint, and red-dyed concrete is even more effective in resisting surface deformation from heavy bus traffic.

Benefits

Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety

Space:

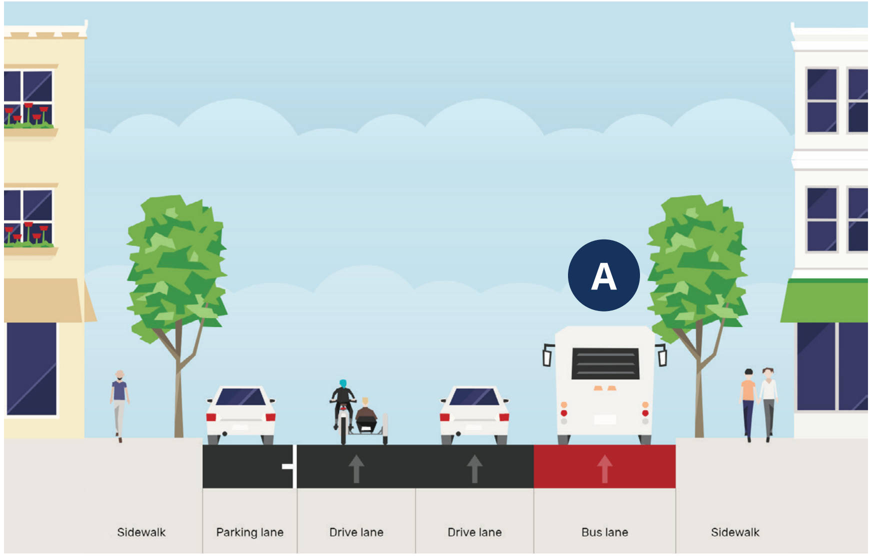
- Minimum width: 11'
- Preferred width: 12'

Consider:

- Bus speed less than 9 mph
- Roadways with 4 or more buses per hour per direction
- Roadways where bus reliability is affected by congestion
- Relatively high passenger throughput

Cost:

$



Space:

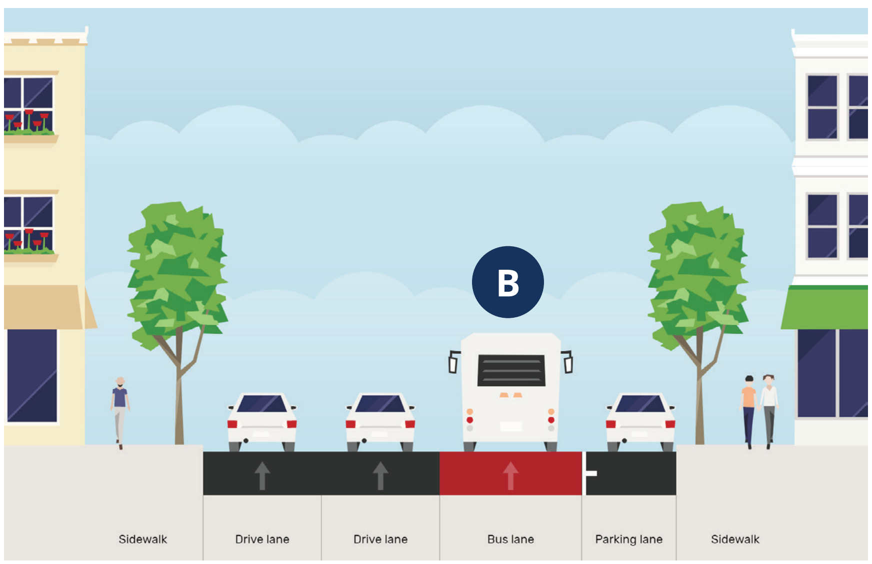
- Minimum width: 11'
- Preferred width: 12'

Consider:

- Bus speed less than 9 mph
- Roadways with 4 or more buses per hour per direction
- Roadways where bus reliability is affected by congestion
- Roadways with demand for curbside parking
- Relatively high passenger throughput

Cost:

$



B. OFFSET BUS LANE

Offset bus lanes separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability.

Function

These lanes typically repurpose a general travel lane adjacent to the parking lane for dedicated bus use. They can be painted or dyed red to distinguish them from the parking and general travel lanes. They can also accommodate cyclists and emergency vehicles, allowing them to reach destinations faster. Buses must pull over to the curb to serve bus stops, but curb extensions or floating bus stops eliminate the need to pull over (see Tools J, K, N, and O).

Applications

In addition to meeting the same volume and congestion justifications as curbside bus lanes, these lanes work best on roadways that have both low general traffic volumes and high demands for curbside parking and access (loading and unloading, deliveries, ridehailing, etc.).

While these lanes preserve curbside parking capacity, vehicles must cross them to park, and they are also vulnerable to illegal parking blockages.

Cost Considerations

The most cost-effective bus lane only requires restriping of existing roadway space; repaving is not typically necessary. Red paint increases the cost, but it is recommended since the paint improves driver compliance.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | Improves Rider Access | Improves Rider Safety

C. CONTRAFLOW BUS LANE

On one-way roadways, contraflow bus lanes allow buses to travel in the opposite direction of general traffic, enabling bidirectional bus travel on what otherwise is still a one-way roadway.

Function

Bus operations on one-way couplets are common, but in some cases it may be preferable to consolidate operations onto a single roadway, such as in cases where the couplets are unusually far apart or where they force deviations or other operational obstacles for buses.

Applications

Contraflow bus lanes eliminate the need for riders to walk to different one-way roadways to catch buses traveling in opposite directions, thereby improving rider access. They also improve bus route legibility, since riders are able to see bus stops for both directions on the same roadway.

Cost Considerations

These lanes do not typically require repaving, but restriping, painting, and marking is necessary to alert drivers of the opposing bus travel. Traffic lights may also need to be updated with new signals to accommodate the opposing bus travel and turning movements.

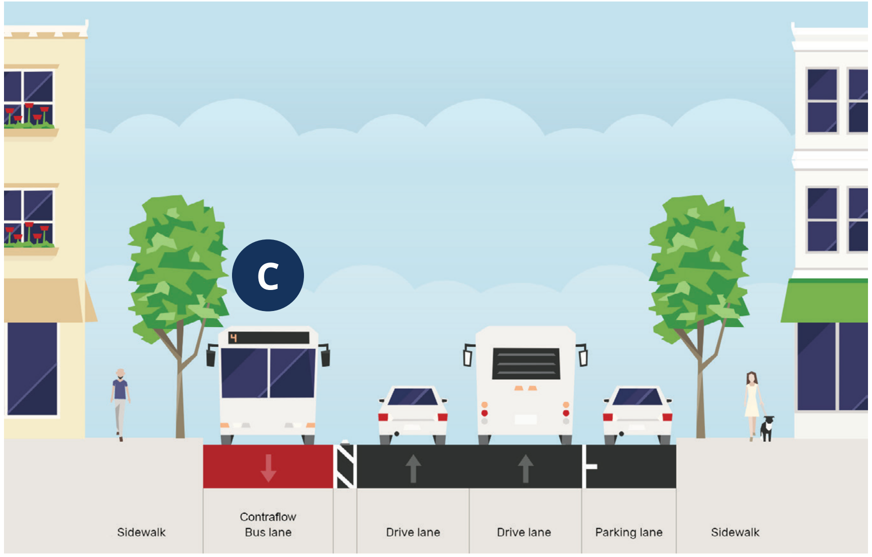
Benefits

- **Reduces Travel Time**
- Reduces Dwell Time
- Reduces Wait Time
- **Improves Rider Access**
- Improves Rider Safety

Space:
- Minimum width: 11'
- Preferred width: 12'

Consider:
- Bus speed less than 9 mph
- Roadways with 4 or more buses per hour per direction
- Roadways where bus reliability is affected by congestion
- One-way roadways that require bidirectional bus travel
- Relatively high passenger throughput

Cost: $ $



Space:

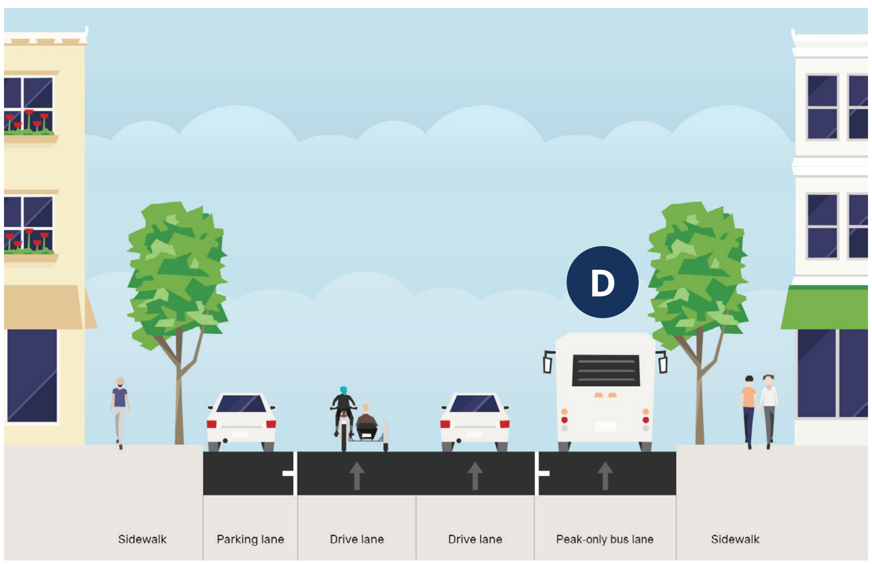
- Minimum width: 11'
- Preferred width: 12'

Consider:

- Roadways with high peak bus traffic but fewer than 4 off-peak buses per hour per direction
- Roadways with demand for off-peak curbside parking

Cost:

$



D. PEAK-ONLY BUS LANE

Peak-only bus lanes temporarily separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability during the morning and afternoon rush hours (peaks).

Function

These lanes typically repurpose a curbside parking lane or general travel lane for dedicated bus use, but only during the morning and afternoon rush hours (typically from 6:00 AM to 9:00 AM and again from 3:00 PM to 7:00 PM). Outside these hours, the curbside lane reverts to general travel or parking as needed.

Applications

These lanes are effective in situations where peak bus volumes are high or peak traffic congestion is heavy enough to affect bus speed and reliability, but where off-peak congestion or bus volumes are also not heavy enough to warrant separating buses from general traffic.

While these lanes help preserve off-peak curbside parking, driver compliance is lower than for other bus lanes, and illegal parking is more common.

Cost Considerations

The most cost-effective bus lane only requires restriping of existing roadway space; repaving is not typically necessary. While marking the lane's time restrictions is recommended, red paint is not recommended since the latter should be used to encourage driver compliance with full-time bus lanes.

