FOURSQUARE ITP
INTEGRATED TRANSPORTATION PLANNING

Battle Creek Transit Master Plan

FINAL REPORT

Fall 2018

Prepared for:

BATTLE CREEK
BREAKFAST CAPITAL OF THE WORLD

CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

Like many American cities, Battle Creek has undergone a series of transformative changes since the middle of the 20th Century. Service, retail, and employment opportunities are increasingly found on the periphery of the community, often beyond the City's municipal boundaries. Similarly, housing patterns have changed, and many multi-family housing communities are unserved or underserved by the existing Battle Creek Transit network. Thus, the potential for transit ridership in Battle Creek region is likely considerably higher than the current ridership figures suggest.

The Battle Creek Transit Master Plan provided an opportunity to take a fresh look at the system's effectiveness and efficiency in serving a community that has seen significant change since the current transit system was initially designed. The study consisted of five major work tasks, corresponding to the chapters of this report:

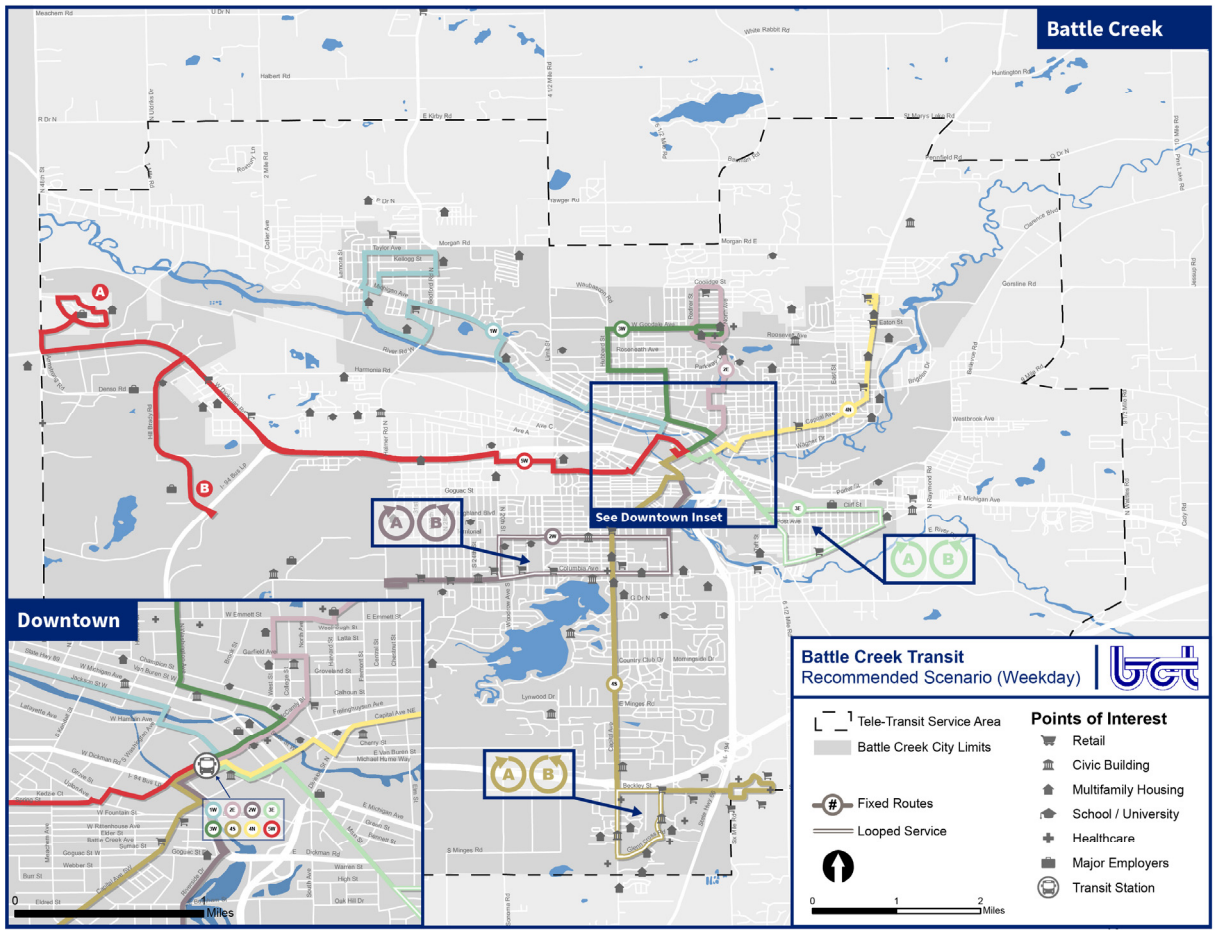
- **Existing Conditions and Market Analysis:** An overview of the overall transit network in the study area and an assessment of existing and potential demand for transit service based on population and employment density, as well as socio-economic and demographic characteristics (Chapter 1).
- **Stakeholder and Public Outreach:** A summary of the rider and non-rider input, collected in meetings and surveys over the course of the study, and used to inform the development of preliminary service improvement recommendations (Chapter 2).
- **Strengths, Weaknesses, Opportunities, and Threats Analysis:** A diagnostic assessment of the existing system's strengths and weaknesses, that also highlights opportunities for service improvements and identifies potential threats that could serve as barriers to the implementation or success of those improvements (Chapter 3).
- **Service Improvement Plan and Recommendations:** A detailed set of recommendations designed to better align transit service with ridership potential, and prefaced with an overview of the evolution of the plan from two preliminary service scenarios to a set of final recommendations (Chapter 4).
- **Financial Plan:** A planning-level forecast of anticipated costs and revenue over the course of a five-year period between Fiscal Years (FY) 2019 and 2023 (Chapter 5).
- **Staffing Analysis:** An assessment of how Battle Creek Transit compares to peer agencies with respect to staffing of bus maintenance technicians (Chapter 6).

At key points in the project, the study team elicited feedback from stakeholders and members of the public. On-board surveys were conducted at the start of the project to gauge service design preferences and priorities. A parallel survey was conducted online in order to reach additional riders, as well as non-riders. Public and stakeholder meetings were held after the completion of the market analysis and then again after the development of the preliminary service redesign scenarios. The preliminary service redesign scenarios were also posted online along with a survey to gauge the community's support (http://www.battlecreekmi.gov/648/Battle-Creek-Transit-Alternatives-Survey).

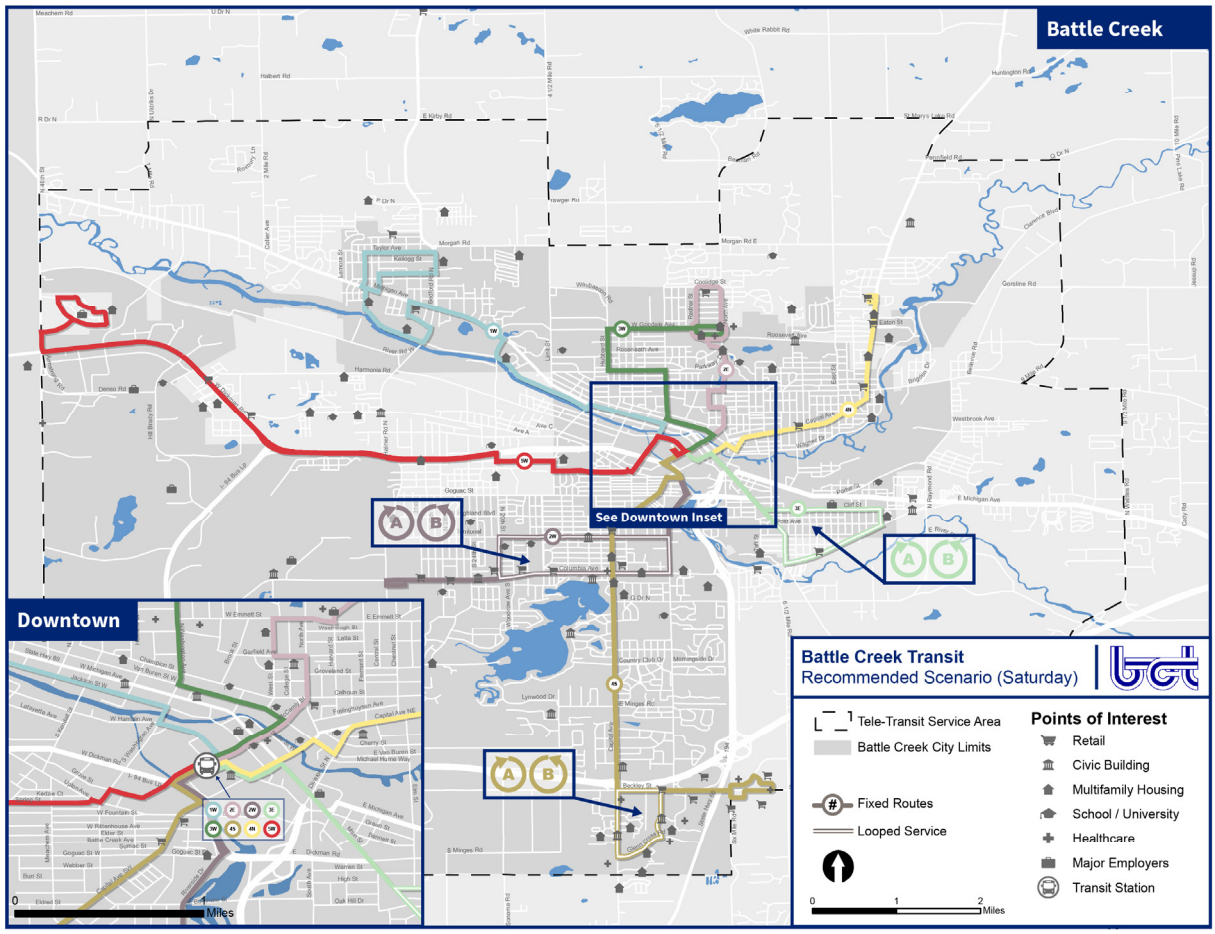
Overall, nearly 500 surveys were completed over the course of the COA study, helping to guide the study team toward the recommended service scenario illustrated in the proposed peak and off-peak system maps below. Detailed schedules for each route are included in **Appendix F.**

The recommended service scenario is designed to be cost-neutral, meaning it can be implemented within the current budget, staff, and fleet size. The projected ridership impact of the proposed redesign is a 12 percent increase in annual passenger trips.

Final Recommend Service Scenario (Weekday Peak Periods)



Final Recommend Service Scenario (Saturdays and Weekday Off-Peak Periods)



1. EXISTING CONDITIONS AND MARKET ANALYSIS

Battle Creek Transit (BCT) is a department of the City of Battle Creek's Transportation Division. As a service of the City of Battle Creek, BCT operates primarily within the City's boundaries. However, limited-stop service is provided in the neighboring communities of Springfield, Bedford Charter Township, Emmett Township, and Pennfield Charter Township in order to give Battle Creek residents access to key destinations in these municipalities.

BCT operates a fleet of 20 vehicles (13 fixed-route; 7 Tele-Transit), employs 40 people (when fully staffed), and provides close to 500,000 passenger trips per year. The BCT network is largely unchanged since the City assumed operations from Cereal City Coach Company in 1976. To ensure that BCT remains relevant and responsive to the mobility needs of Battle Creek residents, the City initiated a Transit Master Plan (TMP) study. As a first step in determining the future direction of BCT, the study team document the existing conditions of the study area. This included four key components:

- **Existing Services:** An overview of existing transit services in the study area, including current operating characteristics;
- **Fares and Finances:** A description of current fare policies and funding sources;
- **Market Analysis:** An assessment of both the need and potential for transit service in the study area based on density and demographic characteristics;
- **Document Review:** A summary of previous planning efforts.

Existing Services

BCT operates eight fixed-route bus lines that serve the City of Battle Creek and make limited stops in the neighboring communities of Springfield, Bedford Charter Township, Emmett Township, and Pennfield Charter Township. All routes operate six days a week (Monday through Saturday). A map of the existing BCT network is shown in **Figure 1**. A list of routes with service characteristics is presented in **Table 1**.

BCT also provides Tele-Transit demand-response service to Battle Creek-area residents. Tele-Transit is a door-to-door service, available upon request, to anyone within the designated Tele-Transit service zone. However, priority is given to Americans with Disability Act (ADA)-eligible individuals. Tele-Transit operates Monday through Friday, from 5:15 AM to midnight, and Saturdays from 9:15 AM – 5:00 PM.

Figure 1 | Battle Creek Transit Network

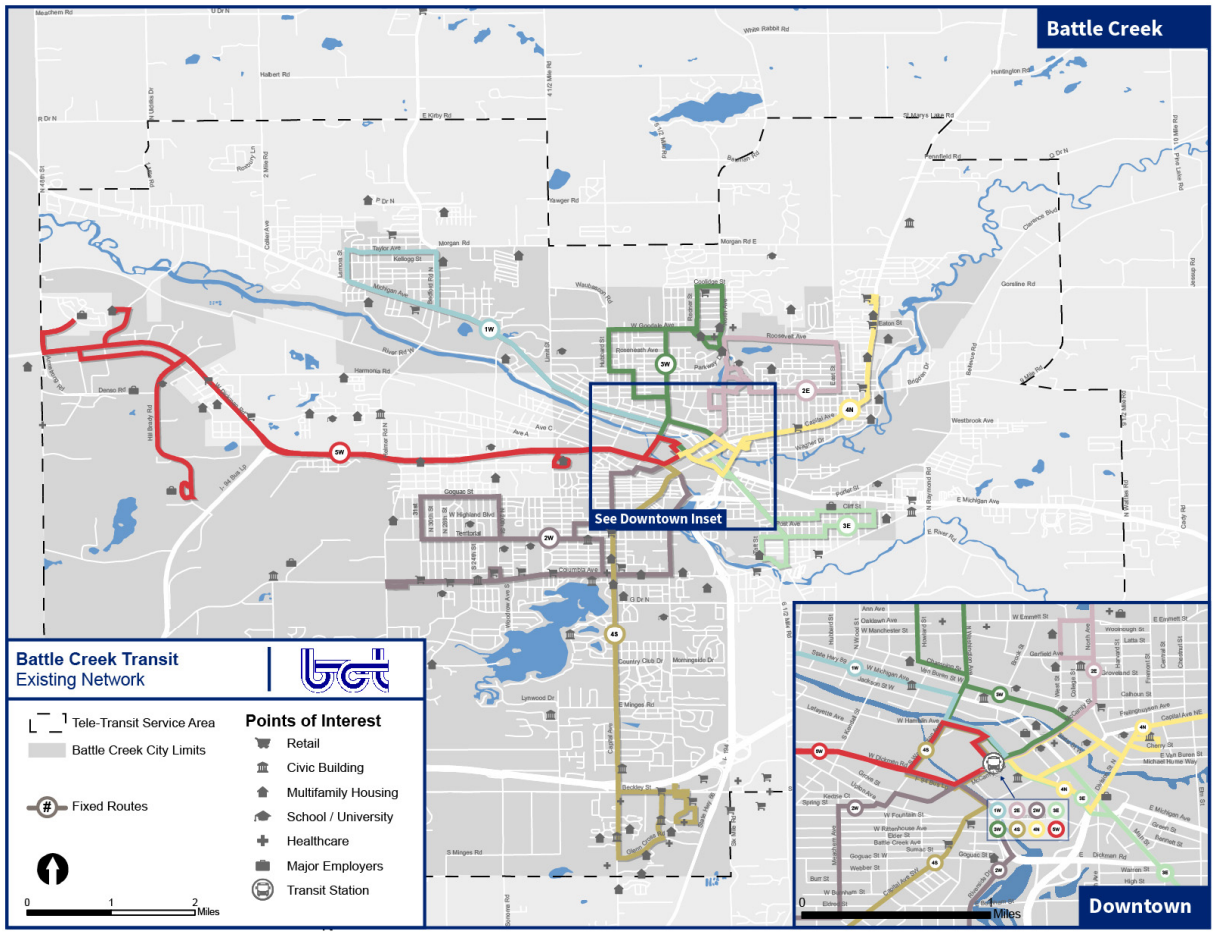


Table 1 | Fixed-Route Services Characteristics

Route	Name	Service Description	Service Span	Service Frequency
1W	West Michigan	Local service operating between the Battle Creek Transportation Center and Taylor Avenue in northwest Battle Creek	Monday-Friday: 5:15 AM – 6:43 PM	60 minutes
			Saturday: 9:15 AM – 5:10 PM	60 minutes
2E	Emmett – East Avenue	Local service operating between the Battle Creek Transportation Center and Roosevelt Avenue in northeast Battle Creek	Monday-Friday: 5:45 AM – 6:13 PM	60 minutes
			Saturday: 9:15 AM – 5:30 PM	30 minutes
2W	Columbia – Territorial	Local service operating between the Battle Creek Transportation Center and Meijer on West Columbia Avenue	Monday-Friday: 5:15 AM – 6:10 PM	60 minutes
			Saturday: 9:15 AM – 5:10 PM	60 minutes
3E	Main-Post	Local service operating between the Battle Creek Transportation Center and Post Cereals on Cliff Street	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
			Saturday: 9:15 AM – 5:13 PM	30 minutes
3W	Kendall – Goodale	Local service operating between the Battle Creek Transportation Center and Springview Tower in north Battle Creek	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
			Saturday: 9:15 AM – 5:13 PM	30 minutes
4N	NE Capital Avenue	Local service operating between the Battle Creek Transportation Center and Family Fare Supermarket in northeast Battle Creek	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
			Saturday: 9:15 AM – 5:13 PM	30 minutes
4S	SW Capital Avenue	Local service operating between the Battle Creek Transportation Center and retail destinations along Beckley Road in south Battle Creek.	Monday-Friday: 5:15 AM – 6:10 PM	60 minutes
			Saturday: 9:15 AM – 5:10 PM	60 minutes
5W	Fort Custer – VA Hospital	Local service operating between the Battle Creek Transportation Center and the Battle Creek VA Medical Center in west Battle Creek	Monday-Friday: 5:15 AM – 6:10 PM	30 minutes
			Saturday: 9:15 AM – 5:10 PM	60 minutes

Passenger Amenities

Transfer Center

All BCT fixed-routes terminate at the system's primary transfer center located at the corner of McCamly Street South and Houston Street in downtown Battle Creek (**Figure 2**). The transfer center has ten sawtooth bays and five bus shelters. Each route has a designated bay. Connections are available to Amtrak and intercity bus service across McCamly Street at the Battle Creek Transportation Center.

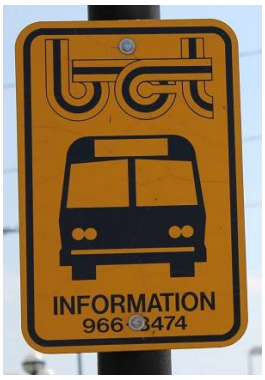
Figure 2 | BCT Transfer Center

BCT Schedules are designed to facilitate transfers between routes, to the greatest extent possible. On weekdays, all routes except for Route 2E depart the transfer center at 15 past the hour. Routes 3E, 3W, 4N, and 5W also depart the transfer center at 45 past the hour. Only Route 2E departs the transfer center at just 45 past the hour. On Saturdays, all routes depart the transfer center and 15 past the hour, with Routes 2E, 3E, 3W, and 4N also departing at 45 past the hour.

Bus Stops

BCT maintains approximately 635 fixed-route bus stops around the cities of Battle Creek and Springfield, and the townships of Bedford, Emmett and Pennfield. All bus stops are marked with a yellow or orange bus stop sign (**Figure 3**). Orange signs designating a time-point. 30 of the bus stops are equipped with passenger shelters.

Figure 3 | BCT Bus Stop Sign



Passenger Information

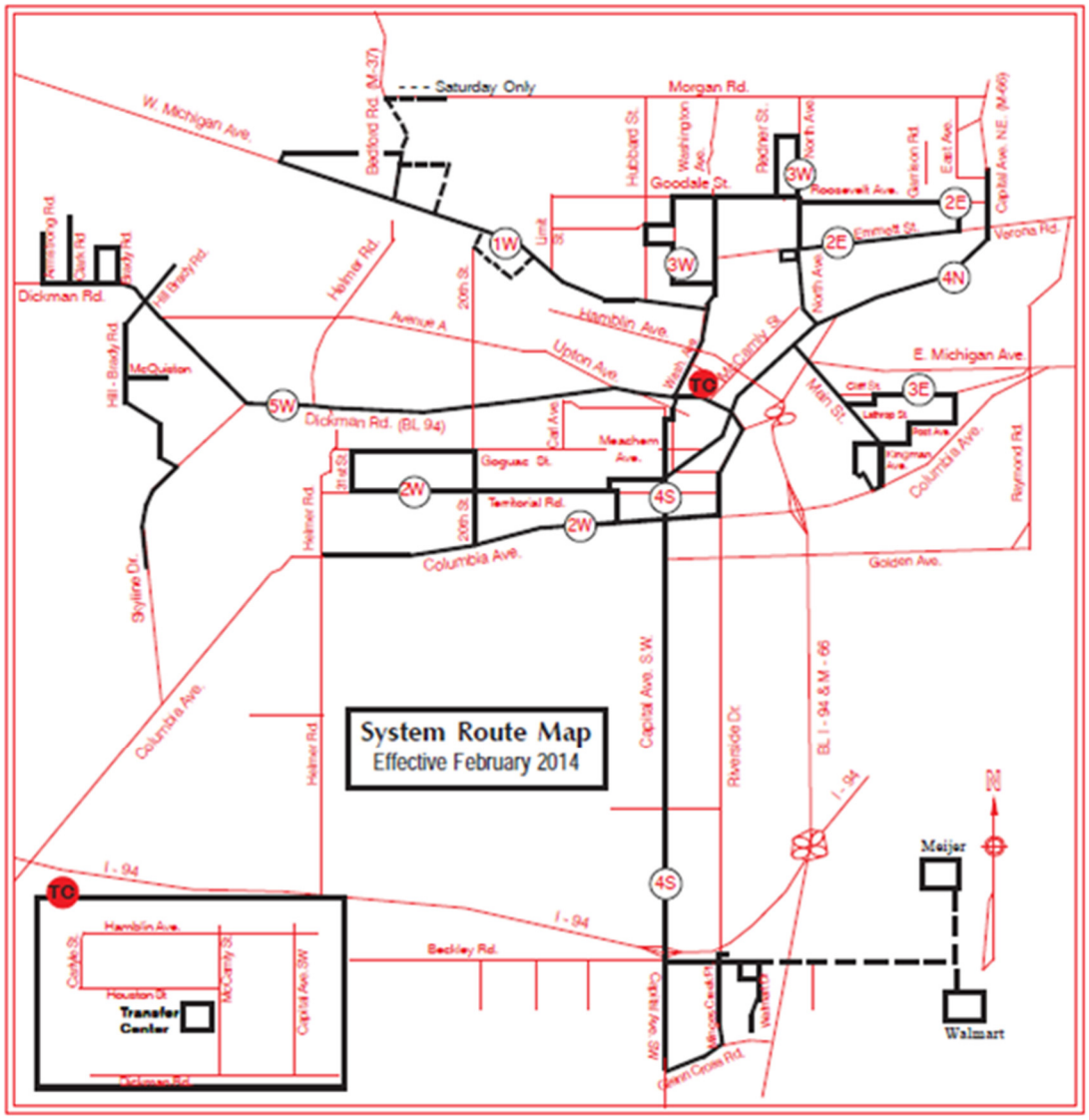
Each BCT bus stop sign includes a telephone number for service information, but the signs do not indicate the route or routes serving a specific stop. Route names are displayed on vehicle head signs to allow passengers to identify the route of an approaching bus.

BCT routes follow a naming convention consisting of a number, letter, and route name. In most cases, the route name refers to the primary service corridor of the route. The one exception is Route 5W Fort Custer – VA Hospital, which is named for the primary destinations it serves. The letter in each route indicates the approximate direction relative to downtown where the route operates.

BCT publishes a number of brochures to provide passengers with the information they need to navigate the system. These include a pocket schedule, with map and timetable, for each route or routes (routes with the same number, like 2E and 2W, are grouped together in one brochure); a rider guide with a system map (**Figure 4**), fare information, and general rules and regulations; and a Tele-Transit Service rider guide. Brochures are available at the BCT office on West Michigan Avenue, or online at http://www.battlecreekmi.gov/287/Transit.

BCT does not currently participate in the Google Transit Partners Program, or offer real-time vehicle tracking information through any other platform. Transit information is available over the phone at 269-966-3474 (Voice/TDD). Important information such as detours, service interruptions, and community events is communicated via Twitter and Facebook as well.

Figure 4 | BCT Published System Map



Regional Transit Services

Amtrak

Amtrak operates daily intercity rail service along its Michigan Line through Battle Creek. Wolverine service makes stops at Chicago, Kalamazoo, Battle Creek, Albion, Jackson, Ann Arbor, Detroit and Pontiac; with three eastbound trains and three westbound trains per day. Blue Water service makes stops at Chicago, Kalamazoo, Battle Creek, East Lansing, Flint, and Port Huron with one eastbound and one westbound train per day. Trains serving Battle Creek stop at the Battle Creek Transportation Center.

Intercity Bus

Three intercity bus operators, Indian Trails, Miller Trailways, and Greyhound, serve Battle Creek with daily long-distance bus service. All buses depart from the Battle Creek Transportation Center, providing connections to Amtrak and BCT services. Indian Trails provides one eastbound departure to Lansing and Flint per day, and one westbound departure to Kalamazoo, Benton Harbor, and Chicago. Miller Trailways provides service once a

day to Detroit and once a day to Kalamazoo. Greyhound provides two westbound departure to Kalamazoo, Benton Harbor, and Chicago; and one eastbound departure to Ann Arbor and Detroit each day.

City of Marshall Dial a Ride/Albion-Marshall Connector

The City of Marshall, which is in Calhoun County and Battle Creek's Metropolitan Statistical Area, provides on-demand bus service to Marshall residents. Marshall's Dial-a-Ride service provides on-demand transport within one mile of Marshall's boundaries. The Albion-Marshall Connector bus provides weekday on-demand service between these two communities. Connections between Battle Creek and Albion can be made via Amtrak or Miller Trailways.

Community Action

Community Action, a community action agency based in Battle Creek, provides on-demand bus service in Calhoun County. This service is only available to seniors 60 years of age and over, or disabled persons 18 years of age and over. In addition, riders must call 24 hours in advance to reserve a ride, which is subject to availability. Service is provided in Battle Creek on weekdays (8:00 AM to 4:30 PM), and in the Albion area weekdays (8:00 AM to 4:00 PM) and Saturday mornings (8:00 AM to 11:30 AM).

Fares and Finances

Fares

BCT accepts both cash fares and multi-ride passes as forms of payment. Cash fares are paid on board vehicles. Passes may be purchased from Full Blast (the website for the City's Recreation Department), the City Treasurer's Office, or BCT's office.

Fixed-Route Fares

Cash fares for fixed-route service are $1.25 per trip for adults and children taller than the farebox (41"). Children shorter than the farebox ride free. The single-ride fare for senior citizens (defined as 60 years old or older) and persons with disabilities is $0.60. Transfers are free with a transfer slip for up to two hours from the time they are issued, and are good for one ride on fixed-route service. Transfers are not valid for a return trip on the same route.

Multi-ride fixed-route passes provide a per-ride discount compared to the regular cash fare (**Table 2**). Senior citizens, persons with disabilities who have a Medicare card, and persons with a BCT ID Card pay a further reduced rate for passes. BCT also offers a special pass for students, which can only be used by students on school days for school activities. Students must show their student ID card when using and purchasing the student bus pass.

Table 2 | Fixed-Route Fare and Pass Prices

	Adults and Children (Taller than 41")	Senior Citizens/Persons with Disabilities	Student	Children (Below 41" tall)
Cash Fare	$1.25	$0.60	-	Free
12-Ride Punch	$11.00	$6.00	-	-
48-Ride Punch	$40.00	$24.00	-	-
Student (48 Rides)	-	-	$32.00	-
Transfer	Free	Free	Free	-

Tele-Transit Fares

The general Tele-Transit fare is $7.00 for a single ride. For trips taken after 7:00 PM, the general passenger fare is $5.00. The fare for senior citizens and persons with disability is $2.00 per trip. While Tele-Transit service is available to anyone who would like to use it, ADA-certified individuals are given priority over other trip requests. There are no transfers available on Tele-Transit service.

BCT also offers several passes for Tele-Transit service that are valid for a prescribed number of rides. Senior citizens, persons with disabilities who have a Medicare card, and persons with a BCT ID Card pay a reduced rate for passes. Fare prices for BCT Tele-Transit service are listed in **Table 3**.

Table 3 | Tele-Transit Fare and Pass Prices

	General Passengers	Senior Citizens/Persons with Disabilities
Cash Fare	$7.00	$2.00
Cash Fare (After 7:00 PM)	$5.00	-
10-Ride Punch	$50.00	$20.00
20-Ride Punch	$100.00	$40.00
Transfer	N/A	N/A

Finances

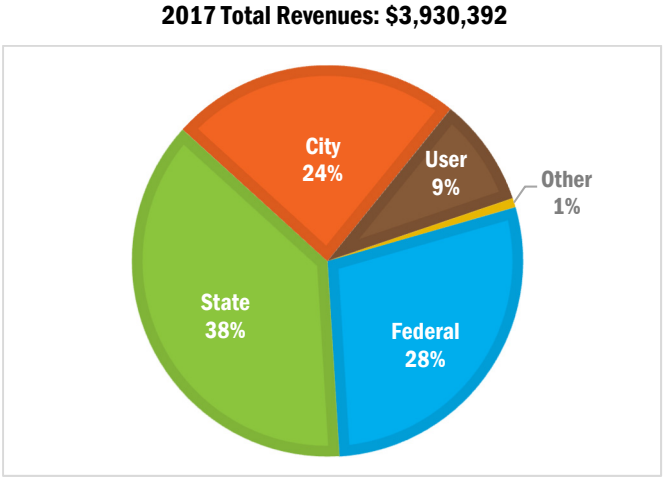
In 2017, fares and passes accounted for approximately 9 percent of BCT's revenue. Other funding sources are discussed below.

Revenues

Funding for the operation of BCT is provided by a combination of FTA 5307 formula funds, assistance from the State of Michigan, Federal and State capital grants, the City of Battle Creek municipal funding, user fees, and a small amount from other sources such as advertising sales. During Fiscal Year 2016-17 (FY16-17), the BCT system received just over $3.9 million dollars in total revenue. As illustrated in **Figure 5**, State and Federal funds accounted for 66 percent of all revenue, local funding from the city accounted for 24 percent, user revenue (fares and passes) accounted for 9 percent, and other sources (advertising and sales) made up 1 percent.

Approximately 10 percent of total revenue to the BCT system came from recovered costs which includes fares, passes, and other sales. Of all trips, only 28 percent generated a full fare, whereas 33 percent were discounted and 39 percent were free (transfers or children).

Figure 5 | BCT Funding Sources

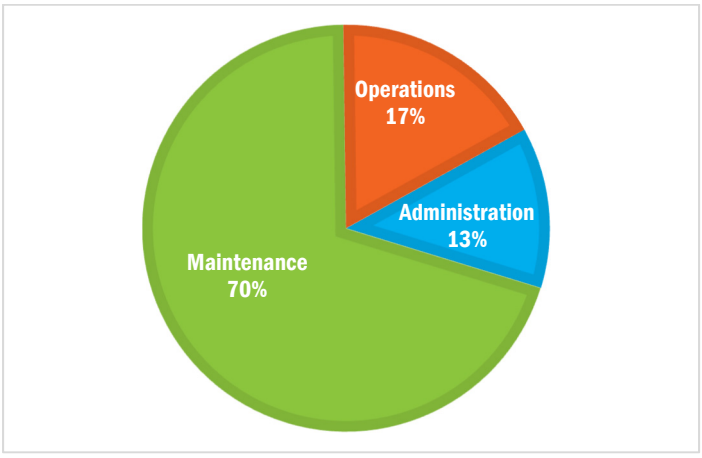


Source BCT 2017

Expenses

In FY16-17, BCT spent just over $4 million dollars to run the system and meet the needs of its passengers, which is slightly more than the revenue that it received. Though the exact annual budget has varied over the past four years, BCT's total expenses have been consistently 3-5 percent greater than its total revenue. As illustrated in **Figure 6**, 70 percent of the budget was spent on system operations, 17 percent was spent on maintenance, and 13 percent on administration.

Figure 6 | BCT Expenses



Source BCT 2017

Peer Comparison

To provide context to BCT's fare policies and financial performance, a set of seven peer systems were identified for comparison. These transit systems have similar characteristics and operating environments to Battle Creek. Four of the systems are from within the State of Michigan, and three are from other parts of the country. The out-of-state peers were chosen based on demographics, operating budgets, and service characteristics. **Table 4** lists each peer along with the characteristics that make it similar to BCT. Comparisons are based on 2015 data (including for Battle Creek), as that is the most recent dataset currently available from the National Transit Database (NTD).

Table 4 | BCT Peers

City	Service Provider	Service Area Population	Density (Population/Sq. Mi)	Sq. Miles	Peak Vehicles	Total Operating Budget
Bay City, MI	Bay Metropolitan Transit Authority	70,585	1,750	40.33	46	$7,726,547
Holland, MI	Macatawa Area Express Transportation Authority	99,941	1,687	59.24	8	$3,787,270
Jackson, MI	City of Jackson Transportation Authority	90,057	1,562	57.67	9	$2,359,910
Kalamazoo, MI	Kalamazoo Metro Transit System	209,703	1,593	131.68	26	$13,058,342
Missoula, MT	Missoula Urban Transportation District - Mountain Line	82,157	1,818	45.20	21	$5,059,347
Pittsfield, MA	Berkshire Regional Transit Authority	59,124	1,765	33.50	15	$5,718,847
Wheeling, WV	Ohio Valley Regional Transportation Authority	81,249	1,728	47.01	14	$3,973,518
Battle Creek, MI	Battle Creek Transit	78,393	1,479	53.02	14	$3,922,502
Peer Average	-	**96,401.13**	**1,672.60**	**58.46**	**19.13**	**$5,700,785**

Source 2015 NTD

Fare Policies

For the seven peer systems, the regular fixed-route fare ranges from $1.00 to $1.75 per trip (see **Table 5**). The reduced rate for the group ranges from $0.50 to $0.85. At $1.25 per ride, BCT is at the lower end of the range for regular fares, and near the middle of the range for reduced fares. All of the systems in the peer analysis, including BCT, provide free transfers.

Demand-response fares are more difficult to compare across the peer systems since the services that are offered vary. Some systems offer subsidized, on-demand service only to seniors and persons with disabilities, while others provided on-demand service to these groups as well as the general public. Demand-response base fares for seniors and individuals with disabilities (Senior/ADA Fare) range from $1.50 to $3.00 across the peer systems. Some systems such as BRTA Paratransit in Pittsfield, MA, and Metro County Connect in Kalamazoo, charge additional reduced fare fees for service to towns outside of the fixed-route service areas in these cities. General demand-response base fares across the peer systems ranges from $3.00 to $14.00. BCT's Tele-Transit fares are below average for both Senior/ADA and general fares at $2.00 and $7.00, respectively.

The fare collection methods used by BCT are limited to cash payments and paper multi-ride passes. While each of the peer systems also accept cash and paper multi-ride passes, some have also expanded their offerings to include reusable and rechargeable fare media. The Kalamazoo Metro Transit System, for example, has

implemented a renewable value card system, and the Berkshire Regional Transit Authority in Pittsfield, MA accepts the CharlieCard, a plastic, contactless smartcard that is compatible with a larger transit systems nearby.

Table 5 | Peer System Fares

City	Fixed-route Fare	Reduced Fare	Demand-Response Provider	General Demand Response Fare	Senior/ADA Fare	Fare Media
Bay City, MI	$1.00	$0.50	DART	$3.00	$1.50	Cash, Paper tickets, Paper transfer slips
Holland, MI	$1.00	$0.50	Reserve-A-Max	$5.00	$2.00	Cash; Paper passes; Paper transfer slips
Jackson, MI	$1.50	$0.75	Reserve- A-Ride	$4.00 - $10.50	$2.00 - $3.00	Cash; Paper passes; Ticket books
Kalamazoo, MI	$1.50	$0.75	Metro County Connect	$10.00 - $14.00	$3.00 - $6.00	Cash; Tokens; Paper passes; Renewable Value Card
Missoula, MT	FREE	FREE	Mountain Line Paratransit	FREE	FREE	None
Pittsfield, MA	$1.75	$0.85	BRTA Paratransit	$7.50 (+$2.50 for each additional town)	$2.50 (Max. $9.00 for additional towns)	Cash, Paper passes, CharlieCard – plastic, contactless smartcard
Wheeling, WV	$1.30	$0.65	AdVANtage Service	-	$2.60	Cash, Paper passes
Battle Creek, MI	$1.25	$0.60	Tele-Transit	$7.00	$2.00	Cash, Paper passes
Peer Average	**$1.33**	**$0.66**	-	**$8.35***	**$2.20***	-

Source 2015 NTD

**Average of mid-range fare values, not including surcharges*

Cost Effectiveness and Efficiency

Table 6 below compares the cost effectiveness and efficiency of BCT's fixed-route service against its peers. For the purpose of comparison, 2015 NTD data was used for all systems, including BCT.

In 2015, BCT's fixed-route ridership per revenue hour was slightly higher than the average of its peer systems, and its cost per passenger trip was below the peer average. These are both positive indicators and point to a system that is relatively effective in attracting riders, compared to its peers. However, in 2015, BCT had a higher fixed-route cost per revenue hour than most of its peers, as well as a below-average farebox recovery rate. The cost per revenue hour reflects operating costs such as salary, wages, benefits, materials, and supplies. Some of these costs are market-based (i.e. fuel and parts prices), while others are functions of service schedules (i.e. frequency and span of service determines staff hours and salary). BCT has some control over both the market-based and service-based operating costs, with much greater sway over the service-based costs.

Farebox recovery is directly related to fare policy. As noted previously, BCT is at the lower end of the range of fixed-route fares among its peers. This would suggest that a fare increase would not be unreasonable for BCT. However, adjusting fares is a balancing act since a fare increase can bring in more revenue only to the extent that ridership does not decline at a rate that would negate the added revenue. Fare revenue and farebox recovery rates can also be addressed in other way, such as reviewing eligibility for reduced fares, and introducing new pass types that incentivize higher up-front investment on the part of users. For example, two one-way fares currently cost users $2.50. Introducing a $3.00 day-pass option may generate more revenue as users understand the conceptual benefit of a day pass, even as many would continue to ride just twice a day.

Table 6 | Fixed-Route Cost Effectiveness and Efficiency Comparison

City	Passengers per Revenue Hour	Cost per Passenger Trip	Cost per Revenue Hour	Farebox Recovery Rate
Bay City, MI	10.3	$10.12	$103.97	12%
Holland, MI	11.4	$5.25	$59.98	8%
Jackson, MI	20.5	$4.23	$86.82	17%
Kalamazoo, MI	25.1	$3.23	$80.99	27%
Missoula, MT	21.3	$4.12	$88.04	5%
Pittsfield, MA	11.3	$8.48	$95.90	17%
Wheeling, WV	7.5	$8.69	$65.56	11%
Battle Creek, MI	17.8	$5.77	$102.49	12%
Peer Average	**15.7**	**$6.24**	**$85.47**	**14%**

Source 2015 NTD
**Source BCT 2017*

Table 7 compares the cost effectiveness and efficiency of Tele-Transit service to other demand-response services, based on 2015 NTD data. In 2015, Tele-Transit carried more passengers per revenue hour than the average of its peers. It also had a lower cost per passenger and cost per revenue hours than the peer average, indicating that it is a fairly efficient service compared to the set of peers. However, Tele-Transit covers less of its costs through farebox revenue than most of its peers. This is not surprising, given that Tele-Transit fares are below-average for both ADA paratransit service and general demand-response service.

Table 7 | Demand-Response Cost Effectiveness and Efficiency Comparison

City	Passengers per Revenue Hour	Cost per Passenger Trip	Cost per Revenue Hour	Farebox Recovery %
Bay City, MI	1.8	$50.55	$92.62	3%
Holland, MI	2.6	$20.09	$51.48	8%
Jackson, MI	2.1	$51.68	$111.02	2%
Kalamazoo, MI	1.9	$26.42	$49.74	14%
Missoula, MT	2.3	$29.88	$67.84	5%
Pittsfield, MA	1.0	$33.44	$33.88	17%
Wheeling, WV	2.2	$83.78	$187.34	3%
Battle Creek, MI	2.3	$35.01	$81.60	5%
Peer Average	**2.0**	**$41.35**	**$84.44**	**7%**

Market Analysis

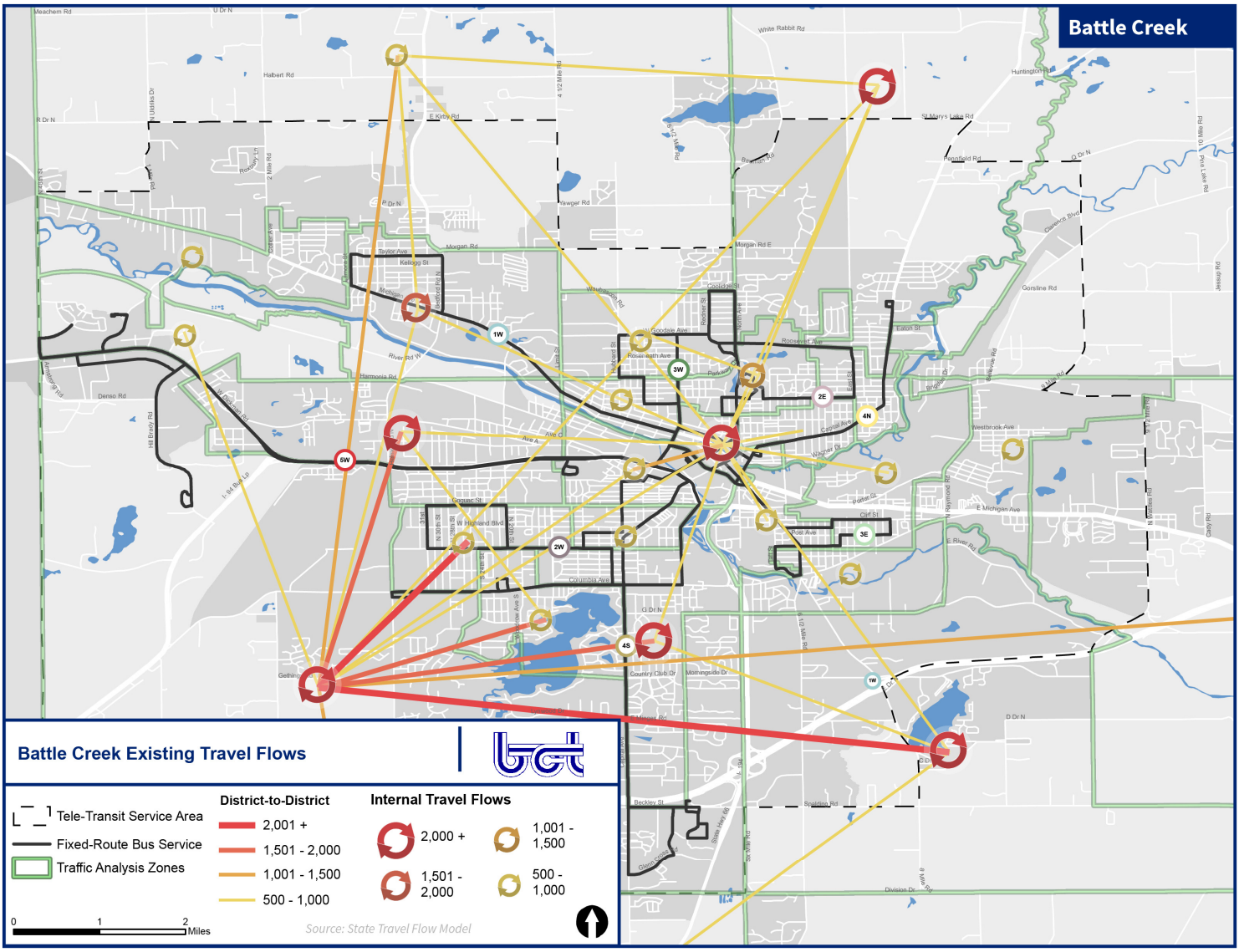
Generally speaking, transit users want to access the same regional destinations as all other commuters, albeit by bus versus some other mode of transportation. Thus, to understand the market for transit service in the Battle Creek region, it is useful to first examine the overall travel patterns in the region, regardless of mode.

Figure 7 shows the most prevalent travel flows in the Battle Creek region according to the Michigan Department of Transportation's statewide travel demand model. The model divides the Battle Creek region into Traffic Analysis Zones (TAZ) for the purpose of estimating travel flow volumes between and within each zone. Only volumes of 500 or more daily trips are shown in this map.

Two important things must be noted when considering the travel flows map in **Figure 7**. First, the travel flows are mapped to the centroid of each zone and are not intended to show travel to or from a precise geographic location within each zone. Secondly, the Traffic Analysis Zones get quite large on the periphery of the region. Often this is related to the population distribution of a community, so each zone has a similar number of residents within its boundaries. In the case of Battle Creek, this results in a very large zone encompassing areas west, south, and southeast of WK Kellogg Airport, stretching from the Fort Custer Industrial Park to the I-94 corridor. This is not an area with a lot of population, but it does represent a large number of jobs. For the purpose of discussion, this zone will be referred to as the "superzone."

The travel demand model shows that six of the top eight travel flows by volume are internal trips that are within their respective zones. This suggests that many Battle Creek Residents have relatively short commutes. The top five external (zone-to-zone) travel flows are all connected to the superzone. This likely illustrates the significance of the Fort Custer Industrial Park as an employment destination for the Battle Creek region.

Figure 7 | Battle Creek Existing Travel Flows



While the regional travel flow data provides a useful overview of the most prevalent travel patterns, it does not provide enough detail to determine the most appropriate alignments for transit service within each zone. For that, a closer analysis of density, demographics, and land-use are required.

More than any other factor, the effectiveness and efficiency of public transportation is determined by density. Where there are higher concentrations of people and/or jobs, transit ridership tends to be higher. At the same time, most transit agencies have a mandate to provide comprehensive service in the communities they serve, and to provide mobility for residents with no other means of transportation.

The purpose of the Market Analysis is to both identify the strongest transit corridors in the Battle Creek region and to highlight areas with relatively high transit need. Thus, in addition to the travel flow analysis discussed previously, the market analysis consists of two key components: Transit Potential and Transit Need.

Transit potential is an analysis of population and employment density, while transit need focuses on socio-economic characteristics such as income, automobile availability, age, and disability status that are indicative of a higher propensity to use transit.

Transit use is also influenced by the built environment. In particular, there are certain land uses, such retail centers, civic buildings, multifamily housing, educational institutions, medical facilities, and major employment centers that tend to generate transit trips at a higher rate than other types of land uses. These ridership generators are included in the maps describing Transit Potential and Transit Need.

Transit Potential

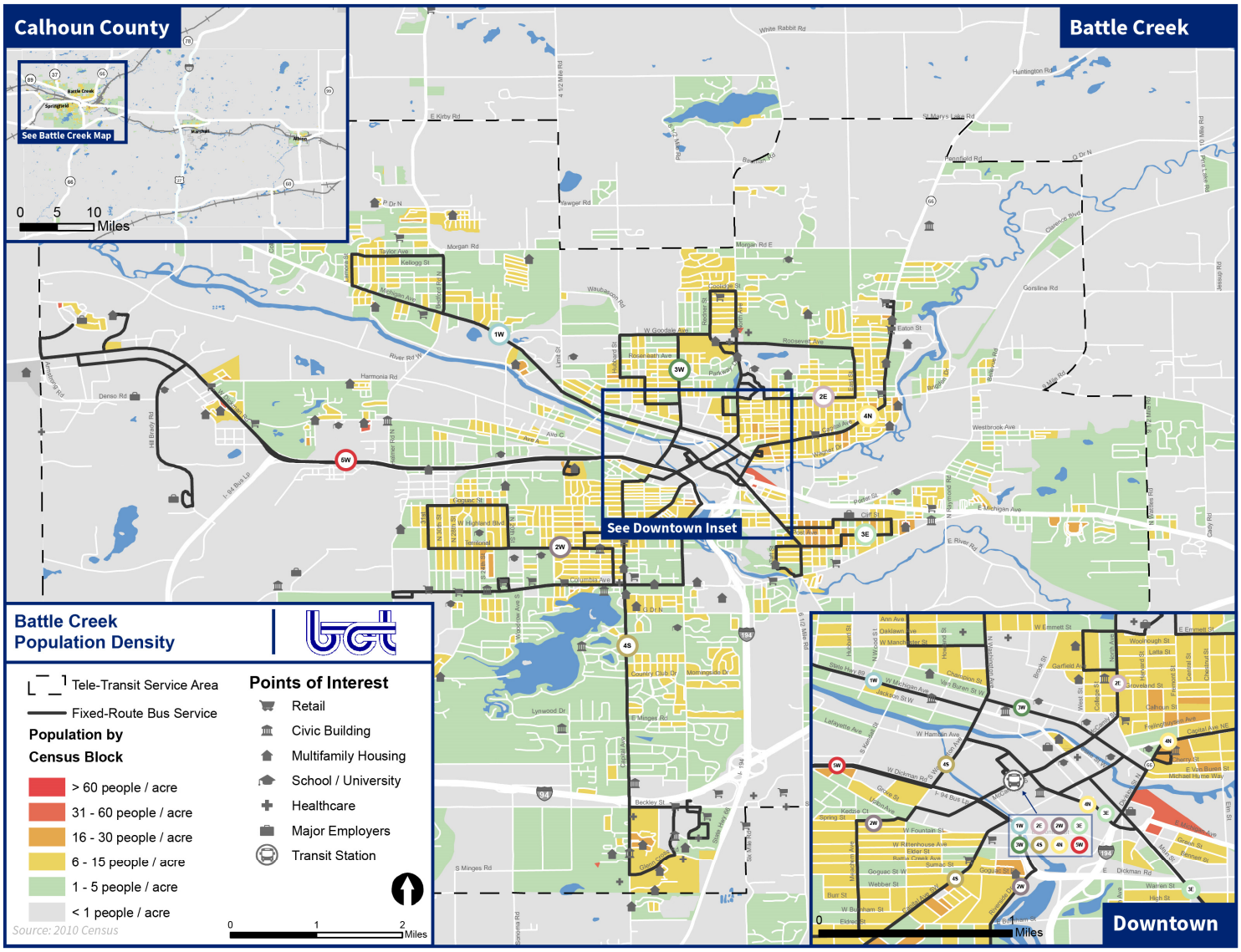
As transit service is generally most effective in areas with high concentrations of residents and/or businesses, combining both residential and employment densities shows the locations with the highest potential to support transit service and generate strong transit ridership.

Population Density

Public transportation is most efficient when it connects population and employment centers where people can easily walk to and from bus stops. The reach of transit is generally limited to within one-quarter mile to one-half mile of the transit line (depending on the built environment), or a 10-minute walk. As such, the size of the travel market is directly related to the density of population in that area. As a general rule, a density of greater than five people per acre is needed to support base-level fixed-route transit service (service every 60 minutes). **Figure 8** shows the population density of the study area. The yellow color indicates densities where fixed-route service begins to make sense; areas with darker colors have the potential to support more frequent service.

Over-all, Battle Creek has moderate population density. Nearly all neighborhoods and corridors that currently have fixed-route service, have the population density to justify the service. There are pockets of transit-supportive population density along the Riverside Drive corridor, along E. Michigan Avenue in Emmett Charter Township, and at several mobile home parks in northwest Battle Creek (and just outside the city limits), that do not currently have fixed-route service in close proximity.

Figure 8 | Battle Creek Population Density

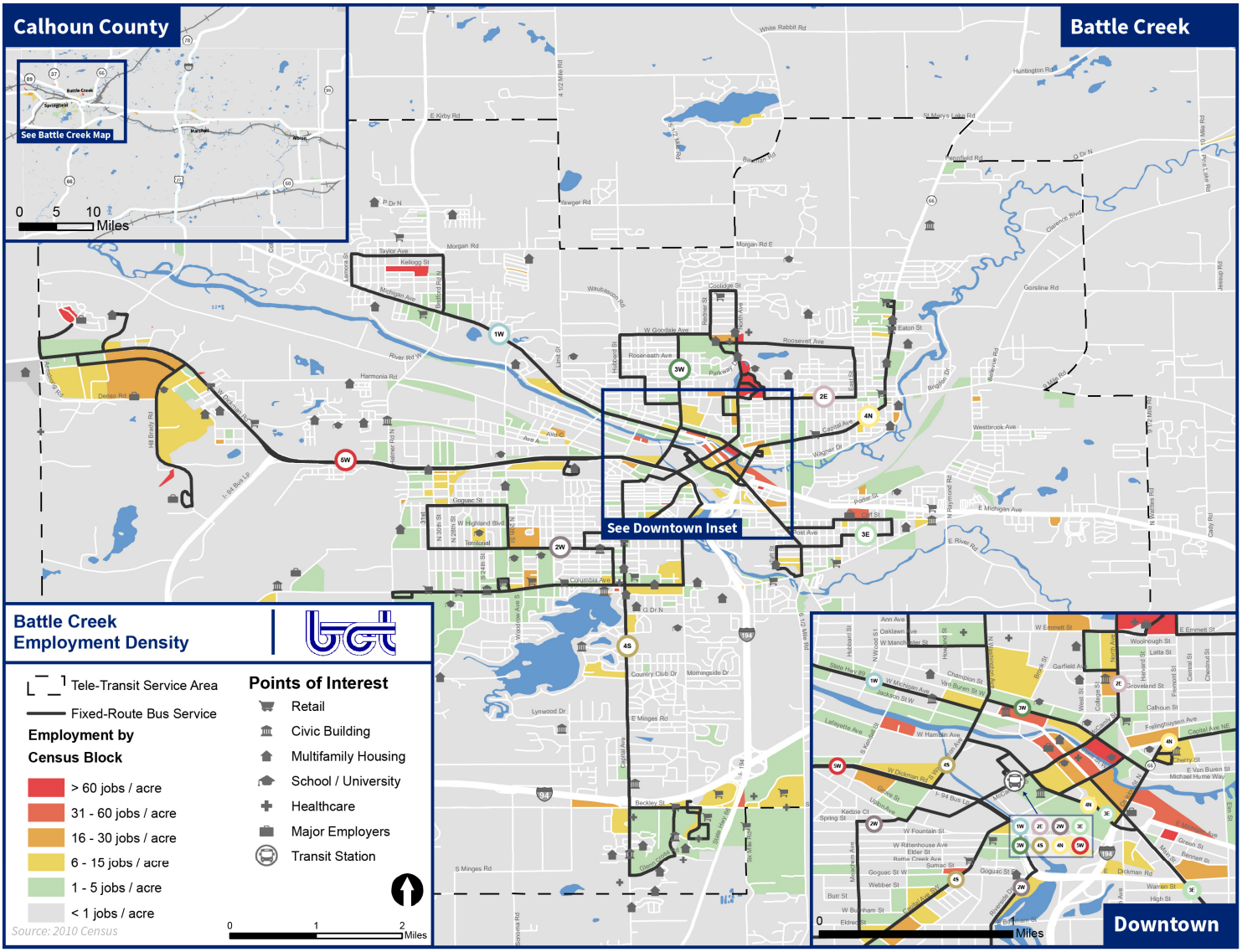


Employment Density

The location and number of jobs is a second strong indicator of transit demand, as traveling to and from work accounts for the largest single segment of transit trips in most markets. Additionally, transit that serves areas of high employment density provides key connections to job opportunities. Like population density, the employment density that can typically support a base-level of fixed-route service is greater than five jobs per acre. This density corresponds to the yellow colored areas in **Figure 9**. Higher employment densities can potentially support greater frequency.