Benefits

Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety

E. MEDIAN BUS LANE

Median bus lanes separate bus traffic from general vehicular traffic and congestion by employing a more durable separator than other types of bus lanes, significantly improving their bus routes' speed and reliability.

Function

These lanes typically repurpose the middle of the roadway for dedicated bus use, pushing general travel lanes and parking lanes to the sides of the roadway. They are often painted or dyed red to distinguish them from the parking and general travel lanes, and can also be separated from the latter via raised curbs, raised domes, bollards, or jersey barriers. Riders access median-running buses at either side-boarding or center-boarding median bus stops (see Tools P and Q).

Applications

These lanes offer a highly visible and durable means of separation analogous to dedicated light rail or heavy rail corridors. They are particularly suited for avenues and boulevards, some of which may already have medians left over from the streetcar era that can be converted to median bus lanes.

Cost Considerations

These lanes are costly; they require significant reconstruction of the roadway, even in situations where medians can be reused. They also require pedestrian infrastructure to access the median bus stops and may even require new signals and overpasses/ underpasses to separate bus movements from other vehicular turns.

Benefits

Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety

Space:

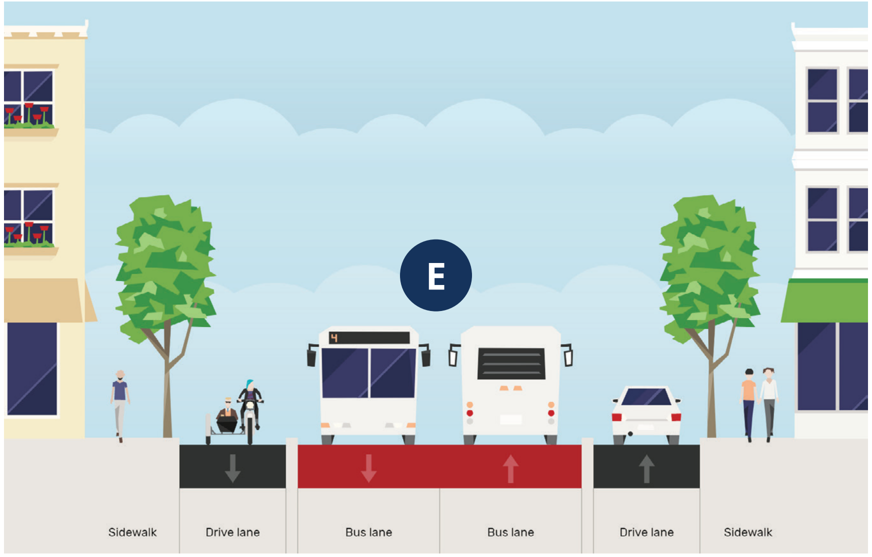
- Minimum width: 22' (11' per direction)
- Preferred width: 26' (13' per direction)

Consider:

- Roadways with 12 or more buses per hour per direction
- Roadways that require separating buses where Tools A, B, C, and D are inadequate
- Relatively high passenger throughput

Cost:

$ $ $



Space:

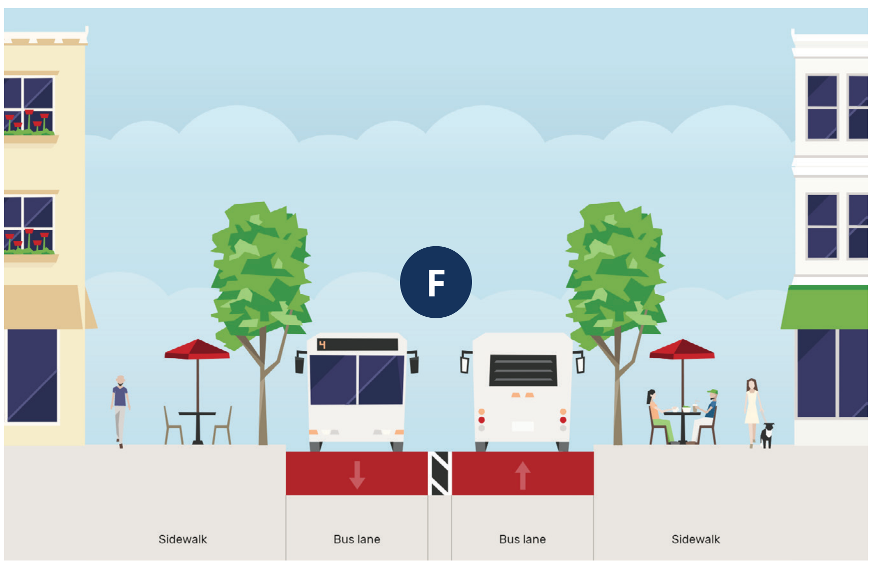
- Minimum width: 22' (11' per direction)
- Preferred width: 26' (13' per direction)

Consider:

- Roadways with 12 or more buses per hour per direction
- Roadways that require reliable bus corridors similar to rail corridors
- Relatively high passenger throughput

Cost:

$ $ $



F. BUSWAY

Busways offer buses their own dedicated roadway, significantly improving their bus routes' speed and reliability. Busways typically come in two formats: *surface* or *grade-separated*. Riders access busways at either side-boarding or center-boarding bus stops (see Tools P and Q).

Function

Surface busways are common in developed areas where they intersect with cross-streets and often contain sidewalks and/or bike lanes to maintain non-vehicular access to adjacent buildings. These lanes often permit emergency vehicles and off-peak or overnight truck deliveries to adjacent businesses.

Grade-separated busways function similarly to light rail or heavy rail tracks in that they allow only buses to travel on and parallel to them. While emergency vehicles may still be permitted, trucks, pedestrians, and cyclists are not.

Applications

Busways offer a highly visible and durable means of separation analogous to dedicated light rail or heavy rail corridors.

Cost Considerations

These lanes are costly; surface busways require reconstruction of existing roadways and coordinating alternative means of vehicular access to adjacent buildings. In addition to the dedicated roadway itself, grade-separated busways require pedestrian infrastructure to access bus stops and may even require new signals and overpasses/underpasses to separate bus traffic from other vehicular and pedestrian traffic.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | **Improves Rider Access** | Improves Rider Safety

G. BUS ON SHOULDER

Bus shoulders separate bus traffic from general vehicular traffic and congestion, thereby improving their bus routes' speed and reliability.

Function

These lanes typically repurpose a boulevard's, highway's, or expressway's shoulder (breakdown lane) for bus use. Vehicle pullovers are still permitted, around which buses must maneuver by merging back into general traffic.

Applications

These lanes are useful on high-speed roadways that are typically congested during peak periods (rush hours), but they can be used during other congested periods too. They are particularly common on highways in and around larger cities, allowing buses to bypass the typically heavy weekday congestion on these highways.

Cost Considerations

While bus shoulders typically only require signage (especially signage at highway exits informing drivers of conflicting bus movements), there are other considerations which can limit their feasibility:

Firstly, roadway shoulders must be wide enough to safely accommodate buses, and many urban highways have narrow or inconsistent shoulders. Secondly, not all roadway shoulders are built to withstand the same amount of vehicular weight as the roadway's general travel lanes. Thirdly, drainage infrastructure may also need to be modified or upgraded.

Benefits

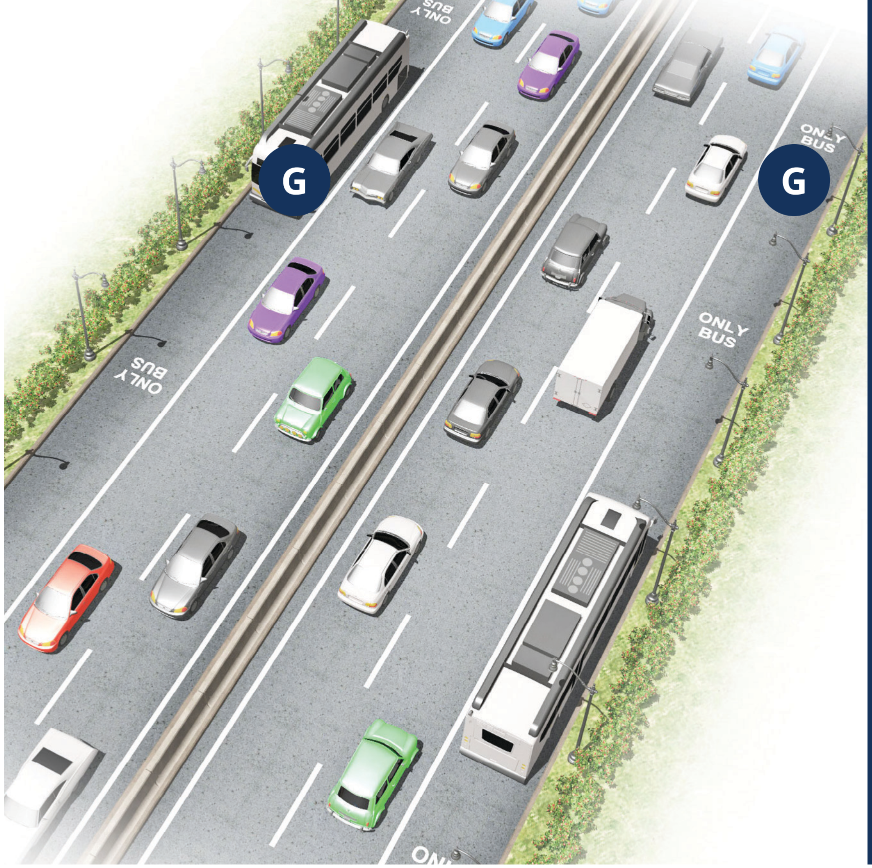
Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety



Space:

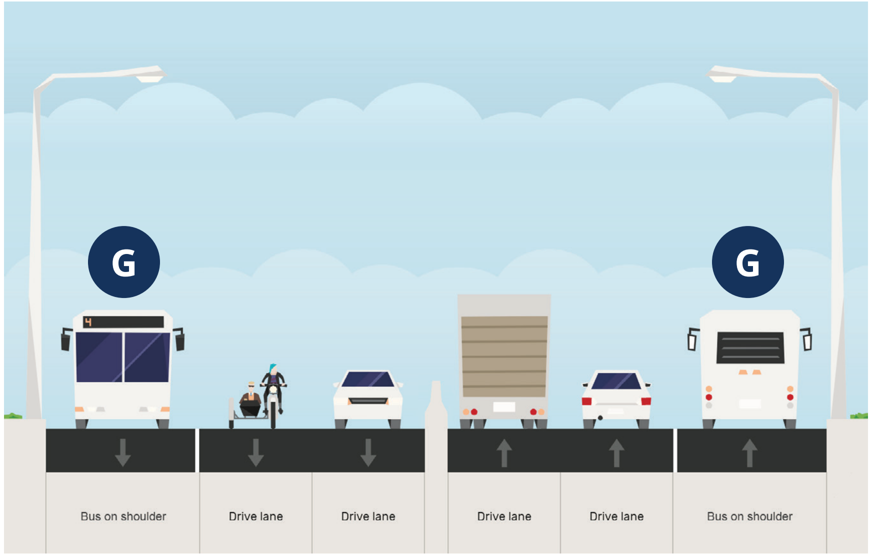
- Minimum width: 11'
- Preferred width: 12'

Consider:

- Pavement thickness of 7" or more to support bus weight
- Roadways where bus reliability is affected by congestion
- Roadways with wide shoulders (see note on pavement thickness above)

Cost:

$ $ $



Space:

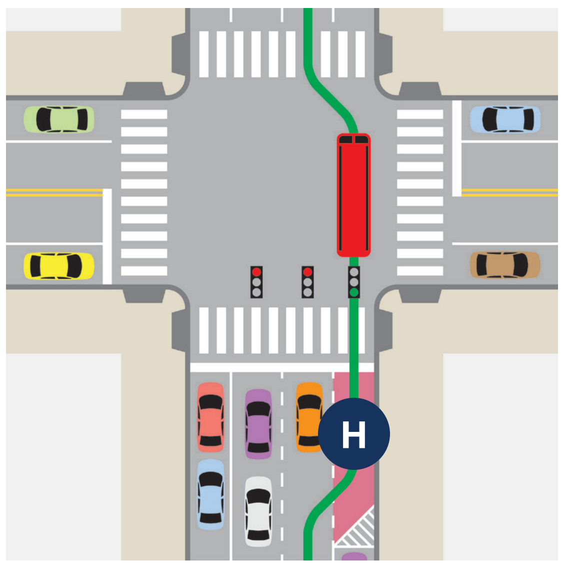
- Minimum length: 70' (to fit at least one 40' or 60' bus)
- Minimum rear taper length: 50'

Consider:

- Signalized intersections with long signal cycles
- Congested roadways where bus lanes aren't possible

Cost:

$ $



H. QUEUE JUMP

Queue jumps improve bus routes' speed and efficiency by allowing buses to pull ahead of general traffic at intersections with traffic lights.

Function

By pairing a short section of bus lane with a traffic light equipped with a transit signal, a queue jump allows buses to pull alongside general traffic, then proceed through the intersection ahead of the general traffic.

Applications

This tool is useful along roadways with congested intersections where full bus lanes may not be possible. If repeated across multiple intersections along the roadway, the small time savings at each intersection may add up to significant time savings along the entire length of the bus route.

Cost Considerations

Queue jumps are more cost-effective than full bus lanes, but they still require a moderate level of investment. Sections of curbside parking must be removed to allow buses to pull up alongside general traffic, and traffic lights must be replaced or upgraded with transit signals. Queue jumps are typically paired with nearside bus stops since the space for the queue jump can also serve as boarding/alighting space.

Benefits

- **Reduces Travel Time**
- Reduces Dwell Time
- **Reduces Wait Time**
- Improves Rider Access
- Improves Rider Safety

I. TRANSIT SIGNAL PRIORITY (TSP)

TSP allows buses to get through intersections faster by modifying the length of red and green traffic lights as buses approach the intersections.

Function

TSP typically works in two ways: if a traffic light about to turn red detects an approaching bus, it can stay green for several seconds longer to allow the bus to pass through the intersection. If an already-red traffic light detects an approaching bus, it can turn green several seconds earlier.

Applications

This tool is useful along roadways with congested intersections, and it can also complement bus lanes. If repeated across multiple intersections along the roadway, the small time savings at each intersection may add up to significant time savings along the entire length of the bus route.

Cost Considerations

TSP requires a moderate level of investment since traffic lights must be replaced or upgraded. Bus fleets also need to be equipped with TSP controllers, so the cost is also affected by the bus fleet size. Finally, TSP requires relocating bus stops from nearside to farside, otherwise, any time savings will be lost by picking up and dropping off riders.

Benefits

Reduces Travel Time | Reduces Dwell Time | **Reduces Wait Time** | Improves Rider Access | Improves Rider Safety

Space:

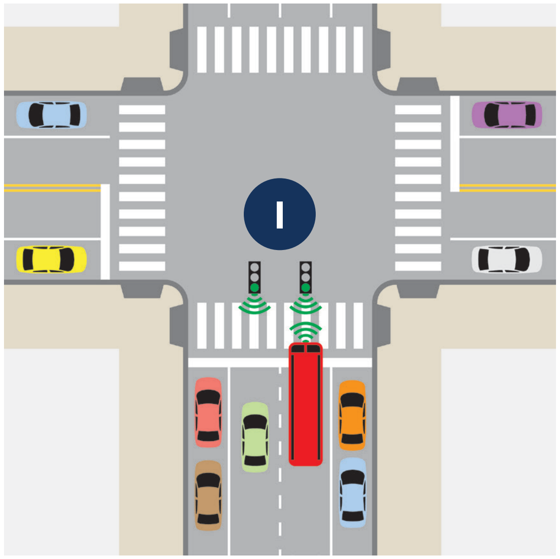
- N/A (placed within existing intersections)

Consider:

- Signalized intersections with long signal cycles
- Signalized intersections with heavy vehicle stacking
- Roadways with long distances between traffic lights

Cost:

$ $



BUS STOP TOOLS

J. TEMPORARY CURB EXTENSION

Temporary curb extensions allow buses to serve bus stops faster by picking up and dropping off riders without having to pull over to the curb.

Function

This tool eliminates the need for buses to wait for a break in traffic to merge back from a bus stop and continue traveling. If repeated across multiple bus stops, the small time savings at each bus stop may add up to significant time savings along the entire length of the bus route.

Applications

This tool is useful along roadways that have more than one travel lane in the same direction: if the bus stops in one travel lane to serve a bus stop, vehicles can still use the other travel lane to pass. Curb extensions also improve wheelchair accessibility since bus stops without them may not always have enough space for buses to fully pull over and deploy ramps.

Cost Considerations

Temporary curb extensions are cost-effective: since they are made of heavy rubberized plastic, they can be dropped in place at existing bus stops without any other roadway modifications or restriping. They can serve as "pilot" experiments before committing to more expensive long-term investments.

Benefits

- **Reduces Travel Time**
- **Reduces Dwell Time**
- Reduces Wait Time
- **Improves Rider Access**
- **Improves Rider Safety**

Space:

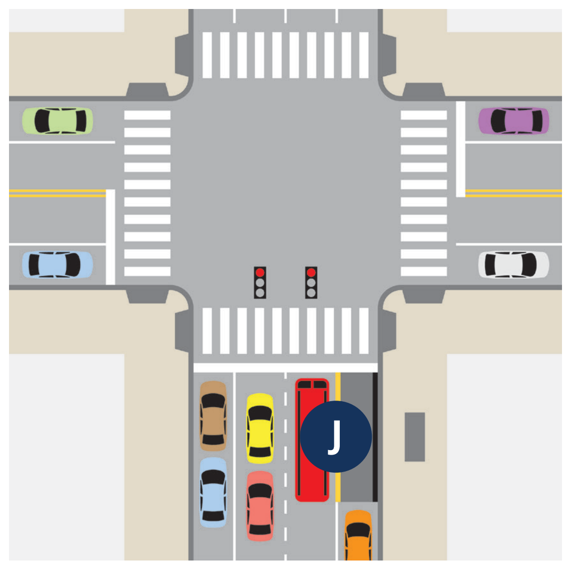
- Minimum length: 42' (fits a 40' bus)
- Preferred length: 62' (fits a 60' bus)

Consider:

- Bus stops with high ridership or with many riders with disabilities
- Roadways with curbside parking to expand into

Cost:

$



Space:

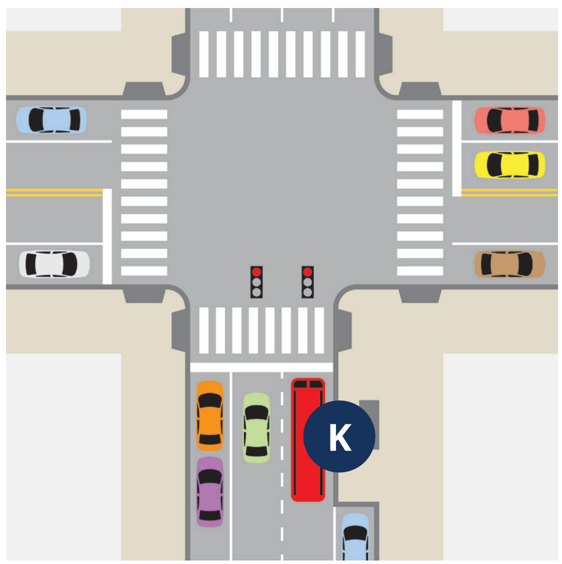
- Minimum length: 50' (for one 40' bus)
- Preferred length: 140' (for two 60' buses)

Consider:

- Bus stops with high ridership or with many riders with disabilities
- Roadways with curbside parking to expand into

Cost:

$ $



K. PERMANENT CURB EXTENSION

Permanent curb extensions allow buses to serve bus stops faster by picking up and dropping off riders without having to pull over to the curb.

Function

Similar to a temporary curb extension, this tool eliminates the need for buses to wait for a break in traffic to merge back from a bus stop and continue traveling. But unlike a temporary curb extension, this tool provides a permanent space for a bus shelter and other bus stop amenities.

Applications

This tool is useful along roadways that have more than one travel lane in the same direction: if the bus stops in one travel lane to serve a bus stop, vehicles can still use the other travel lane to pass. Curb extensions also improve wheelchair accessibility since bus stops without them may not always have enough space for buses to fully pull over and deploy ramps.

Cost Considerations

Permanent curb extensions are significantly more expensive than temporary ones since they require reconstructing curbs and sidewalks, and potentially even relocating storm drain inlets. However, their long-term benefits are greater since they provide permanent waiting, shelter, and amenity space.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | Improves Rider Access | Improves Rider Safety

L. FARSIDE BUS STOP

Unlike nearside bus stops, farside bus stops allow buses to pick up and drop off riders *after* crossing an intersection. They are becoming common prerequisites for efficient queue jumps and transit signal priority (TSP).

Function

While farside bus stops are vulnerable to blockages from illegally parked vehicles, they are more efficient than nearside bus stops: buses can pass through a traffic light *before* picking up and dropping off riders, and buses can depart the stops without waiting for the lights behind them.

As described earlier, this tool's benefits increase when it is paired with queue jumps or TSP: if repeated across multiple bus stops and intersections, the small time savings at each bus stop and intersection may add up to significant time savings along the entire length of the bus route.