The highest employment densities in the region include downtown Battle Creek, the Bronson Battle Creek Hospital/Kellogg Community College area, the VA Medical Center/Fort Custer Industrial Park area, and the Post Foods Plant. Occasionally, a business will list an address as their home office resulting in the appearance of high employment density when in fact all employees work remotely or the business operates online only.

Figure 9 | Battle Creek Employment Density



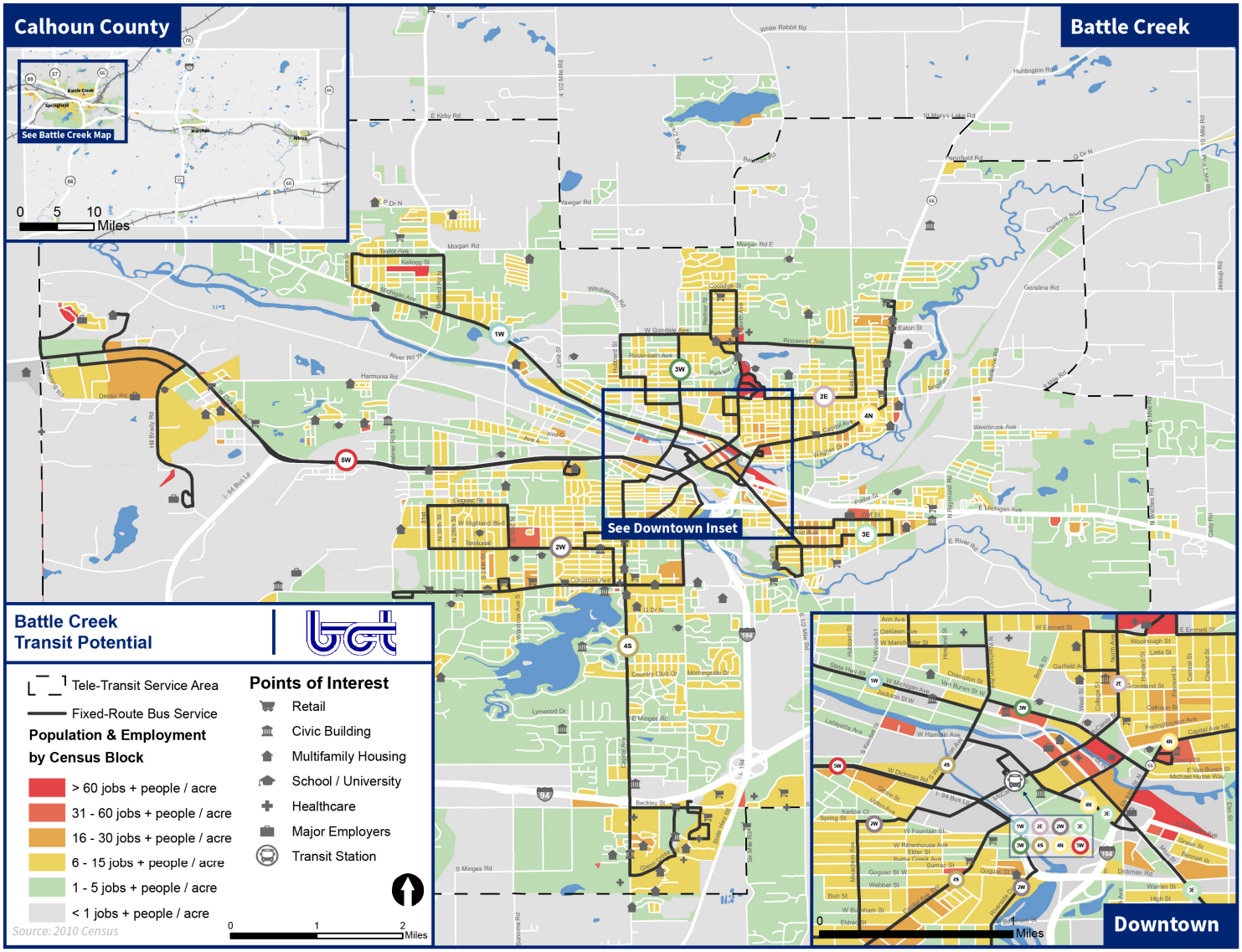
This appears to be the case with a Census block along Kellogg Street in northwest Battle Creek. This block appears to be entirely residential, with an on-line retailer registered in one of the homes. Transit Potential

Transit potential, shown in **Figure 10**, is a composite of the population and employment densities for each Census block, and is an indicator of the viability of fixed route service in a particular area. Most areas of the Battle Creek region with the density to support fixed-route service are currently served by at least one BCT route. A few notable exceptions include the following:

- **East Michigan Avenue, east of Raymond Road**. This segment of East Michigan Avenue includes the Triangle Mobile Home Park, two large apartment complexes, and the Marian Burch Adult Daycare Center.
- **North and east of the Route 1W terminal loop**. This area of Battle Creek includes four large mobile home parks including the Bedford Hills and Creek Valley communities.
- **Avenue A in Springfield**. Avenue A serves the large Avenue A Mobile Home Estates, Fairlane Apartments, and several other residential neighborhood of Springfield.

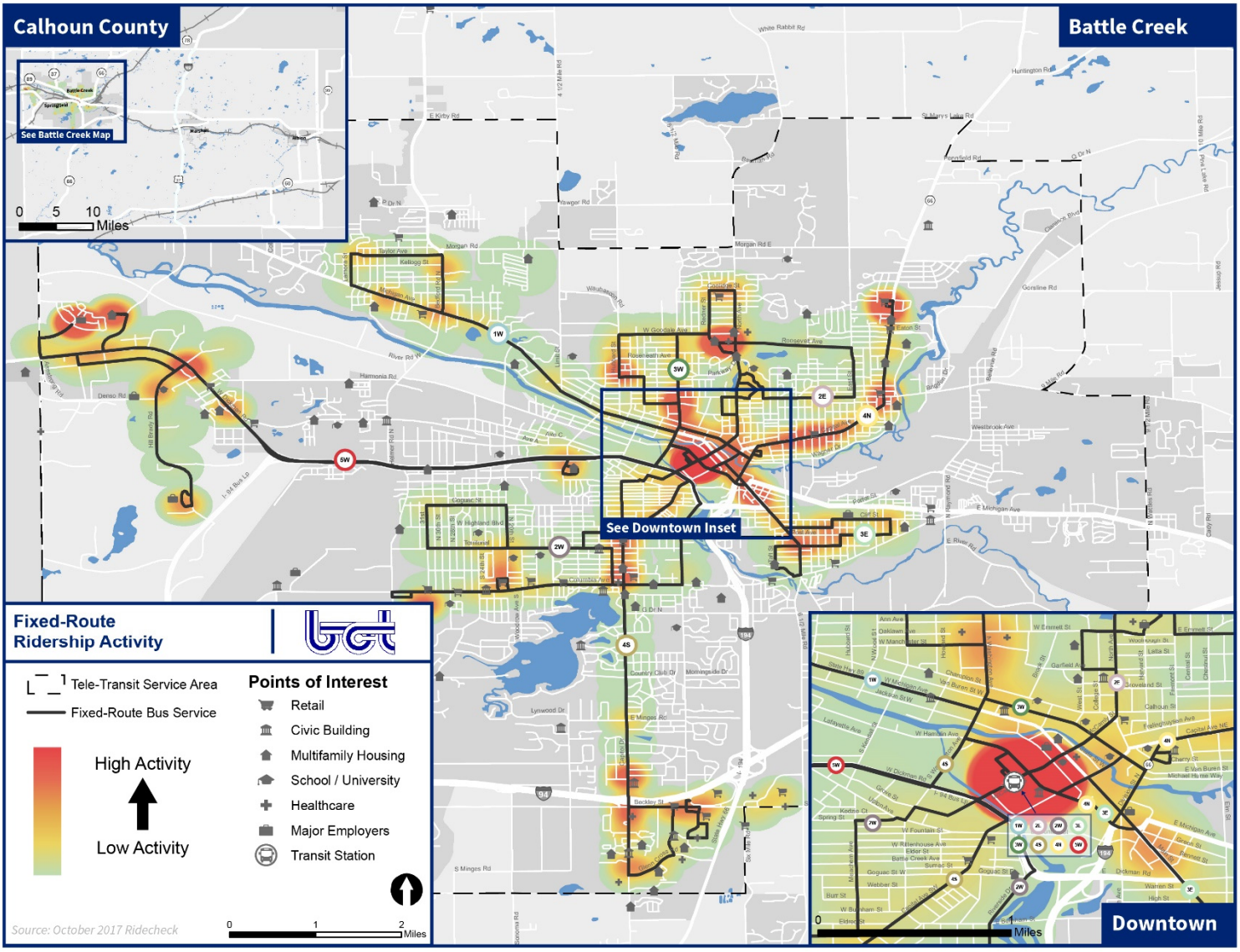
- **Riverside Drive.** This corridor service primarily single-family homes, but still represents one of the largest concentrations of Battle Creek residents without near-by access to fixed-route service.

Figure 10 | Battle Creek Transit Potential



The higher the transit potential is of an area, the higher the likelihood of that area generating substantial transit ridership. This conclusion can be tested by comparing actual transit ridership to the estimated transit potential. **Figure 11** shows a heatmap of BCT ridership representing a typical weekday. While actual ridership is a function of where service is available, **Figure 11** shows that in those corridors where there is transit service, there is a clear correlation between high ridership and high transit potential

Figure 11 | BCT Fixed-Route Ridership Activity



Transit Need

Above all else, public transportation is a mobility tool. Certain population subgroups have a higher likelihood or propensity to use transit as their primary means of local and regional transportation than the population in general. These groups include:

- **People without access to an automobile**, whether it be by choice or due to financial or legal reasons, often have no other transportation options besides using transit.
- **Persons with disabilities**, many of whom can't drive and/or have difficulty driving.
- **Low-income individuals,** typically because transit is less expensive than owning and operating a car.
- **Youth / young adults**, who are either too young to drive, or have in recent years been shown to have a greater interest in transit, walking, and biking than in driving.
- **Older adults**, who as they age, often become less comfortable or less able to operate a vehicle.

Identifying areas with relatively high concentrations of these population subgroups can help determine where the need for transit service in the study area is greatest. The maps that follow (**Figure 12 - Figure 16**) show the density of each of the five high-transit-propensity population subgroups by Census block group. The maps utilize a Jenks Natural Breaks Classification Method to assign each block group to one of five density

categories. The density ranges differ for each demographic analysis, as some measure individuals while others measure households; and some are simply more common (e.g. low-income populations) than others (e.g. zero-vehicle households).

For each demographic analysis, a score of 1-5 is assigned to each block group depending on which natural break category it falls into. If a block group falls into the highest density category for a demographic analysis, it is assigned 5 points for that particular analysis. Block groups that fall into the lowest-density natural break category for a particular population sub-group receive 1 point for that analysis.

The Transit Need Index map (**Figure 17**) shows the composite Transit Need score for each block group based on the sum of its scores in each individual demographic analysis. If a block group falls in the highest density category for each of the five demographic analyses, it will end up with a Transit Need Index value of 25 (5+5+5+5+5). The lowest possible Transit Needs Index is 5 (1+1+1+1+1).

Whereas the Transit Potential analysis highlighted areas of Battle Creek with the actual densities to support fixed-route service, Transit Need is a relative measure. The Transit Need Index map shows which Block Groups have a higher relative need for transit service compared to other block groups. There is not, however, a specific Transit Need Index score or value that represents a threshold for supporting fixed-route service. Instead, transit need should be considered together with transit potential. If two areas have similar and sufficient transit potential, the area with higher transit need should be prioritized for service. Conversely, in some locations, the density of transit-dependent population groups may be relatively high, but if the total population and/or employment density are still quite low, the potential to generate substantial fixed-route transit ridership will remain low as well.

Nearly every area of Battle Creek that falls within the top two Transit Need Index quintiles has at least one fixed-route within close proximity. The one exception is a small neighborhood north of East Emmett Street, just east of the Battle Creek River. However, there are several areas of the City with relatively moderate transit need that are not currently served by fixed-route service. These include the Riverside Drive corridor and Rolling Hills Mobile Home Park.

Figure 12 | Zero-Vehicle Household Density

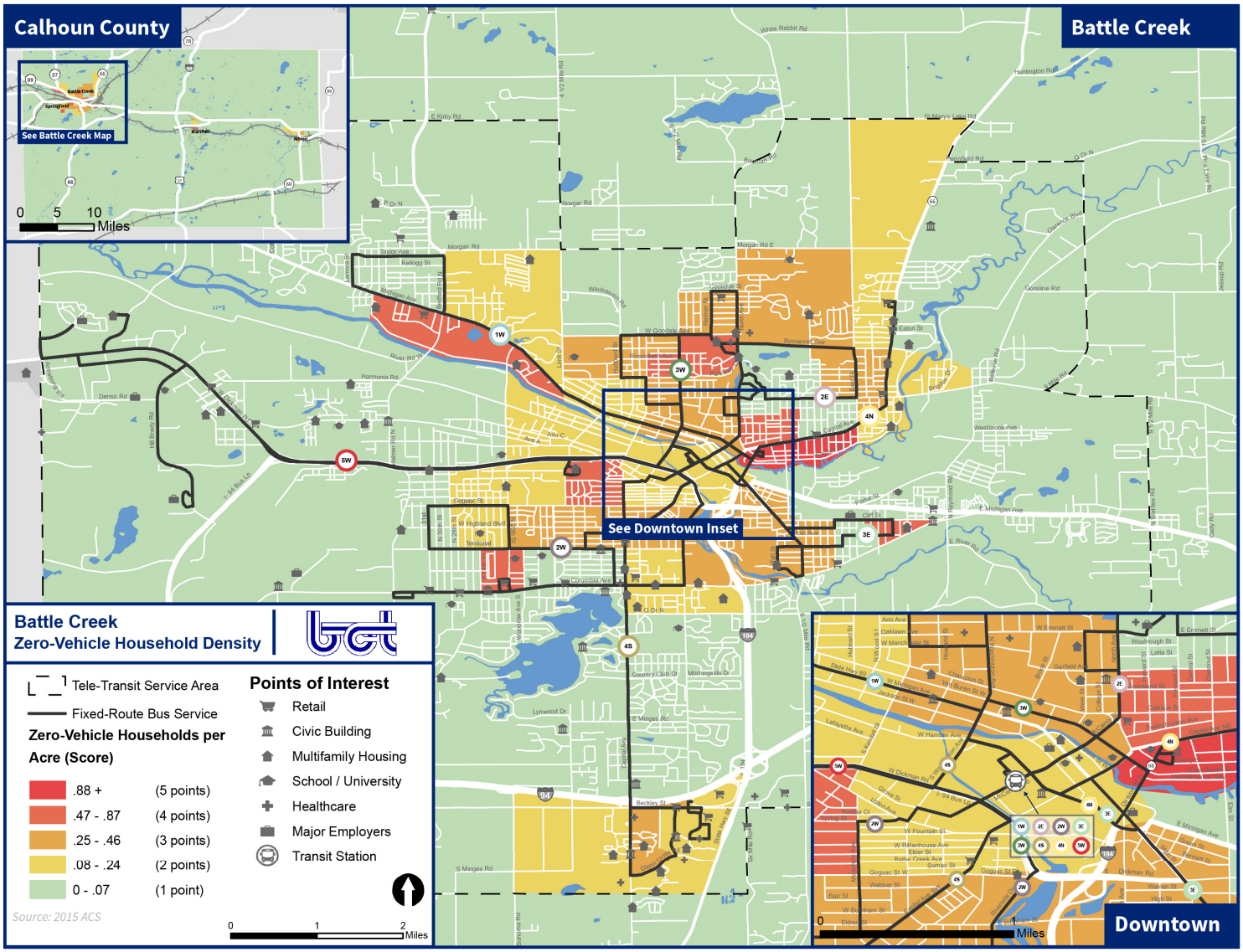


Figure 13 | Disabled Population Density

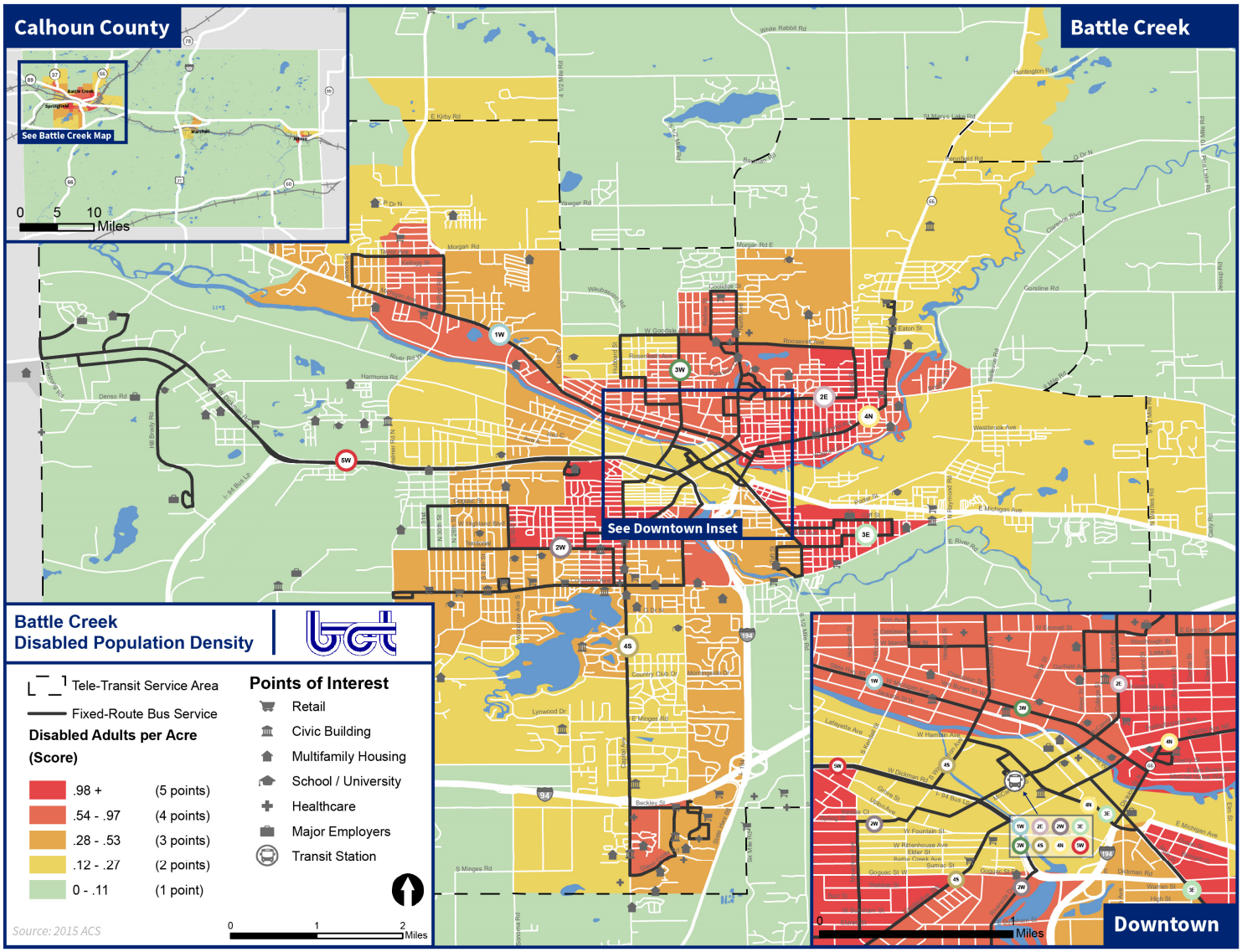


Figure 14 | Low-Income Population Density

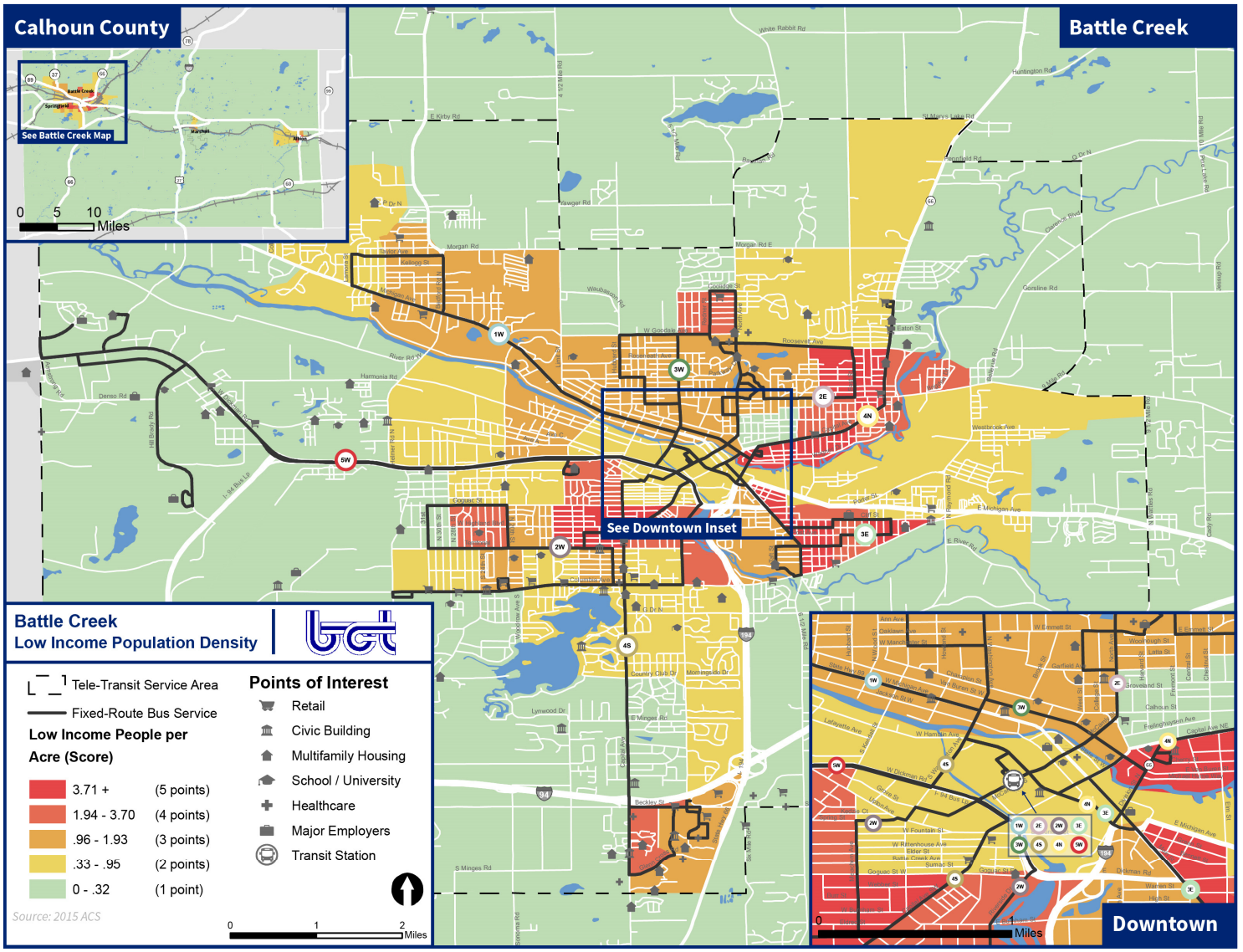


Figure 15 | Youth/Young Adult Population Density

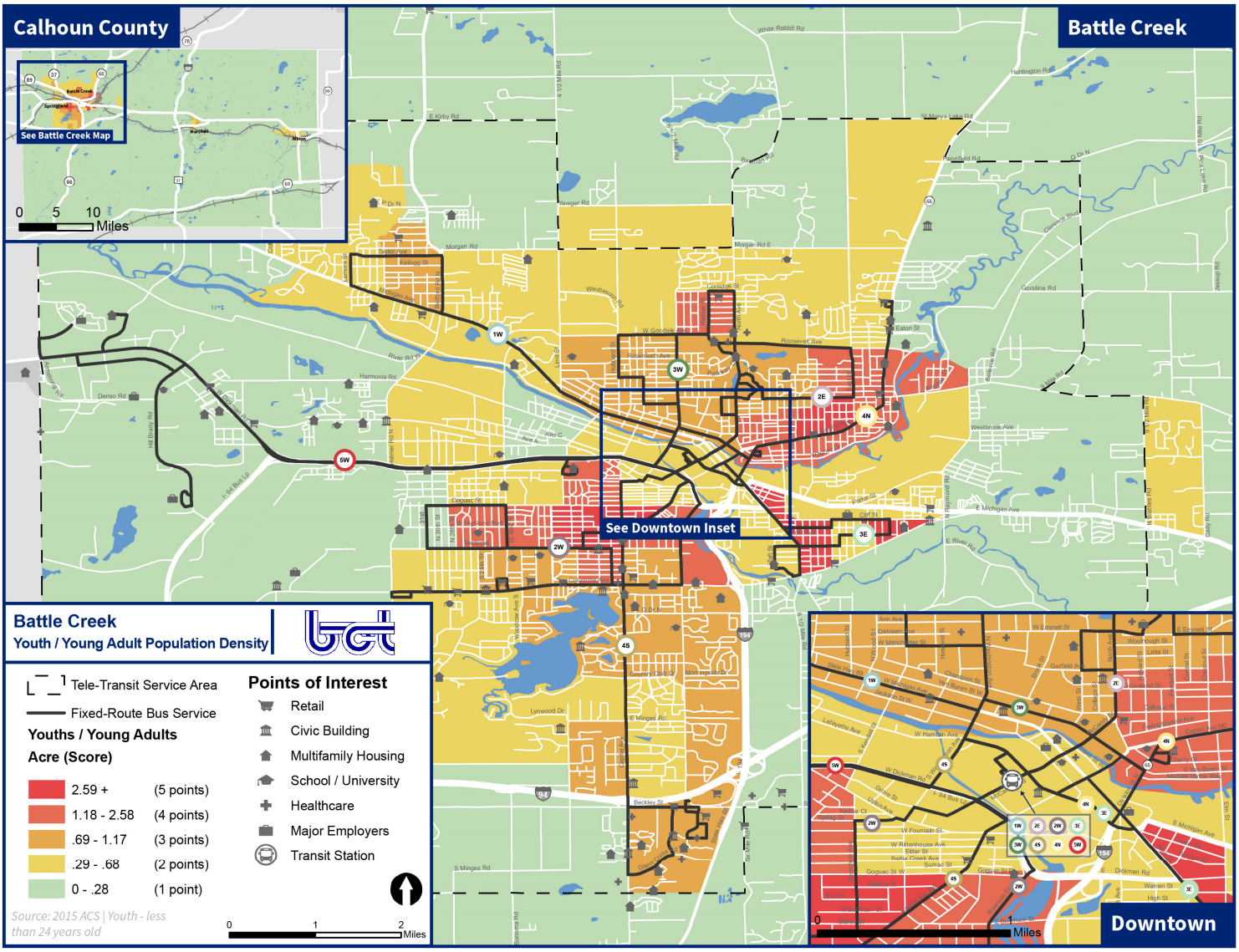


Figure 16 | Older Adult Population Density

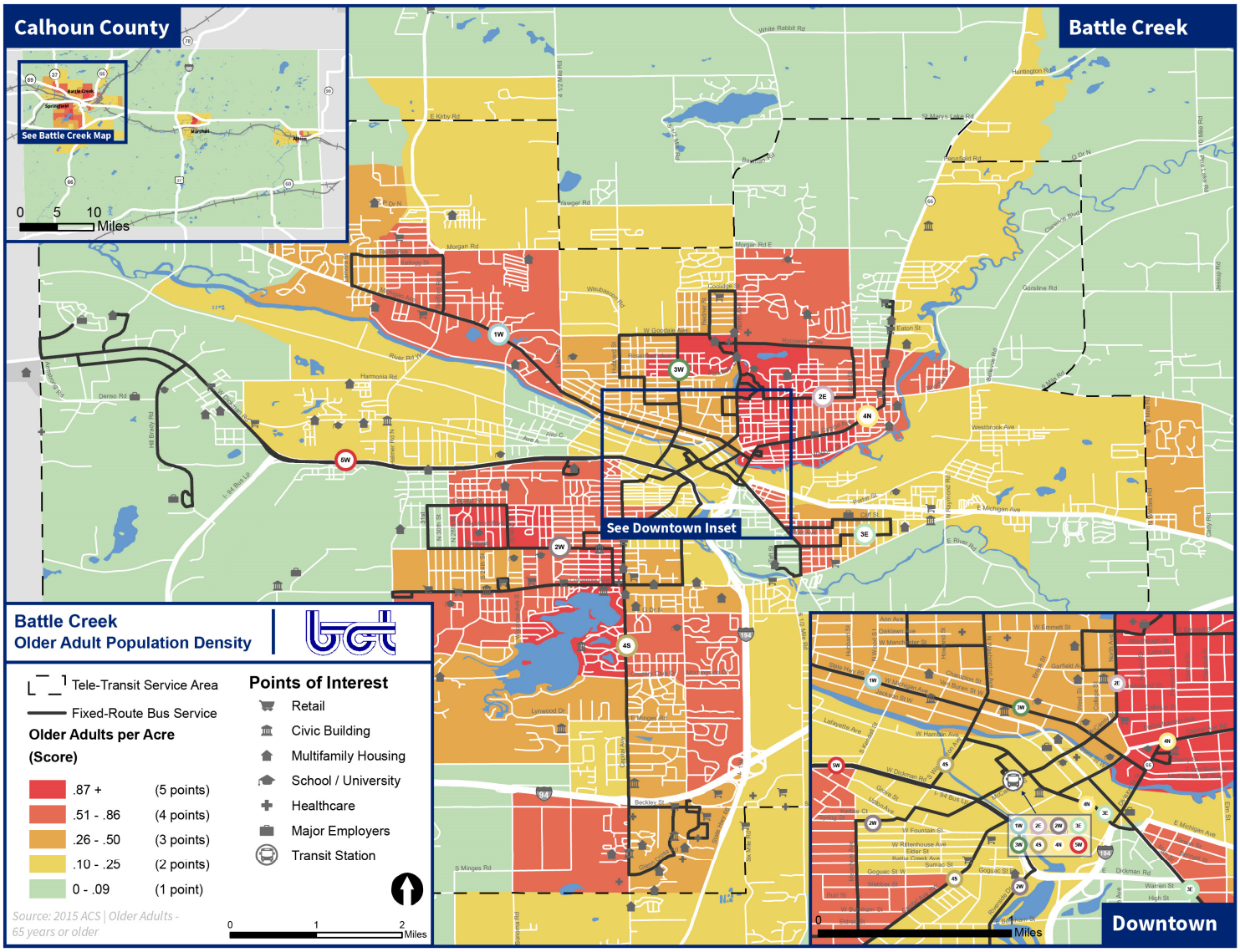
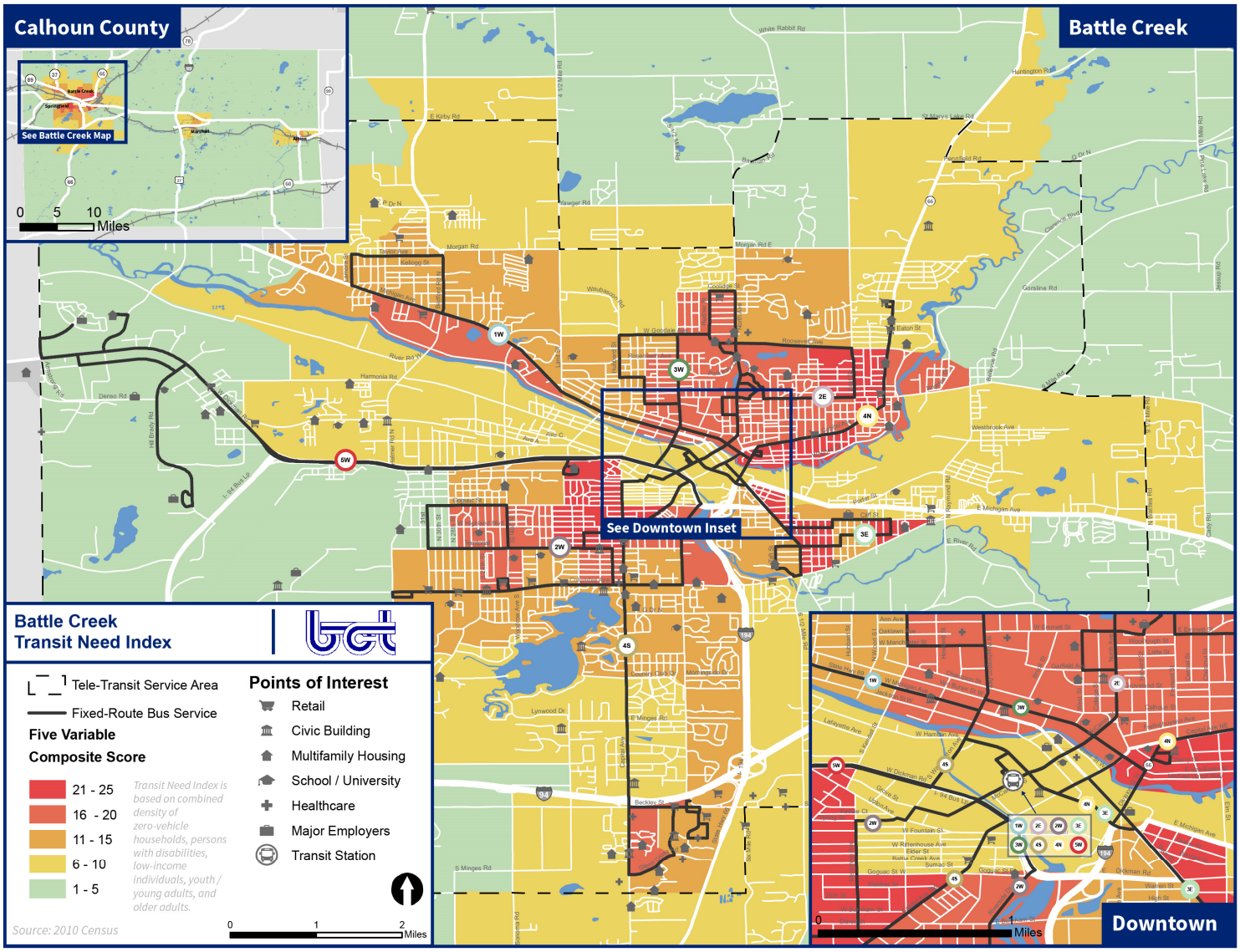


Figure 17 | Battle Creek Transit Need Index



Document Review

In recent years, BCT has been the subject of numerous studies. These studies provide specific service recommendations and summarize community opinion towards the region's transit service. Overall, these documents help to identify trends in the community's transportation needs, while providing a better understanding of the role BCT plays in the community. The following documents were reviewed as part of the TMP study:

- **Battle Creek Vision Transportation Report**
- **Battle Creek Title VI Report**
- **Assessing Customer Satisfaction and Trip Purpose (Demand Response)**
- **Assessing Customer Satisfaction and Trip Purpose (Fixed Route)**
- **Fort Custer Industrial Park Transportation Study**

A summary of each study is provided below, including the purpose of the study and the implication of the project.

Battle Creek Vision Transportation Report

Date: 2017
Author: Scott Cubberly on behalf of Battle Creek Community Foundation

Purpose

The Battle Creek Vision Transportation Report was completed in 2017. The report discusses and offers solutions to address issues Battle Creek community members, especially those of low income and minority status, have accessing transportation, and offers short, mid, and long-term solutions to address these issues.

Summary

The report focuses on three key transportation issues: Workforce Transportation, Non-Emergency Medical Transportation, and Basic Needs Transportation. The report involved a robust outreach process including three focus groups and a community survey. The results suggest that a lack of affordable, accessible transportation options is a barrier to many members of the Battle Creek community especially when trying to access jobs, participate in school activities (both parents and students), and take advantage of social services like ESL classes.

Recommendations covered all facets of transportation in the Battle Creek region including improving relations between City Cab company and immigrant populations, and increasing driver education programs. Primary recommendations include expanding B-cycle to neighborhoods outside downtown for the last mile trip, upgrading BCT's technology (e.g. Remix) to increase route flexibility and build efficiency, implementing a public-private partnership to address gaps in BCT service, and developing a vanpool model.

After working with key employers and Battle Creek Unlimited – Economic Development, an on-demand van service is slated to begin operating in 2018. The service will employ three vans (two 15-passenger vans, one 9-passenger van) and will provide service primarily to second and third shift workers. Additional service may be provided to fill gaps in transit service elsewhere in the greater Battle Creek region, including to Fire Keepers Casino, non-emergency medical needs, Springfield, first shift schedules, and childcare services.

This service provides employers and riders the opportunity to leverage commuter tax benefits with employee contributions. The cost of a monthly pass, which covers 44 rides, will be 264 dollars. Employers will contribute 120 dollars and riders will contribute 144 dollars. Riders can also purchase regular one-way trips for seven dollars. The service will be available to the general public, who can purchase weekly passes, which covers 11 rides, for 70 dollars ($6.37 per ride). This service will be advertised to the community through traditional means (i.e. Press Release) and to employees through the Employer Resource Network at the Fort, which consists of five employers, including the largest employer in Calhoun County. The Employee Resource Network employs a DHS case worker who works directly with employees who have barriers.

Implications

The Battle Creek Vision Transportation Report provides short, mid, and long term sustainable recommendations to improve transportation access to Battle Creek community members. These recommendations can help inform the Battle Creek Transit Master Plan. The report also highlights challenges including limited funding and the need for buy-in from key stakeholders that may restrict the ability for the Battle Creek region to implement proposed

recommendations. Despite the challenges, the report affirms that transportation access is a key part of overall long-term community development in Battle Creek and Calhoun County.

The service slated for implementation in 2018 will provide the second and third shift workers with on-demand transit service, which may reduce the need for BCT to provide service during those times. If the service operates during the first shift or provides general on-demand service, it could take ridership from BCT, especially Tele-Transit service. However, the service's fare structure is much higher than BCT's existing fares.

Battle Creek Transit Title VI Plan

Date: June 2016
Author: Battle Creek Transit

Purpose
The Battle Creek Transit Title VI Plan was completed and became effective in June 2016. The plan outlines the system's compliance with the Federal Transit Administration's Title VI requirements, which ensure that BCT operates all its programs and provides public transportation services without regard to race, color, or national origin.

Summary
The plan identifies Limited English Proficiency (LEP) populations in Battle Creek's urbanized area. LEP populations represent a total of three percent of the total urbanized area's population of 5 years or older. Spanish was identified as the largest non-English-speaking population group. The report notes that the Hispanic population has increased by nearly 10 percent in the last decade.

BCT does not formally track LEP riders. However, the system provides materials in Spanish and provides translation services as requested. The plan identifies public participation strategies the system uses to ensure inclusion.

Implications
The BCT Title VI Plan identifies the LEP population and identifies Hispanics as the largest minority group. These findings will be particularly important to the review of the effectiveness of passenger information materials as part of the Transit Master Plan.

Assessing Customer Satisfaction and Trip Purpose for Battle Creek (D/R)

Date: 2017
Author: Michigan State University on behalf of Battle Creek Transit

Purpose
This document summarizes the results of the customer survey that was distributed to BCT's Demand Response riders in 2017.

Summary
Sixty-five demand response riders completed the survey. The survey asked about overall customer satisfaction with the service, trip purpose, and rider demographics. The survey also provided the opportunity for respondents to provide general feedback.

Overall, respondents provided positive feedback about BCT's Tele-Transit demand response service. Most respondents indicated that they were "very satisfied" with the overall service, and the system's customer service, level of information available, and safety and security. In addition, most respondents indicated that the cost of the service was reasonable.

The survey also assessed trip purpose via origin-destination questions. The number one origin location was home and the number one destination location was a medical appointment. In addition, 53 percent of riders would not have been able to make the trip if this service were not available.

Nearly half of the respondents indicated they were ADA-certified. Most of the survey respondents identified as Caucasian, over 65 years of age, retired, and having mobility disabilities. Most of the respondents also indicated an annual income of less than $10,000, and that they "occasionally" use the Tele-Transit service.

Implications
Overall, the survey indicates that rider satisfaction with Tele-Transit demand response service is high. To address customer feedback, the assessment recommends two ways to improve service: longer operating hours and updating how the drivers interact with passengers (such as assisting elderly or disabled passengers when they are boarding the vehicle). These will be key focus areas of Tele-Transit analysis of the Transit Master Plan.

Assessing Customer Satisfaction and Trip Purpose for Battle Creek (FR)

Date: 2017
Author: Michigan State University on behalf of Battle Creek Transit

Purpose
This document summarizes the results of the customer survey that was distributed to BCT's Fixed Route riders in April 2017.

Summary
Two hundred and two fixed route riders completed the survey. The survey asked about overall customer satisfaction with the service, trip purpose, and rider demographics. The survey also provided the opportunity for respondents to provide general feedback.

Overall, respondents provided positive feedback about BCT's Fixed Route service. Most respondents indicated that they were "satisfied" with the overall service, and the system's customer service, level of information available, and safety and security. In addition, most respondents indicated that the cost of the service was reasonable.

The survey also assessed trip purpose via origin-destination questions. The number one origin location was home and the number one destination location was work. In addition, almost 24 percent of riders would not have been able to make the trip if this service were not available. The bus route most often used by survey respondents was the NE Capital route, followed by the VA/Ft. Custer route.

Half of the survey respondents identified as Caucasian and almost half identified as African American. Most respondents were between the ages of 35 and 54 and had an annual income below $10,000. Most respondents paid with the regular adult fare and nearly 40 percent use the fare multiple times per week.

Implications
Based on customer feedback, the assessment recommends six ways to improve service: provide Sunday service, improve bus stop infrastructure (shelters and/or seats) and safety (lack of sidewalks/crosswalks at stops), reinstate the 30-minute route between Meijer and Target, improve collaboration between Springfield and Battle Creek, enhance service to serve non-traditional work hours, and introduce a smart card (monthly unlimited pass) rather than a punch card. These recommendations will be explored further as part of the Transit Master Plan study.

Fort Custer Industrial Park Transportation Study

Date: March 2014
Author: The Corradino Group of Michigan, Inc. and The Mannik & Smith Group, Inc. on behalf of Battle Creek Transit

Purpose
This study reviewed the existing BCT service at the Fort Custer Industrial Park (FCIP) to understand the feasibility of expanding the service. The study also identified and assessed the feasibility of providing alternative transportation options to FCIP to better meet employee's needs.

Summary
At the time of the study, 90 companies employing over 9,400 workers were based at FCIP. The study found that BCT's existing service, which provides limited weekday and Saturday service from FCIP to downtown Battle Creek via route 5W Fort Custer, did not meet the needs of the majority of FCIP employees. The majority of FCIP employees are shift workers and BCT is not a feasible option given the non-traditional shift times.

The study examined four alternative options to provide transportation to the workers: increase BCT service, utilize organizations/agencies existing transportation resources, subscription taxi service, and a vanpool program. The study analyzed each option based on its ability to address the existing service gap. Analysis found that increasing BCT service would be cost-prohibitive and require altering multiple routes in the system due to the radial nature of the service. Even with the service increase, BCT would not be able to serve the FCIPs three-shift schedule. Additionally, utilizing other organizations/agencies' existing resources faces huge administrative, funding, and implementation obstacles because it requires procuring resources from different organizations that are restricted by the organizations respective funding structure. Subscription taxi services allow for a more flexible service area and would not burden BCT. However, the fare would likely be higher because it requires profitability and may be prohibitively expensive for the employees in need of transportation. Overall, the study recommended implementing a vanpool service because it is not subject to the same financing and administrative hurdles as the other options. Vanpools can be entirely self-sustaining, provide the most flexibility for users, cover a broad area, and have already been implemented successfully in other Michigan jurisdictions

Implications
The Fort Custer Industrial Park Transportation Study highlights key job-access challenges and potential solutions to be explored and addressed through the Transit Master Plan study.

Transit Planning Study

Date: February 2009
Author: The Corradino Group of Michigan, Inc. and The Mannik & Smith Group, Inc. on behalf of Battle Creek Transit

Purpose
This study assessed survey results and existing conditions to develop recommendations for improving the effectiveness and responsiveness of BCT in the Battle Creek community.

Summary
At the time of publication, BCT consisted of eight radial fixed routes and Tele-Transit demand response service. The study examined public opinion and existing operational performance to develop a needs analysis and future service recommendations. The study involved extensive public outreach including an on-board rider survey, mailed household surveys, and focus groups with key community stakeholders. The study's operational analysis examined system performance at the route and stop level, and found most routes to qualify as high performing (performing at or above 80 percent of the system average for passengers per hour). The study noted that the radial system design is appropriate based on the geography and low density of Battle Creek, and the dispersed location of major trip locations. The study also identified areas of inefficiencies in the system and proposed recommendations to address these inefficiencies.

Recommendations included modifications to route headways, re-routing existing routes, implementing circulator services, development of super stops, increased regional connections and potential expansion of evening van service. Recommendations were categized into three categories depending on cost and resource availability: short-term (six months or less), medium-term (six months to two years), and long-term (at least two years).

Implications
The Battle Creek Transit Planning Study provides a historic baseline to explore how the community has changed and remained the same since 2009. It also allows for the analysis of how recommendations fared in subsequent years and what lessons can be learned from that experience.

2. STAKEHOLDER AND PUBLIC OUTREACH

Among the best way to understand how well a transit system is serving its community, is to ask the people who interact with it most. This includes riders, who in many cases experience the system daily, and non-riders who may still be considered "stakeholders" in their capacity as prospective riders, employers, advocates, service providers, or simply tax-payers. This chapter summarizes rider and non-rider input collected during outreach efforts through January 2018.

476 surveys were collected through the combination of an on-board and online surveys. The on-board survey was administered on buses during the week of October 9th, 2017, yielding 241 rider surveys. An online survey was launched at the start of December 2017, and was taken by 235 individuals (46 riders and 188 non-riders) over a two-month period. Additional comments were provided in-person by both riders and non-riders at a series of public and stakeholder meeting held in Battle Creek on December 4th and 5th, 2017.

Rider Survey Responses

Overview

This section summarizes the on-board and online survey responses collected from October 2017 to January 2018 from those who identified as BCT riders. Results from non-riders are summarized in the next section - Non-Rider Survey Results. The on-board and online survey were largely the same; however, similar questions had to be worded differently on the two surveys in some cases because the online respondents were not on a vehicle when completing the survey.

Key Findings

Several key themes and findings emerged from the summary and analysis of the rider survey responses, including the following:

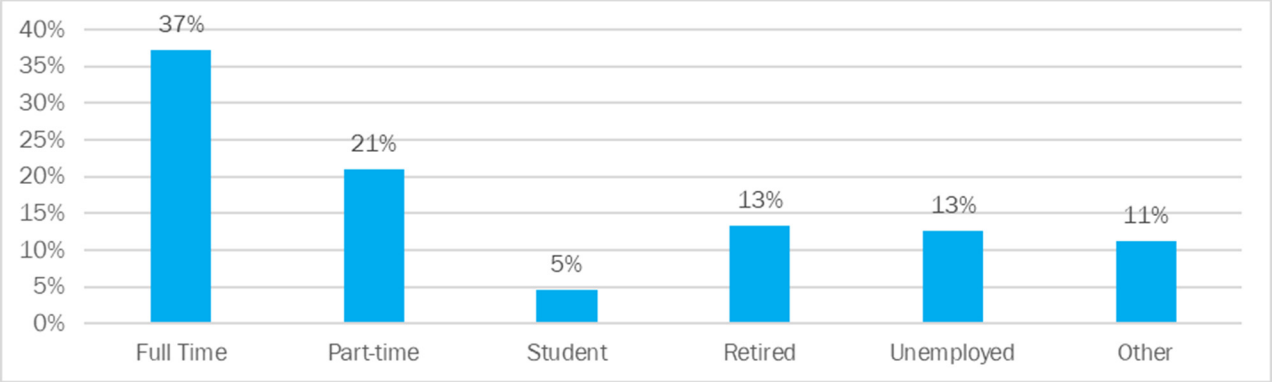
- Existing riders rely heavily on local bus service: 57 percent of riders use the service almost every day and 47 percent of riders do not own a personal vehicle.
- A high percentage of BCT users are economically disadvantaged: 43 percent of passenger households earn less than $10,000 annually and 91 percent earn less than $35,000 annually.
- The highest number of trips completed on the system are made between riders' homes and place of employment, but the system also supports a substantial volume of discretionary trips (shopping, medical, etc.).
- Customers are satisfied with staff conduct and fares: 85 percent agree or strongly agree that BCT staff is professional and courteous while 81 percent agree or strongly agree that fares are reasonable.
- There is strong support for increased evening and weekend service.

Employment Status

Just over half of the respondents to the rider survey reported being employed in either a full-time (37 percent) or part-time (21 percent) positions (**Figure 18**). 13 percent reported being unemployed. By comparison, Battle Creek's unemployment rate was 4.6 percent in October 2017, when the on-board survey was completed.[1] Students and retirees account for less than one-quarter (18 percent) of respondents. The most common "Other" response was "disabled."

[1] Battle Creek, Michigan Unemployment Rate, BLS: https://www.bls.gov/eag/eag.mi_battlecreek_msa.htm

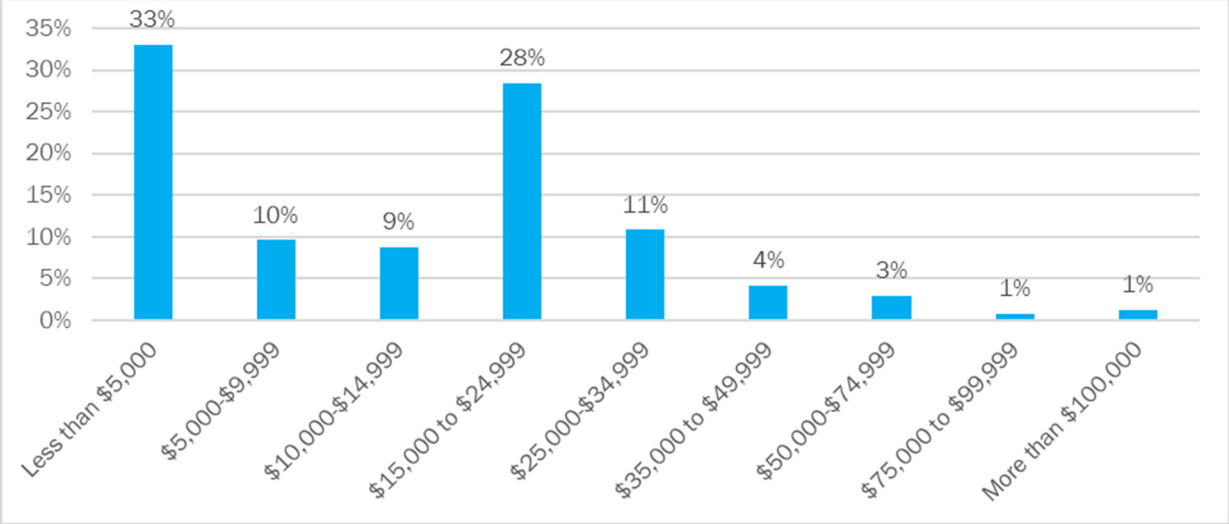
Figure 18 | Employment Status



Household Income

Nearly 95 percent of rider survey respondents report living in households with annual incomes below Battle Creek's median household income ($53,889).[2] 43 percent of respondents reported household incomes of less than $10,000 a year, while five percent of respondents' households earn over $50,000 annually (**Figure 19**). This finding suggests that many transit riders in Battle Creek live below the poverty line.

Figure 19 | Household Income



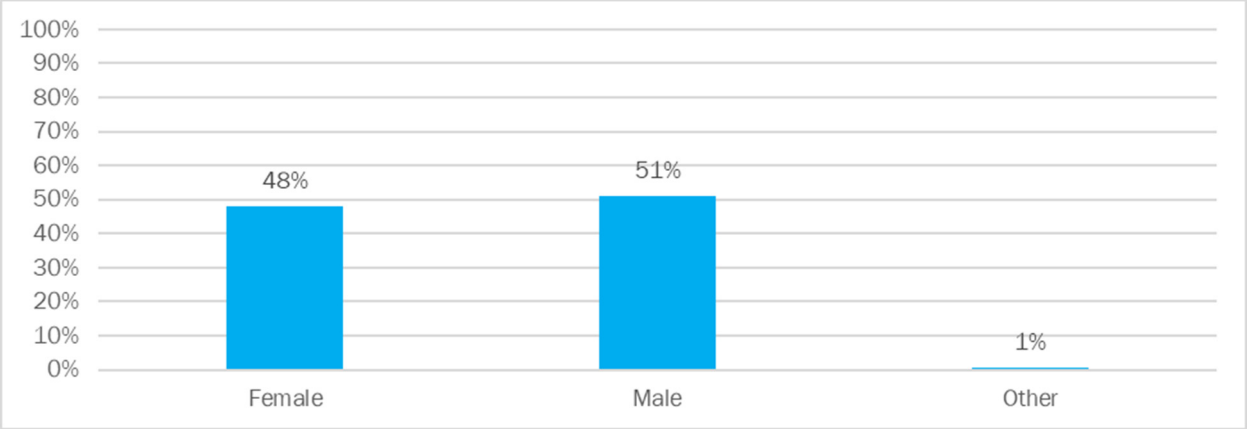
Gender

Transit rider survey respondents were slightly more likely to be male (51 percent) than female (48 percent) (**Figure 20**). Nationally, 55 percent of transit trips are taken by females.[3]

[2] United States Census, Quickfacts: Battle Creek, Michigan: https://www.census.gov/quickfacts/fact/table/battlecreekcitymichigan,US/PST045216

[3] American Public Transportation Association: A Profile of Public Transportation Passenger Demographics and Travel Characteristics Reported in On-Board Surveys.

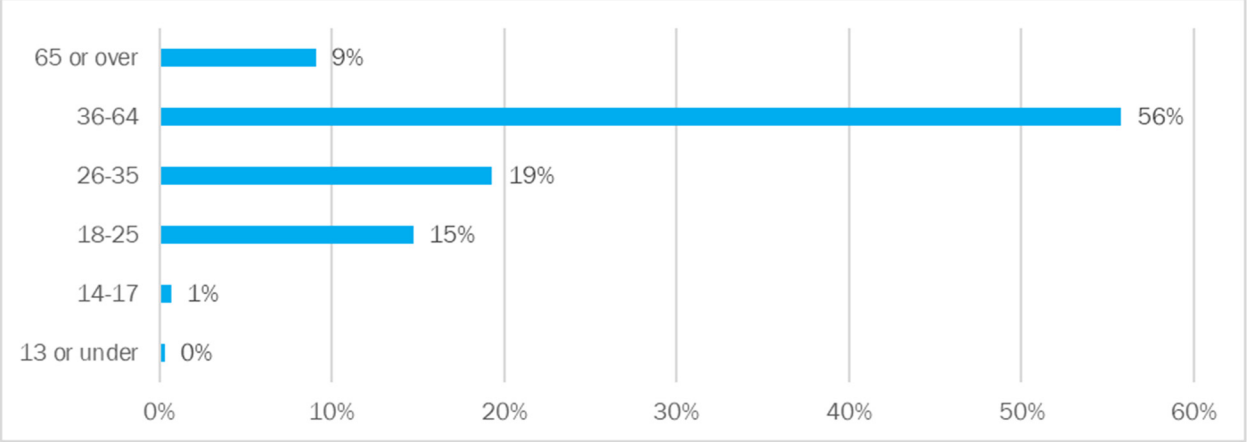
Figure 20 | Gender Distribution



Age

The majority of the transit rider survey respondents – 56 percent – are middle-age adults, between 34 and 64 years old (**Figure 21**). Millennials, approximately age 18 to 35, represent 34 percent of respondents. Only 9 percent of respondents are 65 or older.