Applications

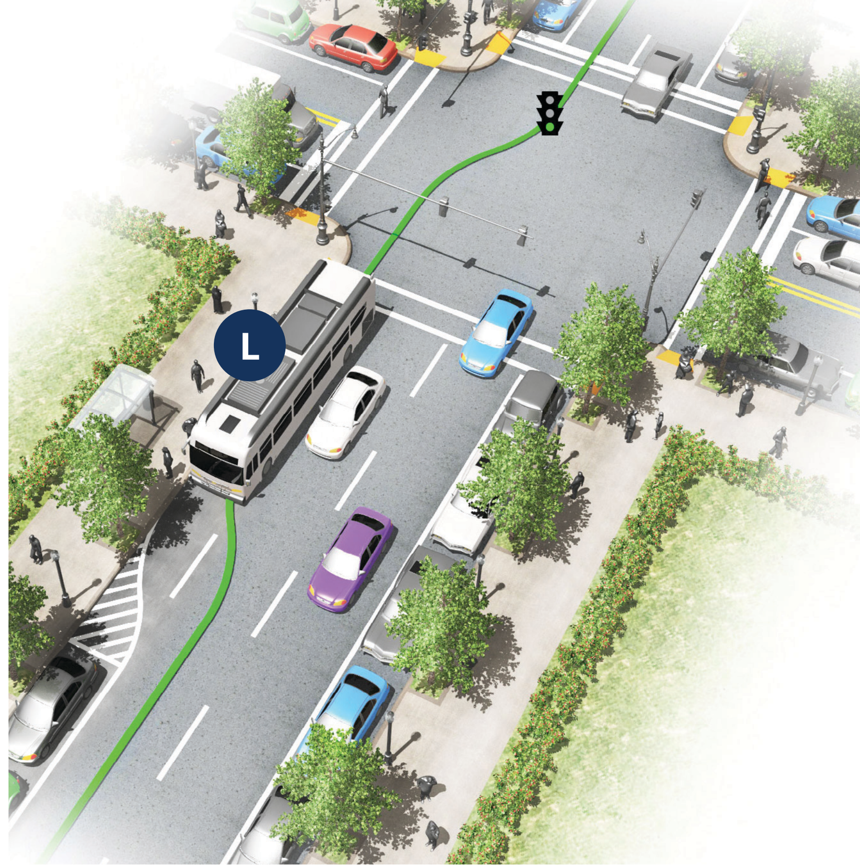
This tool is best for roadways with wide intersections since buses can block narrow intersections upon stopping, especially if there isn't adequate curbside space for a long bus stop on the far side of the intersection. This tool can be paired with a curb extension (see Tools J and K) to improve rider access and safety.

Cost Considerations

While farside bus stops are not inherently more expensive than nearside stops, any associated queue jumps and TSP can increase their cost. High-volume stops can also benefit from more durable concrete roadway pads.

Benefits

Reduces Travel Time | Reduces Dwell Time | **Reduces Wait Time** | Improves Rider Access | Improves Rider Safety



Space:

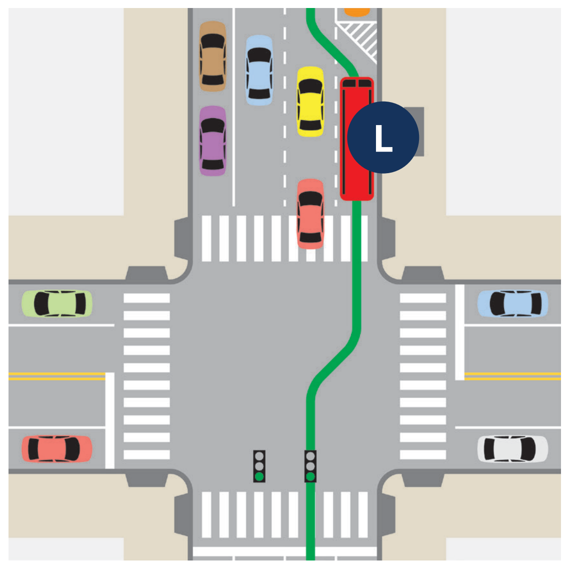
- Minimum length: 70' (to fit at least one 40' or 60' bus)
- Minimum front taper length: 25'

Consider:

- Signalized intersections with long signal cycles
- Transit signal priority or queue jump at preceding intersection

Cost:

$



Space:

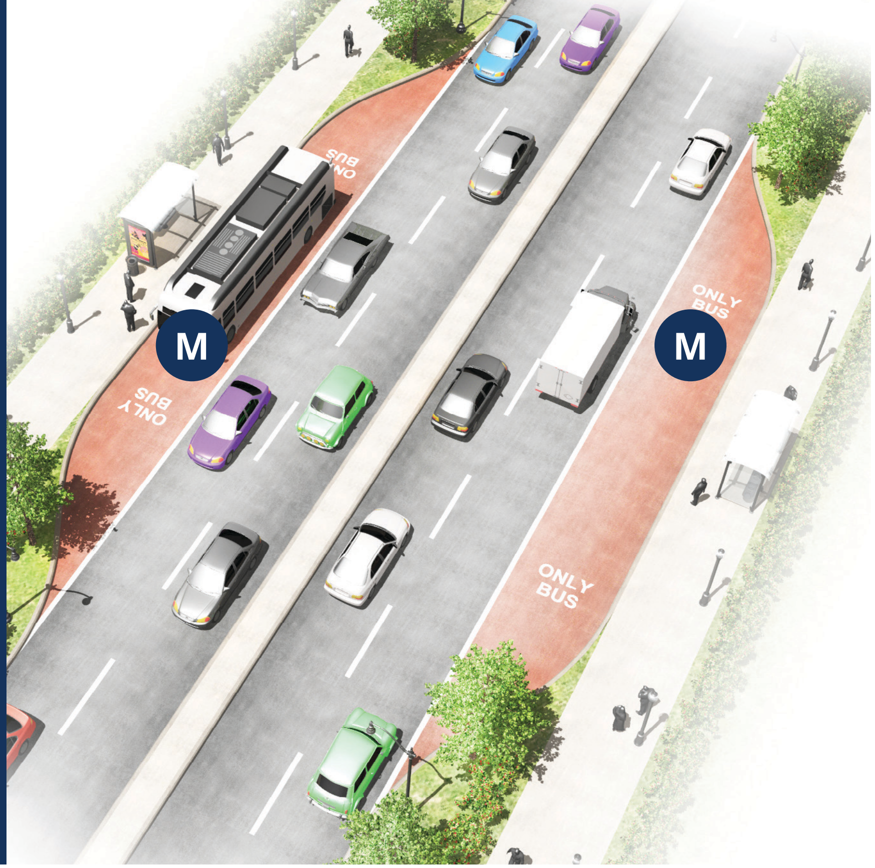
- Minimum length: 70' (to fit at least one 40' or 60' bus)
- Minimum front taper length: 25'
- Minimum rear taper length: 50'

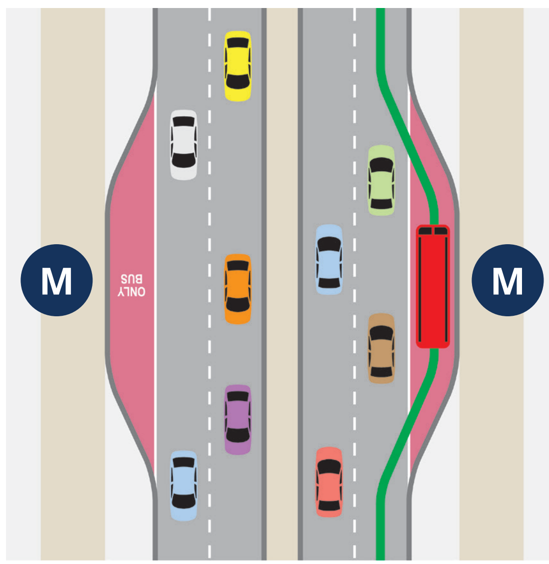
Consider:

- Bus stops with high ridership or with many riders with disabilities
- Bus stops with layovers

Cost:

$ $





M. PULLOUT BUS STOP

Pullout bus stops allow buses to leave the travel lane to pick up and drop off riders. After serving the stop, buses merge back into the travel lane.

Function

Pullout bus stops minimize bus routes' impact to through traffic, but at a cost to dwell and travel times: buses will lose time waiting for a break in traffic to merge back from the bus stop and continue traveling.

Applications

Despite the operational disadvantage above, these stops are useful in locations where better rider access is necessary — for example, at high-ridership stops or stops serving high proportions of riders with disabilities. They are useful at stops where headway-managed buses need to pause and wait to disperse, or where buses need to lay over without impacting through traffic. On corridors with overlapping local and limited-stop buses, they also allow limited-stop buses to pass local buses.

Cost Considerations

The cost for these stops can vary widely depending on the context: in locations where the pullout stop is inset into a curbside parking lane, only signage and marking are typically necessary. Locations where the pullout stop needs to cut into the curbside grass or sidewalk require the more costly reconstruction of curbs, concrete roadway pads, and adjacent sidewalks.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | **Improves Rider Access** | **Improves Rider Safety**

N. TEMPORARY FLOATING BUS STOP

Temporary floating bus stops allow buses to pick up and drop off riders without having to pull over into a bike lane and pose a safety risk for cyclists.

Function

By separating the bus stop from the bike lane, this tool improves cyclist safety and provides more space for waiting riders. Since riders still need to cross the bike lane to travel between the bus stop and sidewalk, cyclists must be alert when approaching and passing temporary floating bus stops: the stop's "bump up" pathway is designed to alert cyclists of crossing riders.

Applications

This tool is useful along roadways that have protected or offset bike lanes. A temporary floating bus stop can also effectively serve as a curb extension (see Tools J and K) if it is built out into the parking lane.

Cost Considerations

Temporary floating bus stops are similar to temporary curb extensions: they are made of heavy rubberized plastic, they contain a “bump up” pathway for cyclists, and they can be dropped in place at existing bus stops. They can serve as “pilot” experiments before committing to more expensive permanent floating bus stops (see Tool O).

Benefits

- **Reduces Travel Time**
- **Reduces Dwell Time**
- Reduces Wait Time
- **Improves Rider Access**
- **Improves Rider Safety**

Space:

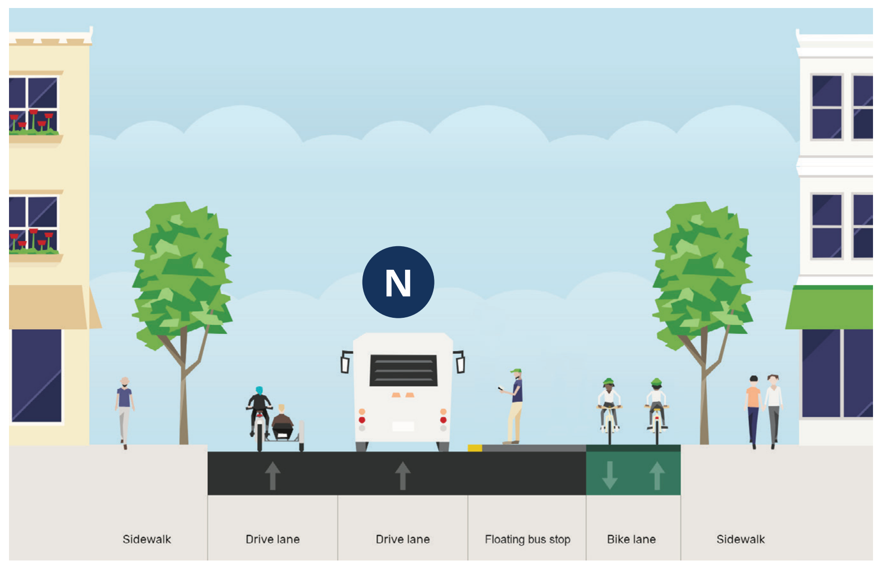
- Minimum length: 42' (fits a 40' bus)
- Preferred length: 62' (fits a 60' bus)

Consider:

- Bus stops adjacent to protected or offset bike lanes
- Roadways with curbside parking to expand into

Cost:

$



Space:

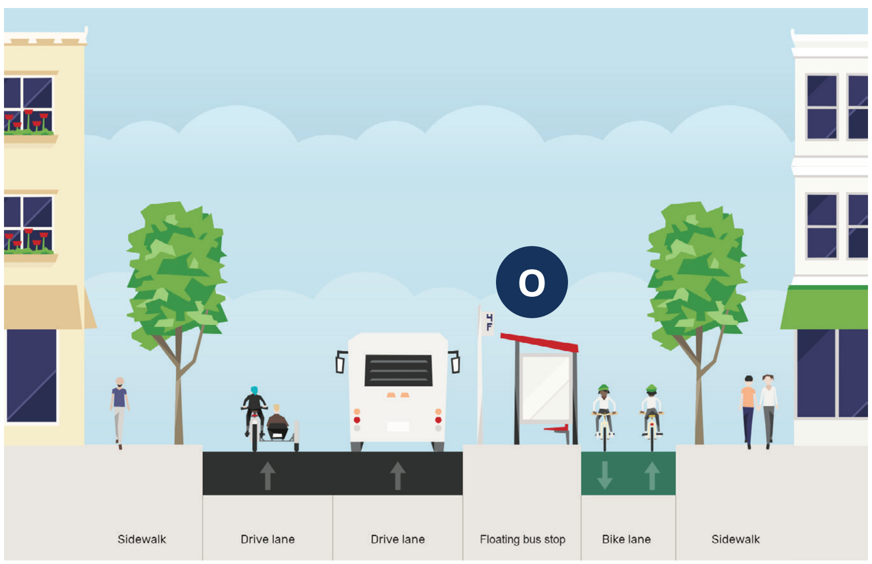
- Minimum length: 50' (for one 40' bus)
- Preferred length: 140' (for two 60' buses)

Consider:

- Bus stops adjacent to protected or offset bike lanes
- Roadways with curbside parking to expand into

Cost:

$ $



O. PERMANENT FLOATING BUS STOP

Permanent floating bus stops allow buses to pick up and drop off riders without having to pull over into a bike lane and pose a safety risk for cyclists.

Function

Similar to a temporary floating bus stop, this tool separates the bus stop from the bike lane, improving cyclist safety but also providing a permanent space for a bus shelter and other bus stop amenities. Since riders still need to cross the bike lane to travel between the bus stop and sidewalk, cyclists must be alert when approaching and passing permanent floating bus stops: signage and surface treatments can help alert cyclists.

Applications

This tool is useful along roadways that have protected or offset bike lanes. A permanent floating bus stop can also effectively serve as a curb extension (see Tools J and K) if it is built out into the parking lane.

Cost Considerations

Permanent floating bus stops are significantly more expensive than temporary ones since they require reconstructing curbs and roadways, and potentially even relocating storm drain inlets. However, their long-term benefits are greater since they provide a firm footing for bus shelters.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | Improves Rider Access | Improves Rider Safety

P. SIDE-BOARDING MEDIAN BUS STOP

Side-boarding median bus stops allow riders to access bus medians or busways (see Tools E and F) and are positioned on the sides of the bus lanes.

Function

While riders must cross the roadway's general travel lanes to access these stops, they offer dedicated shelter and amenity space for waiting riders separated from any conflicting activities on the nearby sidewalks. These stops also allow buses to pick up and drop off riders without interference from other roadway traffic.

Applications

These stops are needed to access median bus lanes, otherwise, buses would need to leave the median to serve curbside bus stops. By eliminating that need, side-boarding median bus stops reduce bus dwell and travel times.

Cost Considerations

These stops are costly; they require significant reconstruction of the roadway and intersections, even in situations where medians can be reused. Rebuilt intersections require pedestrian infrastructure between the stops and the curbside sidewalks. These stops also require barriers separating them from the surrounding traffic, improving riders' and pedestrians' safety.

Benefits

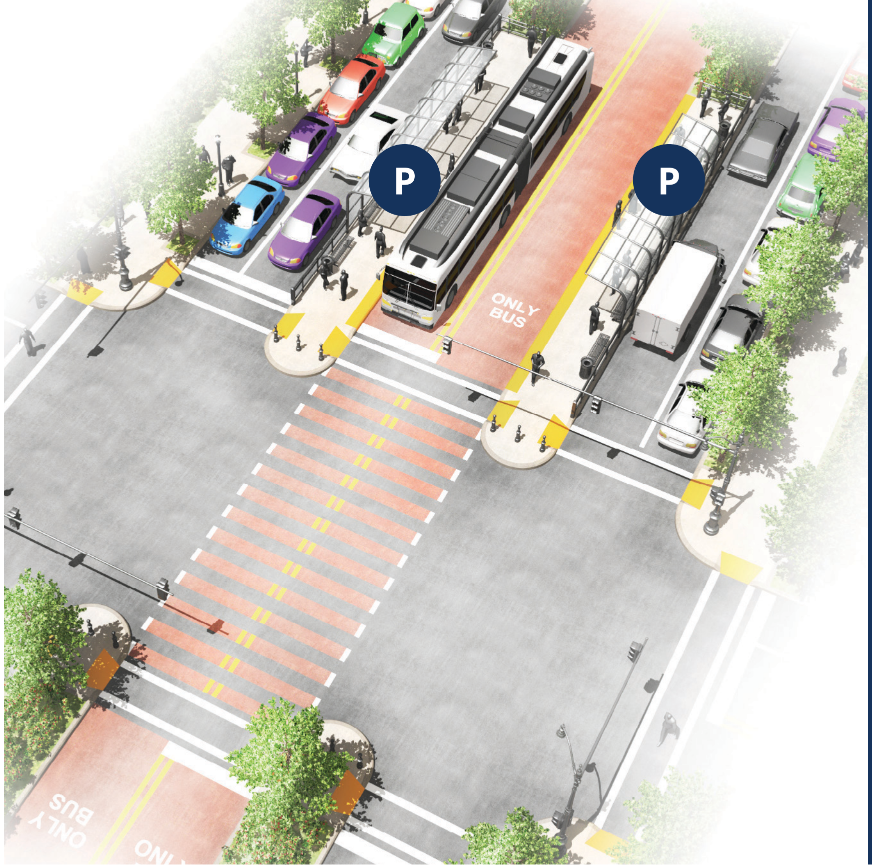
Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety



Space:

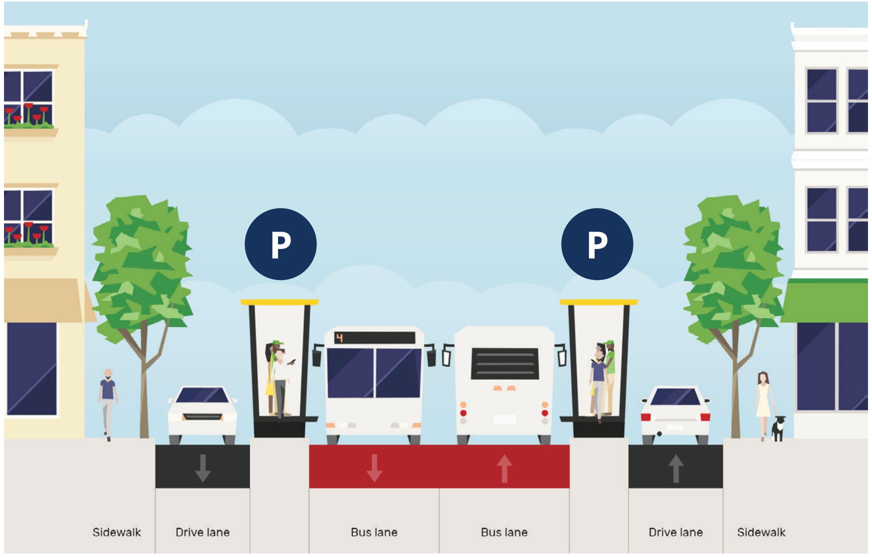
- Minimum length: 50' (for one 40' bus)
- Preferred length: 140' (for two 60' buses)
- Minimum width: 8' ea. (room for wheelchair boarding)
- Preferred width: 12' ea.