Figure 21 | Age Distribution



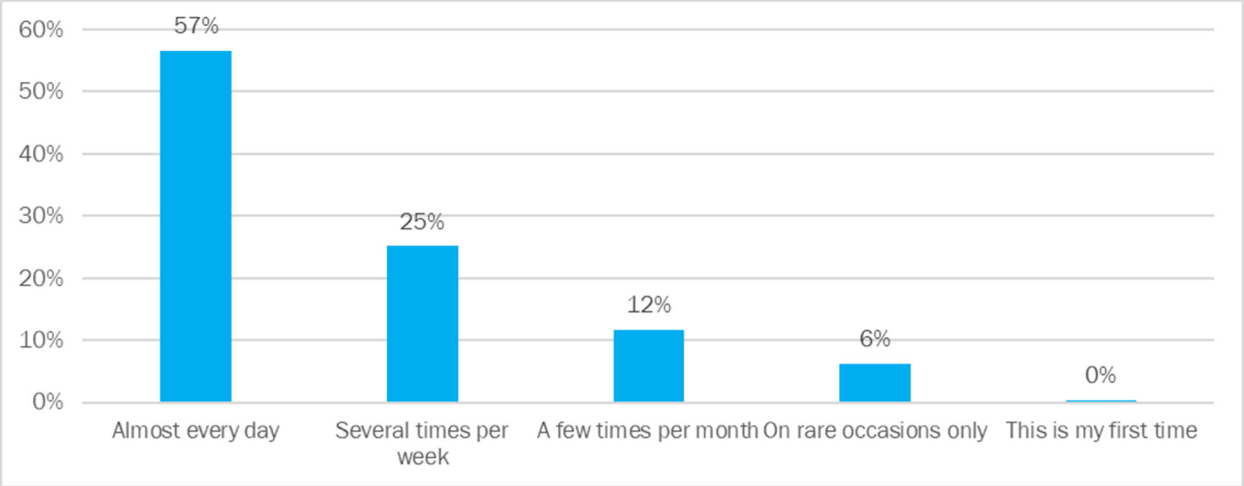
Transit Reliance

Many BCT riders rely on local transit services as their primary means of transportation. The majority of respondents (61 percent) ride transit almost every day, and 32 percent of respondents would rely on walking if transit services were unavailable.

Frequency of Use

Nearly 84 percent of transit rider survey respondents reported that they regularly rely on local bus services to provide mobility around Battle Creek (**Figure 22**). Fifty-seven percent of survey respondents reported that they ride BCT almost every day, while an additional 25 percent ride multiple times per week. A combined 18 percent of respondents use local bus service a few times per month or on rare occasions, while less than one percent of respondents indicated that this was their first time riding the service.

Figure 22 | Transit Use

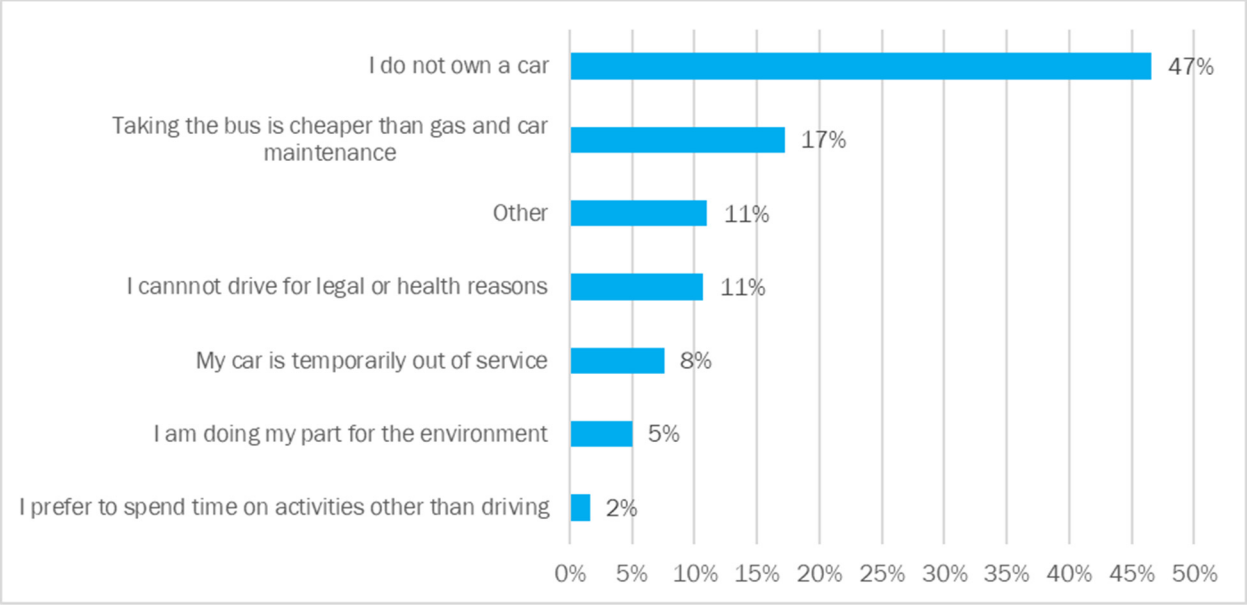


Reasons for Using Transit

The rider survey asked existing users to categorize the primary reasons they use local transit services. Respondents were able to select multiple answers to this question.

Nearly 50 percent of respondents rely on BCT because they do not own a vehicle; an additional 18 percent cannot drive, or their car is temporarily out of service (**Figure 23**). These findings strongly emphasize that many passengers are reliant on transit and ride largely because they do not have other options. Seventeen percent of respondents use transit because taking the bus is more affordable than paying for gas and car maintenance. Environmental impacts and productivity using time on transit are concerns shared by fewer than 10 percent of respondents.

Figure 23 | Transit Reliance

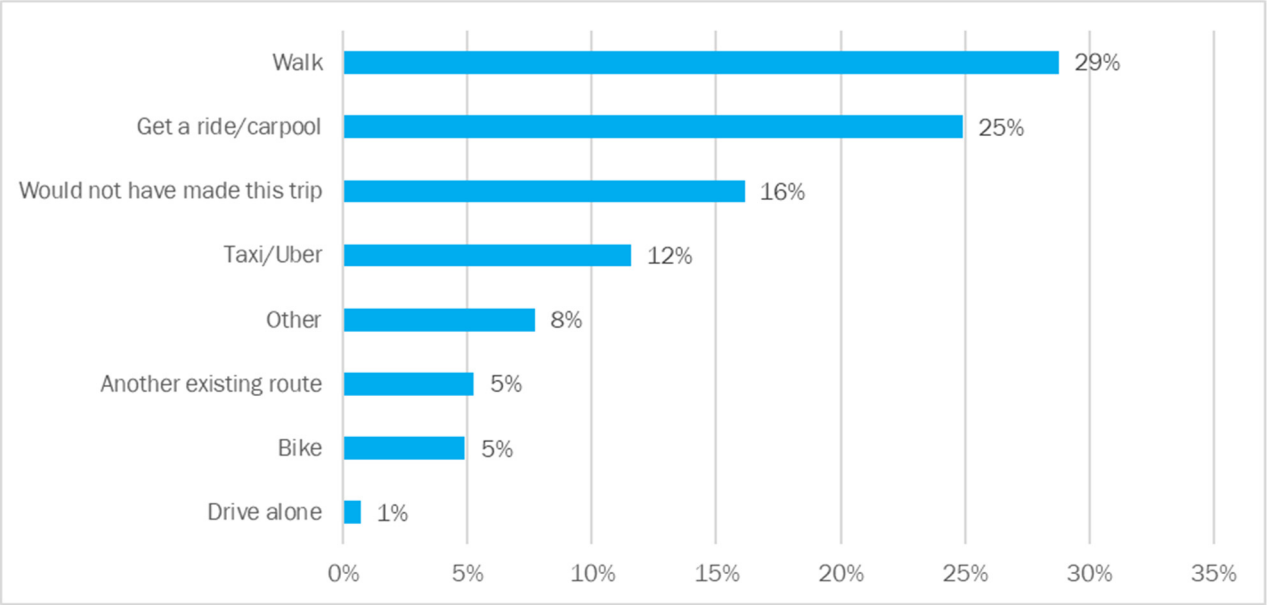


Alternative Modes

Survey respondents who regularly use BCT were asked to evaluate their transportation options if their primary bus route did not exist. Walking scored highest (29 percent), followed by getting a ride or carpooling (25

percent). Only five percent of respondents would use another BCT route, and 16 percent would not make the trip at all, if their preferred route did not operate (**Figure 24**).

Figure 24 | Alternative Travel Mode

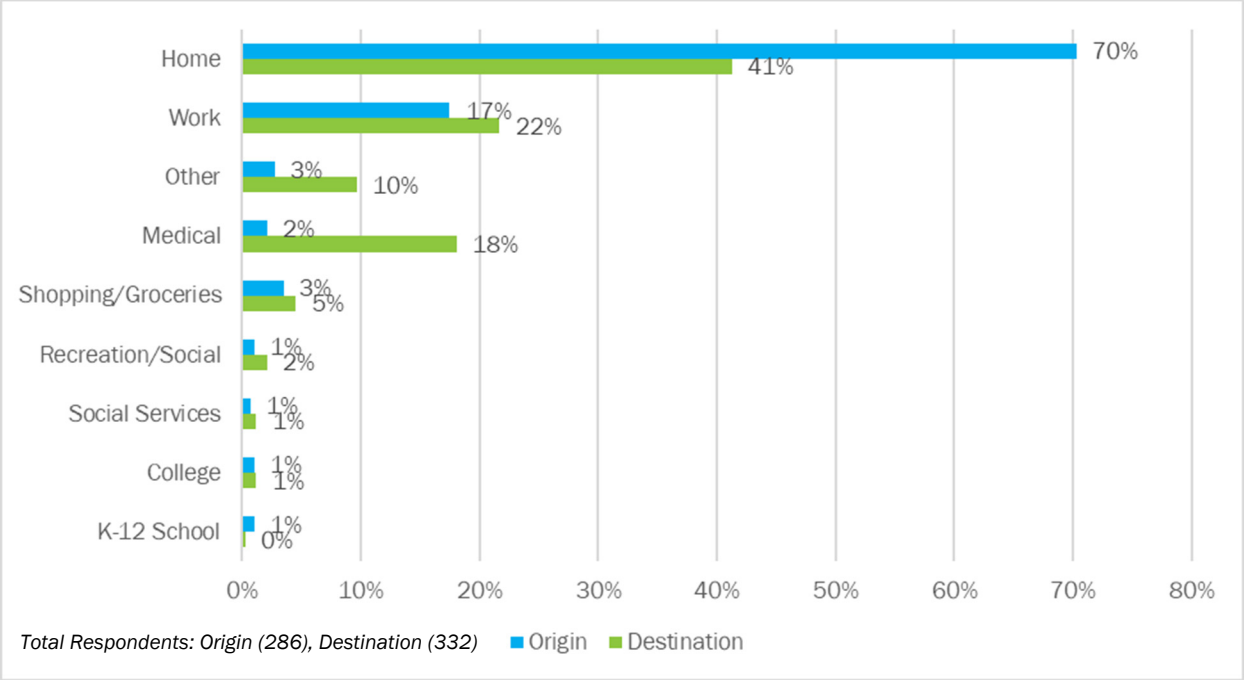


Trip Purpose

Survey respondents were asked to indicate a general trip origin and destination for their most recent trip using BCT. More than two-thirds of survey respondents started their trip from home, while 17 percent began trips from work. Among respondents that began their trip at home, 59 percent traveled to work, 15 percent to college, 12 percent to shopping destinations, and six percent to medical appointments.

Ending destinations were more evenly distributed between home (41 percent), work (22 percent), medical appointments (18 percent), and shopping destinations (five percent) (**Figure 25**). These responses indicate that a high percentage of riders use BCT to commute between home and work, while the service also supports a range of secondary discretionary trips.

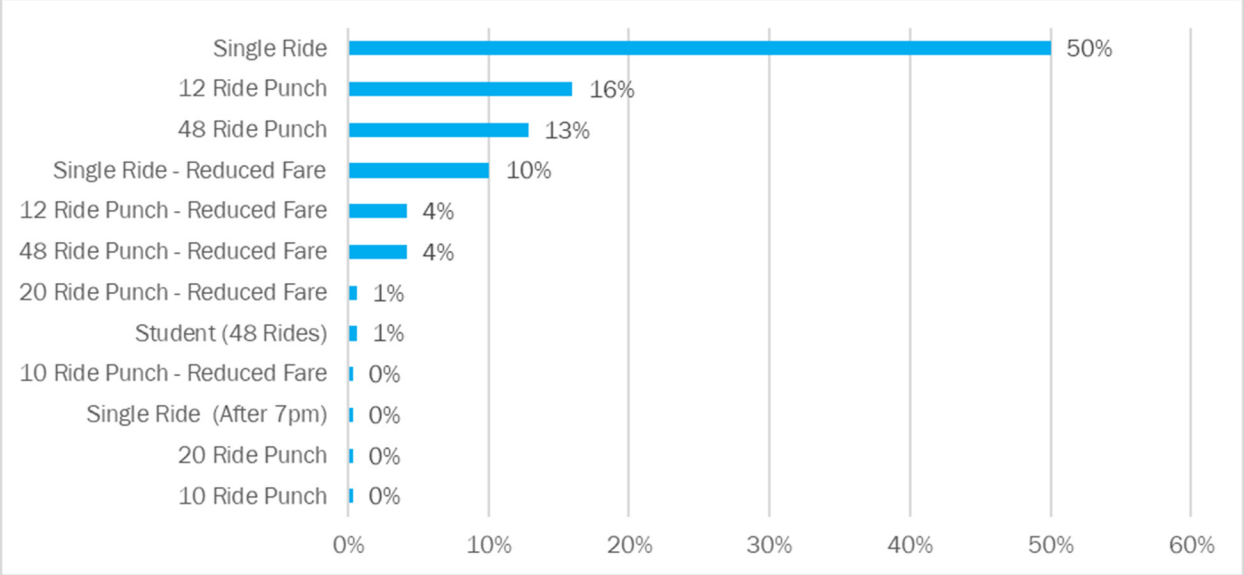
Figure 25 | Trip Purpose



Fare Medium

Single Ride passes were the most popular fare payment method (50 percent), followed by 12 Ride Punch passes (16 percent), and 48 Ride Punch passes (13 percent) (**Figure 26**). While BCT has a high percentage of low-income riders, only 19 percent of survey respondents used a reduced fare payment on their most recent bus trip

Figure 26 | Fare Medium



Transfers

On-board survey respondents and online riders were asked to list the bus routes they used to complete their most recent one-way trip. One-third of survey respondents transferred to at least one other route to reach their final destination. Twenty-five percent transferred once to reach the final destination, eight percent transferred twice, and one percent transferred three times. The most common transfer was from Route 2E – Emmet – East Avenue Bus Route to 1W – West Michigan (**Table 8**).

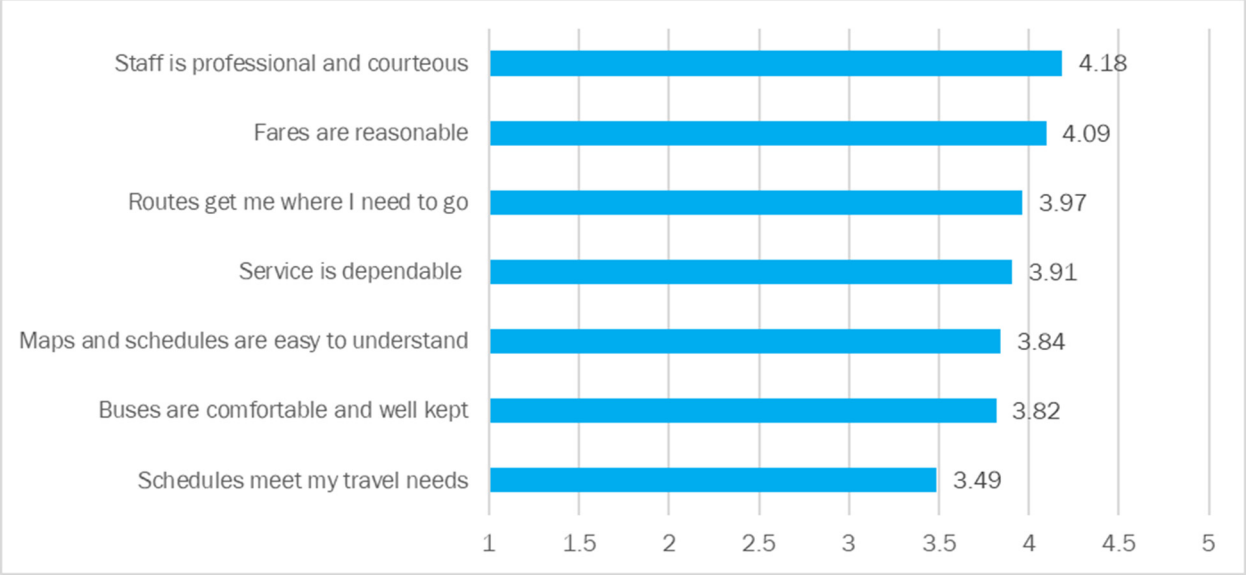
Table 8 | Transfer Matrix

		To Route							
		1W	2E	2W	3E	3W	4N	4S	5W
From Route	1W	-	0	2	3	1	1	4	0
	2E	13	-	1	0	0	2	3	2
	2W	0	0	-	2	1	6	2	1
	3E	0	0	2	-	1	0	3	5
	3W	1	0	0	0	-	0	2	1
	4N	2	0	2	0	0	-	2	7
	4S	2	1	2	6	3	4	-	5
	5W	2	1	3	7	6	4	1	-

Rider Perception

Survey respondents were asked a series of questions regarding their perception of BCT service features (**Figure 27**). The results indicate that on average, current riders are satisfied with BCT's current service conditions. Customers mostly consider BCT's fares reasonable, rating fares an average of 4.09 of out five points, with five representing "strongly agree" and one representing "strongly disagree." Respondents agree on average that staff is professional and courteous (4.18), that routes get riders where they need to go (3.97), that service is dependable (3.91), that maps and schedules are easy to understand (3.84) and that buses are comfortable and well kept (3.82). Respondents are less satisfied with BCT's current schedule: 20 percent of respondents disagree or strongly disagree that BCT's schedules meet their travel needs.

Figure 27 | Customer Perception



Rider Preferences

Survey respondents were asked to select their preference between a series of theoretical service improvement options applied to BCT (**Figure 28**). Preference questions focused on service frequency, span of service, and coverage patterns.

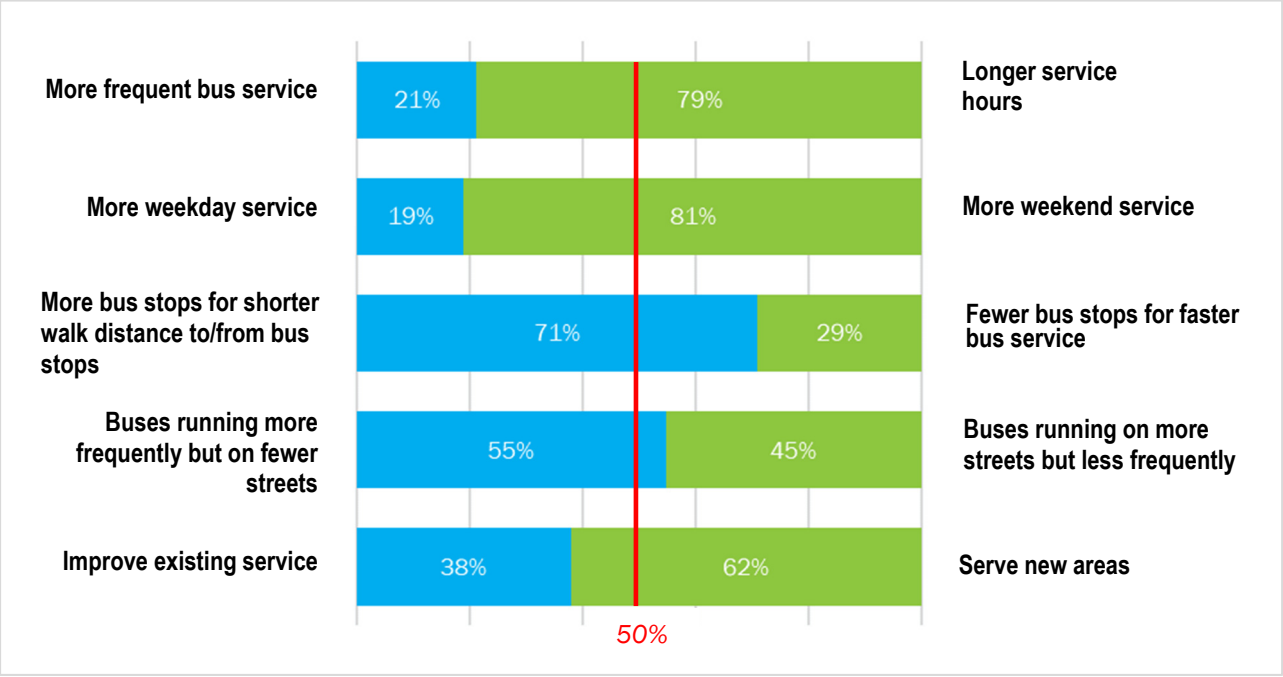
Current riders expressed a preference for longer hours over increased bus frequency by a 58-point margin. A preference for longer service hours was also reflected in the comments submitted along with the survey. Additional evening service, as well as service on Sunday, are the most requested service improvements by current system riders.

Rider survey respondents preferred increased weekend service to additional weekday service by a wide 62-point margin. Twenty-one respondents also submitted written comments in support of Sunday service.

Existing riders significantly favor adding more bus stops along BCT routes in order to reduce walk times to and from final destinations, than eliminating bus stops in order to allow for faster bus service. However, riders also prefer for buses to run more frequently, even if it means service operates on fewer streets, than less frequent bus service operating on more streets.

Finally, 62 percent of transit rider survey participants prioritized serving new areas over improving existing service.

Figure 28 | Rider Service Preferences



Additional Comments

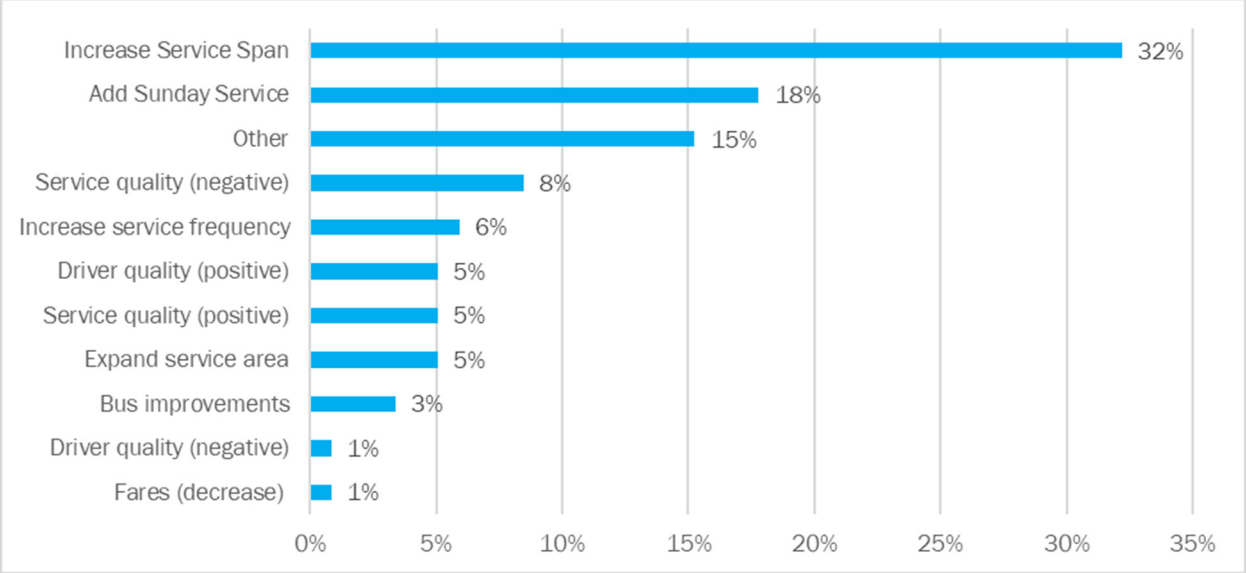
The transit rider survey included an open-ended written comment form. Of the 287 completed surveys, 86 (30 percent) included a written comment. While many riders discussed one specific topic, a number of the responses included comments and suggestions on a variety of topics. For this analysis, each discussed topic was assigned to broader categories to help identify recurring themes (**Figure 29**).

Increasing service spans and adding Sunday service were the most common comments. Within comments addressing service spans, extending weeknight service – especially for second and third work shifts – was the most popular request. Multiple comments also requested earlier Saturday morning service, and increased service frequency.

Positive service quality and driver comments outnumbered negative feedback. The most common positive comments relate to bus drivers' attitudes.

Bus improvement comments were focused on cleanliness concerns and requests for additional amenities (i.e. bike racks, USB chargers). Based on comments received, fares are not a major concern; only one comment addressed fare reductions, specifically transfer rates. Comments classified as "Other" address a broad range of pertinent responses, including increased service and return of express service to Walmart and Meijer, adding bus stops, and service to River Oaks and the Michigan Motel.

Figure 29 | Additional Comments



Non-Rider Survey Results

Overview

This section summarizes the online survey responses from non-BCT riders collected online from December 2017 to January 2018. Many question were the same for riders and non-rider. However, non-riders were asked why they do not use BCT and were not asked about their transit experience and preferences.

Key Findings

Key themes and findings of the non-rider survey include the following:

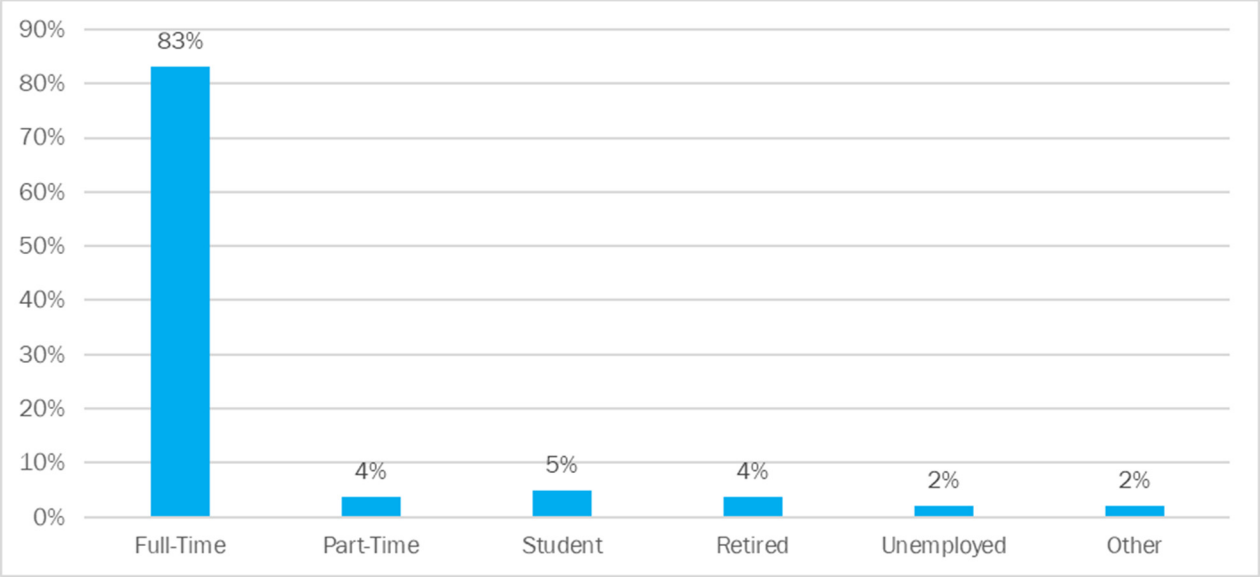
- A high percentage of non-rider survey respondents live in households earning more than $50,000 annually (71 percent). 31 percent reported annual household incomes of over $100,000.
- There is a general lack of interest in taking transit among non-riders, but also many comments that discuss the need to increase awareness of transit services.
- There is strong support for increased evening and weekend service among non-riders.

Employment Status

The majority of non-rider survey respondents reported being employed in a full-time (83 percent) position (**Figure 30**). Only two percent of non-riders described themselves as unemployed, compared to a 4.4 percent rate of unemployment for the City of Battle Creek in November 2017.[4] Students and retirees account for less than one-tenth (9 percent) of non-rider survey respondents.

[4] Battle Creek, Michigan Unemployment Rate, BLS: https://www.bls.gov/eag/eag.mi_battlecreek_msa.htm

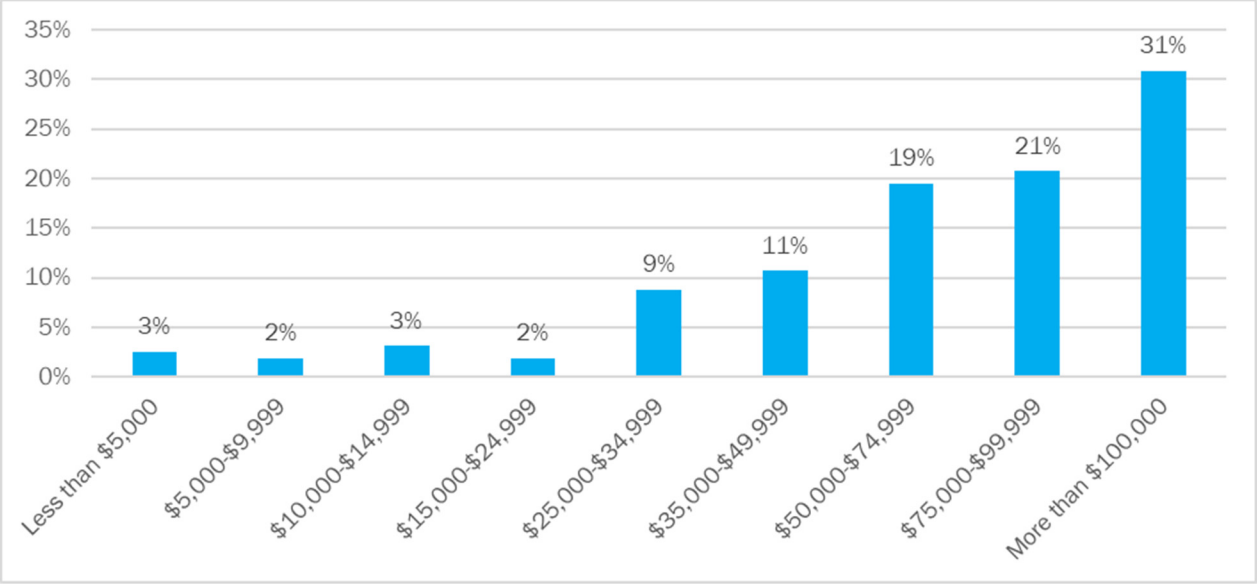
Figure 30 | Employment Status



Household Income

Nearly 71 percent of non-rider survey respondents report living in households with annual incomes above Battle Creek's median household income ($53,889).[5] Only four percent of respondents' households earn less than $10,000 annually (**Figure 31**). This finding suggests that many non-riders in Battle Creek live significantly above the poverty line.

Figure 31 | Household Income

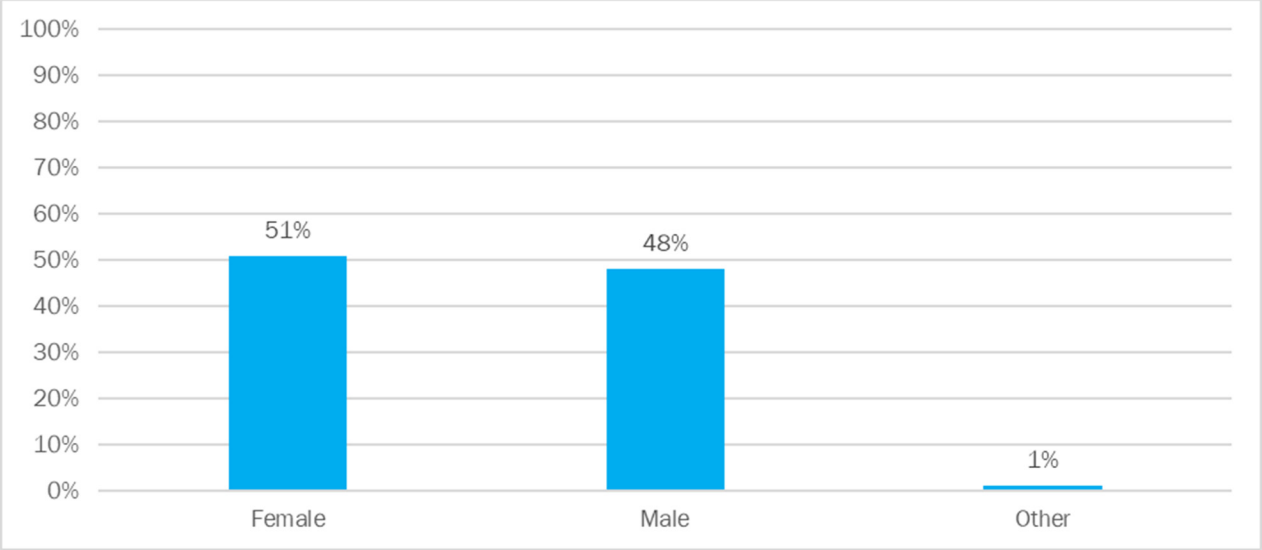


[5] United States Census, Quickfacts: Battle Creek, Michigan: https://www.census.gov/quickfacts/fact/table/battlecreekcitymichigan,US/PST045216

Gender

Non-rider survey respondents were slightly more likely to be female (51 percent) than male (48 percent) (**Figure 32**). Nationally, 55 percent of transit trips are taken by females.[6]

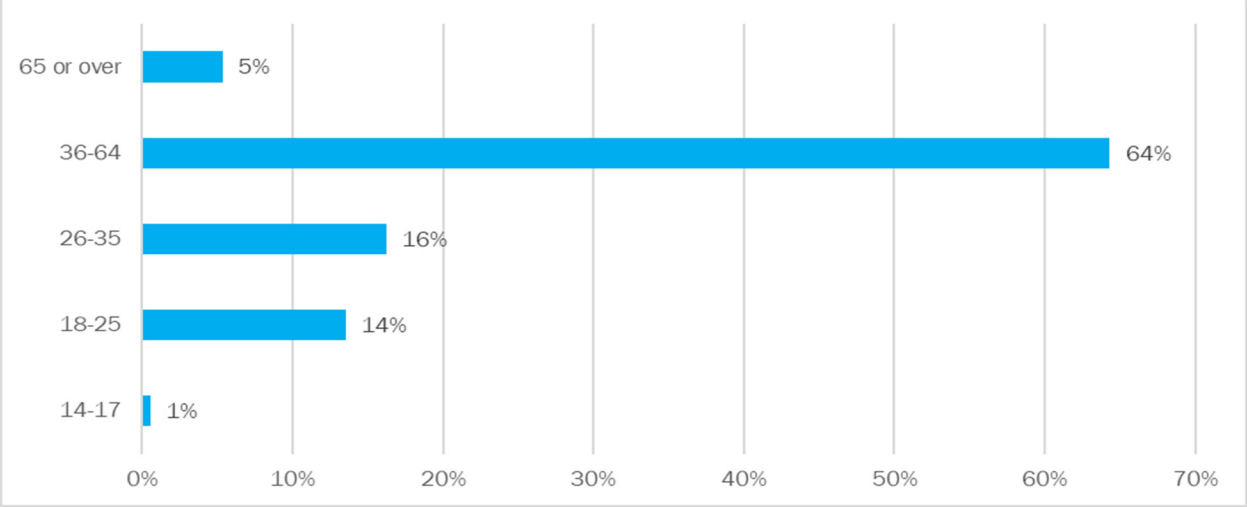
Figure 32 | Gender Distribution



Age

The majority of survey respondents – 64 percent – are middle-age adults, between 34 and 64 years old (**Figure 33**). Millennials, approximately age 18 to 35, represent 30 percent of respondents. Only five percent of respondents are 65 or older.

Figure 33 | Age Distribution



Reasons for Not Using Transit

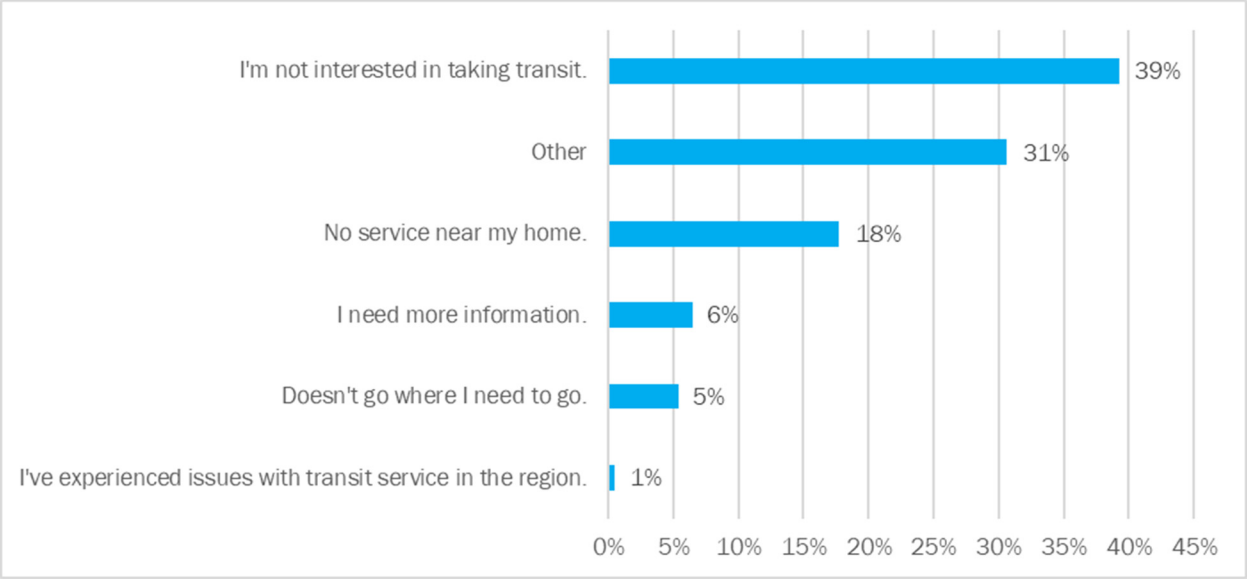
Respondents expressed multiple reasons for not using BCT's service. Simply not being interested in taking transit is the most common reason (59%), followed by "Other," and that there is no service near their home

[6] American Public Transportation Association: A Profile of Public Transportation Passenger Demographics and Travel Characteristics Reported in On-Board Surveys.

(**Figure 34**). The most common "Other" answer was that the respondent had a car or some other reliable form of transportation.

Only one percent of respondents indicated that they have experienced issues with transit services in the region.

Figure 34 | What are the primary reasons you do not use BCT?

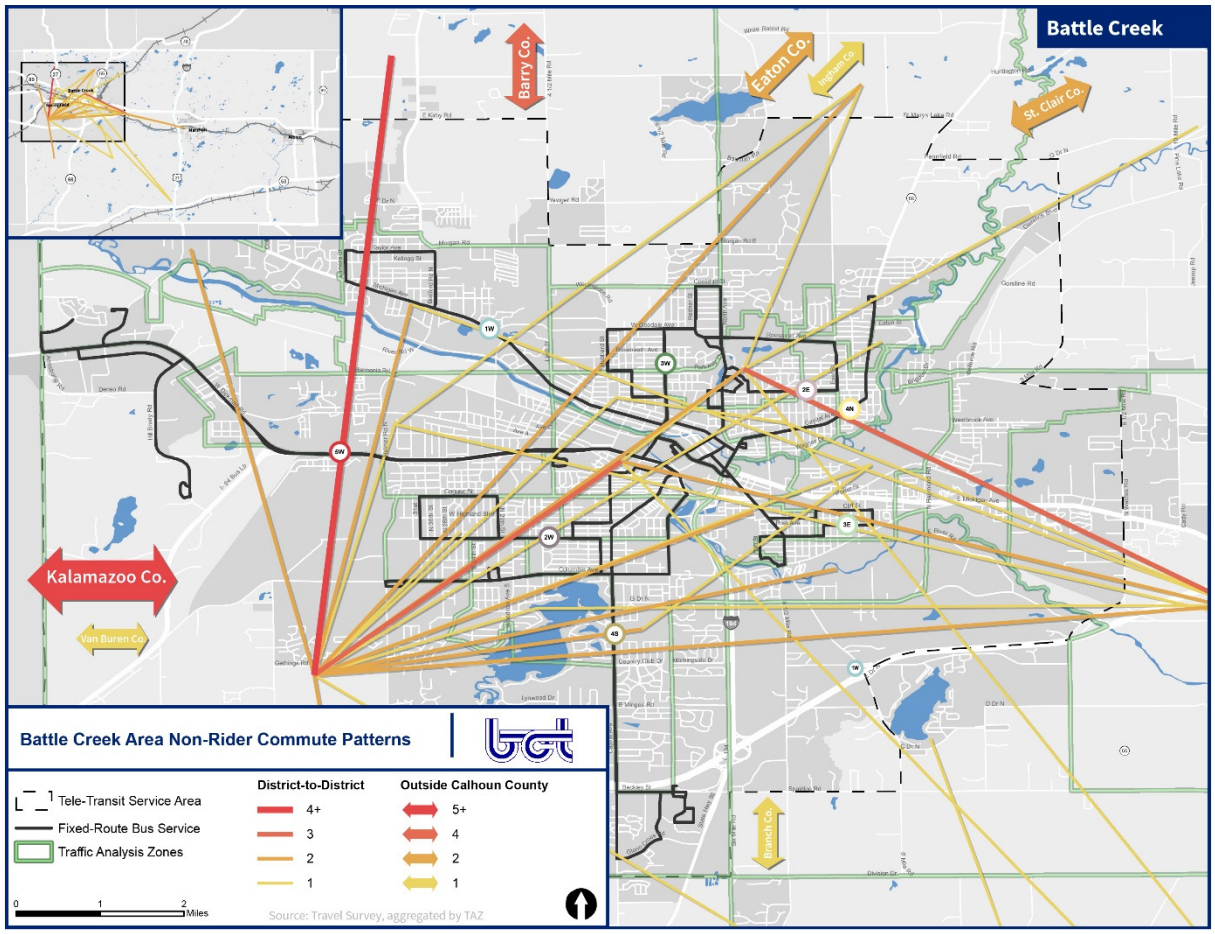


Commute Patterns

Rather than being asked about their typical transit commute, non-riders were asked to describe the start and end point of their typical daily commute, regardless of mode. These responses are mapped in

Figure 35. Many of the most prevalent travel patterns among survey participants have one end of the trip outside of Battle Creek, and even outside of Calhoun County. Kalamazoo County and Barry County registered as popular commute origins or destinations among non-riders. Firekeepers Casino is a common destination for non-riders as well.

Figure 35 | Non-Rider Commute Patterns



Additional Comments

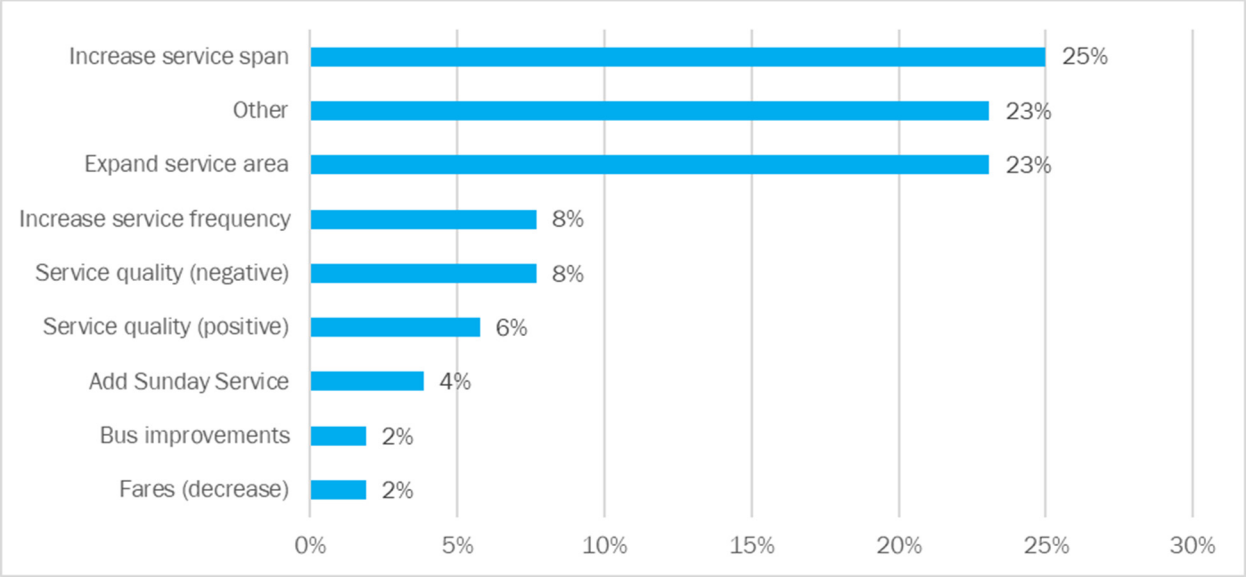
The non-rider survey included an open-ended written comment form. Of the 188 completed non-rider surveys, 43 (23 percent) included a written comment. While many non-riders discussed one specific topic, a number of the responses included comments and suggestions on a variety of topics. For this analysis, each discussed topic was assigned to broader categories to help identify recurring themes (**Figure 36**).

Increasing service span, "Other", and expanding the service area were the most common comment categories. Within comments addressing service spans, extending weeknight service – to help users traveling from home to school (e.g. night class) or work, especially second and third shifts – was the most popular request. Multiple comments also requested earlier morning service.

Comments classified as "Other" address a broad range of pertinent topics, including concern over BCT's cost to taxpayers, support for BCT's overall mission, especially from an environmental perspective, and a need to raise awareness among community members about BCT services.

Negative service quality slightly outnumbered positive service quality comments among non-riders. Bus improvement comments focused on enhancing bus technology. Based on comments received, fares are not a major concern; only one comment addressed fare reductions, specifically by partnering with local companies. There were no comments regarding driver quality.

Figure 36 | Additional Comments



Stakeholder and Public Comments

Battle Creek Transit hosted five in-person outreach activities in December 2017. These included interviews with Battle Creek Transit (BCT) drivers, dispatchers, and supervisors, as well as two public meetings, a working meeting with the Public Transportation Committee, and a stakeholder focus group. Each meeting began with a formal presentation by Foursquare ITP staff that focused on the background, goals, and approach of the Battle Creek Transit Master Plan study. Following the formal presentation, a series of questions were presented to each audience for discussion.

Several recurring themes emerged during the stakeholder and public meetings. These include a desire for:

- Increased evening and weekend service
- Additional service to the Fort Custer Industrial Park area to accommodate second and third shifts
- Enhanced customer information (e.g. real-time information, schedules at stops)

Meeting participants also expressed nearly universal praise for Battle Creek Transit staff. A full summary of the comments received during the December stakeholder and public meetings are provided below. Comments are organized by meeting type and are preceded by the question that they address.

Public Meetings #1 & #2

Public Meetings were held from 6:00 to 8:00 PM on December 4th and from noon to 2:00 PM on December 5th, 2017 at the Department of Public Works (DPW) in Battle Creek. To encourage and facilitate participation, service hours were extended until 9:15 PM on all routes on December 4th. A shuttle from the downtown transfer center to the DPW was provided for both meetings. A total of 20 residents attended the two public meetings (twelve on the 4th and eight on the 5th). The following comments are representative of feedback received at both meetings.

What is Battle Creek Transit doing well?

- Provides service to most major destinations, serving persons that do not own a vehicle and/or are disabled.
- Purchasing new buses.
- Bus drivers are courteous and helpful.

What is the greatest value of Battel Creek Transit to residents?

- Provides riders with freedom to get around town when you do not own a car.
- Provides access to jobs and shopping opportunities.

What are the greatest challenges facing BCT?

- Limited service hours because many riders work later than service is provided.
- Wheelchairs slow down service on routes, especially Northeast Capital.

How can BCT serve the community better?

- Increase span of service, especially evening and weekend hours.
- More buses.
- Bigger buses (40') on VA, Territorial and SW route.
- Improved on-time performance.
- More service to Fort Custer area.
- Electronic Fare Payment.

Are there any existing BCT routes that should be changed?

- Stop by Salvation Army on Northeast Capital route is in the middle of the block and becomes a challenge in the winter for wheelchairs.
- Remove Beckley Road and do the circle at Meijer on Southwest Capital Avenue.
- Washington Street service should be restored.
- Restore service to Main Street Market on Main-Post route.
- Route through Springfield should serve Avenue A.
- Southwest route to Walmart and Meijer every hour instead of only at certain times.

Are there areas that are not currently being served that really should be?

- Extend service along Fort Custer route to serve Jamesville Factory.
- FireKeepers Casino.
- Marshall (St. Marks).
- Previously eliminated service at Main Street Market, Emmett Township, and along Washington Street.
- Mobile Parks.

Are there other service issues that need attention (service frequency, hours of operation, fares, etc.)?

- Need for more regional service to areas like Marshall and Kalamazoo.
- Longer seasonal hours (summer and holiday season) to allow riders additional socializing and shopping opportunities.
- Longer hours year-round on Southwest Capital to serve workers.
- Difficult to get Tele-Transit reservations, requiring passengers to call well in advance.
- Need for more Tele-Transit vans, especially in the evening.

Do passengers have the tools they need to be able to use the system?

- Improve signs at bus stops to include schedules and route information.

Does Battle Creek Transit provide an inviting passenger environment?

- Passengers are sometimes rude, eat on buses, cuss loudly, and generally create poor passenger environments.
- Windows on bus shelters are often broken.
- In winter months, stops are not properly plowed and/or snow plows pile snow at stops.
- Lack of trash cans at stops.

Are there other transit systems that 'get transit right' and could serve as a model for Battle Creek Transit?

- Kalamazoo, Michigan has longer service, more buses, and weekend service.
- Chicago, Illinois has 24/7 service.
- Detroit, Michigan provides passengers with more information.
- Rockford, Illinois has nighttime service which could be a model for BCT.
- Providence, Rhode Island has service seven days a week.

What are the top 2 to 3 goals that Battle Creek Transit should focus on in the coming years.

- Install helpers on buses to assist passengers with wheelchairs.
- Evening service.
- Additional drivers to assist in shortage.
- More Tele-Transit vans, especially in winter months.
- More space on buses for handicap seats.

Other Comments

- More bike racks.
- Fare increase supported if service is increased.

Stakeholder Meeting

Two focus group meetings (Stakeholders and the Public Transportation Committee) were held on December 4th, 2017 at the Department of Public Works in Battle Creek. The first meeting included representatives of the following groups:

- Battle Creek Area Transportation Study
- Michigan Department of Transportation (MDOT)
- Calhoun ISD
- BC Vision
- BC VA Medical Center
- Community Action - Agency of South Central Michigan
- City of Battle Creek
- Summit Pointe
- EG Workforce Solutions
- Magna
- Calhoun County
- Disability Network SW Michigan
- City of Springfield
- DENSO
- Kellogg Company
- Goodwill
- Battle Creek Unlimited

The second meeting consisted of members of the Public Transportation Committee. The following comments are representative of feedback received at both meetings.

What is Battle Creek Transit doing well?

- Customer service. Drivers and the Tele-Transit dispatchers are patient with riders, especially those with disabilities, and have a friendly repartee with regular riders.
- Being resourceful with a very limited budget.
- Maintaining the fleet.
- Even though Battle Creek is large and not very walkable, BCT covers major destinations and connects key areas of the community.

What is the greatest value of Battel Creek Transit to residents?

- BCT provides residents with independence to get around town.
- BCT serves a lot of transit dependent riders, providing them lifeline service.

What are the greatest challenges facing BCT?

- Many destinations in the city operate 24/7, especially the plants (e.g. Fort Custer), however, the bus operates during limited hours, meaning residents cannot access many second or third shift jobs and other destinations without a private automobile.
- There are many locations where buses stop that do not have sidewalks, making it difficult or unsafe for passengers to board and alight the bus in those locations, especially in the winter weather (e.g. Clark Road, Skyline Road).
- Financing and budget constraints.
- Ability to attract new riders, especially since there is a social stigma about riding the bus in Battle Creek.
- Many riders must use multiple buses to access destinations, which are time consuming to riders.

How can BCT serve the community better?

- Increase awareness and advertising of BCT services throughout the community.
- Enhance the customer experience at bus stops (e.g. schedules at stop) and through real time technology (e.g. phone application).
- Increase span of service.
- Increased weekend service, especially on Tele-Transit.
- Provide second and third shift workers transit opportunities.

Are there any existing BCT routes that should be changed?

- Route to Fort Custer, work with companies to determine feasibility of routes going into the facilities and making it easier for riders to access.
- Route through Springfield should be re-routed to serve Avenue A.

Are there areas that are not currently being served that really should be?

- Fort Custer.
- Springfield, especially near rental apartments.
- Previously eliminated service in Harper Creek and Main Street Market.
- Provide more access to schools in the region.
- The Zoo.
- Major retail corridors.

Are there other service issues that need attention (service frequency, hours of operation, fares, etc.)?

- Designated bus lanes along key corridors.
- Fares are excellent.
- Additional shelters along all routes, funding possibility through business partnerships or grants.

- Student fares and passes.

Do passengers have the tools they need to be able to use the system?

- Need increased distribution of schedules.
- Maps could be clearer, especially at downtown transit center.
- Real time application for customers or information on google transit.
- Mailers advertising service to community.
- Translation of materials to other languages (i.e. Burmese).

Does Battle Creek Transit provide an inviting passenger environment?

- Stops are not accessible due to walkability issues.

Are there other transit systems that 'get transit right' and could serve as a model for Battle Creek Transit?

- Kalamazoo, Michigan has extensive countywide transportation.
- Nashville, Tennessee has real time information displays at stops that inform customers when the next bus is coming.
- Ann Arbor, Michigan has clean and easy to use service.
- Indian Trails, a private operator, took over service previously operated by Ann Arbor cheaply.

What are the top 2 to 3 goals that Battle Creek Transit should focus on in the coming years.

- More service to Fort Custer area, especially during second and third shifts.
- Increased passenger information (i.e. google transit, phone app).
- Longer service span.
- Better branding and advertising campaign.
- Increased service to schools in Battle Creek would expand opportunities for students to participate in job training programs.
- Opportunity for employers in the region to come together to coordinate shift times with existing transit service.

Other Comments

- Integration of bus system with bike and pedestrian trails/infrastructure.
- Issue of walkability in the industrial parks.
- Opportunity for employers to subsidize transit costs for their employees due to health benefits.
- Provide transit to areas slated for economic development in city's master plan.

Frontline Staff Meetings

Two meetings, one with transit supervisors at the Department of Public works and one with transit drivers, dispatchers, and maintenance staff at the BCT Facility, were held on December 5th, 2017. The following comments are representative of feedback received at both meetings.

What is Battle Creek Transit doing well?

- Drivers do their best to try to keep buses on time.
- Mechanics are doing a great job maintaining fleet. They are quick to respond when a bus breaks down and cordial with riders in such situations.
- Serve all riders.