Consider:

- Median bus lanes

Cost:

$ $ $



Space:

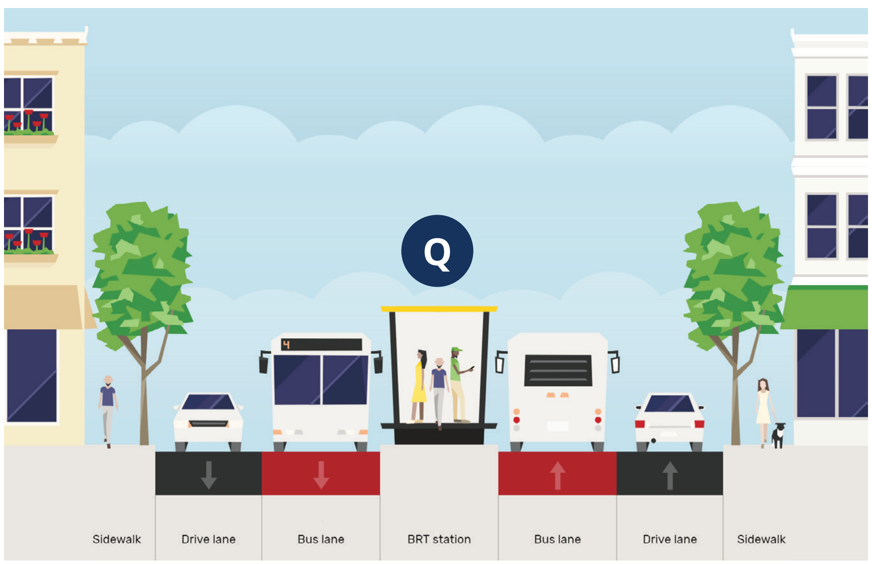
- Minimum length: 50' (for one 40' bus)
- Preferred length: 140' (for two 60' buses)
- Minimum width: 8' (room for wheelchair boarding)
- Preferred width: 12'

Consider:

- Median bus lanes

Cost:

$ $ $



Q. CENTER-BOARDING MEDIAN BUS STOP

Center-boarding median bus stops allow riders to access bus medians or busways (see Tools E and F) from the middle of the bus lanes, allowing riders to access buses traveling in both directions from a single platform.

Function

While riders must cross the roadway's general travel and bus lanes to access these stops, they offer dedicated shelter and amenity space for waiting riders separated from any conflicting activities on the nearby sidewalks. These stops also allow buses to pick up and drop off riders without interference from other roadway traffic.

Applications

These stops are needed to access median bus lanes, otherwise, buses would need to leave the median to serve curbside bus stops. By eliminating that need, center-boarding median bus stops reduce bus dwell and travel times.

Cost Considerations

These stops require less construction than side-boarding median bus stops since a shared platform can serve buses in both directions. However, shared platforms require buses with dual-side doors. Offset platforms — one platform on each side of the intersection serving separate directions — can save space and are compatible with buses with standard right-side doors.

Benefits

- **Reduces Travel Time**
- **Reduces Dwell Time**
- Reduces Wait Time
- Improves Rider Access
- Improves Rider Safety

R. LEVEL BUS STOP

Level bus stops allow riders to get on and off buses without having to step up or down from the sidewalk, and they reduce the horizontal gap between the curb and the bus doors. The surface height of the raised bus stop matches the surface height of the bus floor, which also makes wheelchair ramp deployment and wheelchair maneuvering easier.

Function

This tool is typically built to a surface height higher than the surrounding sidewalk to accommodate the operation described above.

Due to modern low-floor bus technology, however, these stops do not need to be raised as high as most metro, light rail, or commuter rail platforms: typically only an additional several inches of raised height are needed.

Applications

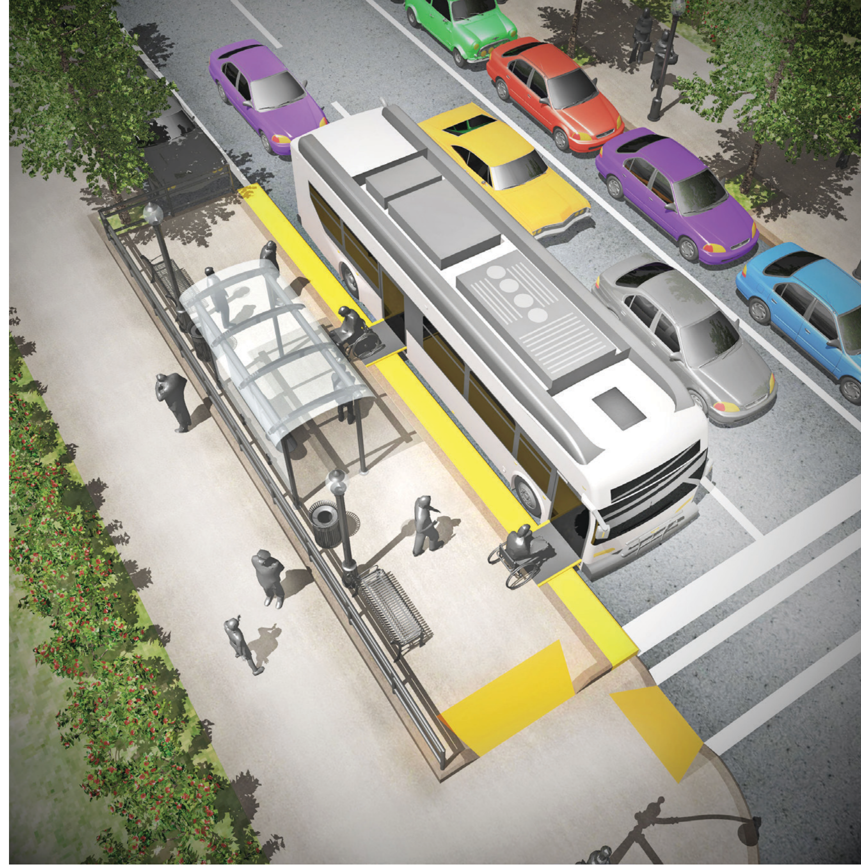
This tool works best at high-volume bus stops and bus stops that serve high proportions of riders with disabilities. The time it takes for riders to step up and step down from buses contributes to their "dwell time," so reducing this time can improve a bus route's speed and efficiency.

Cost Considerations

Raising bus stop surfaces is expensive, especially if sidewalk space is limited. The raised waiting area requires an ADA-compliant ramp and railings, and pouring the raised concrete bed may require relocating posts, grates, utility covers and openings, and other surface obstacles.

Benefits

- **Reduces Travel Time**
- **Reduces Dwell Time**
- Reduces Wait Time
- **Improves Rider Access**
- **Improves Rider Safety**



Space:

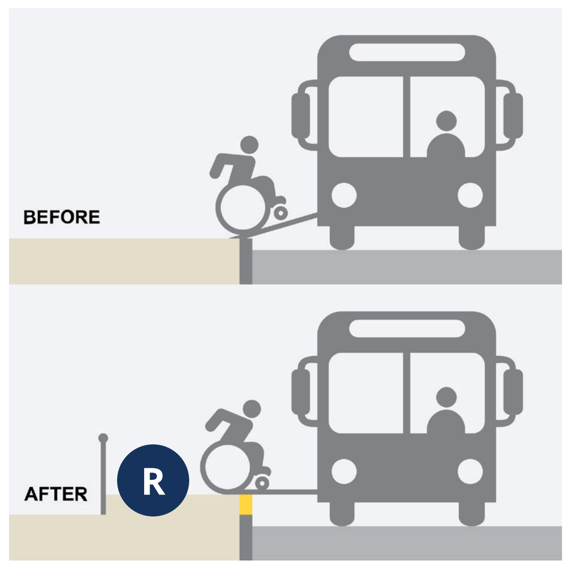
- Minimum length: 50' (for one 40' bus)
- Preferred length: 140' (for two 60' buses)
- Minimum width: 8' (room for wheelchair boarding)
- Preferred width: 12'

Consider:

- Bus stops with high ridership or with many riders with disabilities

Cost:

$ $ $



Space:

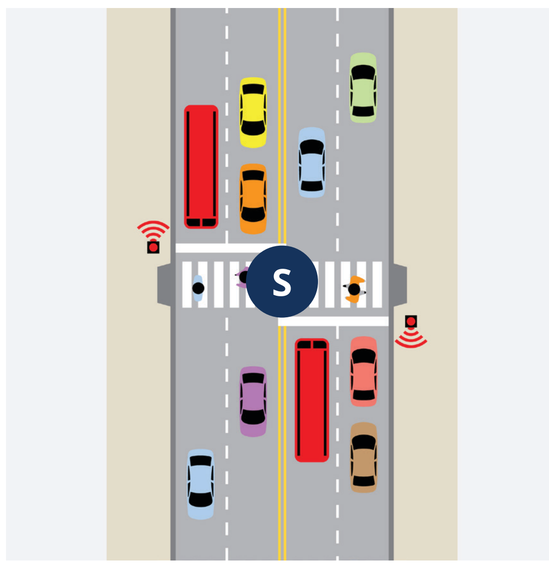
- Minimum ADA-compliant crosswalk width: 4'

Consider:

- Suburban roadways with long distances between intersections, or long urban blocks that impede easy crossing
- Roadways lacking signalized intersection crosswalks

Cost:

$ $



S. FLASHING PEDESTRIAN CROSSING

Flashing pedestrian crossings, commonly known as "HAWKs" (High-Intensity Activated Crosswalk Beacons) or "RRFBs" (Rectangular Rapid Flashing Beacons), enable pedestrians to cross roadways in locations lacking conventional signalized intersection crosswalks.

Function

Flashing crossings may contain pedestrian sensors or push buttons that activate flashing lights to alert approaching vehicles of pedestrians. They may also contain raised crosswalks to slow drivers down and refuge medians to encourage pedestrians to cross roadways at right angles for maximum visibility.

Applications

Flashing crossings improve access to bus stops on long city blocks by providing convenient midblock crossing points. They are also useful on suburban roadways that contain few signalized intersection crosswalks. By providing safe crossing points for bus riders, flashing crossings enable *bidirectional* access to bus stops, improving their bus routes' efficiency.

Cost Considerations

Flashing crossings are less expensive than conventional signalized intersection crosswalks, but they still require a moderate amount of investment for any medians, ADA-compliant curb ramps, raised crosswalks, and beacons.

Benefits

Reduces Travel Time

Reduces Dwell Time

Reduces Wait Time

Improves Rider Access

Improves Rider Safety

T. BUS STOP OPTIMIZATION

Bus stop optimization is the process of adding, removing, or relocating bus stops along a bus route to improve its speed, reliability, and efficiency.

Function

A bus route that stops on every block significantly slows buses down even if the bus stops provide good access for riders. In other locations bus stops may be spaced too far apart, or may be spaced inconsistently, both of which provide poor access for riders. Optimization is the process of re-spacing bus stops consistently while maintaining good access for riders.