What is the greatest value of Battle Creek Transit to residents?

- Drivers have established relationships with regular riders.
- BCT serves a lot of transit dependent riders, providing them lifeline service, especially the elderly and those accessing the VA.

What are the greatest challenges facing BCT?

- Certain buses in the fleet require drivers to put the bus in park before opening the door.
- State of the roads in Battle Creek, especially along half hour routes.
- Dispatch gets so busy that customers cannot get through.
- Some stops are in dangerous locations.
- Staffing issues at all levels.
- Limited budget.

How can BCT serve the community better?

- Additional dispatch staff.
- Better bus assignment.
- More night vans for Tele-Transit.
- Focus service on major trunk lines/streets and increase coverage area.
- Transit signal priority at traffic lights.

Are there any existing BCT routes that should be changed?

- West Michigan/Emmett. Emmett should be de-coupled from the West Michigan route on weekdays as well as Saturdays because the West Michigan/Emmett route is too long, which makes it hard to stay on schedule.
- Lack of left turn signal at Michigan and Lamora Avenue. Possibility to re-route the bus on Bedford.
- Tele-Transt dedicated vans should be extended to Arbors with extended service hours, which could eliminate West Michigan hourly run.
- Reduce number of stops on Northeast Capital.
- Routes serving Springview Towers and Cherry Hill should be rerouted so they do not go inside the facilities, which slows down buses and can be dangerous.
- Routes to the Fort should operate longer to accommodate shifts.
- Circulator bus in industrial area around Fort.
- Coordinate with the employers to provide better service along Fort Custer route.
- Lack of left turn signal at Dickman on Southwest Capital route.
- Should have hourly service to Walmart and service after 5pm.
- Increased service at Harper Village.

Are there areas that are not currently being served that really should be?

- Avenue A.
- Pennfield.
- Bedford.
- FireKeepers Casino.
- Glen Cross

Are there other service issues that need attention (service frequency, hours of operation, fares, etc)?

- Improve fare payment (i.e. laminated, monthly/annual pass, electronic) would make it easier on the driver.
- Remove buses that require drivers to strap down wheelchairs.
- Stops within the transfer square should be removed.
- Passengers not following rules on buses (e.g. not eating, drinking). Possibility to work with police department.

Do passengers have the tools they need to be able to use the system?

- Schedules should be posted on bus stops and at downtown transit center.
- Need increased distribution of schedules because dispatcher answers a lot of schedule information calls.
- Phone application that riders can access while waiting for bus or real time displays at stops.
- Automated Stop Announcements.

Does Battle Creek Transit provide an inviting passenger environment?

- Pretty good overall.
- In winter, snow piles block stops, forcing passengers to walk to closest cleared driveway.

Are there other transit systems that 'get transit right' and could serve as a model for Battle Creek Transit?

- Amalfi Coast, Italy has electronic fare payment.
- Grand Rapids has big shelters at major stops and all rider information posted (e.g. schedules, maps)
- Los Angeles, California has electronic fare payment and real time displays.

What are the top 2 to 3 goals that Battle Creek Transit should focus on in the coming years.

- Fare payment, route expansion, and longer hours on certain routes.
- Hire more drivers to prevent safety issue with drivers working too many hours.
- Accommodate increased demand during beginning of month when buses are busier.
- Increased van service.
- Technology related improvements (low floor buses, app with real time information, and new buses).

Other Comments

- One-year contract with union, wage study, pay issue.
- Increased training budget.
- Fare increase.

3. STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS

The Battle Creek Transit Master Plan is intended to serve as a roadmap for the organization, and will help BCT staff determine the steps to take to improve transit services in the region. In order to chart a path forward, it is important to understand where things currently stand regarding the network as a whole, and each route individually. This chapter assesses the existing system's strengths and weaknesses; highlights opportunities for service improvements; and identifies potential threats that could serve as barriers to the implementation of service improvements, or the long-term success of the system.

Strengths and Weaknesses

Transit services are most successful when they are simple, easy to use, and intuitive to understand. While each operating environment is unique, adherence to a set of general guiding principles, described below, has proven to enhance the quality of transit services and reduce the barriers to access for prospective riders. The strengths and weaknesses of a service can thus be assessed relative to these principles.

Guiding Principles

Service Should Operate at Regular Intervals

In general, people can easily remember repeating patterns but have difficulty remembering irregular sequences. Transit riders may find transit routes that operate at different times each hour cumbersome to use. Irregular schedules increase the likelihood a rider will miss a trip or a transfer, thus decreasing the utility of the service. In many cases, operating a service at regular intervals provides a better transit experience for riders, even if doing so results in slightly decreased service frequency.

Ideally, transit routes that operate less frequently than every 15-minutes should utilize clockface scheduling. With a clockface schedule, each bus arrives at the same time or times each hour. For example, a bus route with 30-minute frequency might arrive at the top of the hour and half past the hour every hour of the service day. On the other hand, a route with 40-minute frequency may arrive at the top of the hour and 40 minutes past the hour one hour, but at 20 past the hour the next hour.

Clockface scheduling significantly enhances transit service usability, especially in systems with less frequent service. Passengers can easily remember when their bus will come, without having to rely on a paper or online schedule. Regular clockface schedules can also help simplify transfers between routes.

Currently, all Battle Creek Transit routes operate either hourly or every half-hour, throughout the service day (**Table 9**). Thus, clockface frequency is a **strength** of the current system.

Table 9 | Fixed-Route Services Characteristics

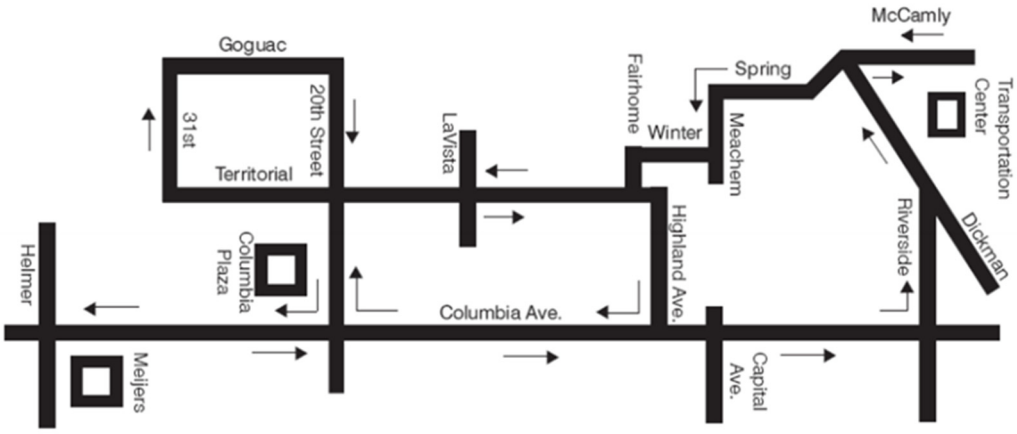
Route	Name	Service Span	Service Frequency
1W	West Michigan	Monday-Friday: 5:15 AM – 6:43 PM	60 minutes
		Saturday: 9:15 AM – 5:10 PM	60 minutes
2E	Emmett – East Avenue	Monday-Friday: 5:45 AM – 6:13 PM	60 minutes
		Saturday: 9:15 AM – 5:30 PM	30 minutes
2W	Columbia – Territorial	Monday-Friday: 5:15 AM – 6:10 PM	60 minutes
		Saturday: 9:15 AM – 5:10 PM	60 minutes
3E	Main-Post	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
		Saturday: 9:15 AM – 5:13 PM	30 minutes
3W	Kendall – Goodale	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
		Saturday: 9:15 AM – 5:13 PM	30 minutes
4N	NE Capital Avenue	Monday-Friday: 5:15 AM – 6:43 PM	30 minutes
		Saturday: 9:15 AM – 5:13 PM	30 minutes
4S	SW Capital Avenue	Monday-Friday: 5:15 AM – 6:10 PM	60 minutes
		Saturday: 9:15 AM – 5:10 PM	60 minutes
5W	Fort Custer – VA Hospital	Monday-Friday: 5:15 AM – 6:10 PM	30 minutes
		Saturday: 9:15 AM – 5:10 PM	60 minutes

Routes Should Operate Along a Direct Path

The fewer directional changes a route makes, the easier it is to understand. Circuitous alignments are disorienting and difficult to remember. Some deviations from the most direct path of travel are necessary and justifiable given that major destinations are sometimes located off of major roadways. However, frequent deviations from the most direct path of travel will increase travel times for the majority of passengers and should be avoided unless there is a strong justification.

Many Battle Creek Transit routes have segments of circuitous alignment. For example, when Route 2W (**Figure 37**) leaves downtown, it travels west toward 31st Street, returns east to Highland Avenue, travels south to Columbia Avenue and then west again on Columbia to Helmer Road. The route then returns to downtown via Columbia and Riverside Drive. Similarly, Route 5W travels west to the VA medical center, making deviations off Dickman Road to serve TMI Compressed Air Systems, Musashi Auto Parts, and the Silver Star Apartments. On return trips, the route deviates from Dickman again to serve DENSO Manufacturing, II Stanley Company, and the Liberty Commons Apartments. These deviations from the most direct path of service, and others along other routes, are a **weakness** of the existing system, and force many riders to travel out-of-direction to reach their intended destination.

Figure 37 | Example of Circuitous Alignment (Route 2W)



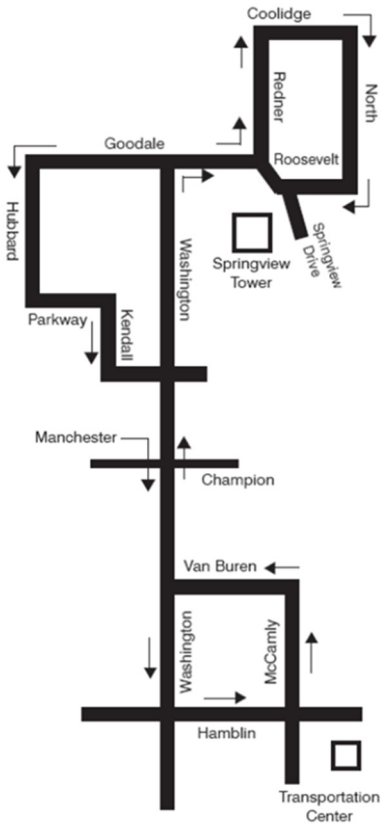
Routes Should be Symmetrical

Routes should operate along the same alignment in both directions to make it easy for riders to know how to get back to where they came from. Providing service on different streets depending on direction can make it difficult for passengers to find the bus stop for their return trip. Splitting service between two streets is sometimes unavoidable due to one-way traffic patterns, but to the extent possible, bus stops for service in opposite directions should be across from one another on opposite sides of the same street.

Large one-way loops can also frustrate riders by forcing out-of-direction travel on either the outbound or return trip. While one-way loops are sometimes necessary in order to find an appropriate path to turn a bus around at the end of its route, transit riders generally prefer two-way service to one-way loops.

Nearly every Battle Creek Transit route has one or more segments of one-way service that limit the appeal of the route. For example, Route 3W (**Figure 38**) operates outbound on Washington Avenue, but inbound on Hubbard Street, some five blocks away. This means that residents of Parkway Manor on Hubbard Street have service in the southbound direction only, and if they wish to travel to retail or grocery destinations along Springview Drive, they must travel in the opposite direction to downtown Battle Creek first. Similarly, the many apartments located along S.W. Capital Avenue, south of I-94, and Glenn Cross Road, are only served in the counter-clockwise direction, making it possible for residents to get to retail destinations along Beckley Road by transit, but impossible to get back. These examples of non-symmetrical service, and others along other routes, are a **weakness** of the existing system, and also force riders to travel out-of-direction to reach their intended destination.

Figure 38 | Example of Non-Symmetrical Service (Route 3W)

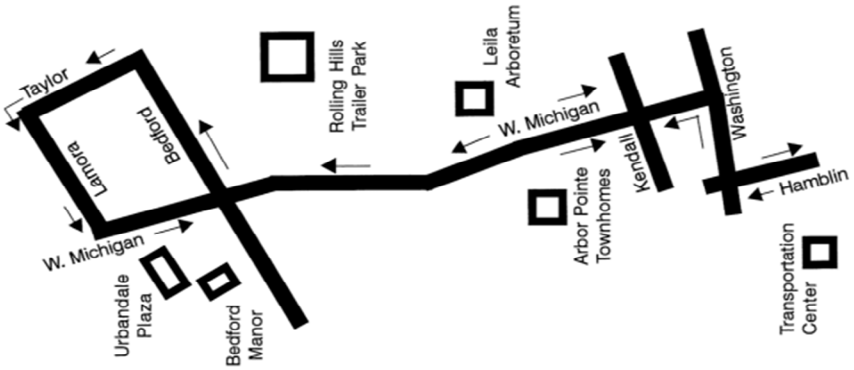


Routes Should Serve Well Defined Markets

The purpose of every transit route should be clear to riders and prospective riders. Strong anchors and a good mix of origins and destinations on each route help ensure a steady stream of riders throughout the service day. If service duplication does exist, it should be for specific purposes such as to increase effective frequency in a high-ridership corridor, or to create a transfer hub at a key destination served by multiple routes.

The Battle Creek Transit network has very little service duplication, and each route does have at least one strong anchor. These are both **strengths**. However, there are numerous missed opportunities when it comes to providing a good mix of origins and destinations on every route. The types of land uses typically generate transit trips include multi-family housing, major retail destinations, medical facilities, educational institutions, major employers, and social service providers. As described previously, some large apartment communities are served in one direction only. Others are just a little bit too far from the route to be considered well-served. For example, the route map for Route 1W (**Figure 39**) shows both the Arbor Pointe Townhomes and Bedford Manor. However, in both cases these multi-family housing communities are just beyond comfortable walking distance to the nearest bus stop on the route. Similar missed market opportunities exist on other routes, but often in one direction of travel only, and are a **weakness** of the current service.

Figure 39 | Example of Missed Market Opportunities (Route 1W)



Service Should Be Well Coordinated

At major transfer locations, schedules should be coordinated to the greatest extent possible to minimize connection times between services. In general, there are two approaches to coordinating transit service:

- The first approach is to establish clockface service frequencies on all routes. This ensures a certain predictability for transfers as passengers know when to expect each route regardless of the hour of the day. Clockface schedules can also facilitate pulsing, which is when several routes are designed to arrive at a particular transfer location at the same time. Pulsing is usually used when a transit network has a single primary hub.
- The second approach to coordinating transit service is simply to maximize service frequencies on all routes. High frequencies reduce the need to pulse services at a particular location because passengers who miss a connection anywhere in the system can catch the next bus in a relatively short time. The challenge to this approach is that greater frequency requires greater resources, including more vehicles and more service hours per day.

Battle Creek Transit routes all operate at 30 or 60-minute frequencies, allowing pulses to occur at the Downtown Transportation Center the top and bottom of the hour. This coordination is a **strength** of the current system.

Tele-Transit Strengths and Weaknesses

Compared to fixed-route service, demand response services like Tele-Transit have inherently low productivity for the following reasons:

- Non-ADA demand response services operate in low-density environments
- ADA demand response passengers often require personal assistance
- ADA and non-ADA demand response trips can materialize anywhere

While these are all **weaknesses** of demand response service in general, there are also issues that are specific to Tele-Transit. One example is Tele-Transit's pick-up window policy. Tele-Transit vehicles may arrive up to 15 minutes before or after a scheduled pick-up time. However, once they arrive they only wait for five minutes before they continue to their next pickup. This means that if a vehicle arrives 15 minutes early, fails to make contact with the customer, and leaves within five minutes, it is still leaving 10 minutes before the scheduled pickup time. In some cases, this may result in a customer "no-show" even if the customer is in fact ready at the originally scheduled time.

Tele-Transit's **strengths** include the fact that the service is available beyond the ADA-mandated ¾ mile buffer from fixed routes service, and thus serves as a mobility lifeline throughout the Battle Creek Urbanized Area. A more comprehensive discussion of Tele-Transit strengths and weaknesses is provided in **Appendix B**.

Opportunities

To develop a comprehensive understanding of Battle Creek's existing fixed-route network, the study team produced a detailed, diagnostic profile of each Battle Creek Transit route. The route profiles, seen in **Appendix A**, describe each route's service characteristics, ridership patterns, productivity, and on-time performance. At the conclusion of each profile is a list of potential service improvement opportunities for the route. The service improvement opportunities are based on the technical findings of the route profiles (i.e. low ridership at a specific stop or poor on-time performance), as well as the guiding principles described above. **Figure 40** and **Table 10** below highlight the key service issues and opportunities identified through the route profile process.

Figure 40 | Service Issues and Opportunities for Improvement (Locations)

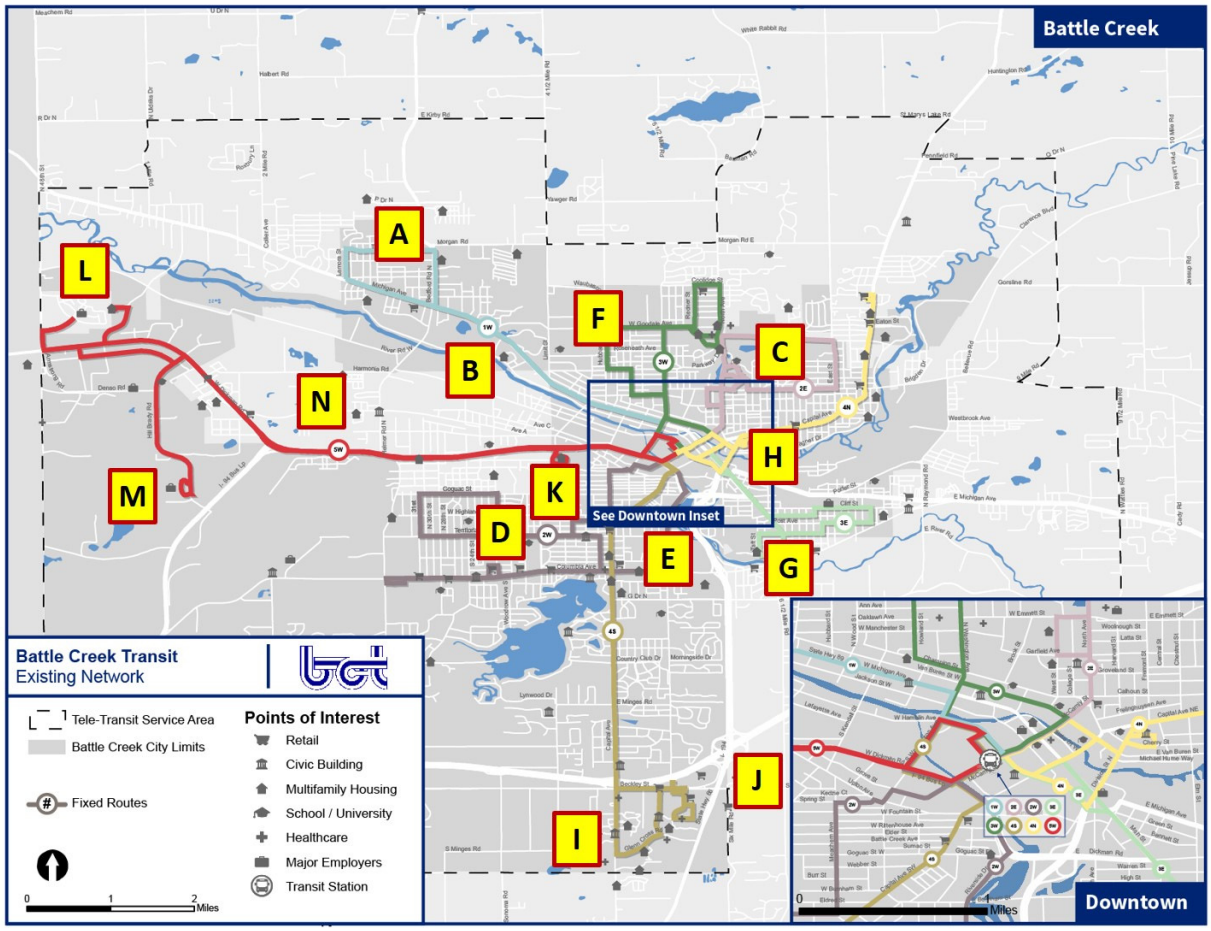


Table 10 | Service Issues and Opportunities for Improvement (Descriptions)

A. **One-way service** – Route 1W terminates with a large one-way loop that allows residents north of Michigan Avenue to get to Urbandale Plaza, but not back home again. Bi-directional service would improve service and ridership.
B. **Coverage gaps** – Route 1W service is just beyond a comfortable walking distance to several large multi-family housing communities including Arbor Point Townhomes, Bedford Manor, and River Apartments. Alignment changes could significantly improve ridership.
C. **Overly complex alignment** – Route 2E has several route segments that are served in one direction only or that differ depending on direction of travel. Simplifying the route by providing bi-directional service where ridership potential is highest would improve ridership.
D. **Indirect service** – Route 2W forces most riders to travel out-of-direction at some point in their trip as it serves multiple corridors in the inbound or outbound direction only. Simplifying the route by providing bi-directional service where ridership potential is highest would improve ridership.
E. **One-way service** – Route 2W serves several multi-family housing communities along Riverside Drive, including Grande Pines, Riverview Pointe, and Tree Top Ridge Apartments, in the northbound direction only. Bi-directional service would improve service and ridership.
F. **One-way service** – Route 3W operates outbound along Washington Avenue, but inbound along Hubbard Street, which gives residents of Parkway Manor service in the southbound direction only. Simplifying the route by providing bi-directional service where ridership potential is highest would improve ridership.
G. **Coverage gaps** – Route 3E service is just beyond a comfortable walking distance to Georgetown Estates and Main Street Market, the only grocery store in the immediate area. Alignment changes could significantly improve ridership.
H. **Service deviation** – Route 4N service deviates from Division Street to provide front-door service to Cherry Hill Manor. A more streamlined alignment would speed up service and reduce out-of-direction travel for the majority of riders.
I. **One-way service** – Route 4S serves several multi-family housing communities along S.W. Capital Avenue and Glen Cross Road, including the Arbors, Willow Creek, Teal Run, Landings, and Minges Village Apartments, in the counter-clockwise direction only. Bi-directional service would improve service and ridership.
J. **Limited service** – Route 4S only provides four trips per day to the Walmart Supercenter on Beckley Road in Emmet Township. Regular service to the key regional destination could significantly improve ridership.
K. **One-way service** – Route 5W provides direct service to the Liberty Commons Apartments terminates with a large one-way loop that allows residents north of Michigan Avenue to get to Urbandale Plaza, but not back home again. Bi-directional service would improve service and ridership.
L. **Overly complex alignment** – Route 5W serves the Silver Star Apartments and VA Medical Center with separate deviations off Dickman Road. The route could be simplified by serving both destinations from William Shafter Circle.
M. **Service deviations** – Route 5W combines service to the VA and destinations in the Fort Custer Industrial Park, both north and south of Dickman Road. As a result, most passenger are forced to travel out-of-direction on either their inbound or outbound trip. Splitting service north and south of Dickman between separate trips or separate routes would improve service for most riders.
N. **Missed market opportunities** – Several areas of the region have the land-use or demographic characteristics to support fixed route service, but fall outside of the Battle Creek city limits. This includes Avenue A in Springfield, Bedford Hill Mobile Home Park in Bedford Charter Township, and Walmart in Emmett Charter Township. Developing funding agreements with these municipalities could allow for expanded fixed-route service and ridership growth.

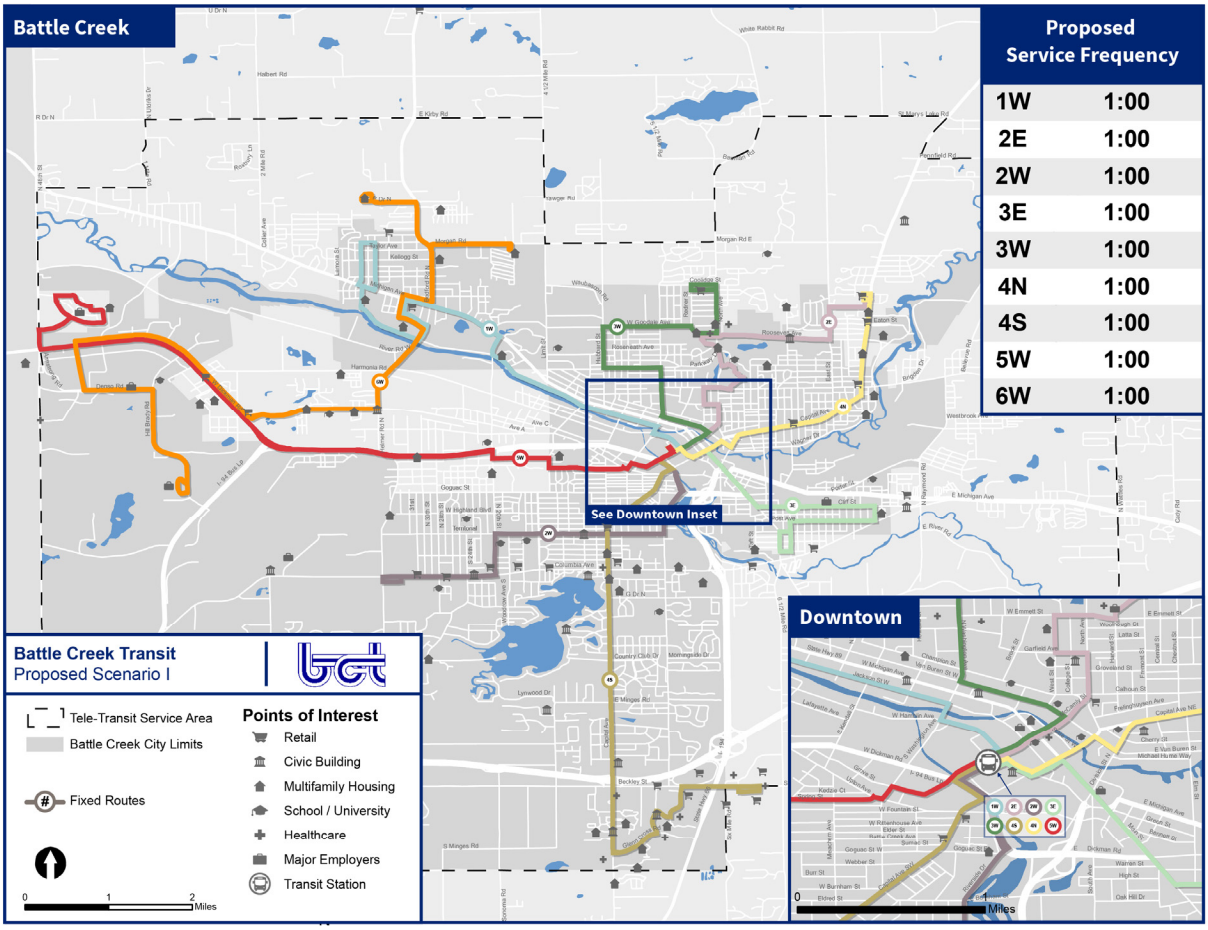
Service Scenarios

To address the service issues and opportunities identified in the route profiles, the study team developed two preliminary service redesign scenarios. The two scenarios have many similarities, as well as some important differences.

Scenario 1

Scenario 1 (**Figure 41**) eliminates most instances of one-way service and introduces new transfer opportunities outside of downtown Battle Creek. This scenario also envisions expanding service coverage with a new route called 6W that would link areas of Battle Creek, Springfield, and Bedford Charter Township. To limit the financial impact of the additional route, service frequency is reduced to hourly on all routes. However, Scenario 1 would still require one additional vehicle, and two additional drivers, compared to the current system.

Figure 41 | Proposed Service Scenario 1



The key features of Scenario 1 include the following:

- Route 1W would be shifted from Michigan Avenue to Jackson Avenue, between Washington Avenue and 20th Street, to better serve the Arbor Point Townhomes. Bi-directional service would be added through Urbandale Plaza, and along Urbandale Boulevard, Jackson Street, and Stringham Road to better serve Bedford Manor and the Rivers Apartments. Buses would use the signalized intersection at Stringham and Michigan at the beginning and end a terminal loop along Woodlawn Avenue, Morgan Avenue, and Sigel Street.
- Route 2E would operate inbound and outbound service along West Street to better serve West Brook Place and other apartment communities. Service to Bronson Battle Creek and Kellogg Community College would shift to the Bronson driveway and Fremont Street for inbound and outbound trips. The route would be extended to Springview Drive and Capital Avenue to increase access to retail, grocery, and multi-family housing destinations. Service along Emmet Street, east of Fremont, and East Street, south of Roosevelt would be eliminated due to low ridership.

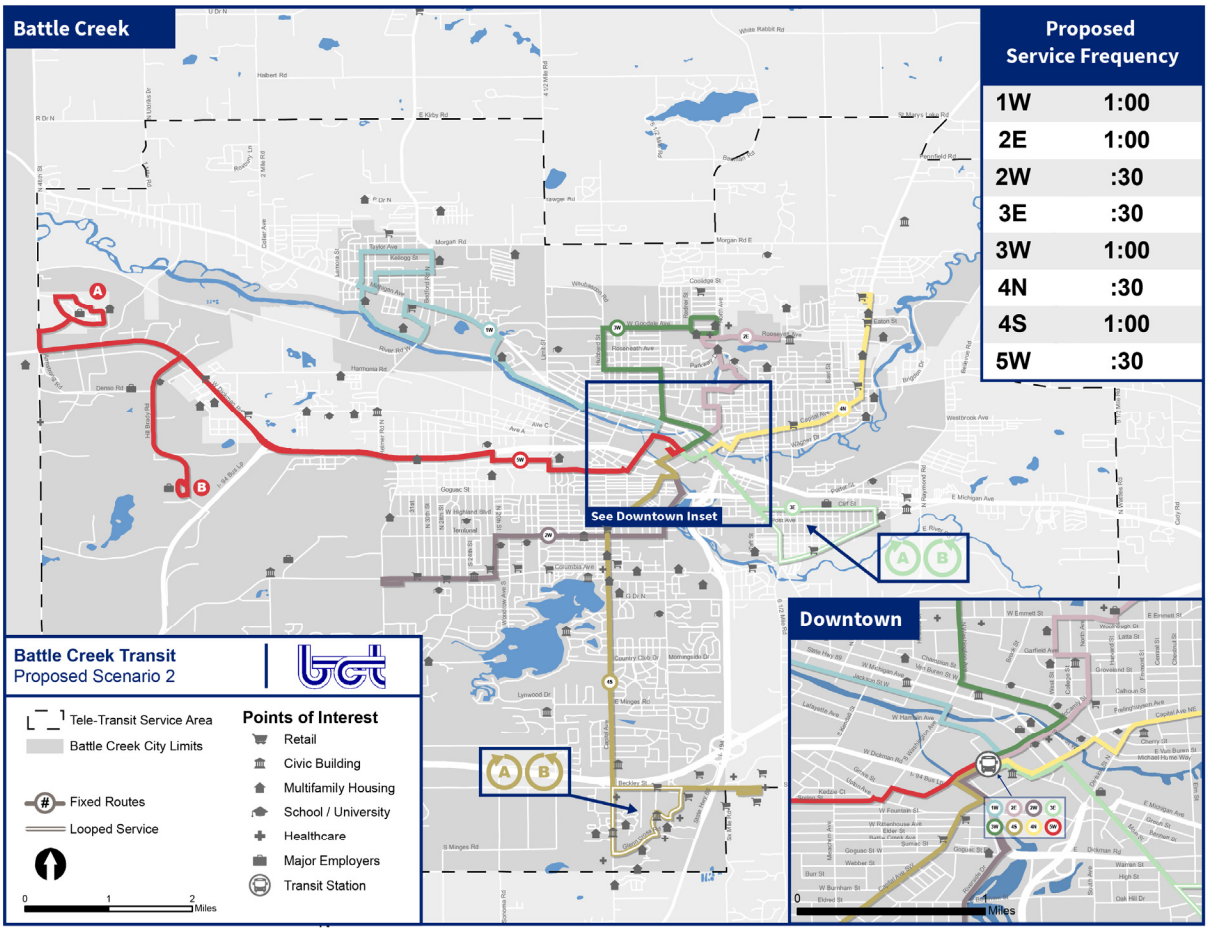
- Route 2W would operate along a single consistent alignment in both the inbound and outbound directions. From downtown Battle Creek, buses would travel south along Dickman Road and Riverside Drive to Territorial Road, then west on Territorial, south on 20th Street, and west on Columbia Avenue to Meijer. Return trips would use the same alignment to allow for bi-directional travel from several apartment communities along Riverside Drive. Service along Territorial Road, west of 20th Street, 31st Street, Goguac Street, and 20th Street, north of Territorial, would be eliminated due to low ridership. Columbia Avenue, east of 20th, and Meachem Avenue, south of Spring Street, would be accessible from other near-by routes.
- Route 3W would shift outbound service from Washington Avenue, north of Parkway Drive, to Parkway and Hubbard Street in order to provide bi-directional service to Parkway Manor residents. The route would also operate bi-directionally on North Avenue to better connect the Legacy at The Oaks to retail and grocery destinations along Roosevelt Avenue.
- Route 3E would operate along a single consistent alignment in both the inbound and outbound directions. From Main Street, buses would travel east on Cliff Street, south on Hannah Street, west on Post, and south on Jericho before turning around via Richmond Avenue, Main Street, and Kingman Avenue. This alignment would improve service to the Georgetown Estates and provide access to groceries at Main Street Market.
- Route 4N would operate inbound and outbound service along Capital Avenue between Hamblin Avenue and Van Buren Street, in order to simplify the route. The route would also be streamlined by eliminating the off-street deviation into Cherry Hill Manor.
- Route 4S would operate along a single consistent alignment in both the inbound and outbound directions. From Capital Avenue, buses would travel east along Glenn Cross Road, north on Minges Creek Place, east Heritage Oak Lane, north on Whitmark Drive, and east on Beckley to Walmart. Return trips would use the same alignment to allow for bi-directional travel from several apartment communities south of Beckley Road.
- Route 5W would be shifted from Dickman Road, between McCamly Street and 20th Street, to Spring Street, Forest Street, and Betterly Road in order to provide consistent service to the Liberty Commons Apartments. Service to the Silver Star Apartments would be provided via Willian Shafter Circle, and service to TMI Compressed Air Systems and Musashi Auto Parts would be provided from Dickman in order to streamline service. Service south of Dickman Road would be provided by a proposed new route called 6W.
- Route 6W would link together several areas of the region that have the land-use or demographic characteristics to support fixed route service, but fall outside of the Battle Creek city limits. From Creek Valley mobile home park in Bedford Charter Township, buses would travel to Rolling Hills Mobile Home Park and then continue south to Urbandale Plaza, Avenue A in Springfield, and into the Fort Custer Industrial Park where it would serve DENSO Manufacturing, KCC Tech Center, and II Stanley. Return trips would use the same alignment.

Scenario 2

Scenario 2 (**Figure 42**) also focuses on increasing bi-directional service throughout the network, but is more conservative in expanding service coverage. Scenario 2 is cost-neutral compared to existing service and requires the same number of vehicles and drivers to operate. It also includes the same number of hourly and 30-minute routes as today, but Route 2W, which is currently hourly becomes a 30-minute route, and Route 3W, which currently runs every 30 minutes, becomes hourly.

To balance regional connectivity and local circulation, Scenario 2 makes use of route variants where one trip circulates an area in one direction, and the next trip circulates in the opposite direction. From a regional standpoint, this allows for access to all destinations on a route on every trip, and from a local standpoint, it gives riders bi-directional service in their neighborhood. Another type of route variant in Scenario 2 is service branches where one trip serves one branch and the next serves a different branch. This allows for more frequent service along the common “trunk” of a route and less frequent service to each branch.

Figure 42 | Proposed Service Scenario 2



The key difference in Scenario 2, as compared to Scenario 1, are the following:

- Route 1W would operate along Michigan Avenue from Washington Avenue to Angell Street, before shifting to Jackson Street from Angell to 20th Street to serve the Arbor Point Townhomes. The end-of-line loop would be extended to Bedford Road to serve the Bent Tree Apartments.
- Route 2E would terminate at Calhoun Area Career Center on Roosevelt Avenue, rather than Family Fare on Capital Avenue.
- Route 3W would use Boyd Street rather than Coolidge Street as its end-of-line.
- Route 3E would operate with two end-of-line loop variants. One loop would travel clockwise along Cliff Street, Hannah Street, Columbia Avenue, and Main Street, and the other would travel along the same alignment but in the counter-clockwise directions. Each variant would operate hourly, with 30-minute service on the common trunk alignment.
- Route 4S would operate with two end-of-line loop variants. One loop would serve Walmart on Beckley Road, and then return on Beckley to Whitmark Drive, turn south on Whitmark, west on Heritage Oak Lane, south on Minges Creek Place, west on Glenn Cross Road, and north on Capital to return to downtown. The other variant would operate in the reverse direction between Capital Avenue and Beckley Road, serve Walmart, and then return to downtown Battle Creek. Each variant would operate every two hours, with hourly service on the common trunk alignment.
- Route 5W would operate with two branch variants. One branch would serve the VA Medical Center, and the other would serve destinations in the Fort Custer Industrial Park, south of Dickman. Each variant would operate hourly, with 30-minute service on the common trunk alignment.

Tele-Transit Opportunities

Given the inherent inefficiency of demand response services, among the most effective ways to improve the services is to limit their scope. This could include reducing the coverage area (i.e. limit service to the mandatory ADA buffer only), or reducing the hours of service beyond the ADA buffer. Additionally, efforts could be made to limit average trip lengths in order to provide more trips per hour. For non-ADA trips, average trip lengths could be reduced by "feeding" passengers to designated transfer locations for fixed-route connections rather than taking providing door-to-door trips. This practice can be incentives by offering lower fares for feeder trips than door-to-door trips. Tele-Transit service would also benefit with the expansion of fixed-route service to locations like the Walmart Supercenter and the mobile home parks new Bedford Road, as this would shift many existing Tele-Transit riders to fixed-route service and potentially reduce the Tele-Transit denial rate.

Other opportunities to improve Tele-Transit service include the use of automated notification technology to inform customers that a vehicle is en-route. This technology would allow Tele-Transit to maintain its 15-minute time window prior to scheduled pickup times but avoid missed trips when a vehicle departs five minutes after arrival, but before the scheduled pickup time. A more comprehensive discussion of Tele-Transit opportunities is included in **Appendix B**.

Threats

Both of the proposed service redesign scenarios represent a simpler transit network with higher ridership potential than the current network. However, there are a number of factors that can threaten to delay or derail the implementation of the service recommendations in either scenario.

Jurisdictional Boundaries

As a municipal system, Battle Creek Transit's fixed route network is limited almost exclusively to the city limits of Battle Creek. But, the travel patterns of area residents do not stop at the City's borders. As the Battle Creek region has changed over the years, both retail and residential developments have sprung up just beyond the borders of the City. For example, several large mobile home parks, including Creek Valley and Bedford Hills are located just north of Battle Creek in Bedford Charter Township. East of the City, there is a large concentration of retail along B Drive in Emmet Township, including Walmart Supercenter, Meijer, Menard's, and TJ Max. Regular service to these and other key destinations, just outside the city limits, are central to many of the recommended service improvements and critical to achieving ridership growth for Battle Creek Transit. However, service to these destinations but will likely require a combination of approval from the Battle Creek City Commission and funding support from the neighboring jurisdictions.

The following is a list of destinations that are recommended for regular fixed-route service in one or both of the service redesign scenarios, but are outside the borders of Battle Creek:

- Walmart Supercenter, Emmet Charter Township
- Main Street Market, Emmet Charter Township
- Family Fare, Pennfield Charter Township
- Creek Valley Mobile Home Park, Bedford Charter Township
- Bedford Hills Mobile Home Park, Bedford Charter Township
- Farelane Apartments, City of Springfield
- Avenue A Mobile Home Park, City of Springfield
- Brookside Apartments, City of Springfield

Of these locations, the highest priorities are regular service to the Walmart Supercenter (currently served just four times a day), which is a top destination of riders in all transit markets, and Main Street Market, which is the only grocery store serving the neighborhood southeast of downtown Battle Creek. Family Fare on N.E. Capital Avenue is currently served regularly by Route 4N.

Infrastructure

Transit services depend on supportive infrastructure, not only for buses to operate on, but also to give passengers access to and from bus stops. Poorly paved streets can make for an uncomfortable ride for passengers and can result in increased maintenance costs for Battle Creek Transit. A lack of sidewalks and

crosswalks puts pressure on Battle Creek Transit to provide closer access to destinations, including entering private driveways, and makes it more difficult to implement recommendations aimed at streamlining service.

Roadways

Within the City of Battle Creek, most street segments that have service currently, or would have service in the two potential redesign scenarios, are fairly well-paved. However, outside of the City, the quality of streets (especially residential streets) tends to be poorer. In the proposed service scenarios, this creates a particular challenge for the implementation of Route 3E in Scenario 1, which includes service on Jericho Road and Richmond Avenue in Emmet Charter Township. This alignment would allow for service to Main Street Market and a new Dollar General, but both streets have multiple potholes on every block (**Figure 43**). In their current condition, these streets are not suitable for fixed-route transit service.

Figure 43 | Potholes on Jericho Road in Emmet Charter Township

Sidewalks and Crosswalks

Sidewalks and crosswalks are important features to ensure walkability in a community, but they are particularly important on street segments with bus stops, or with the potential to support bus service in the future. For example, **Figure 44** shows the intersection of Roosevelt Avenue and Springview Drive. This intersection is within walking distance of Springview Tower, Save-A-Lot, Dollar General, and Walgreens. It also includes a heavily-used bus stop with a passenger shelter. Still, the intersection has no cross-walk and lacks continuous sidewalks from the near-by retail and residential destinations. Under both service redesign scenarios, this street segment would be served by two routes (2E an 3W), making the lack of supportive infrastructure a threat to both route's success.

Figure 44 | Lack of Sidewalks and Cross-Walks at Roosevelt Avenue and Springview Drive

Crosswalks become even more critical when transit service is provided bi-directionally and bus stops are placed on opposite sides of the street. **Figure 45** shows the intersection of Division Street and Cherry Street, near Cherry Hill Manor, St. Philip High School, and a YMCA. There are bus stops on both sides of Division Street, but no crosswalk across the busy street. For the proposal to streamline Route 4N and remove front-door service to Cherry Hill Manor to gain broad levels of support from current Cherry Hill riders, they must feel like they are gaining something in return for the "price" they are paying. The improved ability to cross Division Street could be the incentive that these riders need as it could reduce trip times for passengers who currently ride all the way into downtown and back to Cherry Street to avoid crossing Division Street.

Figure 45 | Lack of Sidewalks at Division Street and Cherry Street

Division Street, like other major arterial streets in Battle Creek, is also a State highway and thus requires Michigan Department of Transportation (MDOT) approval for the installation of crosswalks. According to MDOT's Guidance for Installation of Pedestrian Crosswalk on Michigan State Trunkline Highways[7], crosswalks can be installed on State highways under certain conditions:

7 https://mdotcf.state.mi.us/public/tands/Details_Web/mdot_guidance_for_installation_of_pedestrian_crosswalks_on_michigan_state_trunkline_highways.pdf

"Elements that can affect decisions on whether to install crossing treatments and what type include:

- *Posted speed limit of the roadway*
- *Volumes of vehicular and pedestrian traffic*
- *Number of travel lanes and geometry of the roadway at the crossing location*
- *Profile of pedestrian traffic (proportion of crosswalk used by elderly or children)*
- *Type of roadway*
- *Setting (urban or rural)*

All of the elements listed above can influence decision making on whether a crosswalk should be installed at a given location and if additional treatments should be considered."

Bus Stops

Both of the service redesign scenarios make extensive use of existing Battle Creek Transit bus stop locations, but both scenarios would also require the installation of new bus stops. In some cases, new stops would only need to be added on one side of a street to complement existing stops that already exist on the other side. In other cases, stops would need to be added on both sides of a street that is not currently served. When new bus stops are installed, they are subject to the requirements of the American with Disabilities Act (ADA), which states[8]:

- *"New, altered, or relocated bus stops must have a firm, stable surface and must provide a clear length of 96 inches (2,440 mm), measured perpendicular to the curb or vehicle roadway edge, and a clear width of 60 inches (1,525 mm), measured parallel to the vehicle roadway.*
- *Bus stops must also connect via an accessible route to streets, sidewalks, or pedestrian paths.*
- *The slope of the bus boarding and alighting area in the direction parallel to the roadway must be the same as that of the roadway to the maximum extent practicable. Perpendicular to the roadway, the slope must not exceed 1:48, that is, not more than 1 inch of rise over a horizontal distance of 48 inches.*

These requirements apply to the extent that construction specifications are within the control of public entities; compliance is required to the maximum extent practicable.

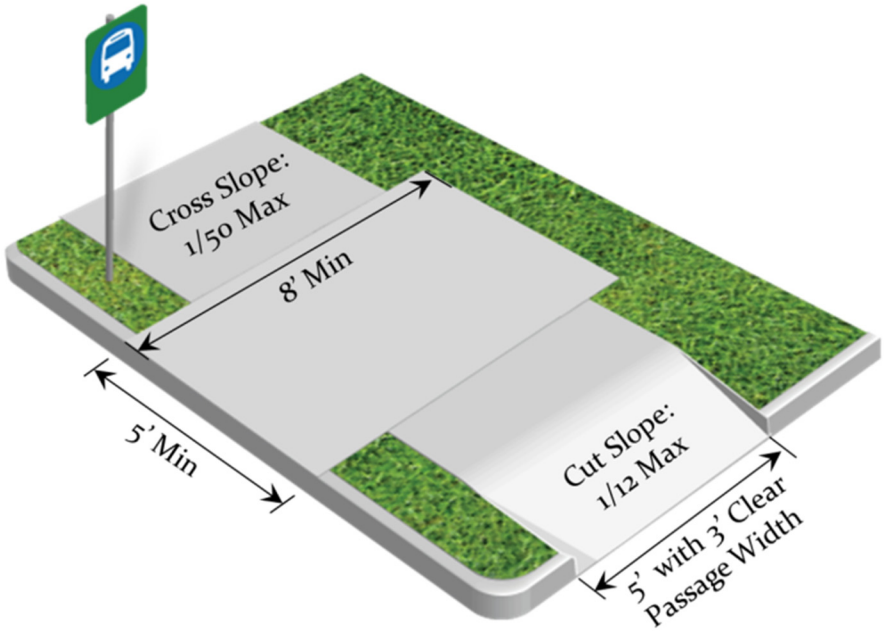
bus stops located on streets without sidewalks are subject to the same requirements to the maximum extent practicable. In these cases, this means constructing or locating bus stops with connections via an accessible route to the public right-of-way; if the only public right-of-way is a roadway, this means providing connections to the roadway."

Figure 46 illustrates an ADA-compliant bus stop. Bringing more stops up to these standards would certainly improve the overall stop environment for all riders, but for Battle Creek Transit, the ADA guidelines are also a financial burden that could limit the department's ability to implement an entire service redesign scenario in a single year. Instead, improvements to individual routes may need to be phased in over time to allow for Battle Creek Transit to budget for associated bus stop improvements.

The exact number of new stops will be determined when the final recommended service redesign scenario is developed.

[8] https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Final_FTA_ADA_Circular_C_4710.1.pdf

Figure 46 | ADA-Compliant Bus Stop



Source: Center for Transportation Research at the University of South Florida

Resources

Of the two service redesign scenarios, one (Scenario 2) is cost-neutral and can be implemented with existing staffing and fleet size, while the other would require additional resources including one additional bus and two additional drivers. While the challenges of the service expansion scenario are clear, there are a number of factors that could make a cost-neutral implementation difficult to achieve as well.

Resources Needs

The number of vehicles required to operate a route depends on the route's cycle time (round-trip running time plus recovery live), and service frequency. If it takes one hour to complete a round-trip on a route, that route can provide hourly service with one bus. To provide 30-minute service, two buses would be required, and three buses would allow for 20-mintue service.

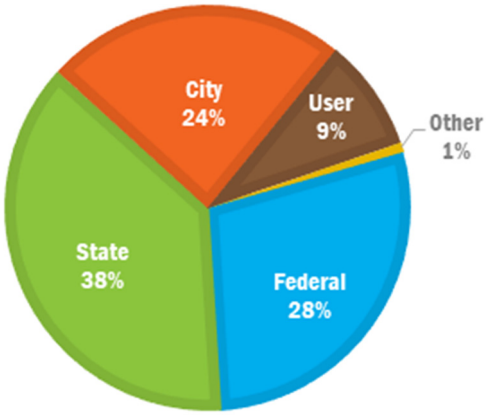
The cycle time of route is a function of distance and average operating speed, which is impacted by a number of variables:

- Route alignment – a streamlined route tends to have a faster average operating speed than circuitous alignment with many turns
- Traffic congestion – some traffic congestion is unavoidable, but congestion due to rail crossings or truck traffic can be avoided through strategic route planning
- Ridership volumes – as ridership volumes increase average operating speeds tend to drop as buses stop more often to load and unload passengers
- Bus stop spacing – to account for rising passenger volumes, bus stops can be spaced farther apart to reduce the number of stops per trip. However, increased bus stop spacing also requires good pedestrian facilities.
- Dwell time – the amount of time a bus spends at a stop impacts its average operating speed. Dwell times are a function of both policies and technology. Polices that can reduce dwell times include replacing transfer slips with day passes. Technology that that can reduce dwell times includes low-floor buses instead of wheelchair lifts.

Resource Availability

Battle Creek Transit receives funding from a variety of sources, including local taxpayer funding, state and federal grant and formula funding, user fares, and advertising revenue (**Figure 47**). The availability and amount of these funding sources determines the levels of service that Battle Creek Transit is able to provide. To increase service, Battle Creek Transit must find new funding sources or find ways to increase revenue from the existing sources.

Figure 47 | Battle Creek Transit Funding



Of its current funding sources, Battle Creek Transit has the greatest ability to generate more revenue from fares. At $1.25 per ride, Battle Creek Transit has among the lowest fares of its peers. A funding analysis in subsequent phases of this project will estimate the level of adiditional revenue that can be generated from various fare increase scenarios.

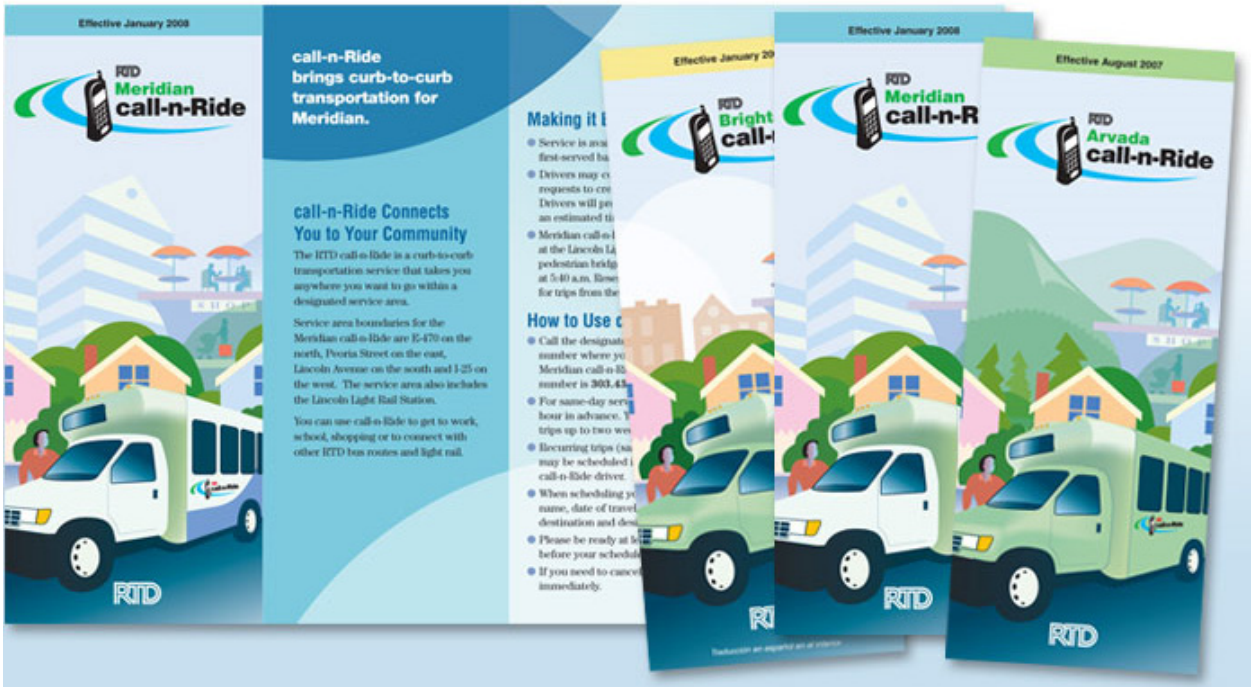
Another potential revenue source for Battle Creek Transit to pursue is funding partnerships with neighboring municipalities and local institutions including KCC and Bronson Battle Creek. Such arrangements are usually built around the identification of mutual benefits. For example, KCC could receive a discounted rate per student if it committed to funding passes for all enrolled students. This would create a predictable funding stream for Battle Creek Transit and could help KCC attract students without their own transportation (a growing trend for youth and young adults), or reduce the financial burden on current students in terms of car and gas payments.

To attract neighboring municipalities to enter into funding agreements, Battle Creek Transit could establish park-and-rides at major retail destinations on the periphery of the service area with excess parking capacity (e.g. Walmart Supercenter, Meijer, Family Fare). While park-and-rides are most popular with commuters in areas with heavy traffic congestion, they can also serve as drop-off locations for one-car households or parents of students attending classes at a community college. The second is the scenario that is most likely in the Battle Creek Region.

Another potential strategy for building funding partnerships with neighboring municipalities is to re-organize Tele-Transit service into a zone structure that is more closely associated with the municipalities. This approach has been used successfully in other communities, including in the Denver region (**Figure 48**). Under a zone-based scenario, Battle Creek Transit could devote two vehicles to ADA Paratransit Service, and use three vehicles for non-ADA service within designated zones. For example, an Emmet Township zone would serve residents in the township and connect them to Battle Creek Transit's fixed route network at designated locations, but would not take them directly to locations throughout Battle Creek. This approach would average Tele-Transit trip lengths, feed riders onto fixed-route service, and give the various Tele-Transit zones a more local identity, which could increase the potential for funding support from the townships.

All of these strategies to foster more funding partnerships will certainly be a challenge for Battle Creek Transit, but a lack of additional funding partners will be an even greater barrier to the implementation and long-term viability of the potential service improvements.

Figure 48 | Zone-Based Demand Response Service in Denver Region, CO



Community Support

In the short-term, the support of existing riders will help determine the final service redesign scenario that Battle Creek Transit implements. With the support of current riders, Battle Creek Transit can see an almost immediate ridership improvement shortly after implementation. However, long-term ridership growth depends on expanding the pool of potential riders in the region, and this can only be done through increasing the awareness and appeal of Battle Creek Transit.

Marketing / Branding

From the 1960s, when most transit systems in the United States transitioned to public operations, until just recently, the marketing and branding of the transit services has been primarily utilitarian. This is true in Battle Creek as well (**Figure 49**). But, over the past decade, many transit systems have begun to see and present themselves differently. Rather than a safety net for dependent riders, many systems are marketing their services as an appealing choice in a crowded mobility market. To stand out in this crowded market, that now includes private automobiles, ride-hailing service like Uber, and a renewed interest in cycling, many transit systems are adopting bolder designs that help attract interest and attention (**Figure 50**).