Applications

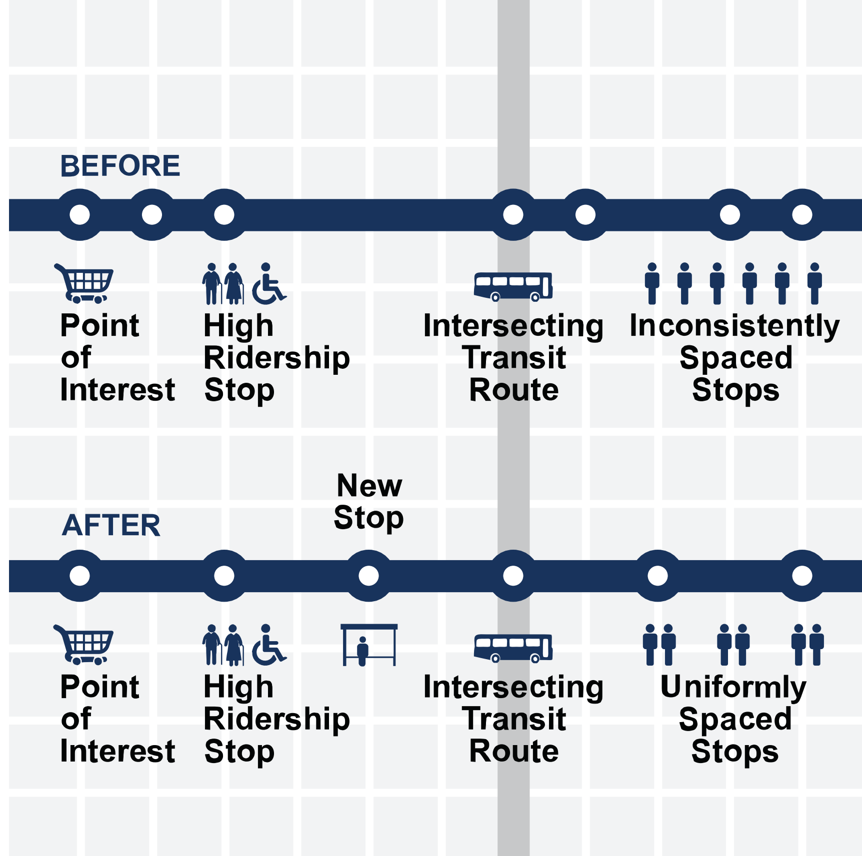
Bus routes that contain closely-spaced stops inherited from streetcar routes, or that have accumulated inconsistent stop spacing from years of piecemeal, ad-hoc stop removals or additions are good candidates for optimization.

Cost Considerations

This tool seldom requires new resources, which are needed only in locations where stops need to be added or moved. However, the resources saved or pulled from discontinued bus stops should be redistributed to the remaining bus stops: optimization is an opportunity to improve the condition of remaining bus stops by adding shelters, benches, and other amenities.

Benefits

Reduces Travel Time | Reduces Dwell Time | Reduces Wait Time | Improves Rider Access | Improves Rider Safety



Space:

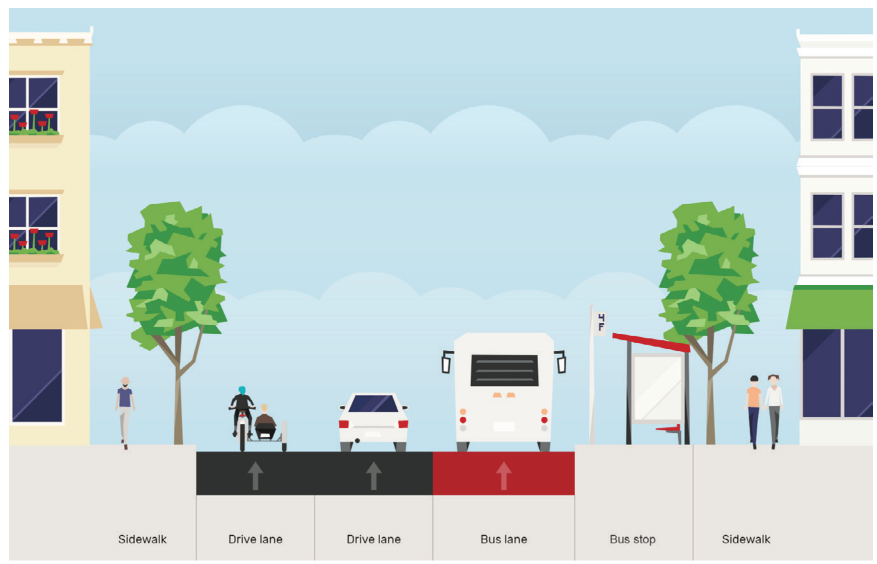
- N/A (space will vary depending on whether stops are added or removed)

Consider:

- Bus stops spaced only one block apart
- Bus stops spaced too far apart
- Inconsistent bus stop spacing

Cost:

$ $



BIKE PRIORITY TOOLS

These tools apply not only to bikes, but also to emerging micromobility technologies such as e-bikes, e-scooters, and other personal mobility devices.

U. CURBSIDE BIKE LANE

Curbside bike lanes improve cyclist safety by allowing them to travel in dedicated lanes separated from moving vehicles.

Function

This tool typically repurposes a roadway's curbside (right side) parking or travel lane for cycling. Curbside bike lanes can be painted green to distinguish them from general travel lanes, and depending on the amount of space allocated, they can be either one-way or two-way.

A curbside bike lane is vulnerable to blockage from illegally parked vehicles (particularly from delivery vehicles), especially if it replaced a curbside parking lane. Raised curbs, raised domes, bollards, or water-filled barricades discourage vehicles from entering or parking in the bike lane and improve cyclist safety and comfort.

Applications

These lanes work best as a network, providing a safe and comfortable environment for cyclists at all experience levels, particularly on higher-speed and higher-volume roadways.

Cost Considerations

These lanes typically only require restriping and painting of existing roadway space, which makes them cost-effective. Repaving is not typically necessary. There are also minor costs for procuring and installing any buffers (raised curbs, raised domes, bollards, or water-filled barricades).

Benefits

- Reduces Pedestrian Conflicts
- Reduces Vehicle Conflicts
- Improves Cyclist Visibility
- Improves Cyclist Access
- Improves Cyclist Safety

Space:

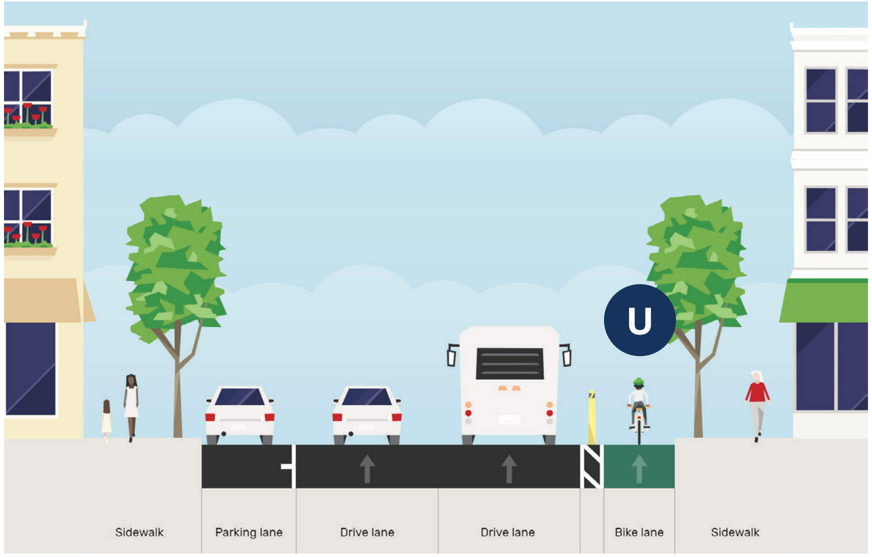
- Minimum width: 3' to 4'
- Preferred width: 5' to 6'

Consider:

- Roadways with 3,000 or more vehicles per day
- Roadways with speed limits of 25 mph or more
- Roadways with high bus or truck traffic

Cost:

$



Space:

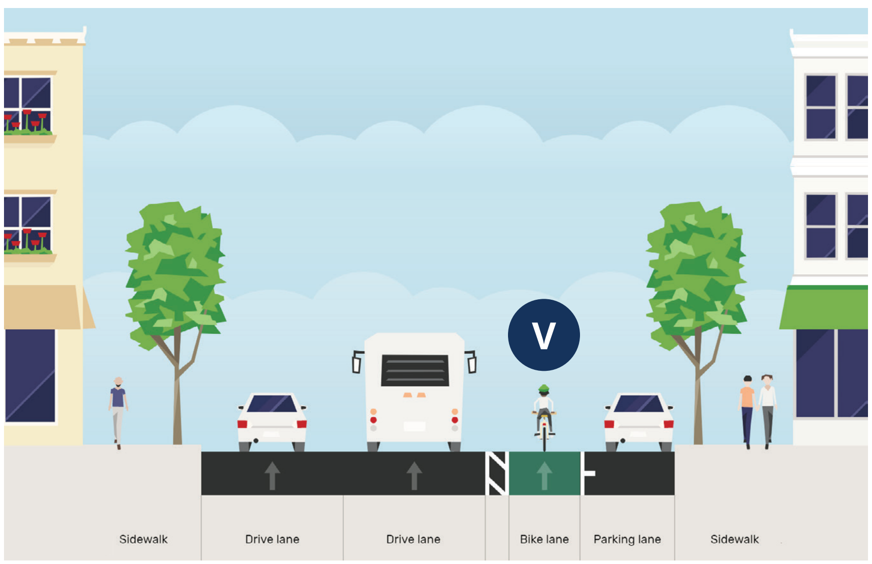
- Minimum width: 5'
- Preferred width: 6'

Consider:

- Roadways with 3,000 or more vehicles per day
- Roadways with speed limits of 25 mph or more
- Roadways with high bus or truck traffic

Cost:

$



V. OFFSET BIKE LANE

Offset bike lanes improve cyclist safety by allowing them to travel in dedicated lanes separated from parked and moving vehicles.

Function

These lanes are placed between a roadway's parking and general travel lanes. They can be painted green to distinguish them from the parking and general travel lanes, and they must be of sufficient width to minimize "dooring" from people entering or exiting parked vehicles.

Vehicles must cross these lanes to park, which can pose a safety risk to cyclists from inattentive drivers. Since vehicles must cross these lanes to park, raised curbs, raised domes, bollards, or water-filled barricades typically cannot be deployed, which in turn makes these lanes vulnerable to blockage from illegally parked vehicles, particularly from delivery vehicles.

Applications

These lanes work best as a network, providing a safe and comfortable environment for cyclists at all experience levels, particularly on higher-speed and higher-volume roadways.

Cost Considerations

These lanes typically only require restriping and painting of existing roadway space, which makes them cost-effective. Repaving is not typically necessary.

Benefits

Reduces Pedestrian Conflicts | **Reduces Vehicle Conflicts** | **Improves Cyclist Visibility** | **Improves Cyclist Access** | **Improves Cyclist Safety**

W. PROTECTED BIKE LANE

Protected bike lanes attempt to reduce the cyclist safety risks of offset bike lanes by moving those lanes adjacent to the roadway curb.

Function

Rather than placing the bike lane between a roadway's parking and general travel lanes, protected bike lanes use the parking lane to buffer and protect cyclists from traffic in the general travel lanes. The buffer can be composed of raised curbs, raised domes, bollards, or water-filled barricades.