Figure 49 | Existing Battle Creek Transit Branding

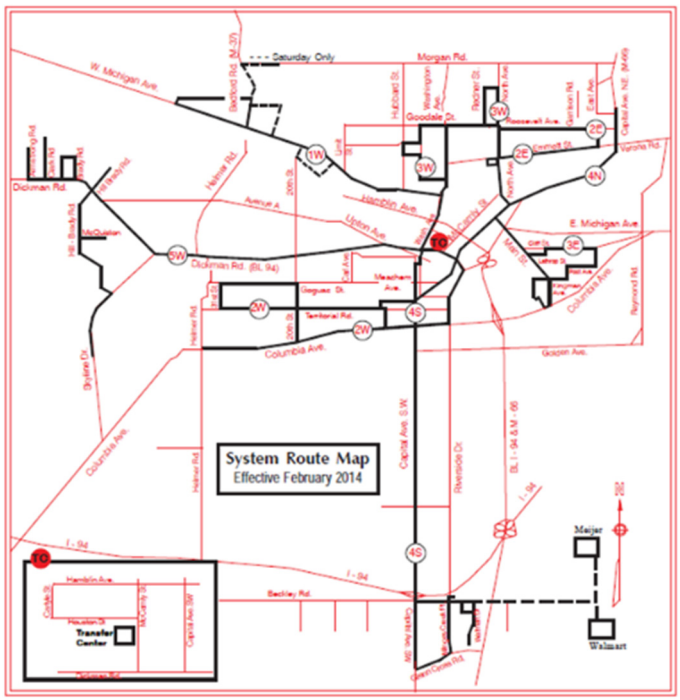
As with funding, establishing an updated and contemporary brand will be a challenge for Battle Creek Transit, but without a refreshed image, the system will find it more difficult to attract attention to its short-term service improvements, which could also jeopardize public and political support for longer-term improvements.

Figure 50 | New (Foreground) and Old (Background) Bus Design – Little Rock, AR

Passenger Information

Easy-to-find and easy-to-understand passenger information can improve the user experience for current riders, and attract new riders, especially those who may have previously used transit in other markets. For many prospective riders, passenger information creates their first impression of a transit system, and can be the difference between a new user and a lost opportunity. Battle Creek Transit's existing system map (**Figure 51**) is relatively easy to understand for those who are already familiar with the system, but these are also the people who need a system map the least.

Figure 51 | Existing System Map

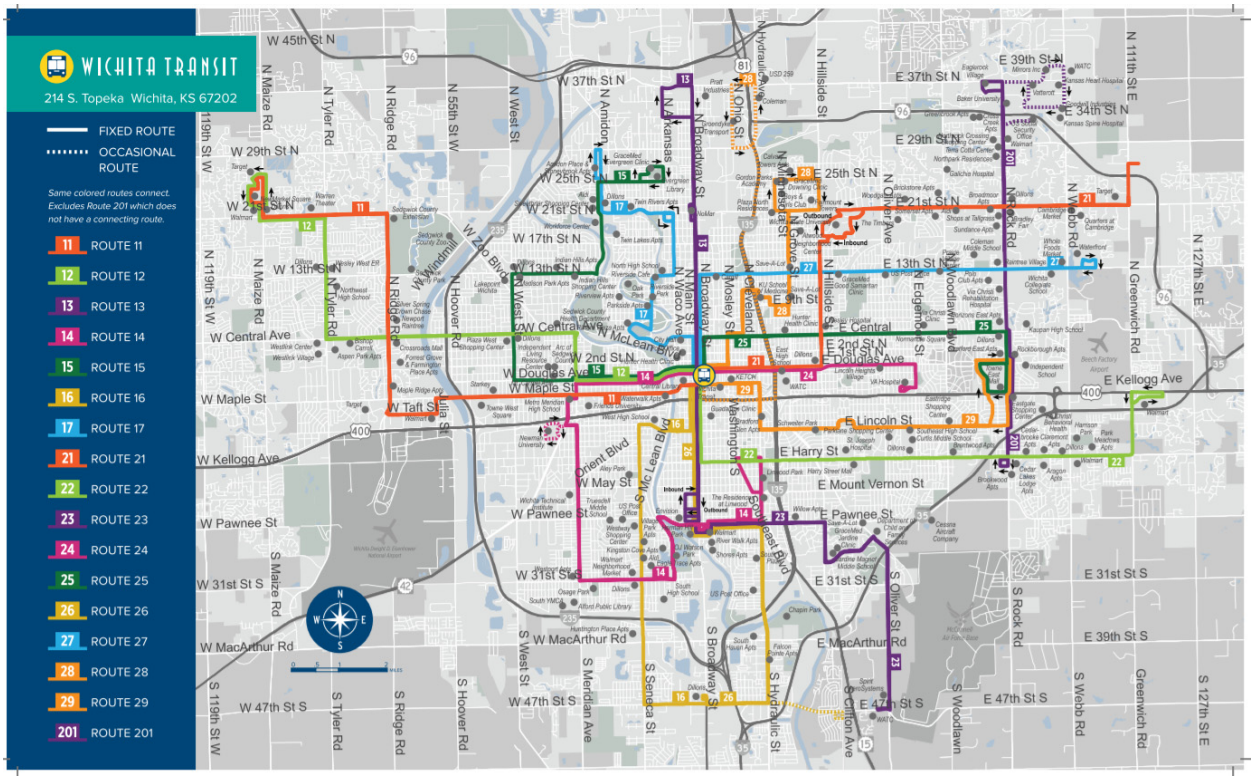


For novice riders, a system map is most easily understood if it includes color coded routes, a clear legend, and labels on major streets and any street with transit service. **Figure 52** shows a system map for Wichita, KS that follows these principles.

Most transit systems also make schedule and route information available online through Google Transit or other transit applications. Increasingly, this information is provided in real-time to allow riders to track buses and be aware of any service delays.

While the more technology-driven approach to passenger information is more than likely a long-term goal for Battle Creek Transit, developing a user-friendly system map and passenger schedules should be a high priority in the near-term. Without easy-to-understand passenger information, the benefits of a service redesign could be lost on many area residents, limiting the potential ridership growth that the redesign could produce.

Figure 52 | Example System Map – Wichita, KS



Service Hours and Frequency

Both of the proposed service redesign scenarios focus on putting service where it is most likely to succeed. Matching service availability to service potential is a proven strategy for ridership growth, but service availability has more than just a geographic component. To achieve sustained long-term ridership growth service must be available where *and* when it is needed. Currently, all Battle Creek Transit routes end service in the 6:00 PM hour on weekdays and the 5:00 PM hour on weekends. Ending service before 7:00 PM on weekdays limits the ability of riders with traditional work shifts to use transit for discretionary trips, and limits the ability of workers with slightly later work shifts (which are increasingly common) from the using transit at all. Thus, to achieve long-term ridership growth, Battle Creek Transit should consider expanding service into at least the 8:00 PM hour on weekdays.

Frequency of service is another challenge that Battle Creek Transit must contend with, particularly with Scenario 1, which proposes hourly service on all routes. For prospective riders with other mobility options, service running just once an hour is often too restrictive to be considered a viable option. To attract more choice riders, Battle Creek Transit should aim to eventually provide 30-minute service on all routes, at least during peak commuting periods.

Fares/Passes

Just as transit users have come to expect certain industry-wide standards in terms of passenger information, prospective Battle Creek Transit users may also expect options other than cash fares and punch cards from their experience in other communities. Day, month, and year-long passes are popular fare options that allow riders to avoid the inconvenience of having correct change or waiting for a driver to punch a card. These fare types would provide benefits to Battle Creek Transit as well, by providing more predictable revenue streams, and often higher revenues per passenger trip as well. However, to ensure that passes are not counterfeited or misused, multi-use passes typically rely on “smart” fareboxes that can read and verify valid passes. The cost of smart fareboxes will create another challenge for Battel Creek Transit, but relying primarily on cash fares will threaten the system’s ability to grow its ridership base.

As mentioned previously, Battle Creek Transit can grow ridership and revenue through partnerships with employers and institutions. These agreements often allow for universal coverage for affiliates of an institution, meaning that all students or employees of a partner organization or institution would have the ability to ride Battle Creek Transit "fare-free" for as long as they are affiliated with the entity. In some cases, turning a student or employee ID into a transit pass is enough incentive for people to give the transit service a try (**Figure 53**). As with other passes, however, there is the potential for fraud and misuse. These challenges can be dealt with through occasional random checks of passes and IDs to ensure that they are valid and that the use is authorized to use them.

Figure 53 | Example Community College ID / Transit Pass – Tulsa, OK

Passenger Amenities

Passenger amenities such as benches and shelters are another tool for building community support. Conversely, without these features, the perception of a transit system can suffer (**Figure 54**). Passenger amenities improve the user experience for current riders and with their presence help remind prospective riders of the presence of transit service in a community.

Figure 54 | Bus Stop with No Amenities

Like buses themselves, the design of passenger amenities has evolved in recent years to include more modern designs that are both attractive and functional. **Figure 55** shows a new bus shelter in Detroit that is turned away from the street to protect transit riders from puddles in the road, and is see-through for visibility and security.

Passenger amenities are an example of a trade-off tool that can allow transit systems to build public support for service efficiency improvements such as streamlining service and adjusting stop spacing. Passengers are generally willing to walk further to a stop that has amenities than to a stop that doesn't. Thus, if funding can be identified, coupling the installation of passenger amenities with major service redesigns, can help ensure a smooth implementation from a customer satisfaction perspective.

Figure 55 | New Bus Stop Amenities – Detroit, MI

THIS PAGE INTENTIONALLY LEFT BLANK

4. SERVICE IMPROVEMENT PLAN AND RECOMMENDATIONS

This chapter presents a service improvement plan, and other recommendations, based on the technical analyses and stakeholder input described in the previous chapters. The recommendations are presented in five sections as described below:

- **Mission/Vision/Values Statements:** A description of the principles meant to guide Battle Creek Transit as an organization;
- **Preliminary Service Recommendations:** An overview of the development and evolution of the preliminary service recommendations;
- **Final Cost-Neutral Service Recommendations:** A detailed description of final recommended service scenario, including cost and ridership estimates;
- **Capital Costs:** A summary of capital costs associated with service implementation, including bus stop upgrades and shelter relocations;
- **Passenger Information and Technology:** A discussion of other supporting elements that would improve the marketing and over-all user experience of Battle Creek Transit.

Mission/Vision/Values Statements

A critical part of developing a comprehensive Transit Master Plan is determining the purpose and goals of transit service in the community, and translating these goals into implementable service and policy recommendations. Mission, vision, and values statements help an organization define what it does and how it does it.

In March 2018, the study team met with members of the Public Transportation Committee and Project Planning Group to obtain input on the key themes that should be reflected in Battle Creek Transit's mission, vision, and values statements. To begin the discussion, the study team provided the following definitions and key purposes of an organization's mission, vision, and values:

- **Mission:** A mission is the fundamental purpose of the organization, and explains why an organization exists. A mission statement is important because any decision made should fit within the organization's reason for existence.
- **Vision:** A vision is a picture or image of the future an organization seeks to create. A vision statement is important because it does not address the why or how but rather the what.
- **Values:** A value is a description of what the organization believes in and how it behaves. A value statement is important because it drives an organization's behavior and choices.

Several examples of mission, vision, and values statements from other transit agencies were provided for informational purposes. These are shown in **Appendix C**.

Based on the input of the Public Transportation Committee, Project Planning Group, and Battle Creek Transit staff, the study team drafted two versions of both the mission and vision statements, and a list of potential values statements. These alternatives were then presented back to the Public Transportation Committee and Planning Team members in the form of an online survey. Survey participants were asked to choose from the two mission and vision statements, respectively, and to vote "yes" or "no" on the inclusion of each values statement. The full list of choices and voting results are shown in **Appendix D**.

Based on the results of this process, the following mission, vision, and values statements are recommended for Battle Creek Transit:

Mission

The mission of Battle Creek Transit is to provide the community with dependable, high quality, cost effective, safe, and accessible public transportation services that connect people, jobs, and communities and enhance Battle Creek's livability.

Vision

The vision of Battle Creek Transit is to do our part to provide residents, visitors, and employees transportation options in our community.

Values

The values of Battle Creek Transit are to be:

- **Sustainable:** We commit to a sustainable business model that includes environmental and fiscal responsibility, business continuity, and succession planning.
- **Accountable:** We are dedicated to public service and strive for excellence and customer satisfaction.
- **Equitable:** We will treat all our customers and employees fairly and equally.
- **Courteous and Clean:** We will create a pleasant environment for our customers and employees.
- **Safe:** We commit to creating a safe and responsible environment for our employees, our customers, and our community.
- **Timely:** We will provide reliable service to our customers.
- **Appealing**: We will provide high quality transit service and amenities to our customers.
- **Accessible:** We will build regional partnerships to expand accessibility to transit.
- **Collaborative:** We will inspire and motivate one another through effective communication, collaboration, and partnership.
- **Following the Disney Way:** We are committed every day to serving our community and each other with integrity, using honesty in each interaction, and treating all people with respect.

Preliminary Service Recommendations

In March 2018, the study team held a series of stakeholder and public meetings. As described previously, these meetings included a discussion of Battle Creek Transit's mission, vision, and values. However, the main focus of these meetings was the presentation of two preliminary service redesign scenarios (**Figure 56** and **Figure 57**), described in Technical Memo #3 – SWOT Analysis, and aimed at addressing the strengths and weaknesses of the existing system. The two scenarios were also posted on the Battle Creek Transit website, along with an on-line survey, to provide additional opportunities for community input.

Initial Public Feedback

Overall, Scenario 1 received more support among meeting and survey participants than Scenario 2. Based on a review of comments, the primary appeal of Scenario 1 was its increased service coverage – particularly in Springfield, Bedford and Pennfield Charter Township – and the direct connection between north Battle Creek and the Capital Square retail center along Capital Avenue NE, provided by the proposed Route 3E. A sample of the survey comments in support of Scenario 1 is provided below, and full summary of the feedback received at the in-person meetings and through the online survey is included in **Appendix E.**

- "*The proposed route would help me because I normally have to walk from the Garrison and Roosevelt area to Pennfield Family Fare*."
- "*Would like to see service in Springfield again*."
- "*Like service to Bedford, and also service up North Ave to Oakridge*."
- "*2E: Like it going to Family Fare complex*."

In addition to providing an opportunity to comment on the proposed service redesign scenarios, the online survey also asked respondents to select up to three general service improvements that they would most like to see. Later bus service was the top choice at 68% of responses, followed by more frequent service at 43%. Sunday service and improved bus stop amenities were the only other choices that were selected by more than 30% of respondents.

Figure 56 | Proposed Service Scenario 1

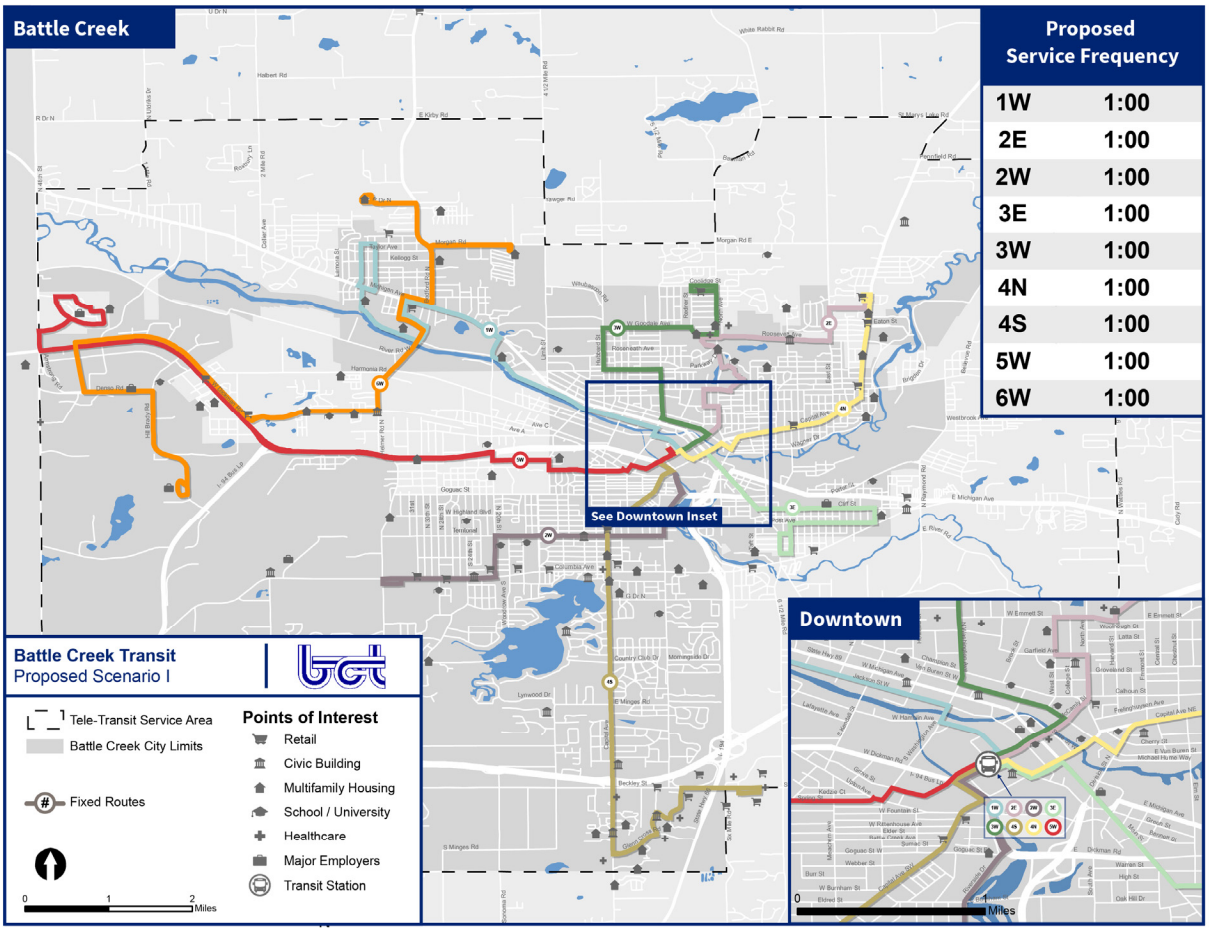
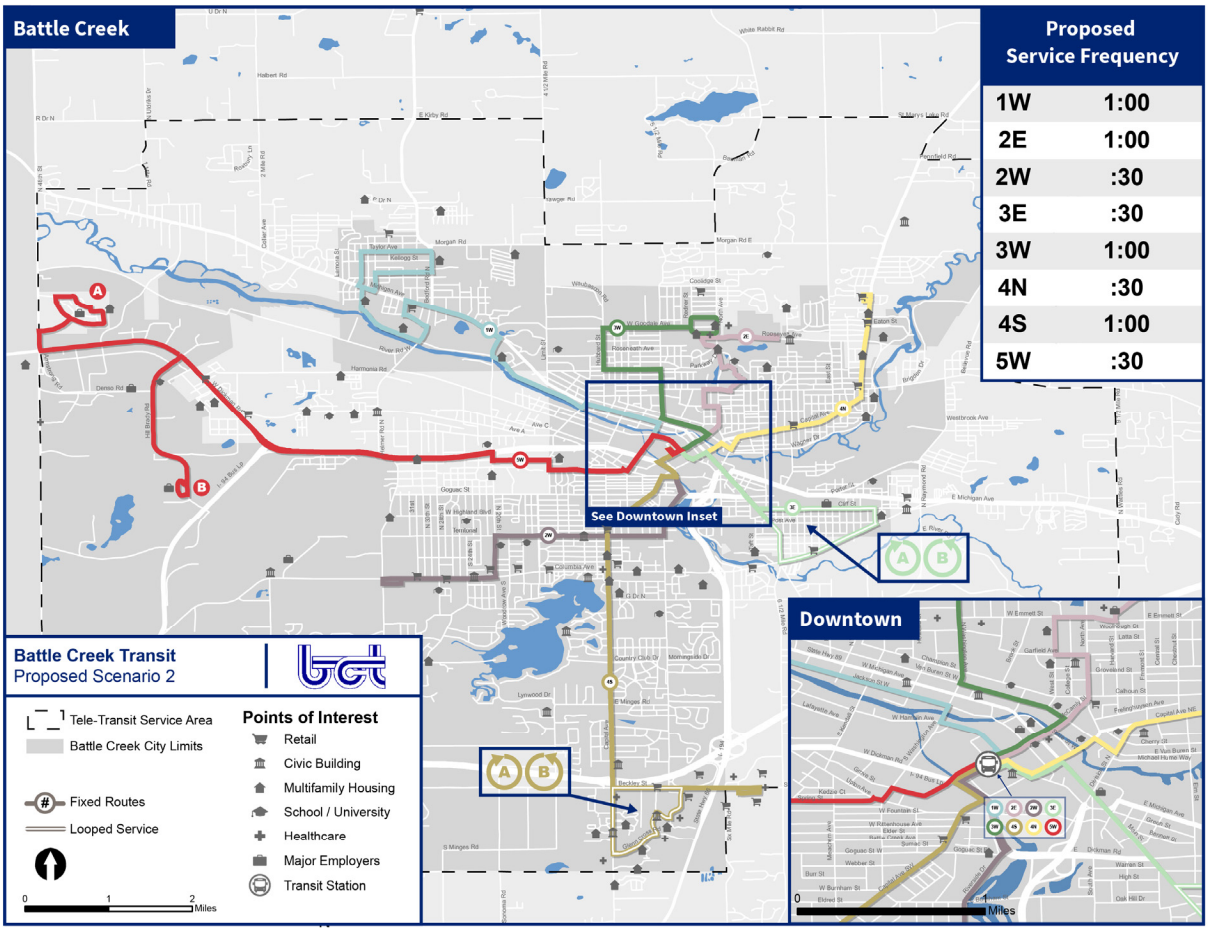


Figure 57 | Proposed Service Scenario 2



Comparison of Service Characteristics

The two preliminary service scenarios differed not only in coverage, but also in service characteristics such as frequency, revenue hours, and peak vehicle requirements. The aim of the study team was for both scenarios to be as close as possible to cost-neutral, compared to existing Battle Creek Transit service.

To maximize service efficiency and minimize operating cost, both scenarios made extensive use of interlining. Interlining is the practice of operating a single bus or group of buses on multiple routes. Interlining is often used to optimize cycle times and recovery times[9]. For example, if one route has insufficient recovery time while another has excessive recovery time, interlining the routes can result in a cycle with an optimal mix of running time and recovery time.

Cycle times that are factors or multiples of 60 allow for the greatest range of clock-face schedules. Clock-face schedules are schedules that result in buses serving a particular stop at the same time or times past every hour (e.g. 1:10, 2:10, 3:10, etc., or 1:00, 1:30, 2:00, 2:30, etc.). Clock-face frequencies make it easy for riders to remember schedules and make it easier to coordinate connections at key hubs.

Table 11 and **Table 12** show the proposed service characteristics, including peak vehicles and daily revenue hours, for each route in Scenario 1 and Scenario 2, respectively. Routes that are shown together in one row

[9] Recovery time is the time between trips that allows a driver to use the restroom or just prepare for the next trip. For a given trip, cycle time is the running time plus recovery time.

are proposed for interlining. Some routes have more than one variant (i.e. clockwise and counter-clockwise). These are designated with an “a” or “b” after the route name.

Clock-face schedules are proposed for all routes in both scenarios, and each route or group of interlined routes is allocated at least 10 percent recovery time. When recovery time is less than 10 percent of total cycle time, there is a high risk of poor on-time performance because there is insufficient buffering between trips. With insufficient recovery time, one late trip can lead to another, causing a bus to get further and further behind schedule. On the other hand, if there is more than 20 percent recovery time in a schedule, buses are sitting unproductively for long periods of time.

In the preliminary planning process, only weekday schedules were compared. The current Battle Creek Transit weekday network requires eight peak vehicles and results in 98 hours of weekday revenue service. Each route provides between 12.5 and 13.5 hours of service a day. By comparison, Scenario 1 requires nine peak vehicles and results in 117 revenue hours per weekday, if each route operates hourly for 13 hours per day. Scenario 2, like the current service, requires eight peak vehicles. If each route operates for 13 hours per weekday, Scenario 2 results in 104 revenue hours with a mix of hourly and 30-minute service. Scenario 2 also has a slight excess of recovery time.

Table 11 | Scenario 1 Service Characteristics

Proposed Route	Avg. Round Trip Mi.	Est. Avg. Speed	Run Time	Min. Recov. Time	Min. Cycle Time	Even Cycle Time	Actual Recovery Time	Actual % Recovery	Peak Freq.	Peak Hours	Peak Trips	Peak Vehic.	Off-Peak Freq.	Off-Peak Hrs.	Off-Peak Trips	Off-Peak Vehic.	Daily Trips	Daily Hrs. Serv.	Rev. Hrs.
4N+3E+2E	23.0	15	1:32	0:09	1:41	2:00	0:28	23%	1:00	7:00	7	2.0	1:00	6:00	6	2	13	13	26
1W+2W+5W	35.7	15	2:22	0:14	2:37	3:00	0:37	21%	1:00	7:00	7	3.0	1:00	6:00	6	3	13	13	39
4S+3W	23.3	15	1:33	0:09	1:42	2:00	0:26	22%	1:00	7:00	7	2.0	1:00	6:00	6	2	13	13	26
6W	20.6	15	1:22	0:08	1:30	2:00	0:37	31%	1:00	7:00	7	2.0	1:00	6:00	6	2	13	13	26

Table 12 | Scenario 2 Service Characteristics

Proposed Route	Avg. Round Trip Mi.	Est. Avg. Speed	Run Time	Min. Recov. Time	Min. Cycle Time	Even Cycle Time	Actual Recovery Time	Actual % Recovery	Peak Freq.	Peak Hours	Peak Trips	Peak Vehic.	Off-Peak Freq.	Off-Peak Hrs.	Off-Peak Trips	Off-Peak Vehic.	Daily Trips	Daily Hrs. Serv.	Rev. Hrs.
1W	12.4	15	0:49	0:04	0:54	1:00	0:10	17%	1:00	7:00	7	1.0	1:00	6:00	6	1	13	13	13
2W + 3Ea	14	15.5	0:54	0:05	0:59	1:00	0:05	10%	1:00	7:00	7	1.0	1:00	6:00	6	1	13	13	13
2W + 3Eb	14	15.5	0:54	0:05	0:59	1:00	0:05	10%	1:00	7:00	7	1.0	1:00	6:00	6	1	13	13	13
2E + 3W	13.5	15	0:54	0:05	0:59	1:00	0:06	10%	1:00	7:00	7	1.0	1:00	6:00	6	1	13	13	13
4N	6.8	15	0:27	0:02	0:29	0:30	0:02	9%	0:30	7:00	14	1.0	0:30	6:00	12	1	26	13	13
4Sa + 4Sb	26.6	15	1:46	0:10	1:57	2:00	0:13	11%	2:00	7:00	4	1.0	2:00	6:00	3	1	7	13	13
5Wa + 5Wb	31.8	18	1:46	0:10	1:56	2:00	0:14	12%	1:00	7:00	7	2.0	1:00	6:00	6	2	13	13	26

Prioritization and Revisions

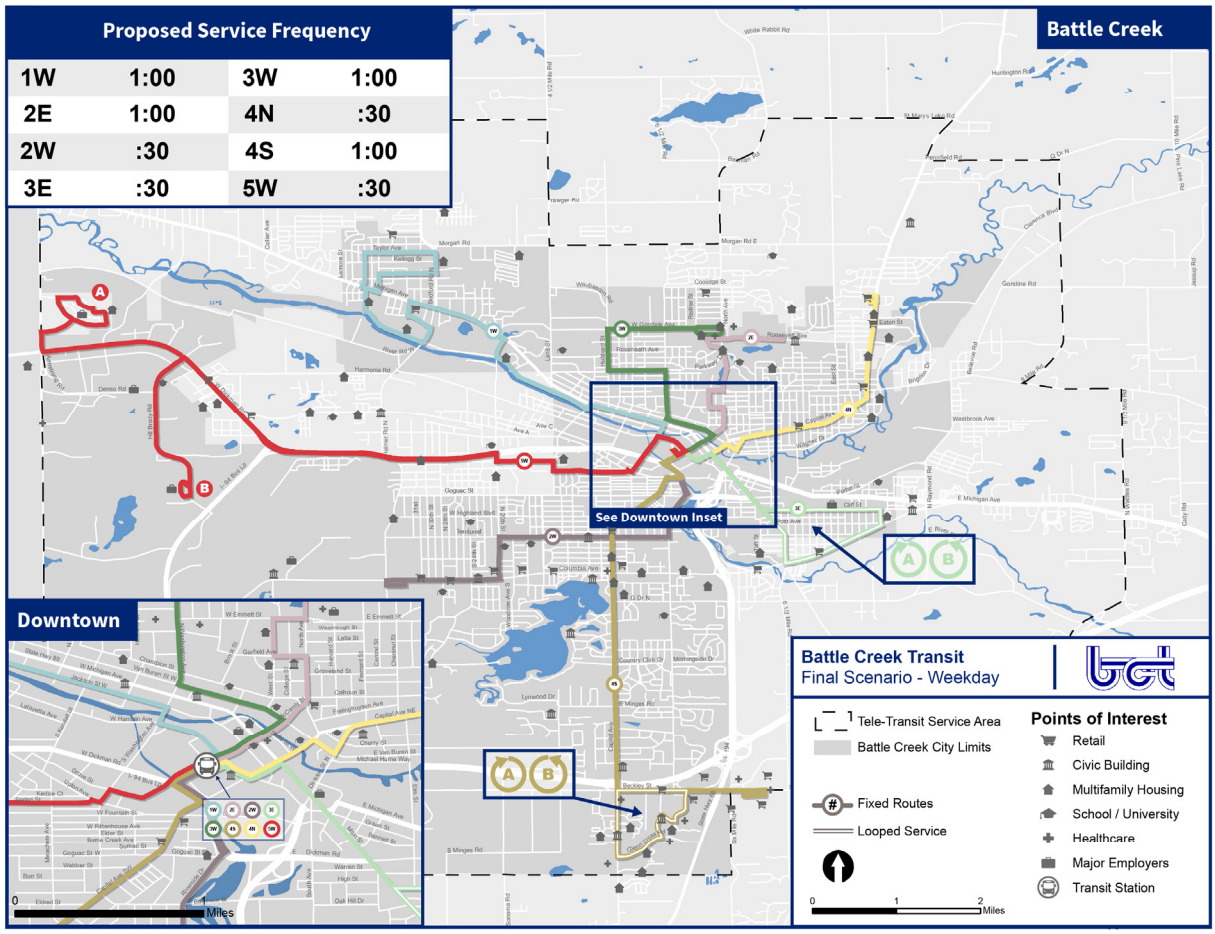
Although the expanded coverage of Scenario 1 was well received by the public, the scenario would require an additional peak vehicle to implement and would necessitate a reduction in service frequency and/or span of service to remain close to cost-neutral. Given the strong interest expressed by survey takers in later and more frequent service, the study team's preliminary recommendation was for Scenario 2 (which preserves similar schedules to current service) to form the basis for short-range service improvements, with elements of Scenario 1 introduced over the longer term, as resources become available.

One revision was made to Scenario 2 before it was presented to Battle Creek Transit staff for field testing. Route 2W was redesigned to restore service to Columbia Avenue, east of 20th Street, by alternating between two service variants. Every other trip would travel outbound along Riverside, Territorial, 20th Street, and Columbia Avenue to Meijer, and return inbound along Columbia Avenue and Riverside. Subsequent trips would travel outbound along Riverside and Columbia Avenue to Meijer, and then return inbound along Columbia, 20th, Territorial, and Riverside.

Battle Creek Transit staff performed field testing of this modified Scenario 2 with a transit vehicle to ensure that all turns could be made safely, and to record the travel times between designated time points. Field testing was conducted at various times of the day and under various traffic conditions to ensure a representative sample of running times.

Based on the field testing, two additional modifications were made to Scenario 2. The first modification was to shift the end of the line of Route 3W from Boyd Street to Goodale Avenue. The second change was to streamline Route 2E by serving both Bronson Battle Creek Hospital and Kellogg Community College from stops along North Avenue, rather than entering the property of either institution. Both of these modifications, included in **Figure 58** below, were made to ensure reliable on-time performance and reduce the potential for conflict with pedestrians and private automobiles circulating through the two campuses.

Figure 58 | Preliminary Recommend Service Scenario



Additional Feedback and Final Revisions

The preliminary recommended service scenario was presented to the public and key stakeholders, including members of the Battle Creek City Commission's Public Transportation Committee, in a series of meetings in August 2018. Based on feedback received at these meetings, and afterwards in discussions with Battle Creek Transit staff, several final revisions were made to the proposed service scenario:

- The proposed end-of-the-line of Route 2E was changed from the Calhoun Area Career Center to Coolidge Street on the City's northern border. This change was made to address the relatively high ridership currently seen on Coolidge Street and the fact that the Calhoun Area Career Center serves high school students with access to school transportation services.
- The proposed schedules for Route 2E and Route 3W were changed to include 30-minute frequency during weekday peak periods. This change was in response to concerns expressed by riders and City Commissioners about reducing Route 3W service from its current 30-minute frequency to hourly service all day.
- The proposed end-of-the-line of the Fort Custer Industrial Park branch of Route 5W was extended across Skyline Drive to provide better access to employment destinations along Logistics Drive. The proposed schedule of this route was also modified so that the Fort Custer Industrial Park branch would operate during peak periods only, when demand for the branch is highest. This would also result in hourly service along the common segment of the route (i.e. Dickman Road, Spring Street, etc.), during middle of the day and on weekends.
- The proposed alignment of Route 5W through the VA Medical Center was changed slightly, at the request of VA staff, to preserve service to the existing bus stop and shelter at the entrance of the campus.

- The proposed alignment of Route 4S was shifted from Heritage Oak Lane and Whitmark Drive to Minges Creek Place, as Heritage Oak Lane was deemed unsuitable for bus operations by Battle Creek Transit staff. The proposed end-of-the-line of this route was also slightly modified to preserve service to the existing bus stop and shelter serving Meijer in Emmett Township.

Final Cost-Neutral Service Recommendations

The service improvements described in this section can be implemented in the short-term, as they are cost-neutral in terms of operating cost, and do not require an expansion of Battle Creek Transit's current fleet. **Figure 59** and **Figure 60** respectively show the proposed weekday and Saturday system maps. These are followed by detailed descriptions of the changes recommended for each route. The service network shown in the Saturday system map also applies to weekday off-peak (i.e. mid-day) periods.

Figure 59 | Final Recommend Service Scenario (Weekday Peak Periods)

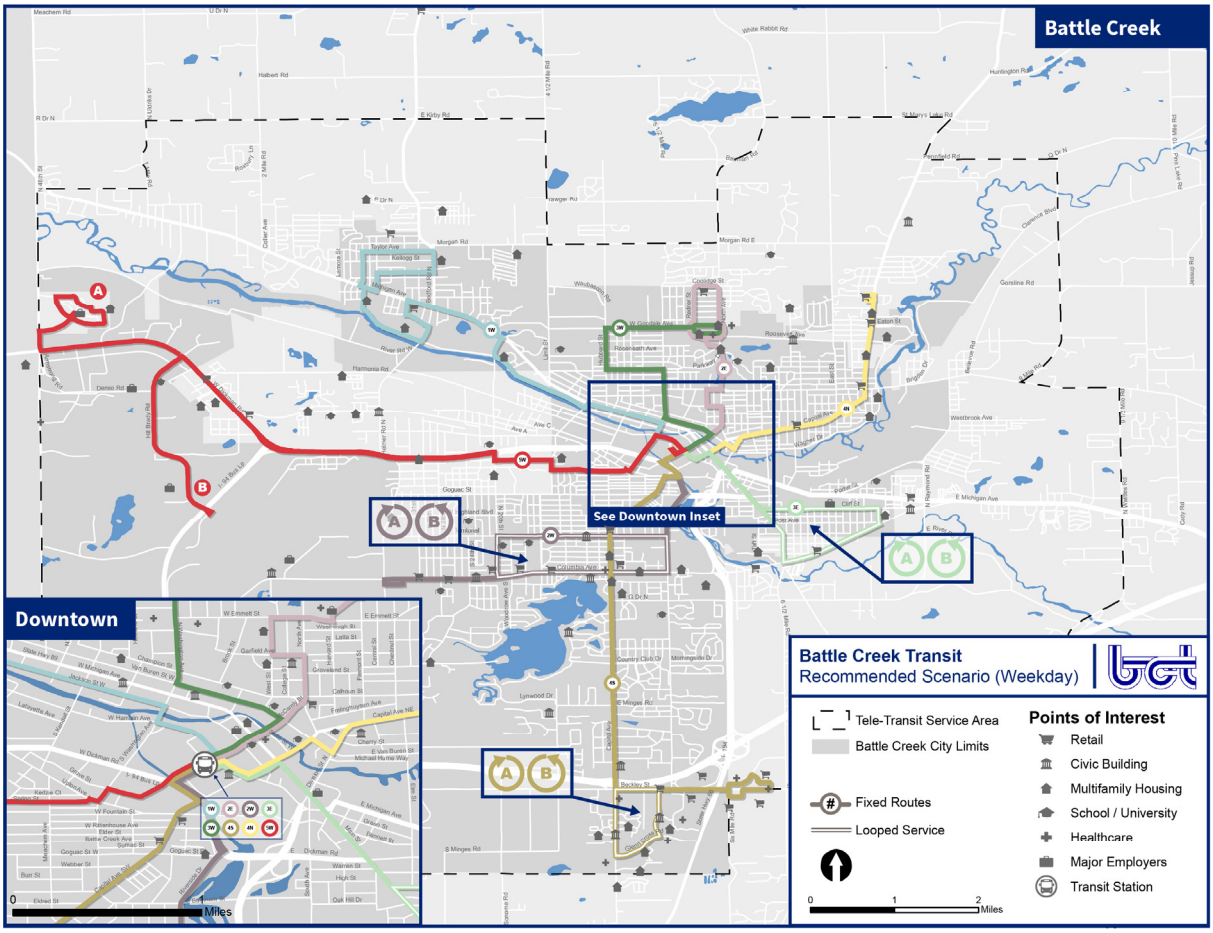
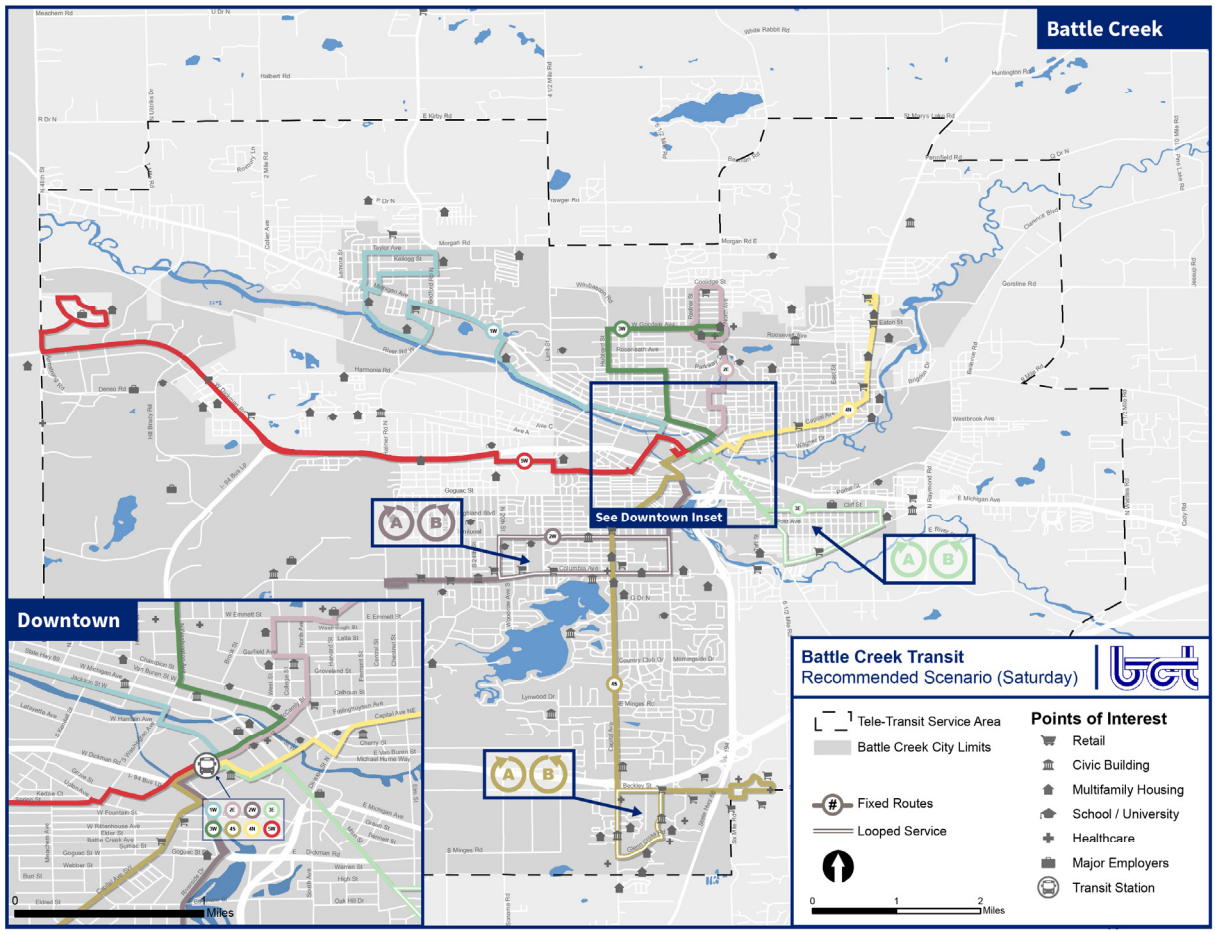


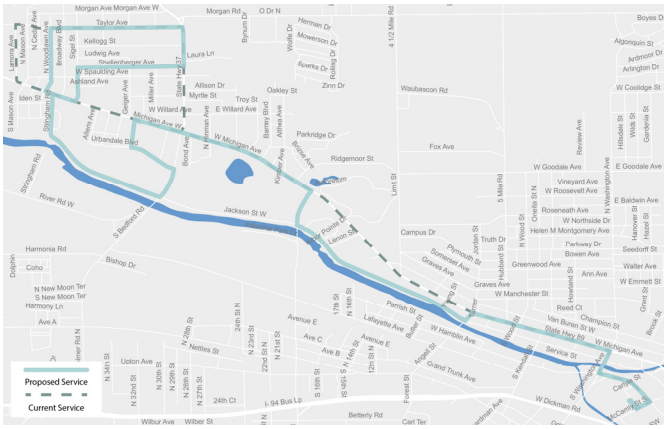
Figure 60 | Final Recommend Service Scenario (Saturdays and Weekday Off-Peak Periods)



Route 1W

The proposed Route 1W (**Figure 61**) would operate between the Battle Creek Transportation Center and Taylor Avenue in northwest Battle Creek. The proposed route would follow the same alignment as the current route between downtown and Angell Street, where service would shift from W Michigan Avenue to Jackson Street in order to provide more direct service to the Arbor Pointe Townhomes. The route would then return to Michigan Avenue via 20th Street, before turning south again at Urbandale Plaza. At Urbandale Plaza, the route would serve the Family Fare Supermarket and then continue on to serve Bedford Manor on Bedford Road, the River Apartments on Stringham Road, and the Bent Tree Apartments, also on Bedford Road.

Figure 61 | Proposed Route 1W



Compared to the current Route 1W, the proposed alignment would provide more bi-directional service, allowing riders to travel more directly between their homes and key retail destinations along W Michigan Avenue. Route 1W would operate hourly throughout the service day on weekdays and Saturdays (**Table 13**). Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Battle Creek Transit Offices
- Arbor Point Townhomes
- Family Fare
- Bedford Manor
- River Apartments
- The Laurels of Bedford
- Bent Tree Apartments

*Table 13 | Route 1W Proposed Service Levels**

Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	60
Midday	9:00 am – 3:00 pm	60
PM Peak	3:00 pm – 7:00 pm	60
Saturday	9:00 am – 6:00 pm	60

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 2E

The proposed Route 2E (**Figure 62**) would operate between the Battle Creek Transportation Center and Coolidge Avenue in north Battle Creek. The proposed route would serve many of the same key destinations as the current Route 2E, but with a more streamlined alignment. Following the current outbound alignment from the Battle Creek Transportation Center to Emmett Street and North Avenue, the route would then turn north to serve both Bronson ProHealth Hospital and Kellogg Community College from North Avenue. The route would then proceed to serve Springview Tower from Springview Drive (rather than entering the property), and the Legacy at The Oaks from North Avenue. After serving the Legacy at the Oaks, the route would complete a terminal loop along North Avenue, Coolidge Avenue, and Redner Avenue, before returning downtown along the same alignment as the outbound trip.

Figure 62 | Proposed Route 2E

Route 2E would operate every 30 minutes during weekday peak periods and hourly in the mid-day and on Saturdays (**Table 14**). The proposed route would eliminate service to some lower density residential areas along Emmett Street, East Avenue and Roosevelt Avenue, but would provide more direct service to key destinations for a number of multi-family housing communities with far higher ridership potential. Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Battle Creek Central High School
- West Brook Place Apartments
- Bronson ProHealth Hospital
- Kellogg Community College
- Springview Tower Apartments
- Save-A-Lot
- The Legacy at the Oaks Apartments

*Table 14 | Route 2E Proposed Service Levels**

Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	60
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	60

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 2W

The proposed Route 2W (Error! Reference source not found.) would operate between the Battle Creek Transportation Center and Meijer on W Columbia Avenue. The proposed route would have two alternating service variants to allow for bi-directional service for all riders. All trips would travel outbound from downtown via Dickman Road and Riverside Drive, but then alternate between traveling westbound on Columbia Avenue ("A" Variant) and Territorial Road ("B" Variant). The two variants would then converge again at Columbia Avenue and 20th Street and both proceed to their end-of-the-line at Meijer. Inbound trips would similarly alternate between the Territorial and Columbia corridors.

Figure 63 | Proposed Route 2W

Route 2W would depart both downtown and Meijer every 30 minutes, but given its alternating alignments, Territorial Road, 20th Street, and Columbia Avenue between 20th and Riverside would be served hourly in each direction (**Table 15**). The common segments of the route's two variants, including Columbia Avenue between Meijer and 20th Street, and Riverside north of Territorial, would have 30-minute service in each direction.

Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Horrocks Farm Market
- Tree Top Ridge Apartments
- Lakeview Meadows Apartments
- Ollie's Bargain Outlet
- Meijer
- Alternatives of Battle Creek
- ALDI
- Salvation Army Family Store
- Family Fare
- Grande Pine Apartments

*Table 15 | Route 2W Proposed Service Levels**

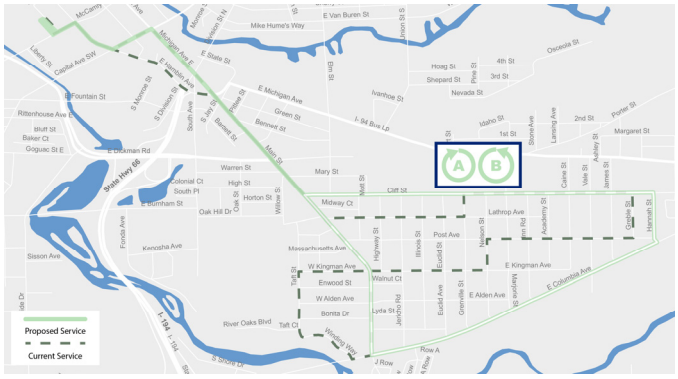
Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	30
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	30

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F.**

Route 3E

The proposed Route 3E (**Figure 64**) would operate between the Battle Creek Transportation Center and E Columbia Avenue in southeast Battle Creek. The proposed route would have two alternating service variants to allow for bi-directional service for all riders and internal circulation through the Post-Franklin neighborhood. All trips would travel outbound from downtown via Michigan Avenue and Main Street, but then alternate between traveling clockwise ("A" Variant) along Cliff Street, Hannah Street, E Columbia Avenue, and Main Street, or counter-clockwise ("B" Variant) along the same alignment.

Figure 64 | Proposed Route 3E



Compared to the current Route 3E, the proposed alignment would provide more bi-directional service, allowing riders to travel more directly between their homes and key retail destinations such as Main Street Market and Family Dollar. Route 3E would depart downtown every 30 minutes, but given its alternating alignments, buses would travel clockwise through the Post-Franklin neighborhood hourly, and travel counter-clockwise every other hour. The common segments of the route's two variants, including Main Street north on Cliff, and Michigan Avenue, would have 30-minute service in each direction (**Table 16**).

Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Kellogg Foundation
- Battle Creek City Hall
- Calhoun County Administration Building
- Post Foods
- Georgetown Estates
- Main Street Market
- Family Dollar

*Table 16 | Route 3E Proposed Service Levels**

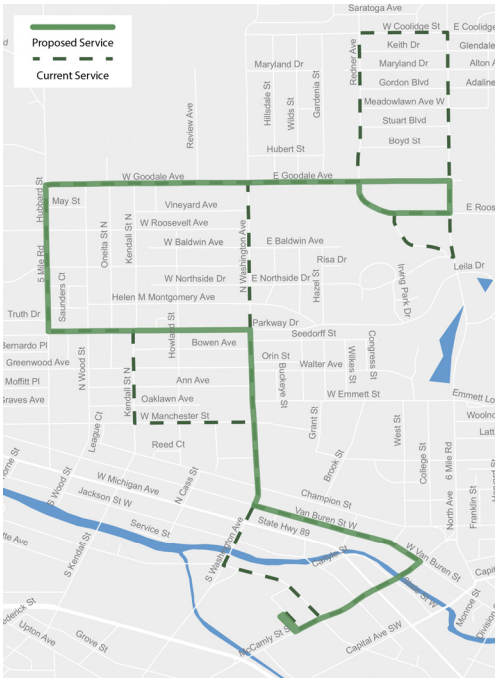
Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	30
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	30

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 3W

The proposed Route 3W (**Figure 65**) would operate between the Battle Creek Transportation Center and North Avenue in north Battle Creek. The proposed route would serve many of the same key destinations as the current Route 3W, but with a more consistent, bi-directional alignment. Following the current outbound alignment from the Battle Creek Transportation Center to Washington Avenue and Parkway Drive, the route would then turn west on Parkway and north on Hubbard Street to service the Parkway Manor Apartments. The route would then proceed north to Goodale Avenue and east to Roosevelt Avenue, terminating with a counter-clockwise loop along Roosevelt, North Avenue, and Goodale. The proposed Route 3W would return to downtown along the same alignment as the outbound trip.

Figure 65 | Proposed Route 3W



Route 3W would operate every 30 minutes during weekday peak periods and hourly in the mid-day and on Saturdays (**Table 17**). The proposed route would eliminate service to some lower density residential areas along Manchester Street, Kendall Street, and Washington Avenue. Service along Springview Drive and Coolidge Avenue would be picked up by proposed Route 2E. Key destinations along the proposed alignment include:

Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Kellogg Company
- Battle Creek Central High School
- US Defense Logistics Agency
- Family Health Center
- Parkway Manor
- Save-A-Lot
- The Legacy at the Oaks

*Table 17 | Route 3W Proposed Service Levels**

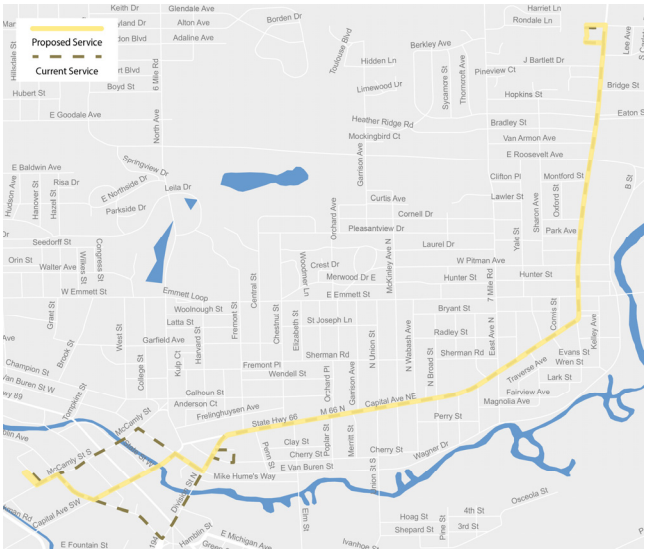
Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	60
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	60

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 4N

The proposed Route 4N (**Figure 66**) would operate between the Battle Creek Transportation Center and Family Fare along Capital Avenue NE. The proposed route would serve most of the same key destinations as the current Route 4N, but with a more consistent, streamlined alignment. Following the current outbound alignment from the Battle Creek Transportation Center to Division Street and Cherry Street, the route would proceed north on Division to Capital Avenue NE, rather than circulating through Cherry Hill Manor. The route would then continue on to Family Fare along the same alignment as the current Route 4N, before returning downtown along the same alignment as the outbound trip.

Figure 66 | Proposed Route 4N



Route 4N would operate every 30 minutes throughout the service day on weekdays and Saturdays (**Table 18**). Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Kellogg Foundation
- St. Philip Catholic Central High School
- Cherry Hill Manor
- Battle Creek Family YMCA
- The Salvation Army
- Crown Chase Apartments
- Family Fare

*Table 18 | Route 4N Proposed Service Levels**

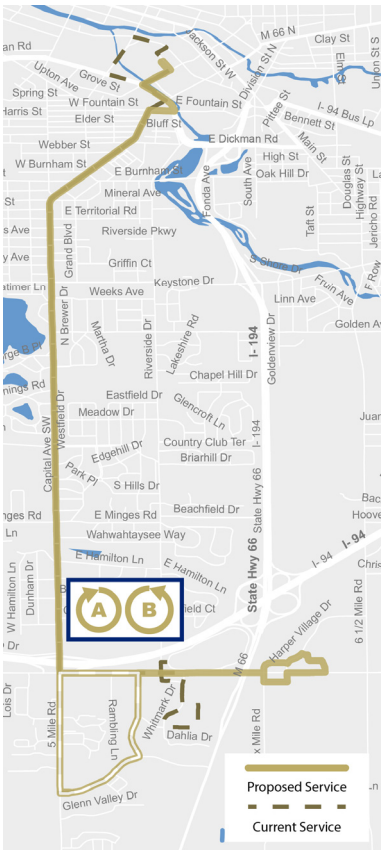
Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	30
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	30

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 4S

The proposed Route 4S (**Figure 67**) would operate between the Battle Creek Transportation Center and Meijer on B Drive in Emmett Township. The proposed route would have two alternating service variants to allow for bi-directional service for all riders, including between numerous apartment communities along Capital Avenue, Glenn Cross Road, and Minges Creek Place, and retail destinations along Beckley Road and B Drive. All trips would travel outbound from downtown via Dickman Road, Fountain Street, and Capital Avenue SW, but then alternate between serving retail destinations along Beckley/B Drive first, and apartments along Minges Creek/Glenn Cross/Capital second ("A" Variant); and serving the apartments first, and the retail destinations second ("B" Variant).

Figure 67 | Proposed Route 4S



Compared to the current Route 4S, the proposed alignment would provide more bi-directional service, and a more regular schedule to key retail destinations such as Walmart and Meijer. However, Target and Lakeview Square Mall would be served from stops along Beckley Road, rather than having buses enter the parking lots of these properties.

Route 4S would depart downtown every hour (**Table 19**), but given its alternating alignments, connections between the apartment communities and retail destinations south of I-94 would be provided every two hours per direction. Regardless of variant, all retail destinations along the route would be served on every trip (i.e. hourly). Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Horrocks Farm Market
- Family Fare
- Social Security Office
- Several large apartment communities
- Southwest Michigan Eye Center
- Target
- Walmart
- Meijer
- Lakeview Square Mall

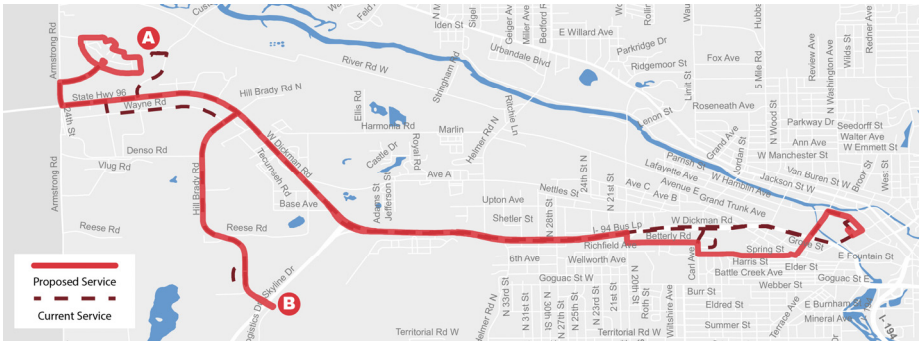
*Table 19 | Route 4S Proposed Service Levels**

Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	30
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	30

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F**.

Route 5W

Figure 68 | Proposed Route 5W



The proposed Route 5W (**Figure 68**) would operate between the Battle Creek Transportation Center and either the Battle Creek VA Medical Center or Logistics Drive, depending on the variant. The proposed route would have two alternating service variants during peak periods. All trips would travel outbound from downtown via W Hamblin Avenue, S Washington Avenue, Spring Street, Carl Avenue, Betterly Road, N 20th Street, and Dickman Road. At Hill Brady Road, buses would either proceed west on Dickman Road to serve the VA and Silver Star Apartments ("A" Variant), or travel south through the Fort Custer Industrial Park to serve RMTC, DENSO Manufacturing, and I I Stanley Company ("B" Variant). The proposed pick up point for the Silver Star Apartments would move from the east side of the building to the west side, to allow for a more efficient alignment serving both the VA and apartments via William Shafer Circle.

Route 5W would depart downtown every 30 minutes during peak periods and hourly in the off-peak and on Saturdays (**Table 20**). When service is provided hourly, the route would only operate along its "A" Variant serving the VA Medical Center and Silver Star Apartments. While Route 5W would not serve the industrial park during off-peak hours, due to low ridership demand, other mobility options would continue to be available in the area. These including Lyft, MichiVan, and potentially a new app-based demand response service provided by a local non-profit called Aequitas Mobility.

Key destinations along the proposed alignment include:

- Battle Creek Transportation Center
- Liberty Commons Apartments
- Brookside Apartments
- Battle Creek VA Medical Center
- Silver Star Apartments
- Kellogg Community College RMTC (peak-periods only)
- DENSO Manufacturing (peak-periods only)
- I I Stanley Company (peak-periods only)

*Table 20 | Route 5W Proposed Service Levels**

Service Day	Approximate Span of Service	Frequency (minutes)
Weekday		
AM Peak	5:00 am – 9:00 am	30
Midday	9:00 am – 3:00 pm	60
PM Peak	3:00 pm – 7:00 pm	30
Saturday	9:00 am – 6:00 pm	60

*Time period definitions are approximate. Detailed schedules can be found in **Appendix F.**

Tele-Transit Service

The Americans with Disabilities Act (ADA) requires public transit providers that operate fixed-route service to provide "complementary paratransit" service to people with disabilities who cannot use the fixed-route bus service because of a disability. However, Battle Creek Transit's Tele-Transit service goes beyond this mandate

both in service area and in span of service. Tele-Transit's service area includes the entirety of City of Battle Creek, City of Springfield, and limited portions of Bedford, Emmett, and Pennfield Townships. Service is available from 5:15 AM until midnight on weekdays and from 9:15 AM until 5:00 PM on Saturdays.

Tele-Transit's large service area can be justified based on the fact that Battle Creek Transit receives funding through federal formula grants that consider the total population of the Battle Creek Urbanized Area, rather than the City itself, to determine funding levels. However, there is little justification for operating Tele-Transit service for more than five hours past the end of fixed-route service each weekday, particularly with the service's low ridership after 7:00 PM (see **Figure 69**). Battle Creek residents who require mobility services after typical business hours currently have the option of using Lyft for their trip, and may soon have another option with the anticipated introduction of a local app-based demand response service provided by Aequitas Mobility.

Table 21 compares the current allocation of Tele-Transit vehicles and service hours throughout the weekday service day, to the recommended allocation, which limits service to between 5:15 AM and 6:45 PM. No changes are recommended for Saturday Tele-Transit service.

Table 21 | Tele-Transit Weekday Current and Proposed Service

Hours of Operation	Vehicles		Service Hours		Revenue Hours	
	Current	Proposed	Current	Proposed	Current	Proposed
5:15 a.m. - 5:45 a.m.	1	1	0.5	0.5	0.5	0.5
5:45 a.m. - 7:15 a.m.	2	2	1.5	1.5	3	3
7:15 a.m. - 8:45 a.m.	3	3	1.5	1.5	4.5	4.5
8:45 a.m. - 9:45 a.m.	4	4	1	1	4	4
9:45 a.m. - 10:15 a.m.	3	3	0.5	0.5	1.5	1.5
10:15 a.m. - 11:15 a.m. a.m.	4	4	1	1	4	4
11:15 a.m. - 12:15 p.m.	3	3	1	1	3	3
12:15 p.m. - 12:45 p.m.	4	4	0.5	0.5	2	2
12:45 p.m. - 4:15 p.m.	5	5	3.5	3.5	17.5	17.5
4:15 p.m. - 4:45 p.m.	4	4	0.5	0.5	2	2
4:45 p.m. - 5:45 p.m.	3	3	1	1	3	3
5:45 p.m. - 6:45 p.m.	2	2	1	1	2	2
6:45 p.m. - 9:15 p.m.	2	0	2.5	0	5	0
9:15 p.m. - 12:00 a.m.	1	0	2.75	0	2.75	0
Total	–	–	**18.75**	**13.5**	**54.75**	**47**

Assuming 250 weekday service days and 52 Saturday service days per year, **Table 22** summarizes current and proposed annual revenue hours and operating costs for Tele-Transit service. Matching weekday Tele-Transit service hours to the fixed-route span of service would result in an approximately 14 percent reduction in annual Tele-Transit revenue hours and operating expenses.

Table 22 | Tele-Transit Annual Current and Proposed Revenue Hours and Operating Costs

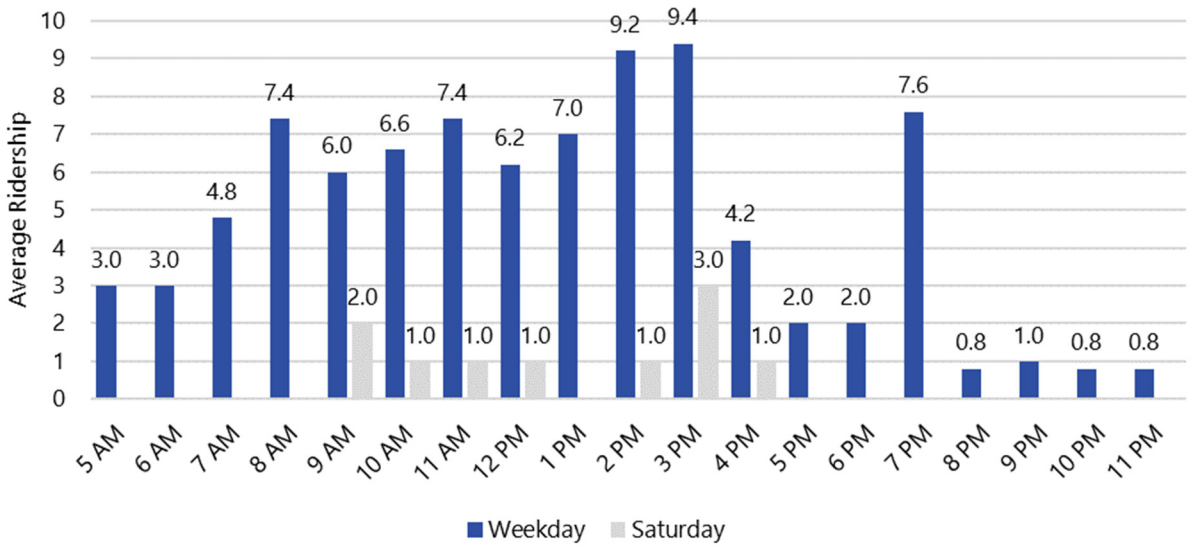
Revenue Hours		Operating Costs	
Current	Proposed	Current	Proposed
14,104	12,166	$1,655,892	$1,428,410

Ridership and Operating Cost Estimates

Tele-Transit

On average, Tele-Transit carries one or fewer passengers per hour after the 7:00 PM hour (**Figure 69**). The 14 percent reduction in operating expenses and revenue hours shown in **Table 22** would likely result in a four percent reduction in ridership, assuming ridership in the 7:00 PM hour mostly shifts to earlier trips and ridership after the 7:00 PM hour is lost.

Figure 69 | Tele-Transit Passengers per Hour



Fixed-Route

To estimate fixed-route ridership, the study team used a three-step process. First, current system ridership was redistributed among the proposed routes based on geographic coverage. If the service area of an existing route is proposed to be picked up by one or more new routes, the current ridership from that route was reassigned proportionally to the new route or routes that will cover the service area. Some ridership is assumed lost if a current route segment is not covered at all in the proposed redesign. However, ridership loss for the recommended service scenario is minimal.

In the second step, the redistributed ridership calculated in Step 1 formed a new baseline. New ridership was then added to this baseline wherever new service coverage is proposed. In newly served areas, ridership was estimated based on the average boardings at stops that serve similar neighborhoods and destinations. For example, if new service is being added to an apartment complex that was not previously served, the estimated ridership for the new stop is based on the current ridership at similarly sized apartment complexes that are currently being served. A second new ridership baseline was established at the end of Step 2. This baseline reflected the impacts of only the geographic coverage changes to the routes.

The third step of the process estimated the ridership impact of service characteristics such as schedule changes and directness of service. Each service characteristic was assigned an impact factor based on TCRP research and the experience of the study team with past service redesigns. Increased service frequency was expected to increase ridership, while decreased service reduced ridership. Routes that would provide more direct connections between major destinations were also anticipated to have increased ridership over previous alignments. The impact factors (listed in several tables by day type in **Appendix G**) were generally assigned in a binary fashion (i.e. if a route was made more frequent, the impact factor was applied to it, and if it was not made more frequent the factor was not applied). However, in some cases a factor was only partially applied. For example, if a route's frequency was improved during the peak period, but not during the off-peak period of the day, then only half of the frequency impact factor was applied. Finally, all the applicable factors were

applied to the ridership baseline established at the end of Step 2 to arrive at a final projected ridership that reflects both the changes in geographic coverage and service characteristics of each route.

Based on the process described above, the recommended service scenario will increase ridership by 12 percent on weekdays and five percent on Saturdays (11 percent overall). However, the impacts of service improvements can take up to two years to fully materialize, as riders must learn the new system and adjust their travel habits accordingly. **Table 23** through **Table 26** outline the abovementioned process in steps for weekday service; **Table 27** through **Table 30** outline the process for Saturday service. The projected ridership growth for both weekdays and Saturdays is based on the assumption that Battle Creek Transit will be able to provide all-day service to Walmart in Emmett Township. Without these additional Walmart trips, ridership growth will likely be more modest (approximately nine percent, instead of 11 percent).

Weekday Ridership Estimates

Table 23 | Weekday Ridership, Step One: Ridership Redistribution by Geographic Coverage

Existing Ridership		Proposed Route & Distribution Factor							
Route	Daily Ridership	1W	2E	2W	3E	3W	4N	4S	5W
1W	107	1.00	--	--	--	--	--	--	--
2E	67	--	0.90	--	--	--	--	--	--
2W	159	--	--	0.80	--	--	--	0.10	0.05
3E	184	--	--	--	1.00	--	--	--	--
3W	326	--	0.15	--	--	0.80	--	--	--
4N	292	--	--	--	--	--	1.00	--	--
4S	265	--	--	--	--	--	--	1.00	--
5W	344	--	--	--	--	--	--	--	1.00
Total	**1,744**								

Table 24 | Weekday Ridership, Step Two: New Baseline Ridership Based on Geographic Coverage

Existing Ridership		Proposed Route & Baseline Ridership								
Route	Daily Ridership	1W	2E	2W	3E	3W	4N	4S	5W	Total
1W	107	107	0	0	0	0	0	0	0	
2E	67	0	60	0	0	0	0	0	0	
2W	159	0	0	127	0	0	0	16	8	
3E	184	0	0	0	184	0	0	0	0	
3W	326	0	49	0	0	261	0	0	0	
4N	292	0	0	0	0	0	292	0	0	
4S	265	0	0	0	0	0	0	265	0	
5W	344	0	0	0	0	0	0	0	344	
Total	**1,744**	**107**	**109**	**127**	**184**	**261**	**292**	**281**	**352**	**1,713**

Table 25 | Weekday Ridership, Step Two (Continued): New Ridership Based on Added Geographic Coverage

Proposed Route	Estimated Daily Riders (Baseline)	Estimated New Daily Riders (Coverage)	Estimated Total Daily Riders
1W	107	20	127
2E	109	0	109
2W	127	0	127
3E	184	10	194
3W	261	0	261
4N	292	0	292
4S	281	10	291
5W	352	5	357
Total	**1,713**	**–**	**1,758**

Table 26 | Weekday Ridership, Step Three: Ridership Adjustment Based on Service Characteristics

Proposed Route	Estimated Daily Riders Based on Geographic Coverage	Impact from Service Characteristics Impact Calculator[10]	Projected Ridership
1W	127	0.1	140
2E	109	0.35	147
2W	127	0.6	204
3E	194	0.1	213
3W	261	-0.15	222
4N	292	0.1	321
4S	291	0.1	320
5W	357	0.1	393
Total	**1,758**	**–**	**1,960**

Saturday Ridership Estimates

Table 27 | Saturday Ridership, Step One: Ridership Redistribution by Geographic Coverage

Existing Ridership		Proposed Route & Distribution Factor							
Route	Daily Ridership	1W	2E	2W	3E	3W	4N	4S	5W
1W	50	1.00	--	--	--	--	--	--	--
2E	20	--	0.90	--	--	--	--	--	--
2W	53	--	--	0.80	--	--	--	0.10	0.05
3E	62	--	--	--	1.00	--	--	--	--
3W	106	--	0.15	--	--	0.80	--	--	--
4N	95	--	--	--	--	--	1.00	--	--
4S	112	--	--	--	--	--	--	1.00	
5W	55	--	--	--	--	--	--	--	1.00
Total	**553**								

[10] Factors based on TCRP 66: Fixed-Route Transit Ridership Forecasting and Service Planning Methods and industry/analogous project experience

Table 28 | Saturday Ridership, Step Two: New Baseline Ridership Based on Geographic Coverage

Existing Ridership		Proposed Route & Baseline Ridership								
Route	Daily Ridership	1W	2E	2W	3E	3W	4N	4S	5W	Total
1W	50	50	0	0	0	0	0	0	0	
2E	20	0	18	0	0	0	0	0	0	
2W	53	0	0	42	0	0	0	5	3	
3E	62	0	0	0	62	0	0	0	0	
3W	106	0	16	0	0	85	0	0	0	
4N	95	0	0	0	0	0	95	0	0	
4S	112	0	0	0	0	0	0	112	0	
5W	55	0	0	0	0	0	0	0	55	
Total	**553**	**50**	**34**	**42**	**62**	**85**	**95**	**117**	**58**	**543**

Table 29 | Saturday Ridership, Step Two (Continued): New Ridership Based on Added Geographic Coverage

Proposed Route	Estimated Daily Riders (Baseline)	Estimated New Daily Riders (Coverage)	Estimated Total Daily Riders
1W	50	10	60
2E	34	0	34
2W	42	0	42
3E	62	5	67
3W	85	0	85
4N	95	0	95
4S	117	5	122
5W	58	2	60
Total	**543**	–	**565**

Table 30 | Saturday Ridership, Step Three: Ridership Adjustment Based on Service Characteristics

Proposed Route	Estimated Daily Riders Based on Geographic Coverage	Impact from Service Characteristics Impact Calculator	Projected Ridership
1W	60	0.1	66
2E	34	-0.4	20
2W	42	0.6	68
3E	67	0.1	74
3W	85	-0.4	51
4N	95	0.1	105
4S	122	0.1	135
5W	60	0.1	66
Total	**565**	–	**583**

Total Impact

Together with Tele-Transit, the total estimated annual ridership impact of the recommended service scenario is an eight percent increase over current ridership levels (**Table 31**), assuming 250 weekdays service days and 52 Saturday service days per year.

Table 31 | Annual Ridership Comparison

	Fixed Route Ridership	Tele-Transit Ridership	Total
Current Service	464,756	29,391	494,147
Proposed Service	520,226	28,215	548,441
Total Ridership Difference	55,470	(1,176)	54,294
Percent Ridership Difference	12%	-4%	11%

Based on the detailed schedules shown in **Appendix F**, the recommend service scenario will result in approximately 103 weekday revenue hours and 53.5 Saturday revenue hours of fixed-route service. Again, assuming 250 weekday service days per year, and 52 Saturday service days per year, the recommended service scenario results in a three percent increase over current operating costs. However, when taken together with the estimated 14 percent decrease in Tele-Transit operating costs, the total estimated annual operating cost of the recommended service scenario is two percent lower than the current annual operating cost for all Battle Creek Transit services (

Table 32). The estimated cost reduction allows for some final schedule adjustments before or after service implantation, so the recommended scenario is essentially cost-neutral.

Table 32 | Annual Revenue Hours and Operating Cost Comparison

	Fixed Route Revenue Hours	Tele-Transit Revenue Hours	Total Revenue Hours	Total Operating Costs
Current Service	27,620	14,104	41,724	$4,898,756
Proposed Service	28,532	12,166	40,698	$4,778,352
Difference	912	-1,938	-1,026	$-120,404
Percent Difference	3%	-14%	-2%	-2%

Capital Costs

The recommended service scenario requires a total of nine peak vehicles (**Table 33**). This is one more than the current peak vehicle requirement, but still within Battle Creek Transit's existing fleet capacity. Thus, no additional vehicles are required to implement the recommended scenario. However, many bus stops and shelters will need to be added, removed, or relocated because of differences between the recommended route alignments and existing service.

Table 33 | Recommended Scenario Service Characteristics

Proposed Route	Avg. Round Trip Mi.	Est. Avg. Speed	Run Time	Min. Recov. Time	Min. Cycle Time	Even Cycle Time	Actual Recovery Time	Actual % Recovery	Peak Freq.	Peak Vehic.	Off-Peak Freq.	Off-Peak Vehic.
1W	12.4	15.5	0:48	0:04	0:52	1:00	0:12	20%	1:00	1.0	1:00	1.0
2Wa + 3Ea	13.9	15.5	0:53	0:05	0:59	1:00	0:06	10%	1:00	1.0	1:00	1.0
2Wb + 3Eb	13.9	15.5	0:53	0:05	0:59	1:00	0:06	10%	1:00	1.0	1:00	1.0
2E + 3W	13	15.5	0:50	0:05	0:55	1:00	0:09	16%	0:30	2.0	1:00	1.0
4N	6.8	15.5	0:26	0:02	0:28	0:30	0:03	12%	0:30	1.0	0:30	1.0
4Sa + 4Sb	26.6	15.5	1:42	0:10	1:53	2:00	0:17	14%	2:00	1.0	2:00	1.0
5Wa	16.4	18.5	0:53	0:05	0:58	1:00	0:06	11%	1:00	1.0	1:00	1.0
5Wb	15.7	18.5	0:50	0:05	0:56	1:00	0:09	15%	1:00	1.0	1:00	1.0
								Total Peak Vehicles:		**9**		

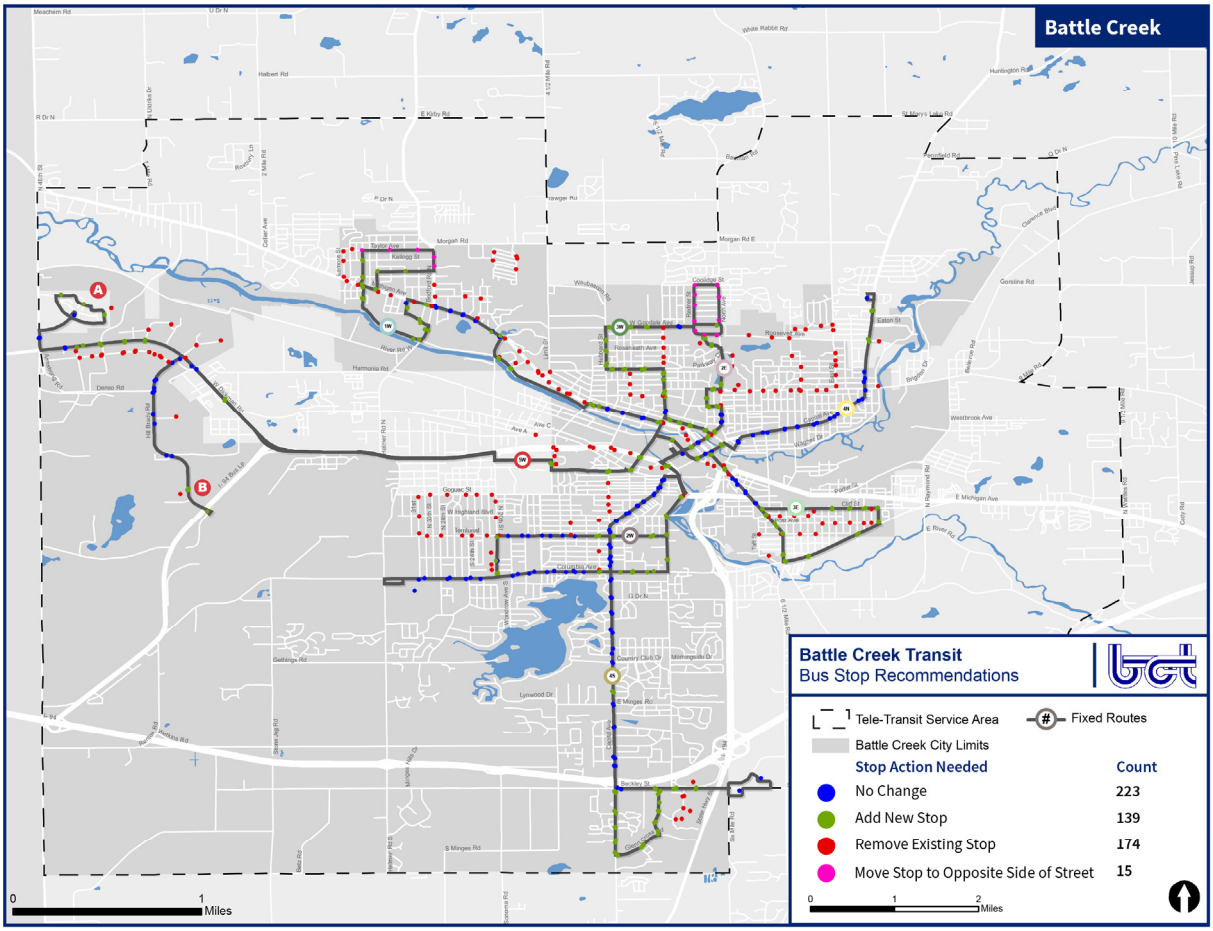
Bus Stop Upgrades

Figure 70 shows that an estimates 154 bus stops would need to be added or relocated with the implementation of the recommended service scenario. An additional 174 stops would need to be removed. Base on the Federal Transportation Administration (FTA)'s interpretation of the Americans with Disabilities Act, any new, altered, or relocated bus stops must meet the following requirements, to the greatest extent practicable:

- Bus stops must have a firm, stable surface and must provide a clear length of 96 inches (2,440 mm), measured perpendicular to the curb or vehicle roadway edge, and a clear width of 60 inches (1,525 mm), measured parallel to the vehicle roadway.
- Bus stops must also connect via an accessible route to streets, sidewalks, or pedestrian paths.
- The slope of the bus boarding and alighting area in the direction parallel to the roadway must be the same as that of the roadway to the maximum extent practicable. Perpendicular to the roadway, the slope must not exceed 1:48, that is, not more than 1 inch of rise over a horizontal distance of 48 inches.

Based on estimates from Battle Creek Transit staff, the cost to upgrade a bus stop to meet ADA requirements is approximately $4,500. For 154 new or relocated bus stops, the estimated cost would total $693,000.

Figure 70 | Bus Stop Recommendations



Shelter Relocations

Battle Creek Transit currently has 25 shelters installed at bus stops throughout the system (not counting the shelters at the Battle Creek Transportation Center, Department of Public Works, or Transit Offices). Of these, 25 shelters, five would no longer be on a route with the recommended service scenario (**Table 34**). One additional shelter would be on route, but would be more useful to riders if placed on the opposite side of the street. Some current shelters serve high-ridership stop locations that are expected to generate similarly high ridership in the opposite direction under the recommended service scenario. Some of the shelters at stops being eliminated could be relocated to these locations to create two-way shelter pairs.

Ensuring that all shelters are placed at high-ridership stops not only positions them to be used by the greatest number of passengers, it also maximizes their visibility and exposure, which is key to attracting advertising revenue.

Based on information provided by Battle Creek Transit staff, the estimated cost to relocate six shelters is $28,800, at $4,800 per shelter. This includes site preparation and shelter installation.

Table 34 | Existing Shelter Locations

Shelter Name/Location	On Proposed Route	Not on Proposed Route	Notes
Back of Denso	X		More useful on opposite side of street
Brookside Apt.	X		
Capital/Ninas	X		
Christ Com Church	X		
Division/Clay	X		Should have pair on opposite side of street
Family Fare	X		
Family Health Ctr.	X		Should have pair on opposite side of street
Greble/Cliff		X	
Highland/Columbia		X	
Hubbard/Parkway	X		Should have pair on opposite side of street
K.C.C.		X	
Kingman/Main		X	
Main St. Market	X		
Minges Crk./Heritage	X		
Riverside G.C.	X		
Roosevelt/Springview		X	Service on opposite side of street only
Teal Run Apt.	X		
The Pines Apt.	X		
VA	X		
Washington/Champion	X		
Washington/Fed Ctr.	X		

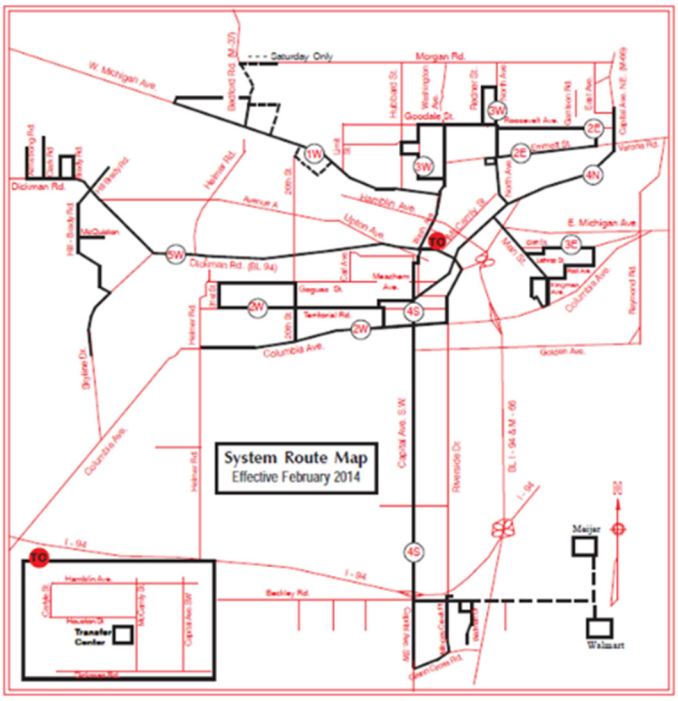
Passenger Information and Technology

For many prospective transit users, a system map, passenger schedule, or bus stop sign is their first interaction with a transit service. Even for seasoned transit users these supporting elements are important way-finding tools. For prospective users, they can make the difference between attracting and losing a new rider.

System Map

While Battle Creek Transit's existing system map (**Figure 71**) shows the alignment of every route, it is difficult to follow due to its lack of color-coding. All routes are depicted in black, making it nearly impossible for a person who is not already familiar with the system to differentiate between one route and another.

Figure 71 | Current Battle Creek Transit System Map



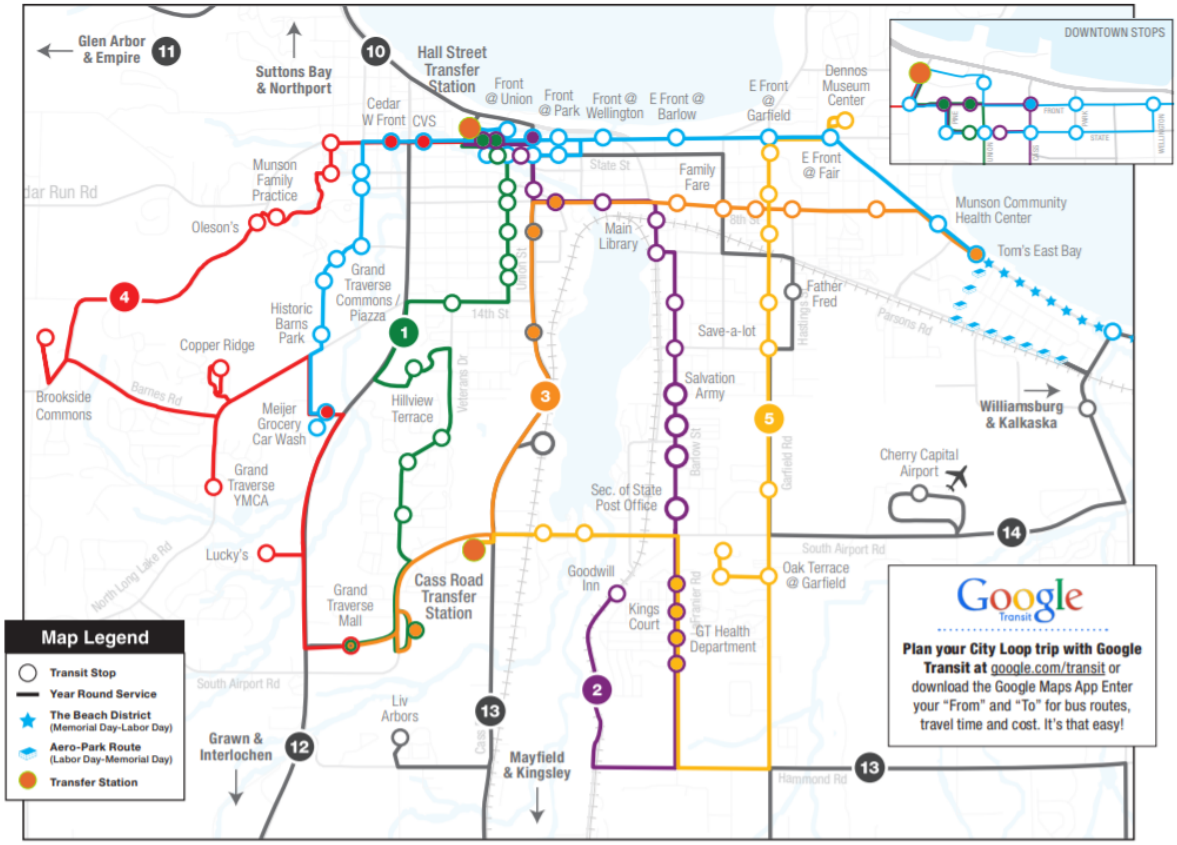
Instead, Battle Creek Transit should develop a system map that uses a different and unique color for every route. Ideally, these same colors would be used in the passenger schedule for each respective route. **Figure 72** shows an example of this approach in the system map for the Bay Area Transportation Authority (BATA) in Traverse City, MI. This map not only shows each route in a different color, but also highlights key stops. In addition, the map references Google Transit as an additional source for transit information.

Google Transit is a powerful trip planning tool that has become an industry standard among transit providers. For Battle Creek Transit, participating in the Google Transit Partner Program is free. Instructions on submitting a "transit feed" are available online at www.google.com/transit.

Google Transit's free trip planner presents transit users (and prospective users) with an online tool similar to the driving directions that most people are already familiar with. Google Transit makes public transportation easy to navigate and removes an element of the unknown that acts as a barrier for many potential transit riders. Users can access Google Transit data on any internet-enabled device including hand-held mobile devices.

Redesigning Battle Creek Transit's system map can be done at minimal cost, potentially with assistance from the City's GIS staff. Thus, this recommendation should be considered a short-term goal.

Figure 72 | BATA Transit System Map

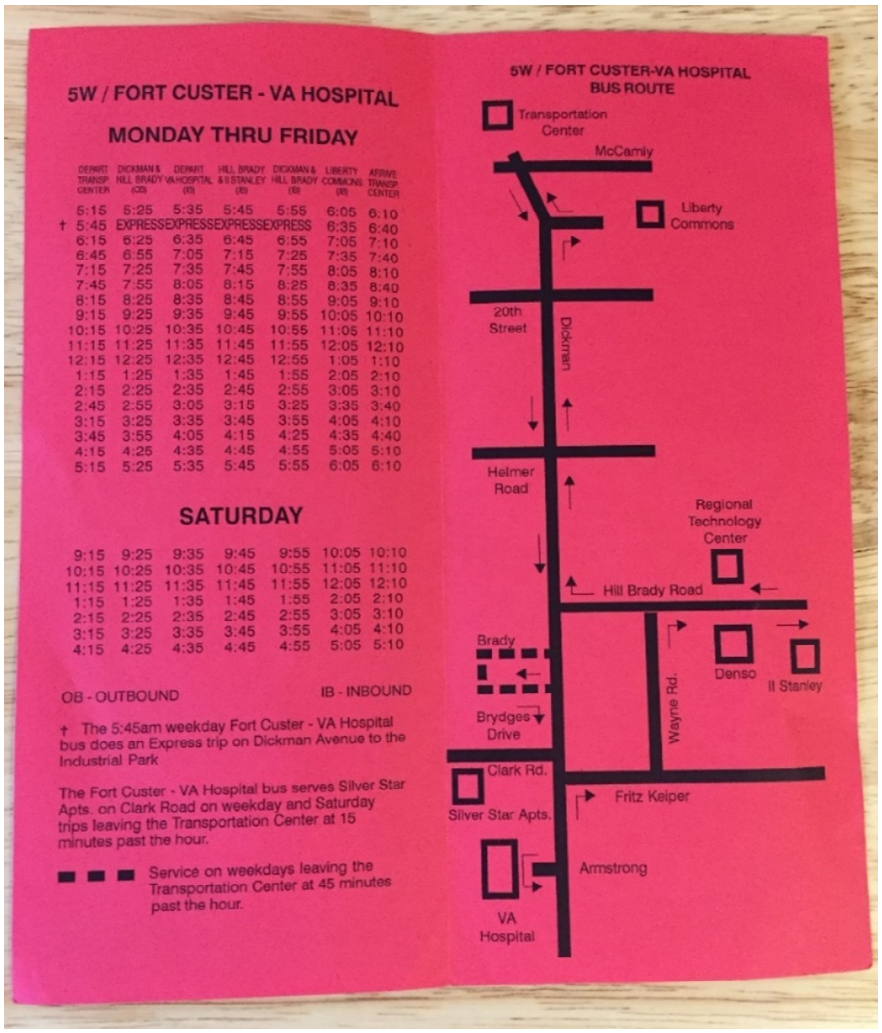


Passenger Schedules

Battle Creek Transit's existing passenger schedules (**Figure 73**) include the basic elements needed to interpret each service, including a timetable and route map. However, one small change can make a big difference for passengers unfamiliar with a service or service area. Adding a letter designation to each timepoint, both on the map and timetable, helps users locate each timepoint and tie scheduled arrival times to designated arrival locations. **Figure 74** shows an example of this approach used by Metro in Kalamazoo, MI.

As with the system map, redesigning passenger schedules is a low-cost effort, and should be considered a short-term goal.

Figure 73 | Current Battle Creek Transit Schedule



5W / FORT CUSTER - VA HOSPITAL

MONDAY THRU FRIDAY

DEPART TRANSP CENTER	DICKMAN & HILL BRADY (OB)	DEPART VA HOSPITAL (IB)	HILL BRADY & II STANLEY (IB)	DICKMAN & HILL BRADY (IB)	LIBERTY COMMONS (IB)	ARRIVE TRANSP CENTER
5:15	5:25	5:35	5:45	5:55	6:05	6:10
† 5:45	EXPRESS	EXPRESS	EXPRESS	EXPRESS	6:35	6:40
6:15	6:25	6:35	6:45	6:55	7:05	7:10
6:45	6:55	7:05	7:15	7:25	7:35	7:40
7:15	7:25	7:35	7:45	7:55	8:05	8:10
7:45	7:55	8:05	8:15	8:25	8:35	8:40
8:15	8:25	8:35	8:45	8:55	9:05	9:10
9:15	9:25	9:35	9:45	9:55	10:05	10:10
10:15	10:25	10:35	10:45	10:55	11:05	11:10
11:15	11:25	11:35	11:45	11:55	12:05	12:10
12:15	12:25	12:35	12:45	12:55	1:05	1:10
1:15	1:25	1:35	1:45	1:55	2:05	2:10
2:15	2:25	2:35	2:45	2:55	3:05	3:10
2:45	2:55	3:05	3:15	3:25	3:35	3:40
3:15	3:25	3:35	3:45	3:55	4:05	4:10
3:45	3:55	4:05	4:15	4:25	4:35	4:40
4:15	4:25	4:35	4:45	4:55	5:05	5:10
5:15	5:25	5:35	5:45	5:55	6:05	6:10

SATURDAY

9:15	9:25	9:35	9:45	9:55	10:05	10:10
10:15	10:25	10:35	10:45	10:55	11:05	11:10
11:15	11:25	11:35	11:45	11:55	12:05	12:10
1:15	1:25	1:35	1:45	1:55	2:05	2:10
2:15	2:25	2:35	2:45	2:55	3:05	3:10
3:15	3:25	3:35	3:45	3:55	4:05	4:10
4:15	4:25	4:35	4:45	4:55	5:05	5:10

OB - OUTBOUND IB - INBOUND

† The 5:45am weekday Fort Custer - VA Hospital bus does an Express trip on Dickman Avenue to the Industrial Park

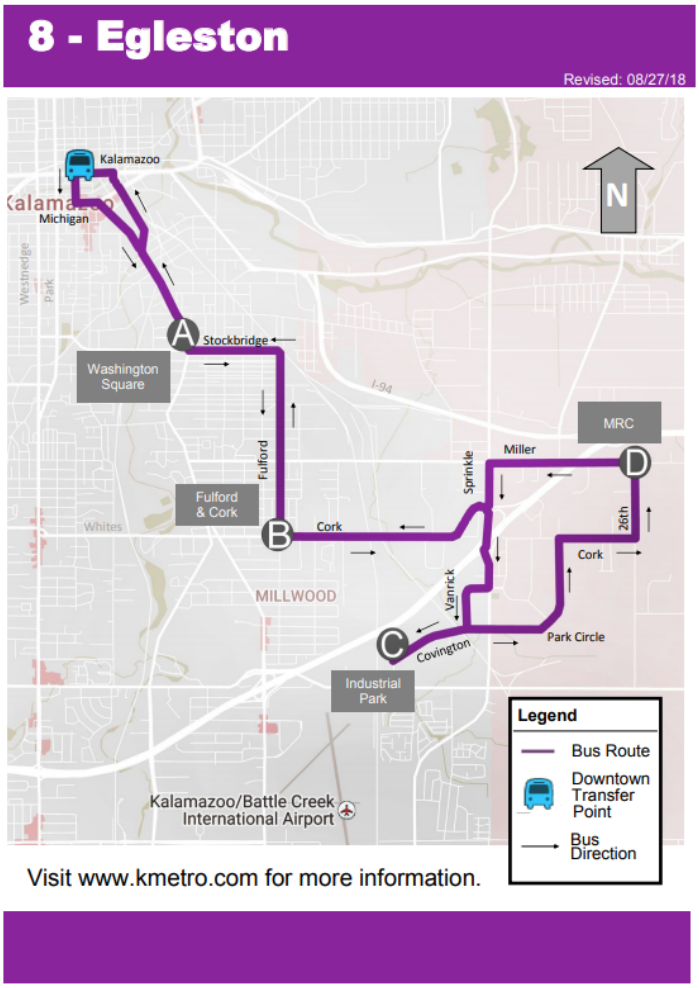
The Fort Custer - VA Hospital bus serves Silver Star Apts. on Clark Road on weekday and Saturday trips leaving the Transportation Center at 15 minutes past the hour.

Service on weekdays leaving the Transportation Center at 45 minutes past the hour.

5W / FORT CUSTER-VA HOSPITAL BUS ROUTE

Transportation Center
McCamly
Liberty Commons
20th Street
Dickman
Helmer Road
Regional Technology Center
Hill Brady Road
Brady
Denso
II Stanley
Wayne Rd.
Brydges Drive
Clark Rd.
Silver Star Apts.
Fritz Kelper
Armstrong
VA Hospital

Figure 74 | Metro (Kalamazoo, MI) Schedule



Outbound: A → B → C → D
Inbound: B → A

Leaves Rose Bay 6	Washington Square Apts	Cork & Lincolnshire	Industrial Park	MRC	Fulford & Sheridan	Washington Square Apts	Arrives Rose Bay 6
5:45		5:57	6:10		6:20		6:38
6:45		6:57	7:10		7:20		7:38
7:45		7:57	8:10	8:15	8:20		8:38
8:45		8:57	9:10	9:15	9:20		9:38
9:45	9:50	9:57	10:10		10:20	10:30	10:38
10:45		10:57	11:10	11:15	11:20		11:38
11:45	11:50	11:57	12:10		12:20	12:30	12:38
12:45		12:57	1:10	1:15	1:20		1:38
1:45	1:50	1:57	2:10		2:20	2:30	2:38
2:45		2:57	3:10	3:15	3:20		3:38
3:15		3:27	3:40	3:45	3:50		4:08
3:45		3:57	4:10	4:15	4:20		4:38
4:15		4:27	4:40	4:45	4:50		5:08
4:45		4:57	5:10	5:15	5:20		5:38
5:15		5:27	5:40		5:50		6:08
6:15		6:27	6:40		6:50		7:08
7:15		7:27	7:40		7:50		8:08
8:15		8:27	8:40		8:50		9:08
9:15		9:27	9:40		9:50		10:08
10:15		10:27	10:40		10:50		11:08
11:15		11:27	11:40		11:50		12:08

Monday—Friday

5:45		5:57	6:10		6:20		6:38
6:45		6:57	7:10		7:20		7:38
7:45		7:57	8:10		8:20		8:38
8:45		8:57	9:10		9:20		9:38
9:45	9:50	9:57	10:10		10:20	10:30	10:38
10:45		10:57	11:10		11:20		11:38
11:45	11:50	11:57	12:10		12:20	12:30	12:38
12:45		12:57	1:10		1:20		1:38
1:45	1:50	1:57	2:10		2:20	2:30	2:38
2:45		2:57	3:10		3:20		3:38
3:45		3:57	4:10		4:20		4:38
4:45		4:57	5:10		5:20		5:38
5:45		5:57	6:10		6:20		6:38
6:45		6:57	7:10		7:20		7:38
7:45		7:57	8:10		8:20		8:38
8:45		8:57	9:10		9:20		9:38

Saturday

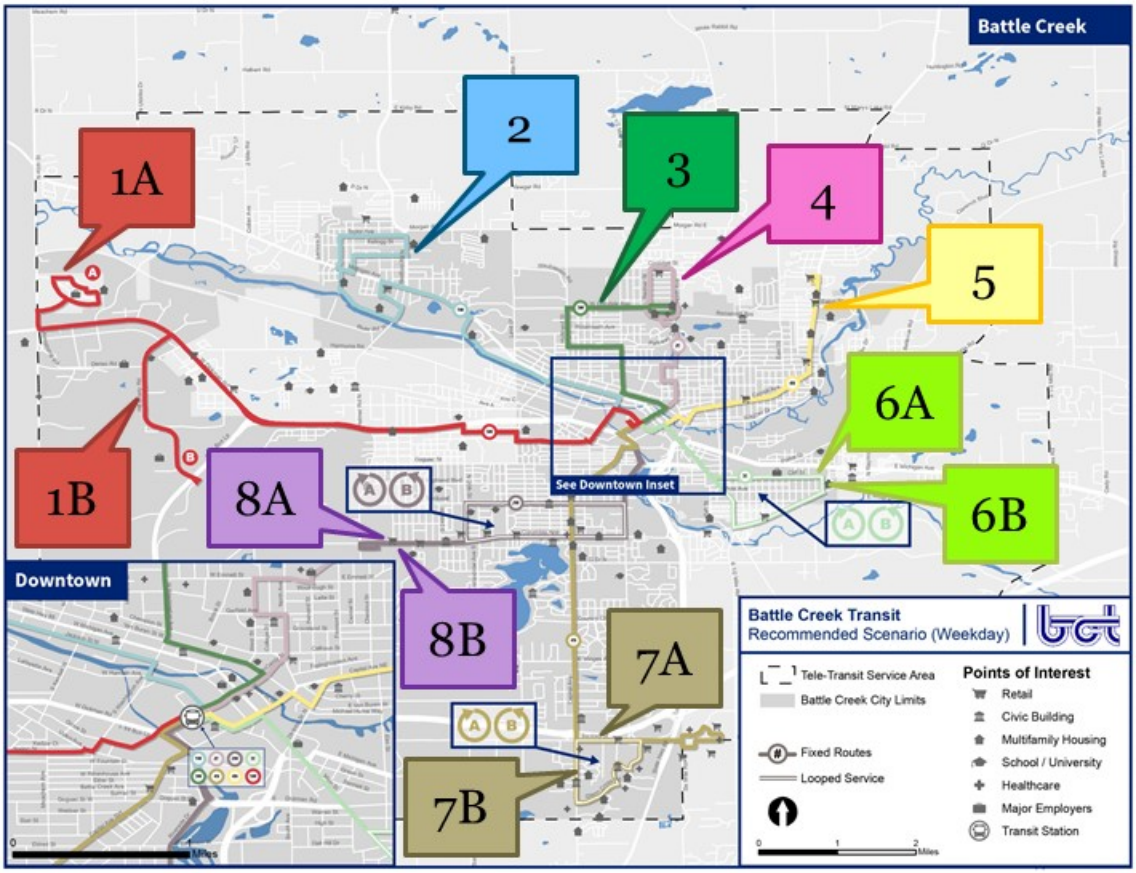
8:15		8:27	8:40		8:50		9:08
9:15	9:20	9:27	9:40		9:50	10:00	10:08
10:15	10:20	10:27	10:40		10:50	11:00	11:08
11:15	11:20	11:27	11:40		11:50	12:00	12:08
12:15	12:20	12:27	12:40		12:50	1:00	1:08
1:15	1:20	1:27	1:40		1:50	2:00	2:08
2:15	2:20	2:27	2:40		2:50	3:00	3:08
3:15		3:27	3:40		3:50		4:08
4:15		4:27	4:40		4:50		5:08

Sunday

Route Naming Convention

The current naming convention of Battle Creek Transit routes incorporates both a route number and geographic direction indicating the sector of the city that the route serves. While this system may make sense for long-time riders it can be confusing for new and prospective riders, especially since route 3W serves areas north and northeast of downtown. A simpler approach would be to simply use a sequential numbering system from 1 to 8 and use an "A" or "B" designator to differentiate service variants, as shown in **Figure 75** below. Given that BCT bus stop signs do not currently include route numbers, the cost of this change would be minimal, if timed to coincide with the redesign and reprinting of the system map and passenger schedules.

Figure 75 | Battle Creek Transit Proposed Naming Convention



Bus Stop Signage

Bus stop signs help existing riders know that they have successfully located a designated pick-up location. They also help increase awareness for transit service in a community by visually advertising the existence of the service to prospective riders. Battle Creek Transit's existing signs (**Figure 76**) convey that service is available in the community, but not much else. The signs could be made more informative by adding route information, like in the example shown in **Figure 77**, from Traverse City. Providing route information on the signs serves as a cross-referencing tool for riders and prospective riders by definitively tying each stop to other information sources such as maps, schedules, and vehicle head-signs. For existing riders, this information validates that they are not only at a bus stop, but at the correct bus stop. For prospective riders, the route information allows them to know which route to search for as they begin to gather information on how to use the service.

Figure 76 | Current BCT Bus Stop Sign

Figure 77 | Traverse City Bus Stop Sign

Route information can be added to signs in a number of ways, ranging from low-cost decals to higher-cost approaches such as on-sign printing or secondary signage above or below the general bus stop sign. The approach chosen by Battle Creek Transit staff will impact the cost of this recommendation and thus its timing. Over-all, this recommendation is a lower priority than the others supporting elements discussed above.

Technology Deployment

While Google Transit has become an industry standard, other technology solutions have also emerged in recent years to make transit service easier to access and understand. Tools like real-time vehicle trackers allow passengers to know where their bus is at any given moment, and help remove a sense of uncertainly that keeps some prospective riders off buses. Mobile ticketing apps now make it possible for transit riders to purchase fares and passes on their mobile devices, eliminating the need to carry cash and coins to board the bus. Finally, app-based demand response services are revolutionizing on-demand transportation by allowing riders to directly schedule pick-ups, bypassing dispatchers and cutting lead times from one day to one hour or less.

Given other more pressing priorities, it may be premature for Battle Creek Transit to procure these technologies in the shot-term, but staff can begin to familiarize themselves with these tools, that can

dramatically improve the transit experience, by inviting vendors to demonstrate their products through Requests for Information. The table below (**Table 35**) lists various technology providers and the products they offer, along with website where additional details and contacts information can be found. This list is not comprehensive, as new vendors continue to come to market every month.

Table 35 | Transit Technology Providers

Company	Website	Mobile Ticketing	Real-Time Transit Tracker	App-Based Demand Response Service
Passport	www.passportinc.com	X		
RideSytems	www.ride-systems.com		X	X
Shotl	www.shotl.com			X
TokenTransit	www.tokentransit.com	X		
TransLoc	www.transloc.com		X	X
Via	www.ridewithvia.com			X

5. FINANCIAL PLAN

The purpose of a financial plan is to provide a planning-level forecast of anticipated costs and revenues over the course of a given planning timeframe. A financial plan includes both an operating and capital budget. This financial plan covers the five-year period between Fiscal Years (FY) 2019 and 2023.

The operating budget is associated with regularly reoccurring costs such as labor, maintenance, insurance, and administration. These costs are typically similar from year to year and tend to be closely tied to the amount of service provided and the fares that are collected for that service.

Capital costs reflect one-off investments in procurement of replacement or expansion assets such as vehicles, facilities, equipment, and IT systems. These figures can fluctuate considerably year over year. In some cases, funding provided in one year can be "rolled over"; i.e. spent in a subsequent year, once enough funds are available to cover a large capital purchase, for example.

To develop this financial plan, a range of assumptions were made. Multi-year budgets are projections based on a snapshot in time. As such, they should be updated regularly to ensure accuracy. Generally, certainty over costs and revenue decrease further into the future.

Operating Budget

Operating Budget Assumptions

Operating Revenue

Operating revenue is revenue that is directly earned through an agency's activities, including the provision of transportation services, as well as through activities such as advertising. Fares are the primary source of direct operating revenue for Battle Creek Transit (although advertising revenue may play a larger role in the future). The ridership assumptions in the operating budget are based on projections discussed in Chapter 4. Fare revenue forecasts are identified by multiplying forecasted ridership by BCT's average fare revenue per trip of 83 cents.[11]

In order to better understand the likely fiscal impact of increasing fares, a series of fare increase scenarios were developed; for more information, see the **Operating Budget Scenarios** section below.

Operating Grant Revenue

The federal government, the State of Michigan, and the City of Battle Creek provide operating assistance to BCT in the form of grants. The 2019 and 2020 allocation for federal and state funding is derived from the Battle Creek Area Transportation Study (BCATS) Transportation Improvement Program (TIP) for 2017-2020 or from data provided directly by BCT. In recent years, local funds have covered the remaining balance after all other revenues are accounted for.

BCT's federal operating funding comes from Section 5307 Urbanized Area formula funds. This funding is expected to grow year-over-year by 2.1 percent, the nationwide average growth of the Federal Formula fund program. State and local funding is assumed to reflect the BCATS TIP through 2020, and then to grow by 2% per year starting in 2021.

Operating Costs

Operating costs are assumed to grow by 3% per revenue hour year-over-year.

Operating Budget Scenarios

Battle Creek Transit has faced, and will likely continue to face, a significant gap between operating revenues and operating costs. Absent significant changes in the level of service provided or fares, and based on this

[11] This average fare revenue per trip was identified by dividing BCT's 2018 total fare revenue ($410,941) by its total 2018 ridership for both fixed route and tele-transit services (494,147).

financial plan's assumptions, this gap will be just under $1 million in FY 2019 and is expected to increase to over $1.37 million by FY 2023. In the past, the City of Battle Creek has helped to bridge the gap between planned funding and actual expenses; however, there is no guarantee that City funding will always be available for this purpose. For that reason, BCT has decided to explore the operating budget impacts of increasing fares.

To do this, three fare scenarios were developed; they are described in **Table 36** below. Scenario 1 is the status quo and does not involve any fare changes over the lifetime of this financial plan.

Table 36 | BCT Exploratory Fare Increase Scenarios

Scenario 1: No Fare Changes	Scenario 2: Modest General Fare Increases; No Changes for Other Fare Categories	Scenario 3: Moderate General Fare Increases; Modest Fare Increases for Other Categories and Services
Description: No change in fares between FY 2019 and FY 2023.	Description: 25 cent increase in adult single ride fare for fixed route service; other increases of 5-20 percent in adult/general passenger fares for both fixed route and tele-transit services; no change to fares for seniors, persons with disabilities, or students.	Description: 50 cent increase in adult single ride fare for fixed route service, other increases of 35-40% across regular adult fare types; $1 increase to for tele-transit regular fare (29%); modest (9-17%) increases to fares for seniors, persons with disabilities, and students for both fixed route and tele-transit services.

To identify the revenue impact of these fare increase scenarios, it is important to consider the impact that raising fares will have on ridership. Economic principles indicate that when the price of an item (such as a bus ride) increases, the demand for that item (the number of people who purchase bus rides) will decrease. Fare elasticity is used to measure the intensity of fare price changes on ridership. An elasticity of -1 means that on average, for every 1 percent increase in price, there is a corresponding 1 percent decrease in demand (ridership). While there is extensive literature on transit fare elasticity, there is no universal standard relationship between fare increases and corresponding decreases in ridership. Studies have shown that factors such as city size, type of commute, and length of trip all impact elasticity. Overall, transit tends to be an inelastic good, meaning that ridership declines by a smaller percentage than price increases. National studies have placed fare elasticity at around 0.34, meaning that a 1 percent increase in fares results in a 0.34 percent decrease in ridership. For the purposes of this analysis, a fare elasticity of -0.34 has been assumed.

Using this fare elasticity, the study team calculated the anticipated fare revenues under each scenario by multiplying the ridership, which was adjusted downward using the fare elasticity, by the average fare revenue per trip, which was increased based on the average percentage fare increase across fare categories under each scenario. It is important to note that this analysis is based on a simple average percentage change in fares across all fare categories; in other words, the increase was not weighted based on the relative frequently with which fares are paid by people in each fare category (student, senior, adult, etc.).