These lanes can be painted green and can be one-way or two-way depending on the amount of space allocated. Two-way lanes must be wide enough to allow cyclists traveling in opposite directions to safely pass each other.

Applications

These lanes work best on higher-speed roadways on which offset bike lanes are inadequate in reducing cyclists' discomfort with heavy traffic. They are useful in creating connected bike networks and in increasing the cycling mode share, particularly among younger and less experienced cyclists.

Cost Considerations

These lanes require restriping and painting of existing roadway space to indicate the new position of the shifted parking lanes. While repaving is not typically necessary, there are minor costs for procuring and installing any buffers (raised curbs, raised domes, bollards, or water-filled barricades).

Benefits

- **Reduces Pedestrian Conflicts**
- **Reduces Vehicle Conflicts**
- Improves Cyclist Visibility
- **Improves Cyclist Access**
- **Improves Cyclist Safety**

Space:

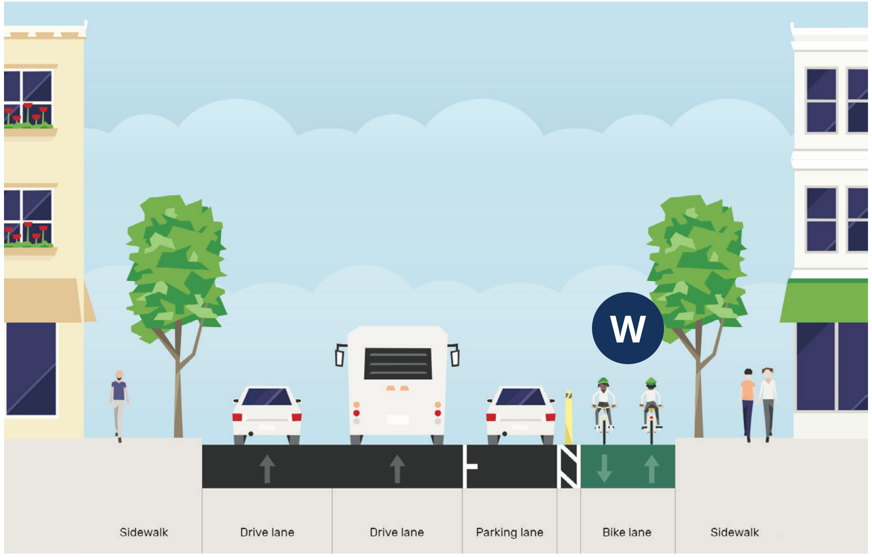
- Minimum width: 8' (4' per direction)
- Preferred width: 12' (6' per direction)

Consider:

- Roadways with many cyclists
- Roadways with multiple travel lanes, high speeds, high parking turnover, or other stressors for cyclists

Cost:

$



Space:

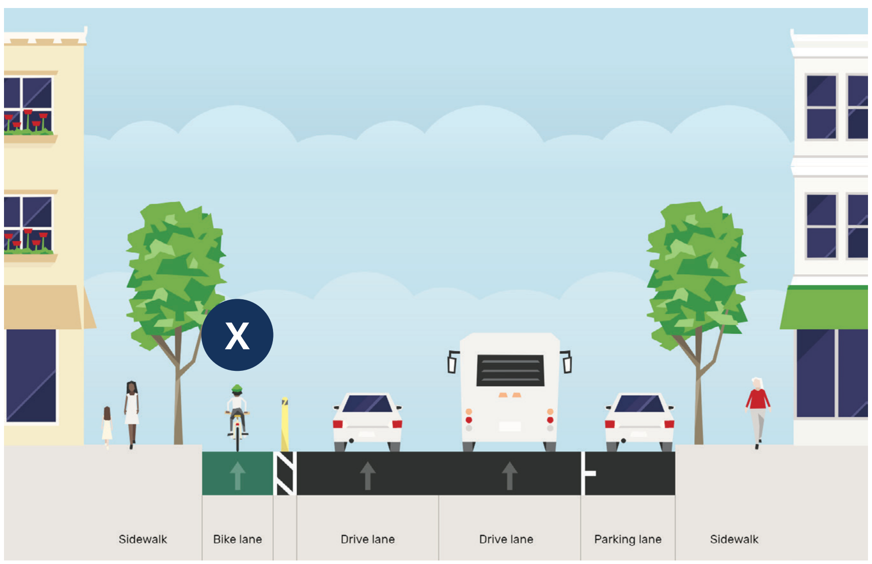
- Minimum width: 3' to 4'
- Preferred width: 5' to 6'

Consider:

- Roadways with bus stops
- Roadways with high parking turnover
- Frequent turning vehicles (fewer conflicts with right turns; more visibility for left turns)

Cost:

$



X. LEFT SIDE BIKE LANE

Left side bike lanes improve cyclist safety by allowing them to travel in dedicated lanes separated from and on the *left side* of moving vehicles, where their visibility among drivers is highest.

Function

By repurposing the leftmost lane of a roadway for cycling, this tool eliminates conflicts between cyclists and parking vehicles in offset bike lanes, as well as conflicts between cyclists and buses in curbside bike lanes, in which buses need to enter the lanes to serve bus stops. Left side bike lanes also position cyclists closer in drivers' sightlines, improving their safety.

Applications

These lanes work best on one-way roadways with significant bus traffic by minimizing conflicts between cyclists, buses, and bus stops. They are also effective on roadways that see a high proportion of left turns: by placing cyclists closer in drivers' sightlines, drivers are more likely to yield to cyclists when making left turns.

Cost Considerations

These lanes typically only require restriping and painting of existing roadway space, which makes them cost-effective. Repaving is not typically necessary. There are also minor costs for procuring and installing any buffers (raised curbs, raised domes, bollards, or water-filled barricades).

Benefits

- **Reduces Pedestrian Conflicts**
- **Reduces Vehicle Conflicts**
- **Improves Cyclist Visibility**
- **Improves Cyclist Access**
- **Improves Cyclist Safety**

Y. BIKE BOULEVARD

Bike boulevards improve cyclist safety by prioritizing cycling on narrower, quieter roadways with low speed limits, often providing a safer alternative to wider, higher-speed roadways in the area.

Function

Since cyclists and drivers must share the same travel lanes, bike boulevards contain signage and pavement markings called *sharrows* to alert drivers to the presence of cyclists. To slow drivers and improve cyclist safety, traffic calming tools such as narrow lanes, chicanes, intersection diverters, raised crosswalks/intersections, and curb extensions (see Tools J and K) should be applied to the travel lanes.

Applications

Bike boulevards work best on quieter roadways with less than 1,500 vehicles per day, and where prevailing speeds are under 25 mph. Tools U, V, and W are better-suited for busier, faster roadways since cyclists are less comfortable sharing travel lanes with drivers. Not only can a strategic network of bike boulevards help cyclists avoid busier, faster roadways, but bike boulevards also help create quiet neighborhood streets that are more comfortable for children, pets, and other vulnerable groups.

Cost Considerations

While signage and pavement markings (sharrows) are cost-effective, they alone do not improve cyclist safety. The traffic calming tools described above are essential for effective bike boulevards, and their costs can vary widely. For example, it is possible to narrow lanes with simple restriping (cost-effective), or by widening sidewalks to reclaim roadway space (more costly).

Benefits

Reduces Pedestrian Conflicts | Reduces Vehicle Conflicts | **Improves Cyclist Visibility** | **Improves Cyclist Access** | **Improves Cyclist Safety**

Space:

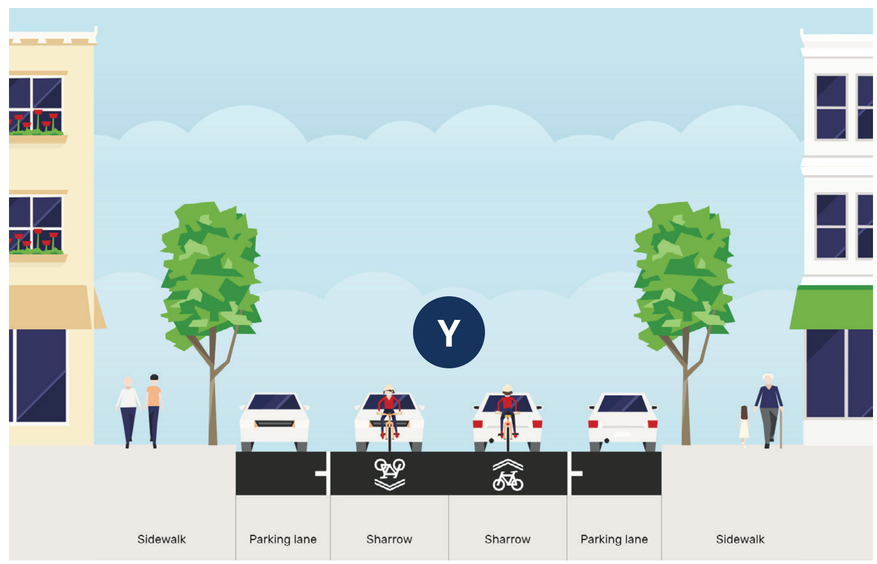
- Cyclists use a full travel lane marked with sharrows
- Maximum travel lane width of 10' preferred

Consider:

- Roadways with less than 1,500 vehicles per day
- Roadways with prevailing speeds under 25 mph

Cost:

$ $



REFERENCES

The information in this toolbox is sourced from a variety of industry publications, primarily from the *Transit Street Design Guide, Urban Street Design Guide,* and *Urban Bikeway Design Guide* published by the National Association of City Transportation Officials (NACTO). Additional information on each tool can be found at the links below:

BUS PRIORITY TOOLS

- Curbside Bus Lane
- Offset Bus Lane
- Contraflow Bus Lane
- Peak-Only Bus Lane
- Median Bus Lane
- Busway
- Bus on Shoulder
- Queue Jump
- Transit Signal Priority (TSP)

BUS STOP TOOLS

- Temporary Curb Extension
- Permanent Curb Extension
- Farside Bus Stop
- Pullout Bus Stop
- Temporary Floating Bus Stop
- Permanent Floating Bus Stop
- Side-Boarding Median Bus Stop
- Center-Boarding Median Bus Stop
- Level Bus Stop
- Flashing Pedestrian Crossing
- Bus Stop Optimization

BIKE PRIORITY TOOLS

- Curbside Bike Lane
- Offset Bike Lane
- Protected Bike Lane
- Left Side Bike Lane
- Bike Boulevard

Each NACTO link above has a references section with additional links to research and policy papers, case studies, and transit agency publications with even more detailed information.

This toolkit was prepared for CDTC and CDTA by Foursquare ITP. Section illustrations were prepared with the Streetmix tool.

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