BCT's estimated operating budgets for the period between fiscal years 2019 and 2023 are shown below for Scenario 1 (

Table 37), Scenario 2 (**Table 38**), and Scenario 3 (**Table 39**).

Table 37 | Operating Budget Forecast - Scenario 1: No Fare Changes

Fiscal Year	2019	2020	2021	2022	2023
Operating Revenue					
Fare Revenue	$456,093	$456,093	$456,093	$456,093	$456,093
Operating Revenue Subtotal	$456,093	$456,093	$456,093	$456,093	$456,093
Grants					
Federal (5307)	$1,057,581	$1,057,581	$1,079,790	$1,102,466	$1,125,618
State	$1,523,051	$1,557,307	$1,588,453	$1,620,222	$1,652,627
Local (City)	$938,230	$938,230	$956,995	$976,134	$995,657
Grant Revenue Subtotal	$3,518,862	$3,553,118	$3,625,238	$3,698,822	$3,773,901
Total Revenue	**3,974,955**	**4,009,211**	**4,081,331**	**4,154,915**	**4,229,994**
Operating Costs					
Service	$4,972,522	$5,121,697	$5,275,348	$5,433,609	$5,596,617
Total Operating Costs	**$4,972,522**	**$5,121,697**	**$5,275,348**	**$5,433,609**	**$5,596,617**
Anticipated Deficit (Total Revenues minus Total Costs)	**$997,567**	**$1,112,486**	**$1,194,017**	**$1,278,693**	**$1,366,623**

Table 38 | Operating Budget Forecast - Scenario 2: Modest General Fare Increases

Fiscal Year	2019	2020	2021	2022	2023
Operating Revenue					
Fare Revenue	$475,558	$475,558	$475,558	$475,558	$475,558
Operating Revenue Subtotal	$475,558	$475,558	$475,558	$475,558	$475,558
Grants					
Federal (5307)	$1,057,581	$1,057,581	$1,079,790	$1,102,466	$1,125,618
State	$1,523,051	$1,557,307	$1,588,453	$1,620,222	$1,652,627
Local (City)	$938,230	$938,230	$956,995	$976,134	$995,657
Grant Revenue Subtotal	$3,518,862	$3,553,118	$3,625,238	$3,698,822	$3,773,901
Total Revenue	**$3,994,420**	**$4,028,676**	**$4,100,796**	**$4,174,380**	**$4,249,459**
Operating Costs					
Service	$4,972,522	$5,121,697	$5,275,348	$5,433,609	$5,596,617
Total Operating Costs	**$4,972,522**	**$5,121,697**	**$5,275,348**	**$5,433,609**	**$5,596,617**
Anticipated Deficit (Total Revenues minus Total Costs)	**$978,102**	**$1,093,021**	**$1,174,552**	**$1,259,228**	**$1,347,157**
% Decrease in Deficit vis-à-vis Scenario 1	**-1.95%**	**-1.75%**	**-1.63%**	**-1.52%**	**-1.42%**

Table 39 | Operating Budget Forecast - Scenario 3: Moderate Fare Increases

Fiscal Year	2019	2020	2021	2022	2023
Operating Revenue					
Fare Revenue	$508,067	$508,067	$508,067	$508,067	$508,067
Operating Revenue Subtotal	$508,067	$508,067	$508,067	$508,067	$508,067
Grants					
Federal (5307)	$1,057,581	$1,057,581	$1,079,790	$1,102,466	$1,125,618
State	$1,523,051	$1,557,307	$1,588,453	$1,620,222	$1,652,627
Local (City)	$938,230	$938,230	$956,995	$976,134	$995,657
Grant Revenue Subtotal	$3,518,862	$3,553,118	$3,625,238	$3,698,822	$3,773,901
Total Revenue	**$4,026,929**	**$4,061,185**	**$4,133,305**	**$4,206,889**	**$4,281,968**
Operating Costs					
Service	$4,972,522	$5,121,697	$5,275,348	$5,433,609	$5,596,617
Total Operating Costs	**$4,972,522**	**$5,121,697**	**$5,275,348**	**$5,433,609**	**$5,596,617**
Anticipated Deficit (Total Revenues minus Total Costs)	**$945,593**	**$1,060,512**	**$1,142,043**	**$1,226,719**	**$1,314,648**
% Decrease in Deficit vis-à-vis Scenario 1	**-5.21%**	**-4.67%**	**-4.35%**	**-4.06%**	**-3.80%**

Under each scenario, the difference between total operating revenues and total operating costs is significant; generally, the difference is at least 20 percent of BCT's total operating budget. The difference widens between FY 2019 and FY 2023 because costs are anticipated to increase at a higher rate than revenues.

Under Scenario 1, as noted above, the gap between anticipated revenues and anticipated costs will be just under $1 million in FY 2019 and is expected to increase to over $1.37 million by FY 2023. Under Scenario 2 (modest fare increases), this gap is expected to decrease by about 2 percent in FY 2019; by 2023, the decrease will only be about 1.4 percent below the gap in Scenario 1. Under Scenario 3, the gap will be reduced by 5.2 percent in FY 2019, and by 3.8 percent in FY 2023.

Scenarios 2 and 3 demonstrate that, because fares make up only a modest portion of BCT's revenues, even moderate fare increases will only result in a modest reduction in the gap between revenues and costs.

Capital Budget

Capital Budget Assumptions

Capital Revenue

BCT relies on federal funding for a large portion of its capital needs. This capital budget assumes federal funds will continue to support 80% of capital needs, with 20% coming from state matching funds.

Capital Costs

BCT's capital costs for the horizon of this financial plan include vehicle purchases, equipment purchases, bus stop upgrades (concrete pad installations) to ensure compliance with Americans with Disabilities Act (ADA) standards, and bus shelter moves to ensure that the location of bus shelters is consistent with the stop

location changes called for in the Transit Master Plan. BCT's vehicle and equipment purchase costs for FY 2019 and 2020 are identified in the BCATS 2017-2020 TIP. For FY 2021 through 2023, this financial plan assumes that capital costs will increase by 3 percent annually from 2020 levels, with the exception of vehicle costs, which are assumed to increase 4 percent annually.[12]

This plan assumes that all six bus shelter moves will occur in 2019 and that all other bus stop ADA upgrades are assumed to be spread nearly evenly across all five years of this capital budget. It is recommended that BCT phase these upgrades in a way that is responsive to the highest need areas for residents with disabilities.

Some of the capital funding for BCT identified in the BCATS 2017-2020 TIP is not mandated for specific purchases or purposes. Some of that funding may be dedicated to the other capital needs identified in the capital budget in the case of any gaps between capital needs and available capital funds. (For example, this "unspecified projects" funding could be used for the bus stop ADA upgrades.)

Capital Budget

Table 40 presents the 5-year capital budget forecast for BCT. BCT's capital needs are expected to average about $700,000 per year over the 5-year planning timeframe.

Table 40 | Capital Budget Forecast

Fiscal Year	2019	2020	2021	2022	2023
Capital Revenue Required for All Planned Improvements					
Federal	$410,080	$576,328	$595,545	$612,318	$633,660
State	$102,520	$144,082	$148,886	$153,079	$158,415
Local	$ -	$ -	$ -	$ -	$ -
Revenue Total	**$512,600**	**$720,410**	**$744,432**	**$765,397**	**$792,075**
Costs of Planned Capital Improvements					
Vehicle Purchases	$217,000	$456,725	$474,994	$493,994	$513,754
Funding in TIP for Unspecified Projects	$120,000	$120,000	$120,000	$122,400	$124,848
Equipment	$2,800	$ -	$1,442	$1,485	$1,530
Bus Shelter Moves and Bus Stop ADA Upgrades	$172,800	$143,685	$147,996	$147,518	$151,944
Total Capital Costs	**$512,600**	**$720,410**	**$744,432**	**$765,397**	**$792,075**

Financial Plan Conclusion

BCT, like many transit providers in Michigan and through the United States, faces a restrictive revenue environment that limits its ability to expand service with existing resources. Available revenues to support all of the needs identified in the operating and capital budgets are not guaranteed; any gaps between revenues and expenses will result in cuts to operating expenses (service) and/or capital expenses. There is a risk associated with delaying fulfillment of capital needs, which is that it will become increasingly difficult for BCT to maintain its assets in a state of good repair. Further, as capital assets become older due to delayed capital investments, operating expenses related to their maintenance will increase.

[12] Because no equipment purchases were planned for 2020 in the TIP, the average equipment costs for 2019 and 2020, plus cost escalation, was assumed for FYs 2021 through 2023.

6. BATTLE CREEK TRANSIT PEER STAFFING ANALYSIS

Overview

Delivering high quality, reliable transit service requires adequate staffing of properly skilled staff. The purpose of this analysis is to identify how Battle Creek Transit compares to peer agencies with respect to staffing. Achieving the appropriate level of staffing is important. Without adequate staffing, service quality is likely to suffer as vehicles in need of repair are not returned to service as quickly or customer needs are not met. On the other hand, having excess staff increases BCT's expenses and reduces the funding available for providing service.

In order to conduct this analysis, the study team identified a group of six peer agencies based on service and community characteristics. A particular effort was made to include transit agencies serving other medium-sized cities in Michigan due to their shared regulatory and funding environments. However, the goal of including several Michigan peers resulted in a group with a wide range of service areas, and population densities (**Table 41.**). BCT is in the middle of the group in terms of its population density.

Table 41 | Peer Agencies and Key Characteristics

Agency	State	Service Area Size (square miles)	Service Area Population	Population Density (persons per square mile)
Battle Creek Transit	Michigan	73	87,735	1,202
Bay Metropolitan Transit Authority	Michigan	442	106,832	242
Macatawa Area Express Transportation Authority	Michigan	42	71,572	1,704
City of Jackson Transportation Authority	Michigan	702	159,494	227
Kalamazoo Metro Transit System	Michigan	69	209,555	3,037
Missoula Urban Transportation District	Montana	70	72,087	1,030
Berkshire Regional Transit Authority	Massachusetts	384	127,500	332

The study team contacted peer agencies and asked them to provide data on their vehicle fleets and number of staff by category. Data points included the number of bus operators, dispatchers, mechanics, supervisors, and administrative staff. The number of annual revenue hours and annual revenue miles were collected from the National Transit Database agency profiles.[13] **Table 42** summarizes these data points.

[13] https://www.transit.dot.gov/ntd/transit-agency-profiles.

Table 42 | Peer Agency Staffing Data

Data Point	Battle Creek	Bay Metropolitan Transit Authority	Macatawa Area Express Transportation Authority	City of Jackson Transportation Authority	Kalamazoo Metro Transit System	Missoula Urban Transportation District	Berkshire Regional Transit Authority
Revenue hours – Demand response	10,941	25,829	29,839	15,550	88,806[14]	13,305	19,666
Revenue hours – Fixed route	27,662	48,832	33,046	25,951	130,134	50,244	55,705
Revenue miles – Demand response	113,431	427,580	387,269	205,020	1,266,677[2]	161,793	283,190
Revenue miles – Fixed route	409,113	1,008,331	412,389	347,630	1,734,288	697,824	968,305
Service vehicles – 29' or larger buses	13	42	9	17	40	24	13
Service vehicles – cutaway buses or similar vehicles	7	15	23	26	68	10	57
Number of mechanics[15] (Full Time Equivalent[16])	4	8	2	5	23	5	10
Number of operators (FTEs)	24	59	42	19	83	45	37
Number of supervisors (FTEs)	2	4	5	7	7	4	7
Number of custodial staff (FTEs)	4	1	4.25[17]	2	0	3	2
Number of dispatchers (FTEs)	4	4	2	5	1	2	4
Number of administrative staff (FTEs)	2	10	5	3	13	5	3
Number of other positions (FTEs)	1	7	10.75[5]	4	0	3	8

[14] Kalamazoo Metro Transit contracts out its demand response transit service.
[15] Mechanic FTEs have been adjusted based on the amount of time they spend on vehicle maintenance, as indicated by the peer agency.
[16] Agencies use different calculations to determine what constitutes a "Full Time Equivalent". For the purposes of this study, the numbers provided by the various peer agencies were treated as comparable across agencies.
[17] Macatawa utilizes part-time positions, resulting in non-integer values.

Because the functions performed by employees in categories can vary significantly between agencies, the study team grouped staff positions into two main categories: administrative and operations. This allowed for better overall comparison across agencies. Administrative positions were considered to include any role that contributes to the provision of transit service in an indirect way. These include general managers, financial officers, human resources, planners, schedulers, purchasing agents, utility workers, grant administrators, and bookkeepers. Positions were considered operations if the staff in these positions are directly involved in providing or facilitating transit service in the field. Operations positions include vehicle operators, mechanics, supervisors, or dispatchers.

The percentage of total staff for each agency that falls into each of these two categories is shown in **Table 43**. The average breakdown between administrative and operations staff was 18 percent and 82 percent, respectively. Relative to its peers, BCT falls within the middle of the range for the distribution of its staff.

Table 43 | Percent Administrative and Operations Staff

Agency	Percent Administrative	Percent Operations
Battle Creek	17%	83%
Bay City	19%	81%
Macatawa	28%	72%
Jackson	20%	80%
Kalamazoo	10%	90%
Missoula	16%	84%
Berkshire	18%	82%

Staffing Levels Analysis

Findings for Overall Staffing

The study team normalized staffing data relative to each agency's level of service (revenue hours and revenue miles) to facilitate comparisons across agencies.

Table 44 summarizes the number of annual revenue hours and annual revenue miles per total staff, per administrative staff, and per operations staff for each peer agency.

Table 44 | Total Staff, Administrative, and Operations Staff per Level of Service

Agency	Annual Revenue Hours per Total Staff	Annual Revenue Miles per Total Staff	Annual Revenue Hours per Admin. Staff	Annual Revenue Miles per Admin. Staff	Annual Revenue Hours per Ops. Staff	Annual Revenue Miles per Ops. Staff
Battle Creek	942	12,745	5,515	74,649	1,135	15,369
Bay City	803	15,440	4,148	79,773	995	19,145
Macatawa	886	11,263	3,144	39,983	1,233	15,680
Jackson	922	12,281	4,611	61,406	1,153	15,351
Kalamazoo	1,025	13,656	10,010	133,407	1,142	15,213
Missoula	948	12,830	5,777	78,147	1,135	15,350
Berkshire	1,062	17,627	5,798	96,269	1,300	21,578

While there are a few outliers, BCT's results fall within the range of its peer agencies, suggesting that the *overall* level of staffing at BCT is appropriate, given its level of service. One factor that can impact revenue miles per staff is the size of the service area. In terms of revenue hours per total staff and administrative staff,

BCT is generally toward the top of the ranges, indicating that its staff have slightly heavier workloads than those at other agencies. For operations staff, BCT is closer to the middle of the range.

Findings by Operations Positions

The study team also normalized specific job positions by level of service and compared the findings across agencies, as shown in **Table 45Error! Reference source not found.**. This analysis was limited to operations staff (mechanics, operators, operations supervisors, and dispatchers), as their job responsibilities are generally more clearly delineated than administrative roles.

Table 45 | Operations Staff per Level of Service

Agency	Annual Revenue Hours per Mechanic	Annual Revenue Miles per Mechanic	Annual Revenue Hours per Operator	Annual Revenue Miles per Operator	Annual Revenue Hours per Ops. Supervisor	Annual Revenue Miles per Ops. Supervisor	Annual Revenue Hours per Dispatcher	Annual Revenue Miles per Dispatcher
Battle Creek	11,354	153,689	1,608	21,773	19,302	261,272	9,651	130,636
Bay City	9,333	179,489	1,265	24,337	18,665	358,978	18,665	358,978
Macatawa	31,443	399,829	1,497	19,039	12,577	159,932	31,443	399,829
Jackson	9,765	130,035	2,184	29,087	5,929	78,950	8,300	110,530
Kalamazoo	7,073	94,255	1,568	20,895	18,591	247,755	130,134	1,734,288
Missoula	13,239	179,087	1,412	19,103	15,887	214,904	31,775	429,809
Berkshire	7,537	125,150	2,037	33,824	10,767	178,785	18,843	312,874

Because this level of analysis was more granular, there was more variation between peer agencies, depending on the specifics of each agency's situation. In some instances, the responsibilities that are encompassed by each position may vary as well. Despite this, BCT's metrics generally fall within the calculated range for most job categories, oftentimes scoring around the median value. Findings by position are described below.

Mechanics

The number of revenue hours and miles per mechanic at BCT is in the middle of the range of values at other peer agencies. Apart from a single significant outlier,[18] values ranged from 7,500 - 13,200 revenue hours and 94,200 - 179,500 revenue miles.

Operators

For vehicle operators, BCT once again employs a similar number of bus drivers relative to its peers. This metric was slightly more consistent across the peer agencies, with values ranging from 1,400 - 2,100 revenue hours and 19,000 - 29,100 revenue miles. BCT falls comfortably within both of these ranges.

Operations Supervisors

The number of revenue hours and miles per operations supervisor ranged from 10,700 - 19,300 revenue hours and 178,800 - 261,200 revenue miles.[19] BCT scored the highest in terms of revenue hours per operations supervisor, indicating a higher workload per operations supervisor than some other agencies. In terms of revenue miles, BCT also has the second highest results, indicating that its operations supervisors have a higher workload than their peers at most other agencies.

[18] Macatawa employs only two mechanics, which relative to its level of service, is much less than other peer agencies, making it an outlier. One possible explanation for this difference is that Macatawa may include some mechanical functions among the services that are provided by contractors.

[19] The City of Jackson was somewhat of an outlier, with significantly more supervisors per unit of service than the other peers. Bay City Transit had fewer supervisors than the range of the rest of the peer group, specifically relative to the number of revenue miles.

Dispatchers

Finally, the number of revenue hours and miles per dispatcher varied more significantly across the peer group: approximately 8,300 - 31,800 revenue hours and 110,500 - 429,900 revenue miles; these numbers exclude Kalamazoo, which is a significant outlier using these metrics.[20] Within this wide range, BCT scored on the lower end of the spectrum. This suggests that BCT is adequately staffed with dispatchers relative its service levels.

Appendix H – Graphs for each MetricAppendix H – Graphs for each Metricincludes graphs for each metric included in Table 44 and Table 45. The agencies within each graph are sorted by level of service, as measured by total number of annual revenue hours or miles. Appendix I – Mechanic Staffing Analysis based on TCRP Research Findings includes a more detailed analysis of the staffing levels for vehicle maintenance technicians, based on the Transit Cooperative Research Program's Report 184.

Conclusion

Overall, BCT's staffing levels are in the middle of ranges of the peer agencies identified for this analysis, suggesting that BCT's overall staffing levels are appropriate. Given that BCT is smaller than many of the peer agencies and, thus, has fewer opportunities to achieve economies of scale, the fact that its performance is in line with others suggest it is operating quite efficiently. The analysis indicates that BCT is generously staffed with respect to dispatchers, while its operations supervisors have a higher workload than their peers at other agencies. A possible solution to this imbalance, given a probable lack of available funding to create new positions, could be to train existing employees in new skills over time to alleviate the burden on operations supervisors. Eventually, one or more staff may be able to dedicate a portion their time to a function other than that of his or her primary position. A side benefit of such an approach would be that the agency will function more smoothly in the case that one or more staff are unavailable.

[20] Kalamazoo Metro Transit was a significant outlier, with only one dispatcher despite the fact that it provides significantly more service than any other peer.

PAGE INTENTIONALLY LEFT BLANK

APPENDIX A: BATTLE CREEK TRANSIT ROUTE PROFILES

Battle Creek Transit (BCT) operates eight fixed-route bus lines. This document provides a detailed diagnostic profile of each of the routes. The process of developing these profiles allows the study team to become familiar with all aspects of the service, and provides BCT staff with new perspectives on the services that operate every day.

Each route profile includes a route description as well as discussions of operating characteristics; service productivity; ridership; and strengths, weaknesses, and opportunities. The weekday service productivity and ridership analyses are based on ridership and on-time-performance data collected by the study team during the week of October 9th, 2017. Boarding and alighting data was recorded at each stop for every scheduled trip on a typical weekday. On-time-performance was recorded for designated time-points only.

Saturday ridership data was based on farebox reports, rather than a manual ride-check. To ensure a representative sample, an average Saturday ridership figure for each route was calculated by taking the average of the daily ridership of each route for every Saturday in the month of October 2017. Saturday ridership data was not available at the stop or trip level and did not include on-time-performance.

Overall, the aim of the route profiles is to begin to develop and document service improvement opportunities based on the strengths and weaknesses identified in each route. Some of the service improvement recommendations presented in this document will eventually evolve into recommendations, while others will not.

PAGE INTENTIONALLY LEFT BLANK

ROUTE 1W: WEST MICHIGAN

Service Description

Route 1W (**Figure 78** and **Figure 79**) is a local service operating between the Battle Creek Transportation Center and Taylor Avenue in northwest Battle Creek. The route operates on weekdays and Saturdays, primarily along W. Michigan Avenue. On Saturdays, the route has an alternative alignment and service is extended to the Rolling Hills Trailer Park on all trips and to Bedford Manor on select inbound trips. In addition, Northwestern Junior High School is directly served on one outbound trip on school days only.

Figure 78 | Route 1W Weekday Alignment

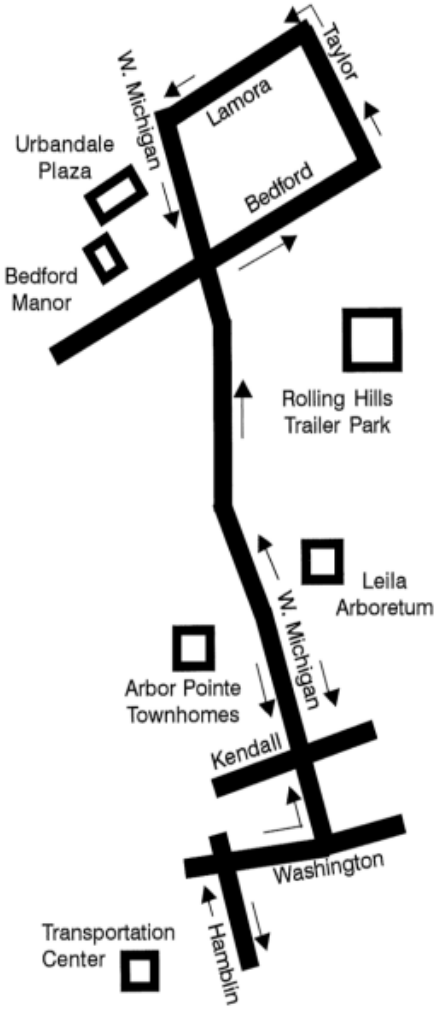
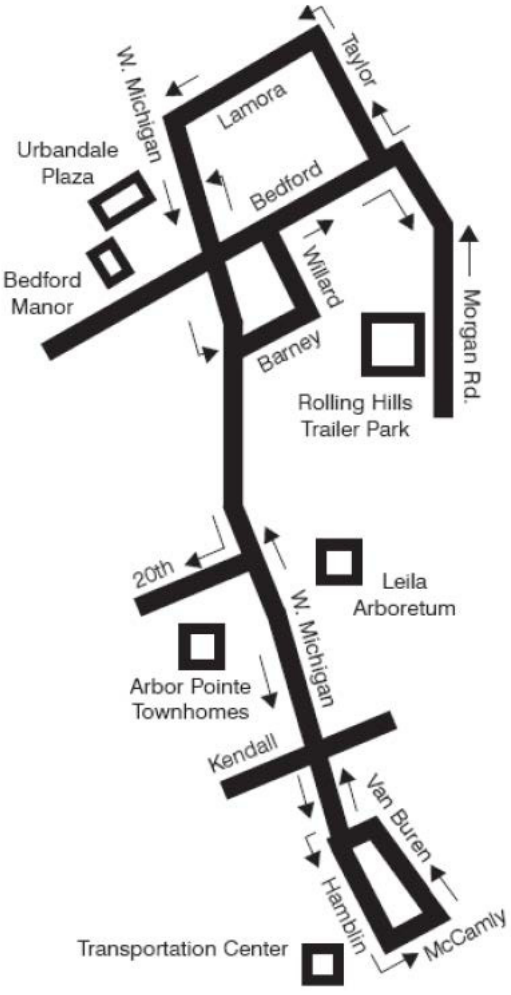


Figure 79 | Route 1W Saturday Alignment



Operating Characteristics

Table 46 | Route 1W Operating Characteristics

Destination	**From**		Battle Creek Transportation Center
	To		Taylor Avenue & Mason
Span	**Weekday**		5:15 AM – 6:43 PM
	Saturday		9:15 AM – 5:10 PM
	Sunday		-
Frequency	**Weekday**	**Peak**	60
		Off-Peak	60
	Saturday		60
	Sunday		-
Daily Operating Cost	**Weekday**		$705.11
	Saturday		$705.11
Route Connections			2E, 2W, 3E, 3W, 4N, 4S, 5W
Key Destinations			Downtown Transportation Center, Calhoun County Work First, Family Fare Supermarket

Service Productivity

Route 1W carries approximately 15.3 passengers per revenue hour on a typical weekday. This is somewhat below the fixed-route average for the system (see **Table 2**), and ranks 5th among all BCT routes. The route also ranks 5th in weekday on-time performance, with 84 percent of timepoints served between zero and five minutes late during a typical weekday (15 percent early and one percent late).

Route 1W carries approximately 3.8 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in 6th place for this metric among the eight BCT routes. Finally, at $6.59 per passenger trip, Route 1W has the 4th highest weekday operating costs per passenger among BCT routes, falling just above the system average of $6.38.

At 7.1 passengers per revenue hour on Saturdays (**Table 48**), Route 1W has a lower productivity than it does on weekdays, and falls below the Saturday system average. The route carries 3.5 passengers per one-way trip on Saturdays, matching the system average, and has a slightly higher-than-average operating cost per passenger on Saturdays.

Table 47 | Route 1W Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1 / 15.3	Average 85% / 84%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9 / 3.8	Average $6.38 / $6.59

Table 48 | Route 1W Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 / 7.1	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 / 3.5	Average $14.47 / $14.24

Ridership

Route 1W carries approximately 107 passengers on a typical weekday, and 50 on an average Saturday. This is the second-lowest daily ridership count among BCT routes for both service day types.

Ridership by Stop

Figure 80 and **Figure 81** summarize weekday passenger activity (boardings and alightings) by stop in the westbound direction. Westbound ridership activity is highest at Taylor Avenue, Post Community Credit Union and the downtown Transportation Center.

Figure 82 and **Figure 83** summarize total activity by stop in the eastbound direction. In this direction, boarding activity is highest at the Transportation Center, Rite Aid on Michigan Avenue, and 236 Bedford Road.

Figure 80 | Route 1W Weekday Ridership by Stop: Westbound

Figure 81 | Route 1W Weekday Boardings and Alightings, by Stop: Westbound

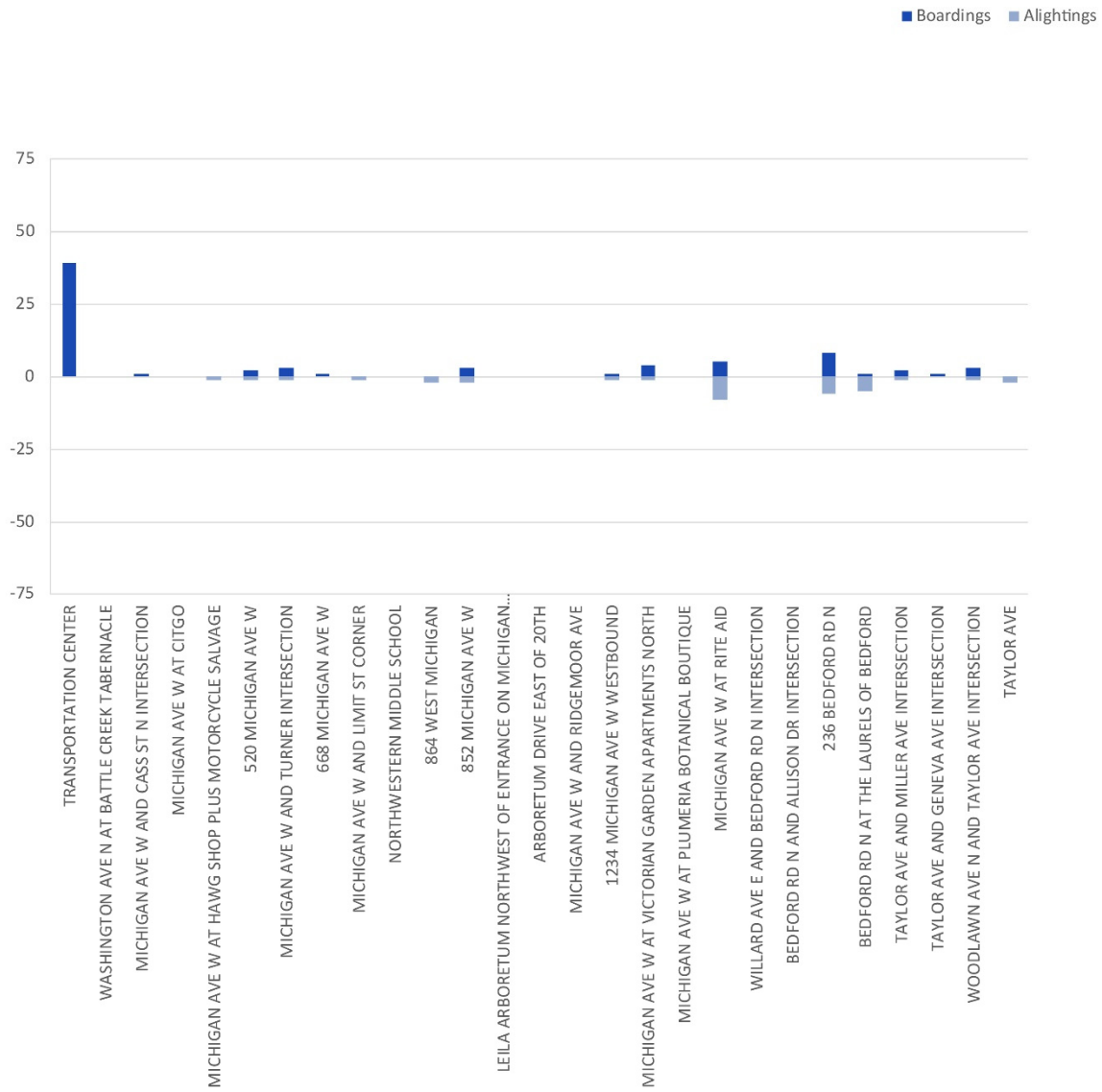


Figure 82 | Route 1W Weekday Ridership by Stop: Eastbound

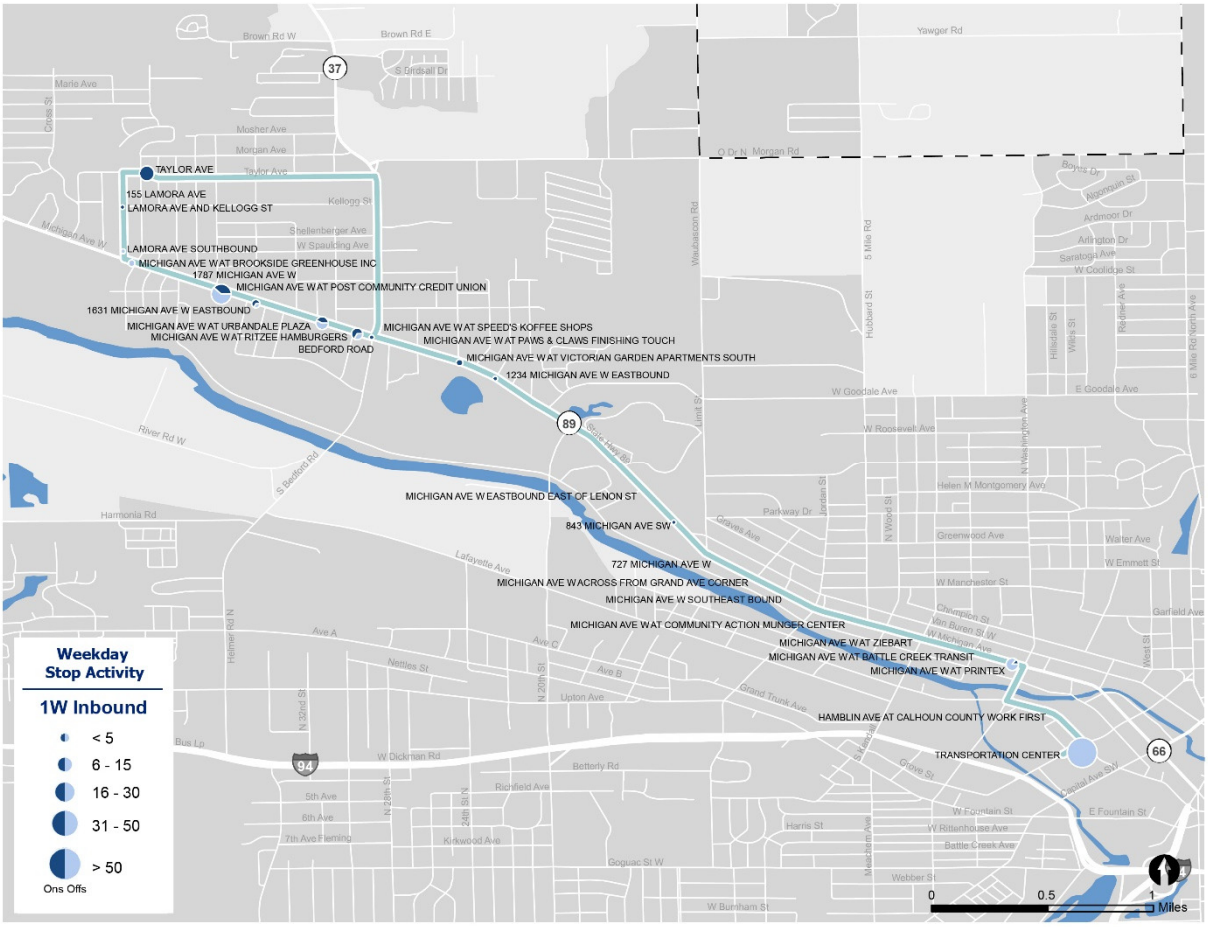
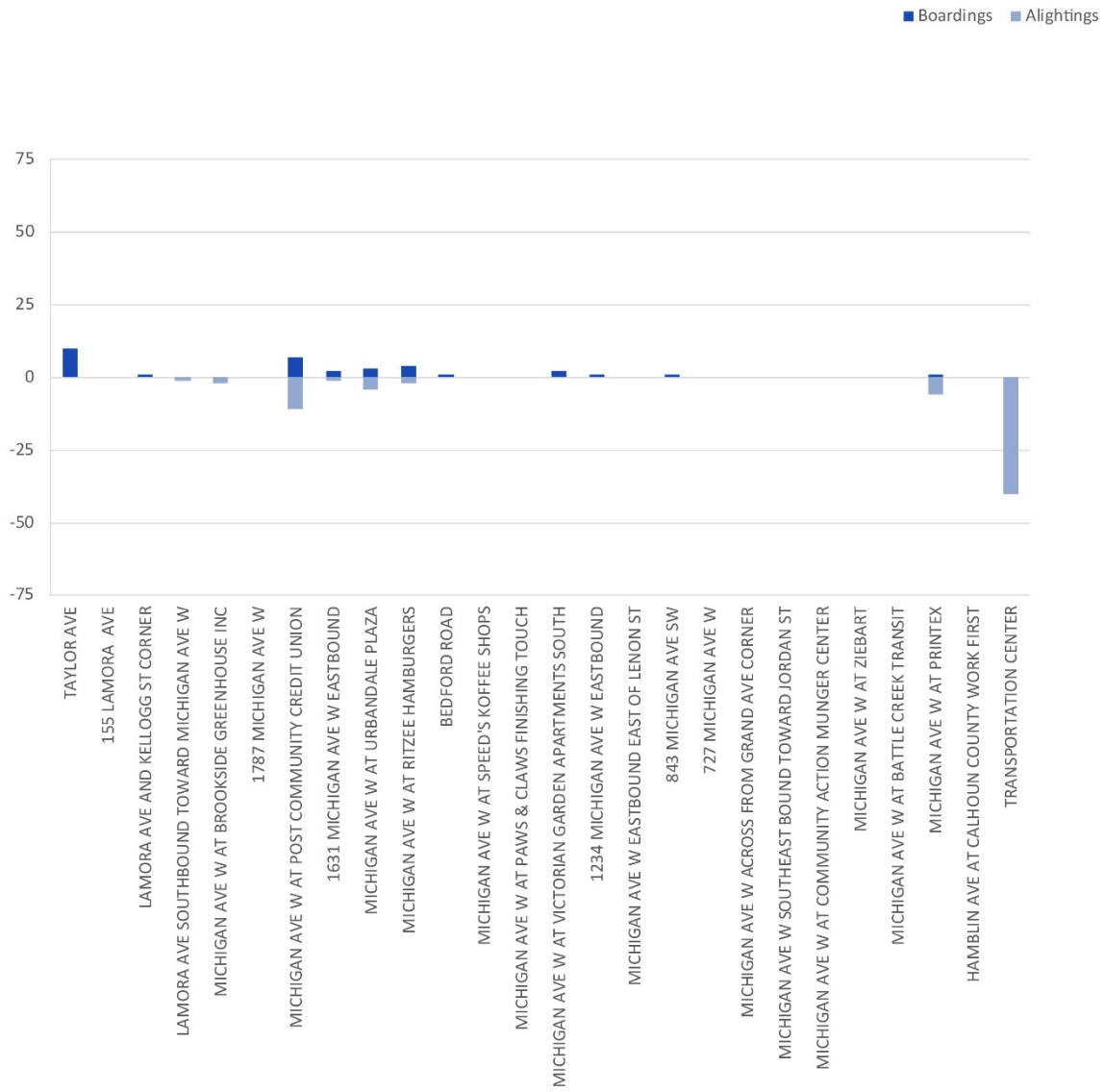


Figure 83 | Route 1W Weekday Boardings and Alightings, by Stop: Eastbound



Ridership by Trip

Figure 84 (westbound) and **Figure 85** (eastbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 1W trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Figure 84 | Route 1W Weekday Ridership by Trip: Westbound

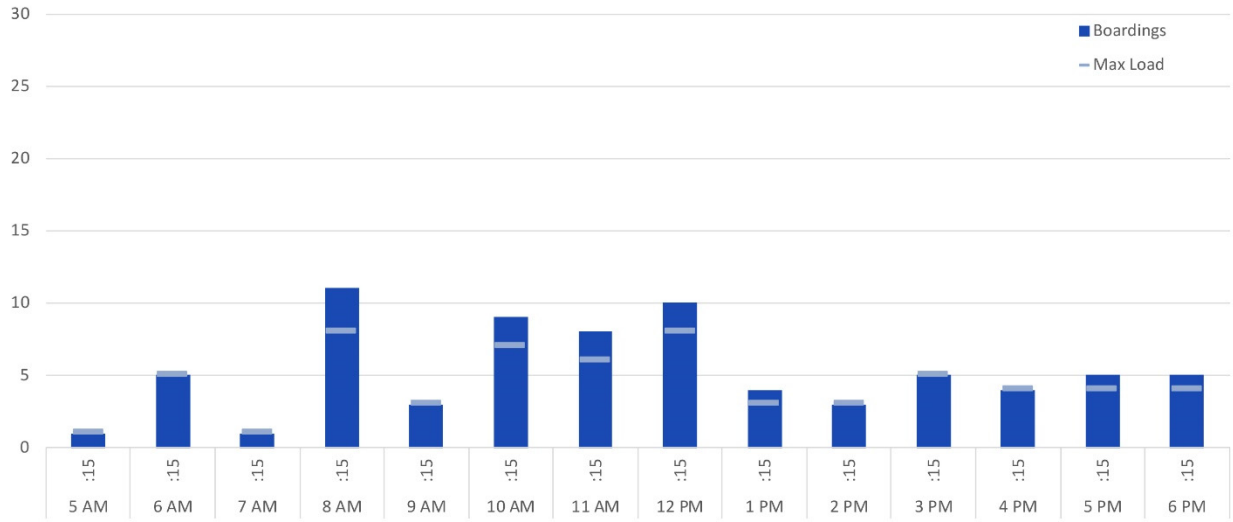
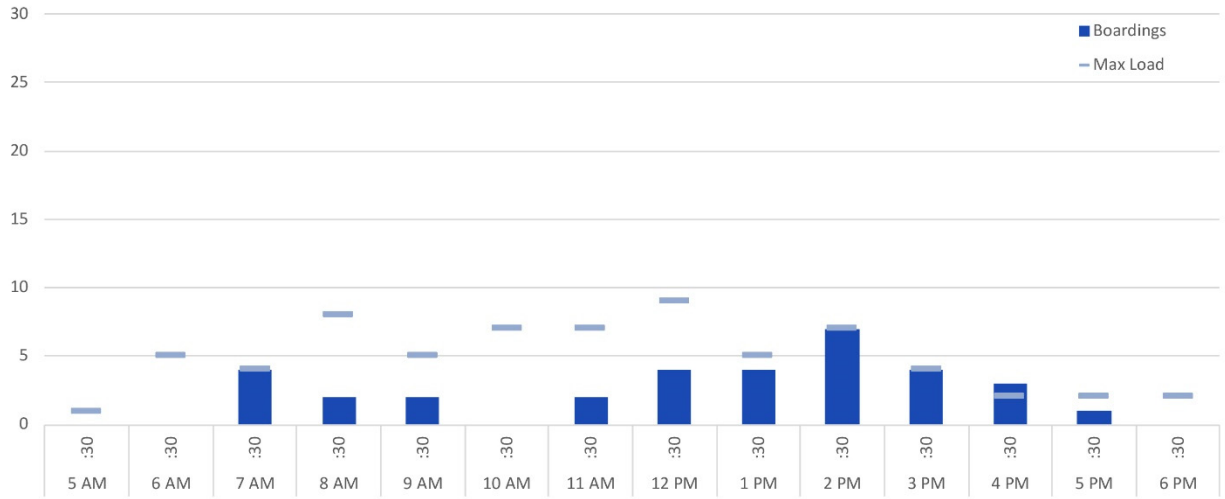


Figure 85 | Route 1W Weekday Ridership by Trip: Eastbound



Summary of Observations

Strengths

- Only route serving W. Michigan Avenue corridor
- Simple and direct service alignment
- Easy-to-remember clock-face frequency
- Well-coordinated connection opportunities in downtown Battle Creek
- Relatively strong on-time performance (although below system average)

Weaknesses

- Below-average weekday ridership and productivity
- Above-average weekday cost per passenger
- Relatively large one-way loop that allows residents of neighborhoods north of Michigan Avenue to easily get to nearest grocery store, but makes it difficult to get back home with groceries

- Very low ridership before 6:00 AM on weekdays
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 1W are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

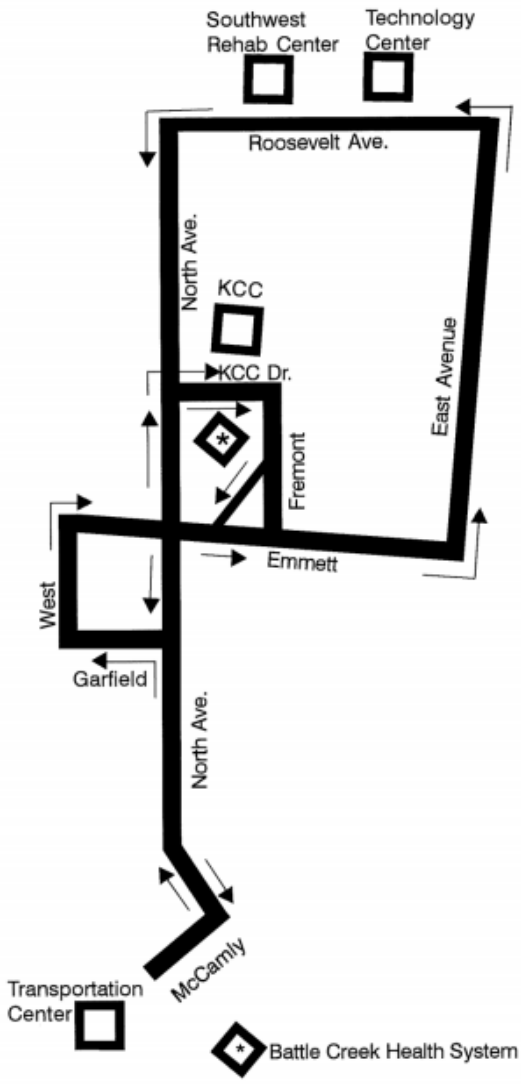
- **Improve access to large multi-family housing complexes.** Route 1W comes within close proximity of two large multi-family housing complexes (Arbor Point Townhomes at Jackson Street and Arbor Point Drive, and River Apartments at Stringham Road and Babcock Street). Both complexes have the potential to generate strong ridership, but neither has good pedestrian connections to near-by bus stops on Michigan Avenue. Access to these complexes could be improved by either adding sidewalks to link them to Michigan Avenue (i.e. along Lenon Street, N. 20th Street, and Stringham Road), or by rerouting to serve these complexes more directly (i.e. shift some route segments to Jackson Street).
- **Establish mini-hub at Urbandale Plaza.** Route 1W currently includes a large one-way terminal loop that allows residents of the neighborhoods north of Urbandale Plaza get to Dollar Tree and Family Fare, but not to get back home without a long walk, out-of-direction ride, or transfer between buses. This limits the appeal of the service for most prospective riders. Terminating the route at Urbandale Plaza could allow for the creation of a local shuttle service the neighborhoods and mobile home parks north of Michigan Avenue. Urbandale Plaza could serve as a transfer points for passengers wishing to connect from the local shuttle to the more traditional line-haul route serving downtown. Feeding the local shuttle into Urbandale Plaza would create a strong hub, both for retail activity and transit connections. Passengers waiting to make a transfer could make good use of their time with shopping or other errands at the various Urbandale Plaza retailers.
- **Begin service in the 6:00 AM hour.** Route 1W ridership is very low before 6:00 AM. Beginning service an hour later would improve the routes over-all productivity with minimal disruption to the vast majority of current riders.

ROUTE 2E: EMMETT – EAST AVENUE

Service Description

Route 2E (**Figure 86**) is a local service operating between the Battle Creek Transportation Center and Roosevelt Avenue in northeast Battle Creek. The route operates on weekdays and Saturdays, primarily along North Avenue, Emmett Street, East Avenue, and Roosevelt Avenue. Outbound trips directly serve Garfield Avenue, West Street, and Kellogg Community College, while inbound trips directly serve Bronson Battle Creek Hospital.

Figure 86 | Route 2E Weekday/Saturday Alignment



Operating Characteristics

Table 49 | Route 2E Operating Characteristics

Destination	**From**		Battle Creek Transportation Center
	To		Roosevelt Avenue & East
Span	**Weekday**		5:45 AM – 6:13 PM
	Saturday		9:15 AM – 5:30 PM
	Sunday		-
Frequency	**Weekday**	**Peak**	60
		Off-Peak	60
	Saturday		30
	Sunday		-
Daily Operating Cost	**Weekday**		$654.75
	Saturday		$805.84
Route Connections			1W, 2W, 3E, 3W, 4N, 4S, 5W
Key Destinations			Downtown Transportation Center, Bronson Battle Creek Hospital, Save-A-Lot Supermarket

Service Productivity

Route 2E carries approximately 10.3 passengers per revenue hour and 2.6 passengers per trip one-way trip on a typical weekday, ranking last among BCT routes for both metrics (**Table 50**). The route also has a significantly higher-than-average operating cost per passenger than the weekday system average. However, Route 2E has relatively strong on-time performance compared to other weekday routes. 88 percent of time points are served between zero and five minutes late during a typical weekday (six percent early and 1 percent late).

On Saturdays, Route 2E ridership is generally very low. The route carries just 2.5 passengers per revenue hour and less than one passenger per trip on an average weekday. Route 2E provides more trips on Saturdays than on weekdays, resulting in a very high operating cost of $39.79 per passenger trip.

Table 51 provides productivity information for Route 2E on Saturdays.

Table 50 | Route 2E Weekday Service Productivity Metrics

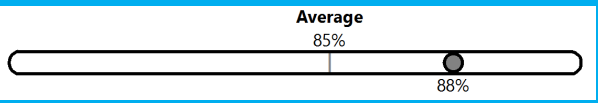
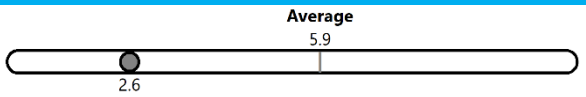
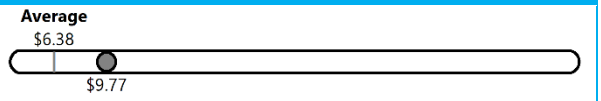
Passengers per Revenue Hour	On-Time Performance
	
Passengers per trip	**Operating Cost per Passenger**
	

Table 51 | Route 2E Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 (2.5)	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 (0.6)	Average $14.47 ($39.79)

Ridership

Route 2E carries approximately 67 passengers on a typical weekday and 20 on an average Saturday. This is the lowest daily ridership count among BCT routes for both service day types.

Ridership by Stop

Figure 87 and **Figure 88** summarize weekday passenger activity (boardings and alightings) by stop in the northbound direction. Northbound ridership activity is highest at the downtown Transportation Center and Kellogg Community College, but is quite low overall.

Figure 89 and **Figure 90** summarize total activity by stop in the southbound direction. In this direction, passenger activity is highest at 378 Emmett Street, BCHS Outpatient, North Avenue near the Christian Science Reading Room, and the downtown Transportation Center.

Figure 87 | Route 2E Weekday Ridership by Stop: Northbound

Figure 88 | Route 2E Weekday Boardings and Alightings, by Stop: Northbound

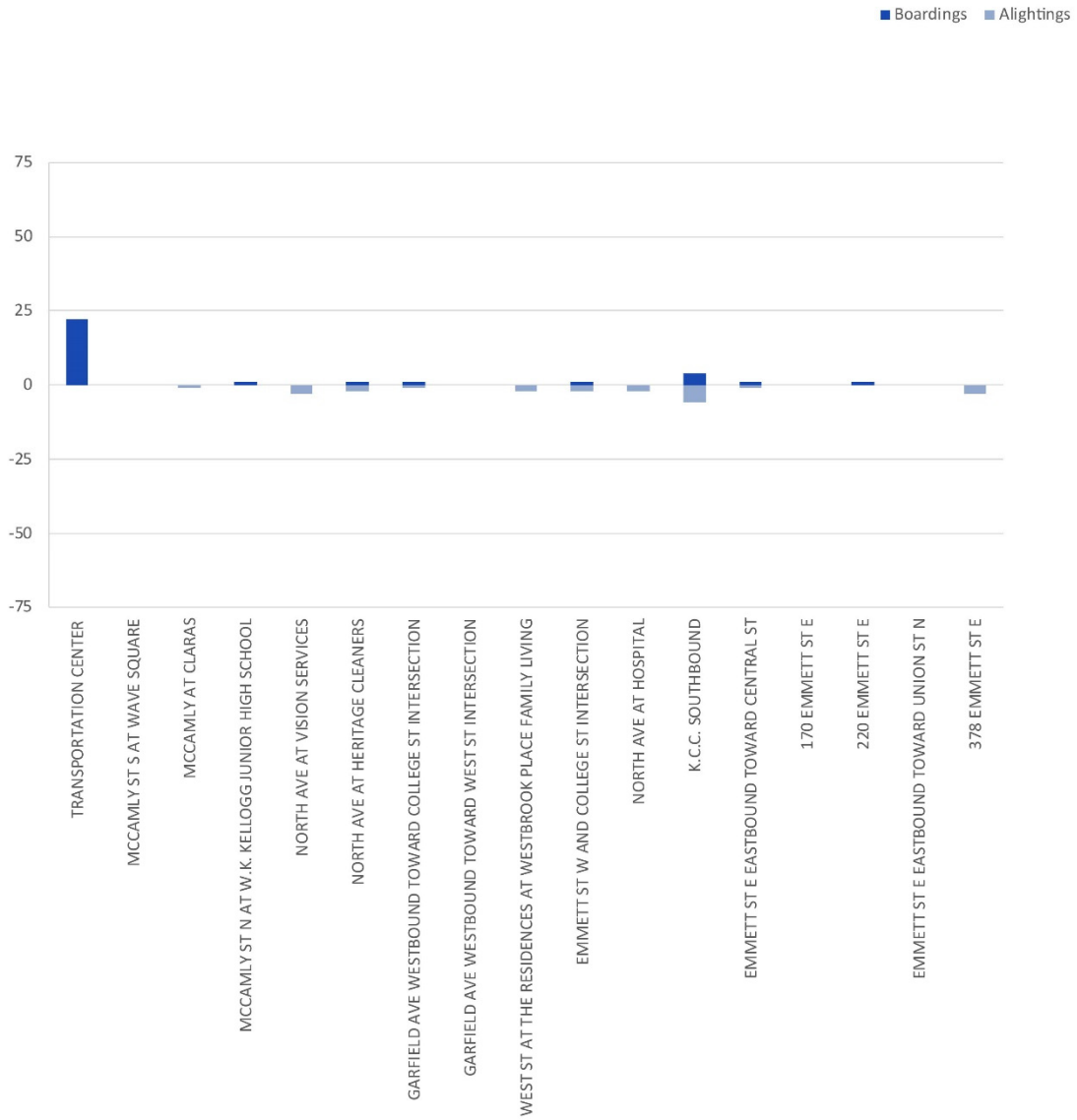
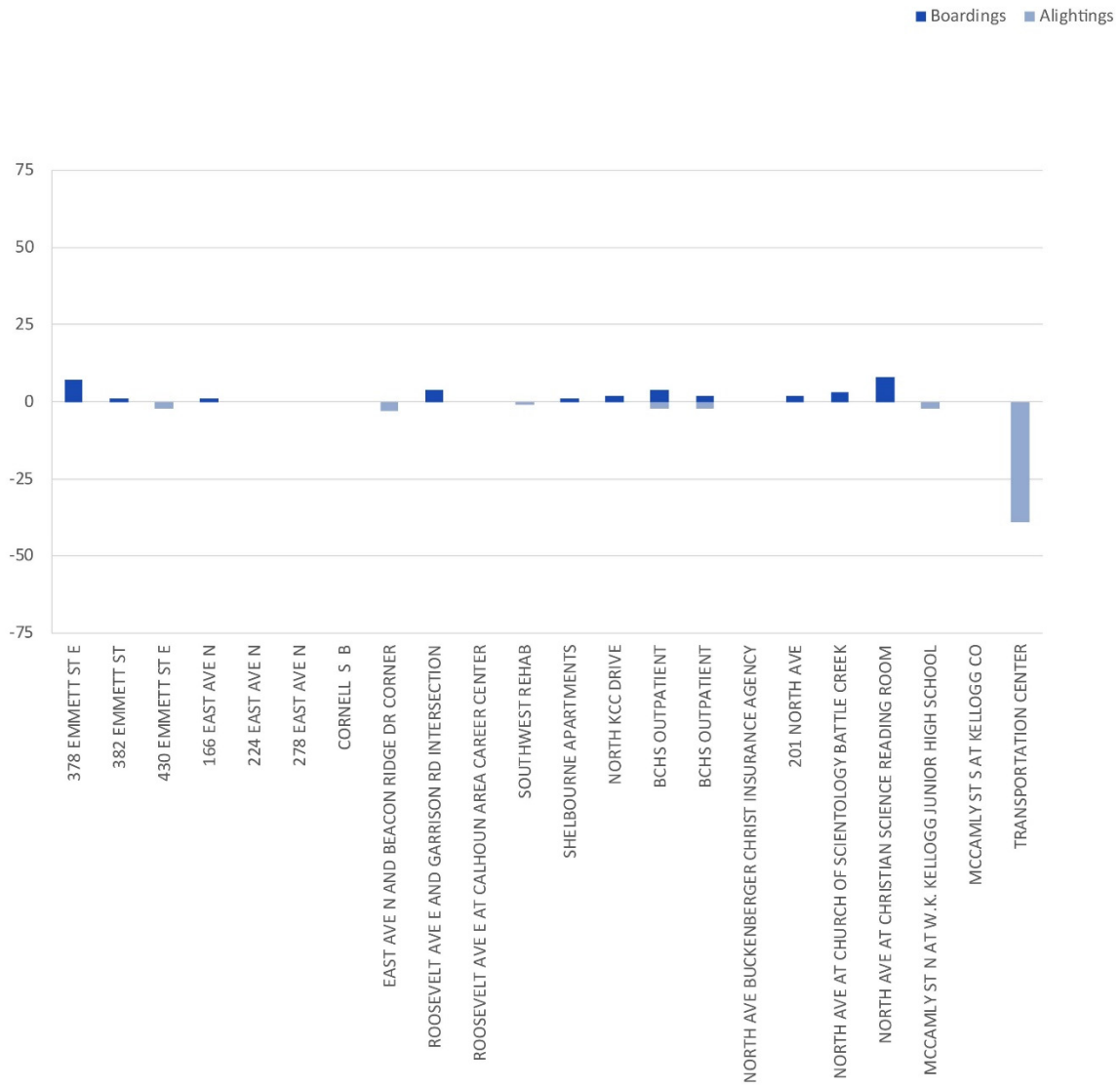


Figure 89 | Route 2E Weekday Ridership by Stop: Southbound

Figure 90 | Route 2E Weekday Boardings and Alightings, by Stop: Southbound



Ridership by Trip

Figure 91 (northbound) and **Figure 92** (southbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 2E trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Figure 91 | Route 2E Weekday Ridership by Trip: Northbound

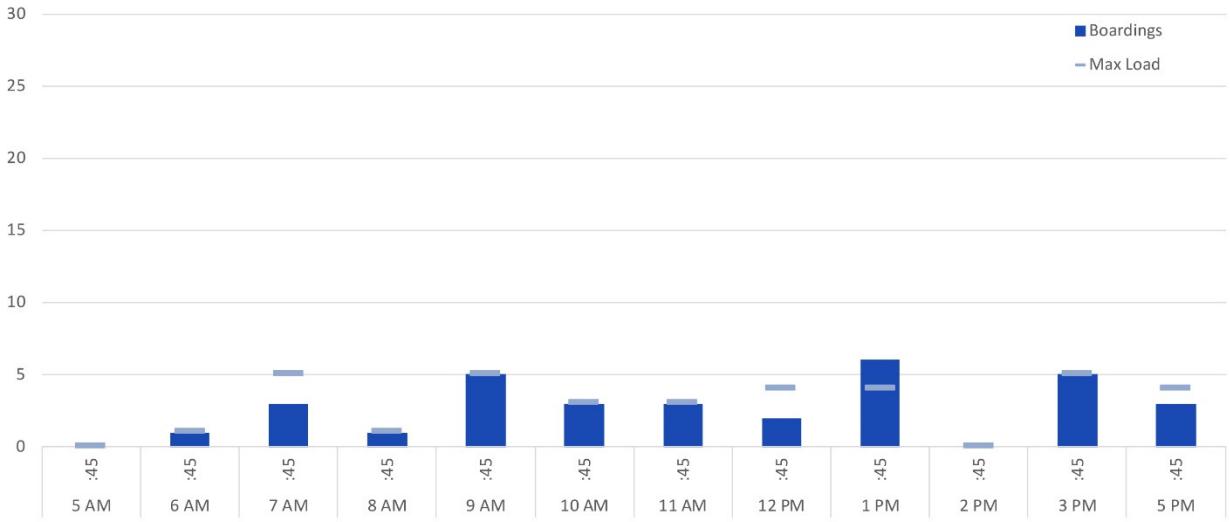
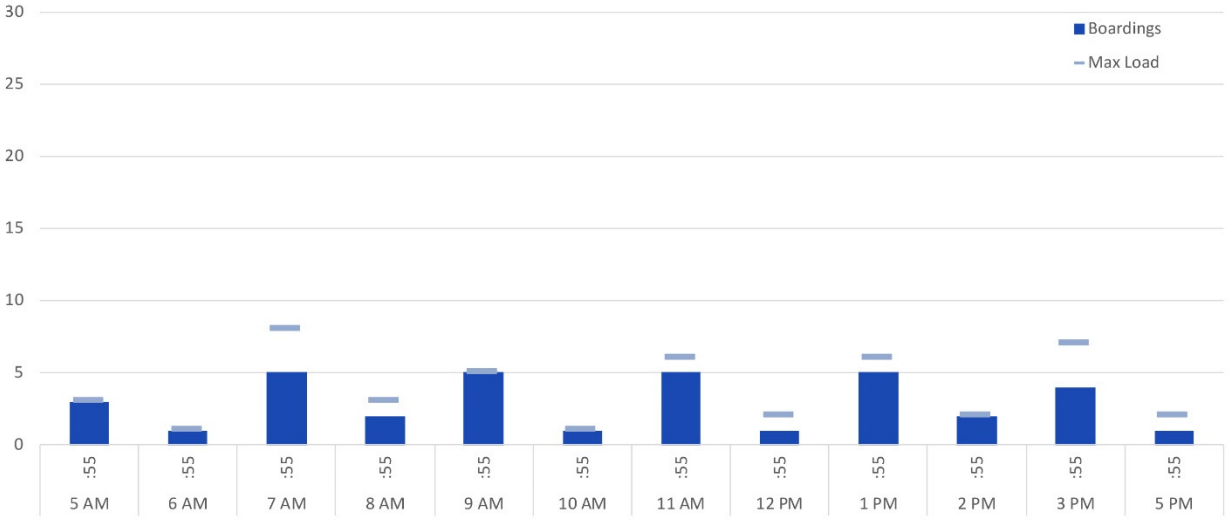


Figure 92 | Route 2E Weekday Ridership by Trip: Southbound



Summary of Observations

Strengths

- Only route serving Bronson Battle Creek Hospital and Kellogg Community College
- Easy-to-remember clock-face frequency
- Well-coordinated connection opportunities in downtown Battle Creek
- Relatively strong on-time performance

Weaknesses

- Very low productivity on all service days
- High cost per passenger, especially on Saturdays
- Many stops with no riders adjacent to single-family residential neighborhoods
- Most stops along Emmett Street and East Avenue serve single-family home neighborhoods and generate little or no ridership
- Large one-way loop that forces many riders to travel out-of-direction on either their inbound or outbound trip.
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 2E are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

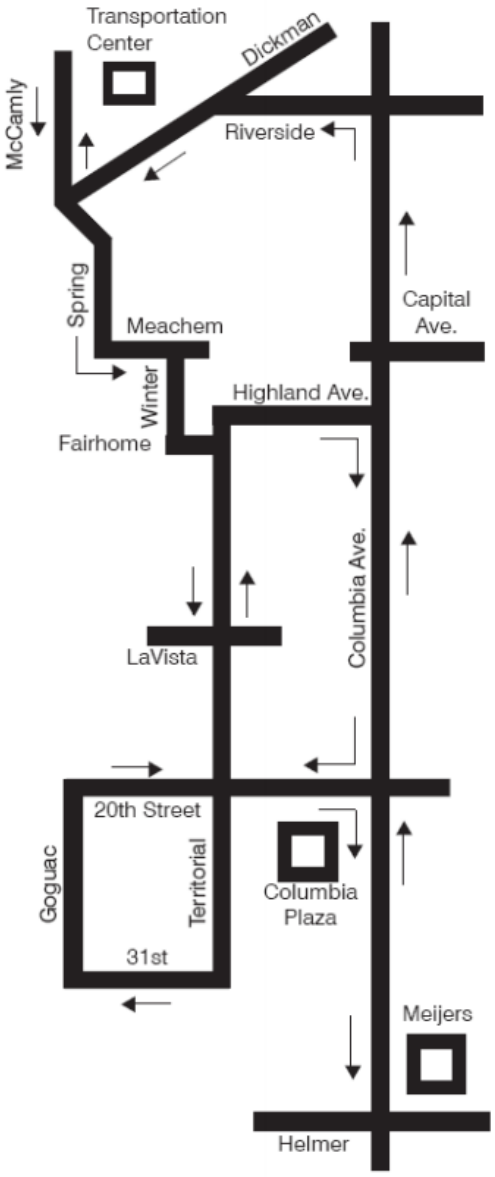
- **Simplify alignment.** Route 2E has several route segments that are served in one direction only or that differ depending on direction of travel. For example, West Street is served in the northbound direction only, requiring passengers to walk to or from North Avenue for southbound service. Given the high population density along West Avenue, with several large apartment complexes, the street should be served consistently in both directions. Similarly, service could be provided more consistently to Bronson Battle Creek Hospital and Kellogg Community College, particularly if the Route's large terminal loop is replaced with bi-directional service (see below).
- **Eliminate unproductive service segments and provide more bi-directional service.** Most Route 2E stops east of North Avenue generate little or no ridership, as they serve primarily single-family home neighborhoods. Eliminating service along Emmett Street and East Street could allow Route 2E to provide better service in areas where the potential for ridership is greatest. For example, from West Street, the route could turn east onto Emmett, but then enter the Bronson Battle Creek Hospital driveway from the south. It could then continue to Fremont Street and serve Kellogg Community College, exiting onto North Avenue. From North Avenue, Route 2E could serve the apartments and retail destinations along Springview Drive, and then turn east onto Roosevelt Avenue in order to serve the Calhoun Area Career Center. If a suitable turn-around location can be identified along Garrison Avenue, the route could serve several more large apartment communities before returning downtown along the same alignment.
- **Extend route to Capital Avenue.** An alternative to terminating Route 2E at Garrison Avenue is to extend it to the Family Fare Supermarket on Capital Avenue. This extension would give the route a very strong anchor and facilitate convenient connections between several large apartment communities along West Street and Springview Drive, and the Family Fare Supermarket. In addition, if buses are routed via East Avenue and J Bartlett Drive, improved access could be provided to the Crown Chase Apartments. Buses serving Family Fare would return downtown along the same alignment as their outbound trip.

ROUTE 2W: COLUMBIA – TERRITORIAL

Service Description

Route 2W (**Figure 93**) is a local service operating between the Battle Creek Transportation Center and Meijer on West Columbia Avenue. The route operates on weekdays and Saturdays, primarily along Meachem Avenue, Territorial Road, and Columbia Avenue. Several route segments are served either on inbound trips or outbound trips, but not both. 31st Street, Goguac Street, and 20th Street are only served outbound, while Riverside Drive is served inbound only.

Figure 93 | Route 2W Map



Operating Characteristics

Table 52 | Route 2W Operating Characteristics

Destination	**From** **To**		Battle Creek Transportation Center Meijer West Columbia
Span	**Weekday** **Saturday** **Sunday**		5:15 AM – 6:10 PM 9:15 AM – 5:10 PM -
Frequency	**Weekday**	**Peak** **Off-Peak**	60 60
	Saturday **Sunday**		60 -
Daily Operating Cost	**Weekday** **Saturday**		$1,309.49 $705.11
Route Connections			1W, 2E, 3E, 3W, 4N, 4S, 5W
Key Destinations			Downtown Transportation Center, Columbia Plaza, Alternatives of Battle Creek, Meijer, Lakeview High School

Service Productivity

Route 2W carries approximately 12.2 passengers per revenue hour on a typical weekday. This is below the weekday average for the system and is second-lowest among BCT routes (**Table 53**). This also results in a higher-than-average operating cost per passenger. Route 2W is a relatively long route, so it is able to provide fewer total trips per day than many other routes. As a result, its ridership per trip is above the weekday system average. It also has best on-time performance of all fixed-routes, with 91% of weekday timepoints being served between zero and five minutes late (9 percent early and 0 percent late).

At 7.5 passengers per hour on Saturdays (**Table 54**), Route 2W is less productive than it is on weekdays and falls below the Saturday system average. The route carries 3.8 passengers per one-way trip on Saturdays, slightly better than the Saturday system average, and also has a slightly better-than-average operating cost per passenger on Saturdays.

Table 53 | Route 2W Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1; 12.2	Average 85%; 91%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9; 6.1	Average $6.38; $8.24

Table 54 | Route 2W Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2; 7.5	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5; 3.8	Average $14.47; $13.43

Ridership

Route 2W carries approximately 159 passengers on a typical weekday and 53 on an average Saturday. This puts it in 6th place among BCT routes for both service day types.

Ridership by Stop

Figure 94 and **Figure 95** summarize weekday passenger activity (boardings and alightings) by stop in the outbound direction. Given the route's multiple directional changes, Columbia Plaza was designated as the transition point between outbound and inbound service. Service up to Columbia Plaza is generally described as westbound, even though buses travel east along some outbound route segments. Similarly, ridership is generally referred to as eastbound after Columbia Plaza, even though buses initially travel further west from plaza before returning east.

Westbound ridership activity is highest at the downtown Transportation Center, 192 Meachem Avenue, Territorial Road near 20th Street, and Columbia Plaza.

Figure 96 and **Figure 97** summarize total activity by stop in the eastbound direction. In this direction, passenger activity is highest at Columbia Plaza, Meijer, Columbia Avenue near Alternatives of Battle Creek, and the downtown Transportation Center.

Figure 94 | Route 2W Weekday Ridership by Stop: Westbound

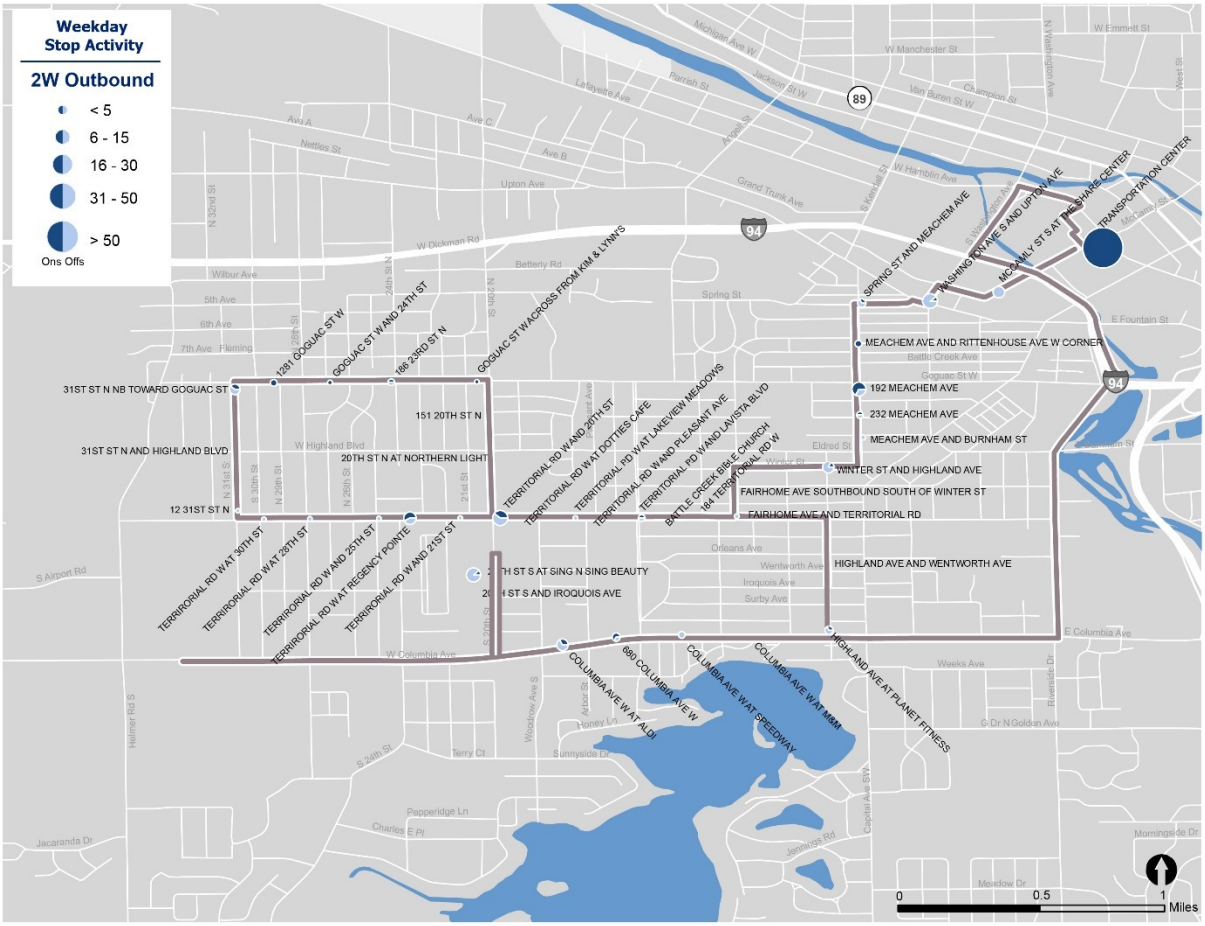


Figure 95 | Route 2W Weekday Boardings and Alightings, by Stop: Westbound

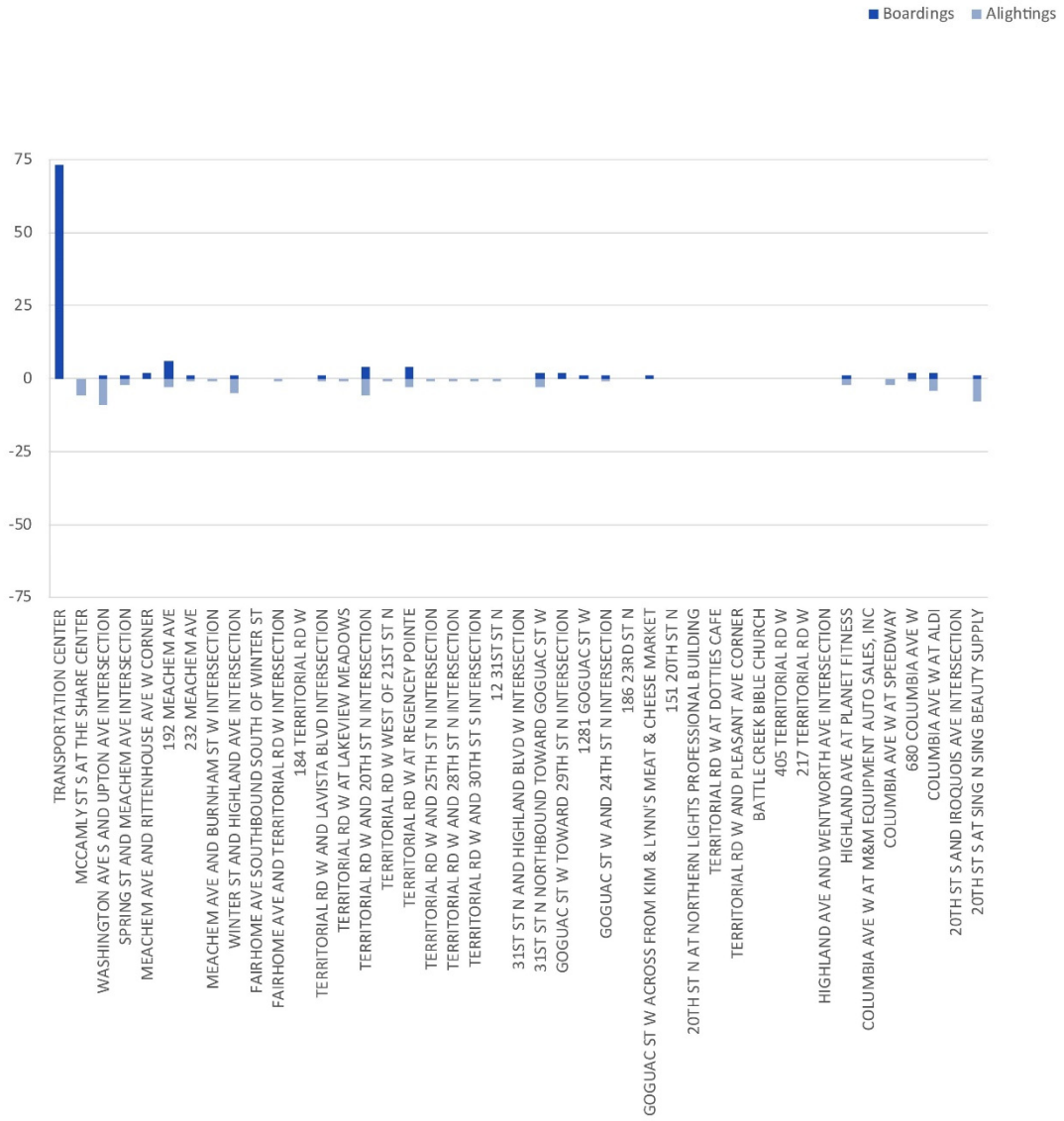


Figure 96 | Route 2W Weekday Ridership by Stop: Eastbound

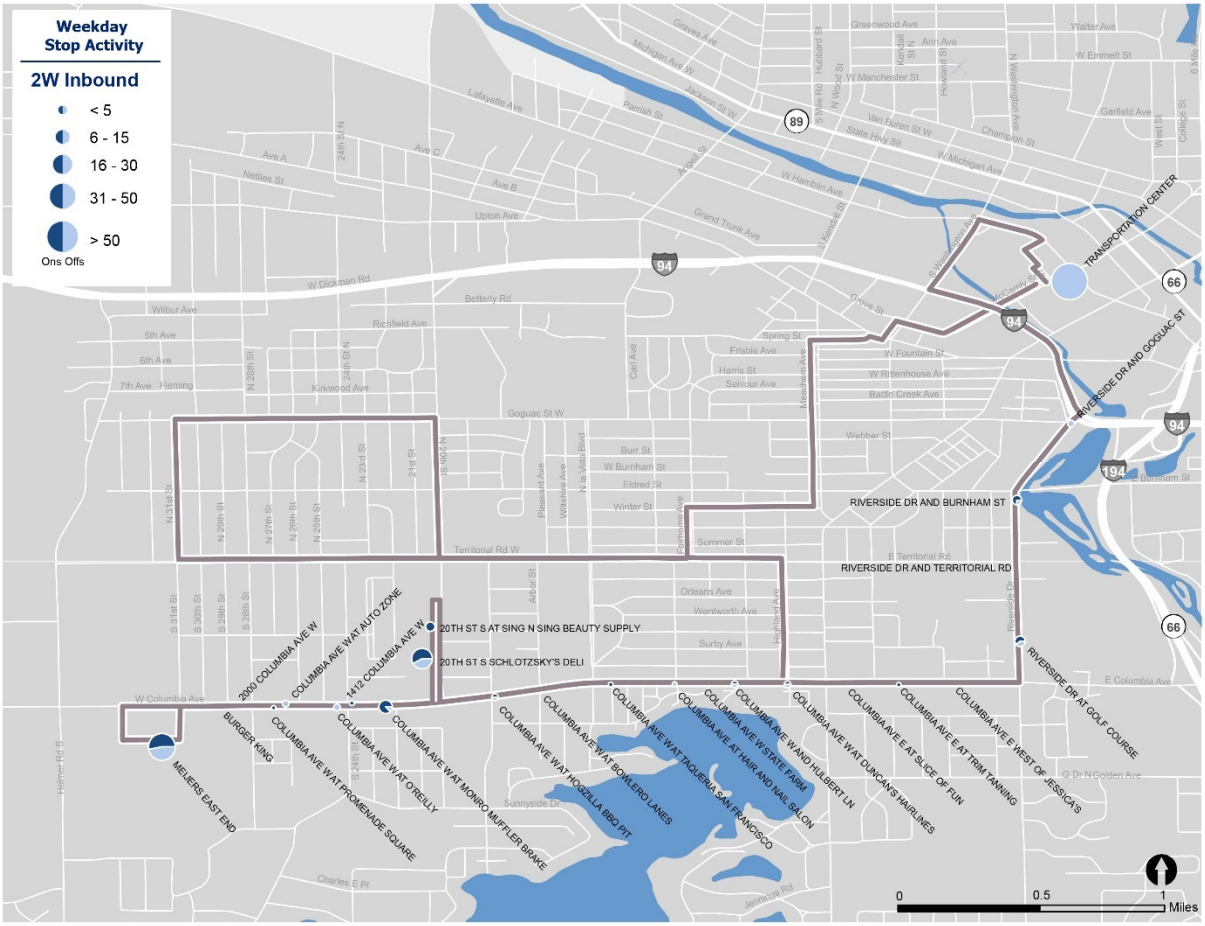
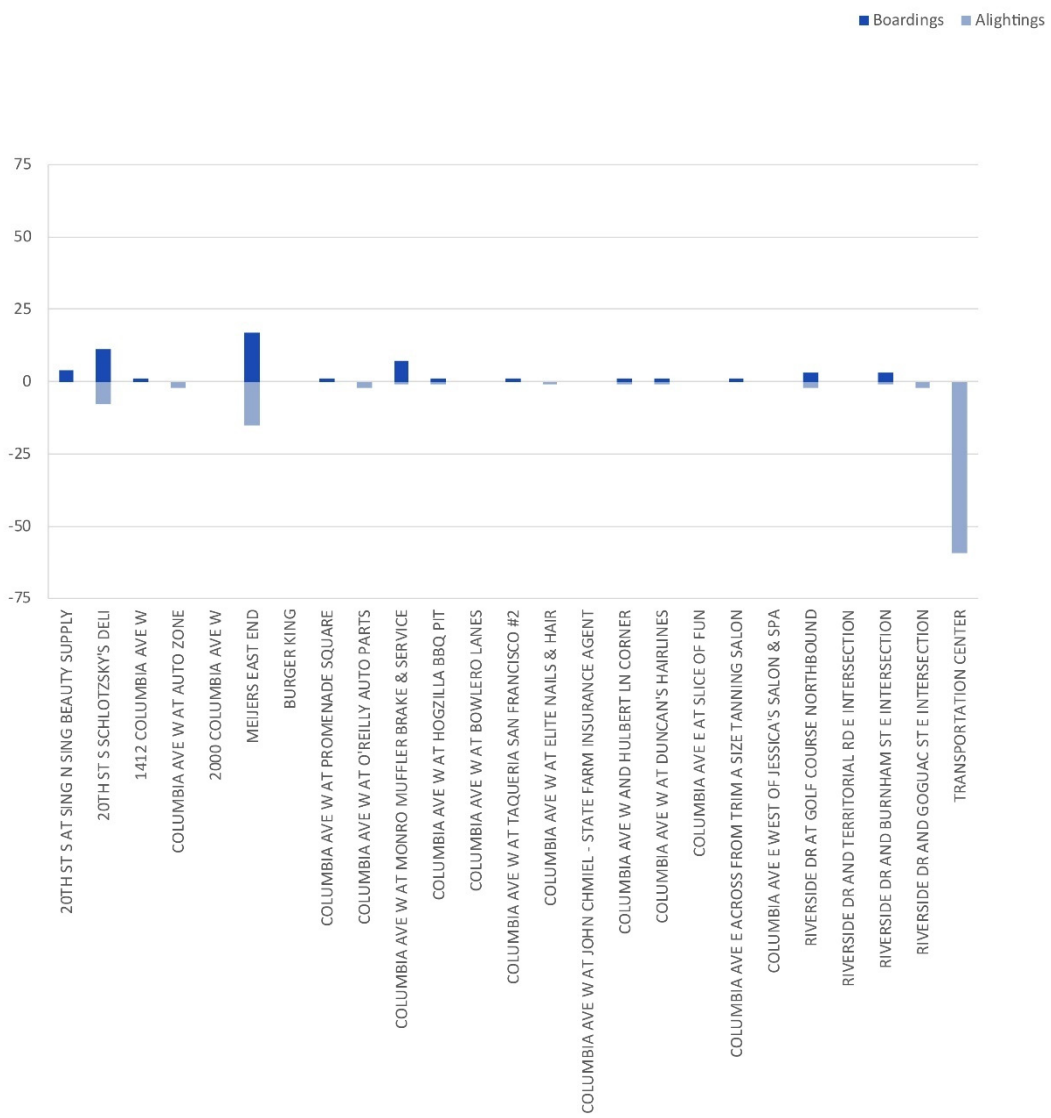


Figure 97 | Route 2W Weekday Boardings and Alightings, by Stop: Eastbound



Ridership by Trip

Figure 98 (westbound) and **Figure 99** (eastbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 2W trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Figure 98 | Route 2W Weekday Ridership by Trip: Westbound

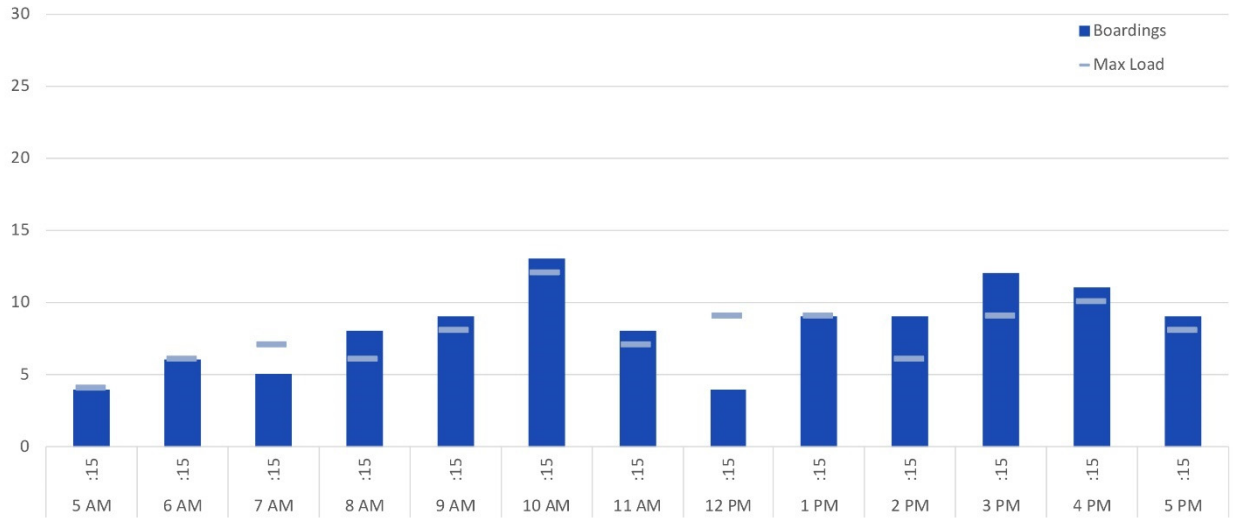
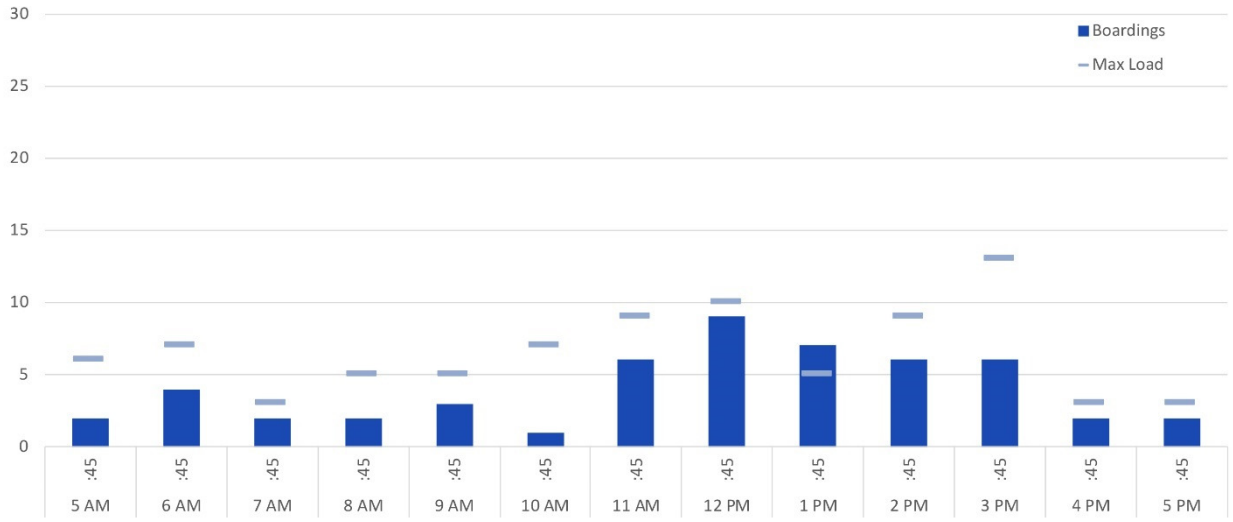


Figure 99 | Route 2W Weekday Ridership by Trip: Eastbound



Summary of Observations

Strengths

- Only route serving W. Columbia retail corridor
- Easy-to-remember clock-face frequency
- Well-coordinated connection opportunities in downtown Battle Creek
- Very strong on-time performance
- Above-average ridership trip

Weaknesses

- Below-average ridership per hour
- Above-average weekday cost per passenger

- Circuitous alignment with several segments of one-way service loop that allows residents of neighborhoods along Territorial Road to get to grocery stores along Columbia Avenue, but makes it difficult to get back home with groceries
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 2W are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

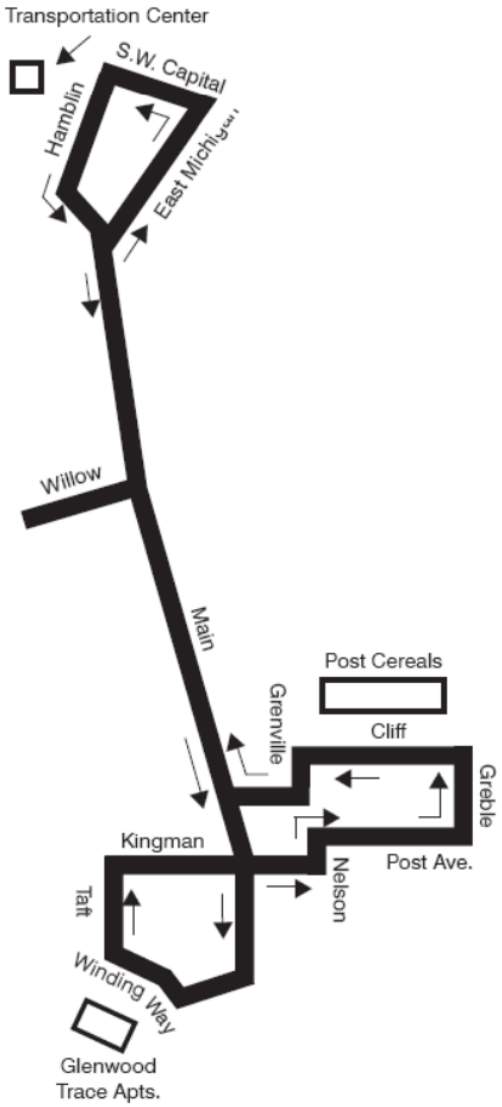
- **Simplify alignment and provide more bi-directional service.** Route 2W is a very circuitous route with several one-way segments and reversals in direction. While this approach allows the route to cover a large area, it also makes the service inconvenient for current riders and unappealing to most prospective riders. For example, a passenger who boards at the Lakeview Meadows Apartments and wishes to go to Meijer, must first ride eastbound toward downtown before heading west to Meijer. After shopping, the passenger would need to ride all the way to downtown Battle Creek before being able to return to Lakeview Meadows. The route could be substantially simplified by eliminating the Territorial/Goguac loop, which generates very little ridership. Instead, outbound buses could turn south on 20th Street and then west on Columbia Avenue to Meijer. Inbound trips could follow the same alignment as the outbound service to provide bi-directional service along the entire route.
- **Shift outbound service from Meachum Avenue to Riverside Drive.** To streamline service and generate higher ridership, Route 2W could operate outbound along Riverside Drive before turning west on E. Territorial Road and rejoining the current alignment west of Capital Avenue. This alignment would allow for bi-directional service to several apartment complexes along Riverside Drive and link them to retail and grocery destinations along Columbia Avenue. Most stops along Meachum Avenue, Winter Street, and Fairhome Avenue generate very little ridership.

ROUTE 3E: MAIN – POST

Service Description

Route 3E (**Figure 100**) is a local service operating between the Battle Creek Transportation Center and Post Foods on Cliff Street. The route operates on weekdays and Saturdays, primarily along Main Street, Kingman Avenue, and Cliff Street. Until recently, the route included two one-way loops as shown in **Figure 23**, serving the River Oaks (formerly Glenwood Trace) Apartments and Post Cereals, respectively. However, the route no long serves Winding Way, which is in Emmett Township. Instead, buses traveling south on Main Street now turn right on right on Massachusetts Avenue, left on Taft Street, and left on Kingman Avenue toward Post Foods. The maps and figures in this document reflect the previous alignment as this information is still shown in passenger schedules.

Figure 100 | Route 3E Map



Operating Characteristics

Table 55 | Route 3E Operating Characteristics

Destination	**From** **To**		Battle Creek Transportation Center Post Foods
Span	**Weekday** **Saturday** **Sunday**		5:15 AM – 6:43 PM 9:15 AM – 5:13 PM -
Frequency	**Weekday**	**Peak** **Off-Peak**	30 30
	Saturday **Sunday**		30 -
Daily Operating Cost	**Weekday** **Saturday**		$1,359.86 $805.84
Route Connections			1W, 2E, 2W, 3W, 4N, 4S, 5W
Key Destinations			Downtown Transportation Center, Battle Creek City Hall, Calhoun County Department of Health and Human Services, Post Foods, Main Street Market

Service Productivity

Route 3E carries approximately 13.6 passengers per revenue hour on a typical weekday. This is below the weekday average for fixed-route service (see **Table 56**), and ranks 6th among all BCT routes. The route has relatively poor on-time performance on weekdays, with just 77 percent of timepoints served between zero and five minutes late during a typical weekday (23 percent early and 0 percent late).

Route 3E carries approximately 3.4 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in 7th place for this metric among the eight BCT routes. Finally, at $7.39 per passenger trip, Route 3E has the third-highest weekday operating costs per passenger among BCT routes.

At 7.8 passengers per revenue hour on Saturdays (**Table 57**), Route 3E has a lower productivity than on weekdays, and than the Saturday system average. The route carries 1.9 passengers per one-way trip on Saturdays, compared to a Saturday system average of 3.5 passengers per trip. However, at $13 per passenger, Route 3E beats the Saturday average for fixed-route operating cost per passenger trip.

Table 56 | Route 3E Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1, 13.6	Average 85%, 77%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9, 3.4	Average $6.38, $7.39

Table 57 | Route 3E Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2, 7.8	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5, 1.9	Average $14.47, $13.00

Ridership

Route 3E carries approximately 184 passengers on a typical weekday and 62 on an average Saturday. This puts it in 5th place among BCT routes for weekday ridership and 4th for Saturday ridership.

Ridership by Stop

Figure 101 and **Figure 102** summarize weekday passenger activity (boardings and alightings) by stop in the outbound direction. Given the route's multiple directional changes, Post Foods was designated as the transition point between outbound and inbound service. Service up to Post Foods is generally described as eastbound, service after Post is referred to as westbound.

Eastbound ridership activity is highest at the downtown Transportation Center, Main Street near the Calhoun County Department of Health and Human Services, Kingman Avenue near Pathways Church, and Greble Street near Cliff Street.

Figure 103 and **Figure 104** summarize total activity by stop in the westbound direction. In this direction, passenger activity is highest at Post Foods, Main Street near the Calhoun County Department of Health and Human Services, and the downtown Transportation Center.

Figure 101 | Route 3E Weekday Ridership by Stop: Eastbound

Figure 102 | Route 3E Weekday Boardings and Alightings, by Stop: Eastbound

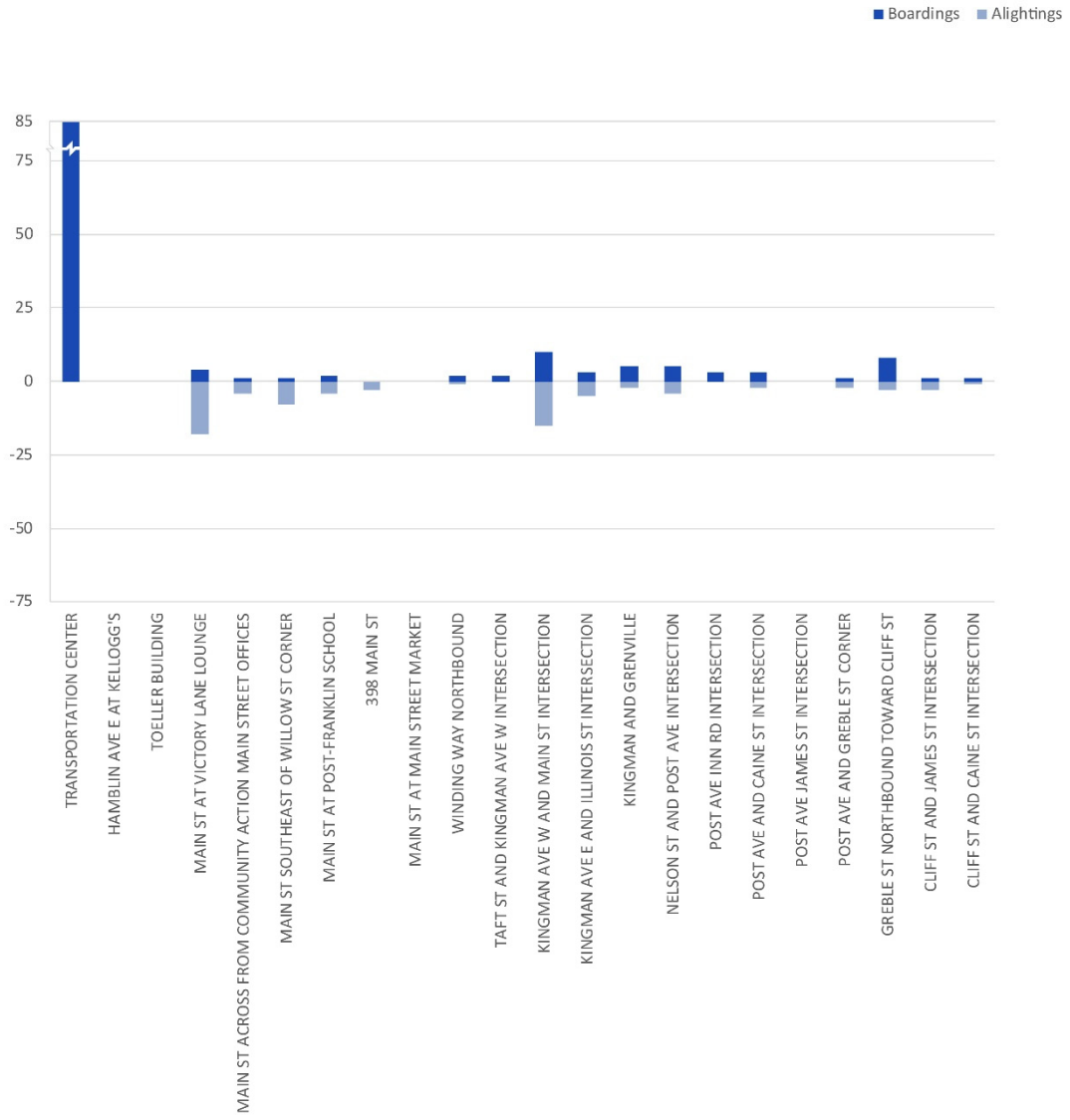


Figure 103 | Route 3E Weekday Ridership by Stop: Westbound

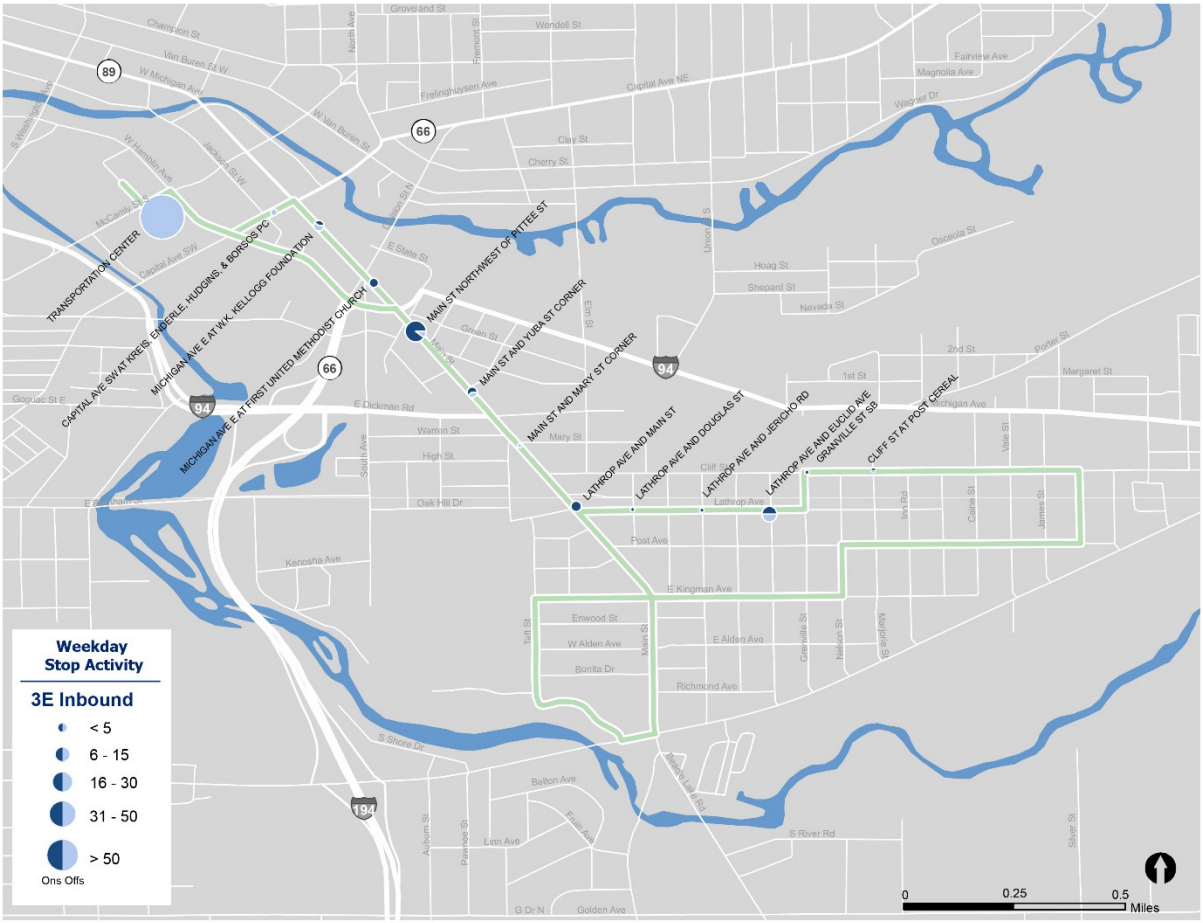
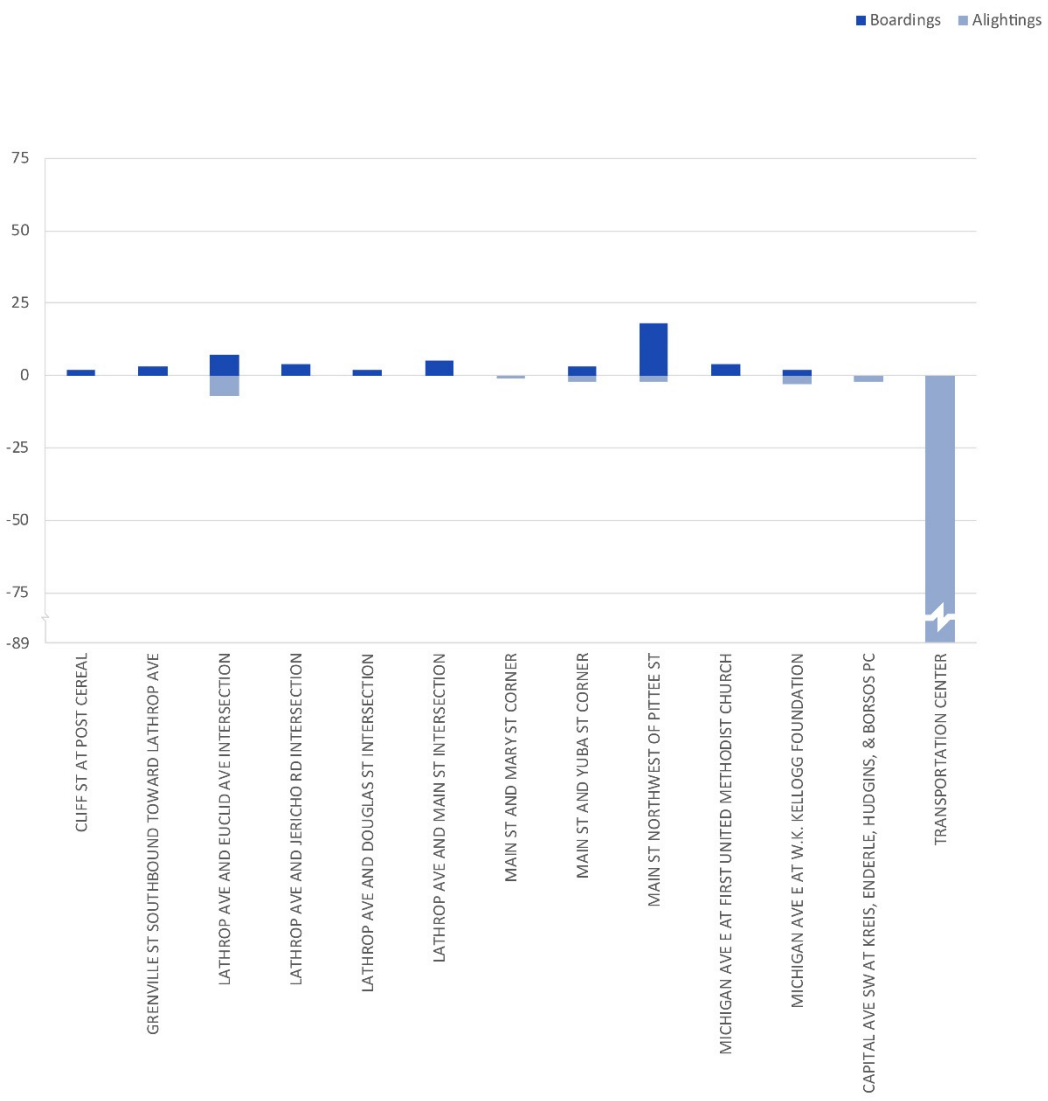


Figure 104 | Route 3E Weekday Boardings and Alightings, by Stop: Westbound



Ridership by Trip

Figure 105 (eastbound) and **Figure 106** (westbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. Route 3E ridership is very low after 5:00 PM. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 3E trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Figure 105 | Route 3E Weekday Ridership by Trip: Eastbound

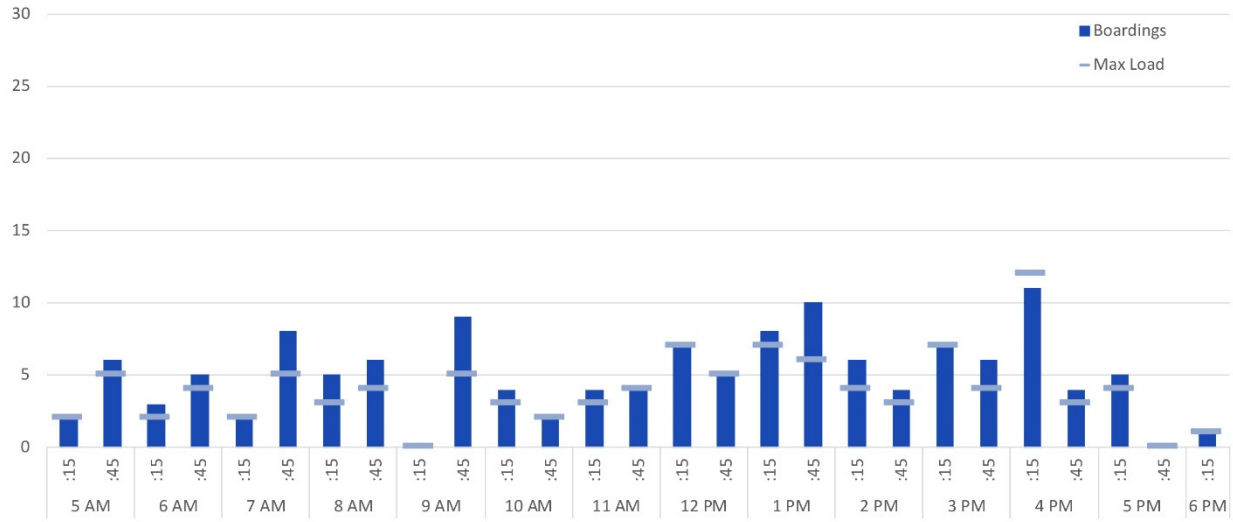
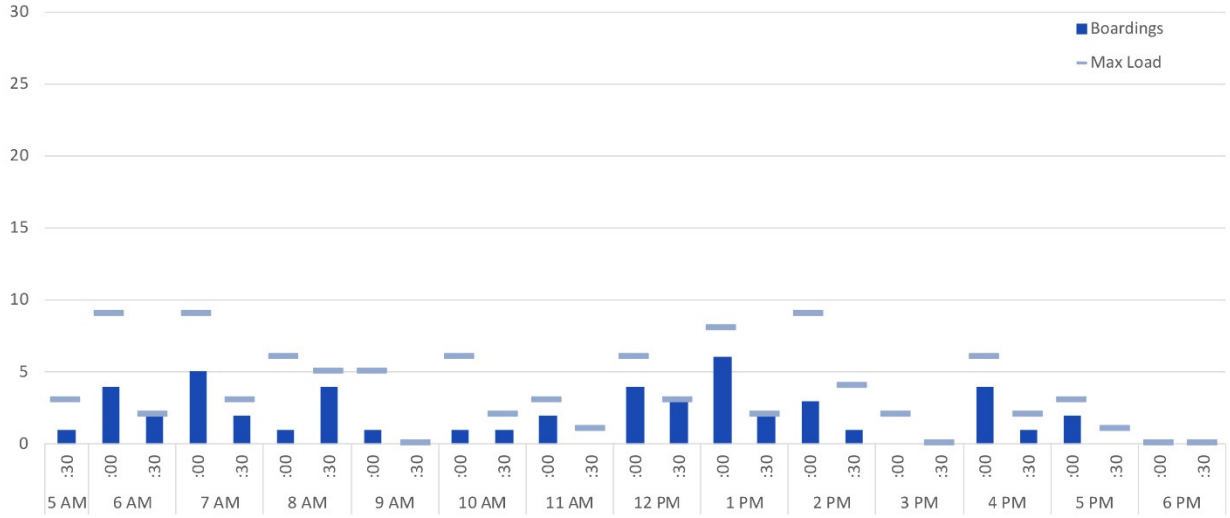


Figure 106 | Route 3E Weekday Ridership by Trip: Westbound



Summary of Observations

Strengths

- Only route serving Post Foods plant
- Easy-to-remember clock-face frequency
- Relatively frequent service
- Well-coordinated connection opportunities in downtown Battle Creek
- Better-than-average operating cost per passenger on Saturdays.

Weaknesses

- Below-average weekday and Saturday ridership and productivity
- Above-average weekday cost per passenger
- Two one-way loops that make it difficult for residents along the route to get either to or from Main Street Market, the only supermarket serving the neighborhoods southeast of downtown.

- Very low ridership after 5:00 PM on weekdays
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 3E are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

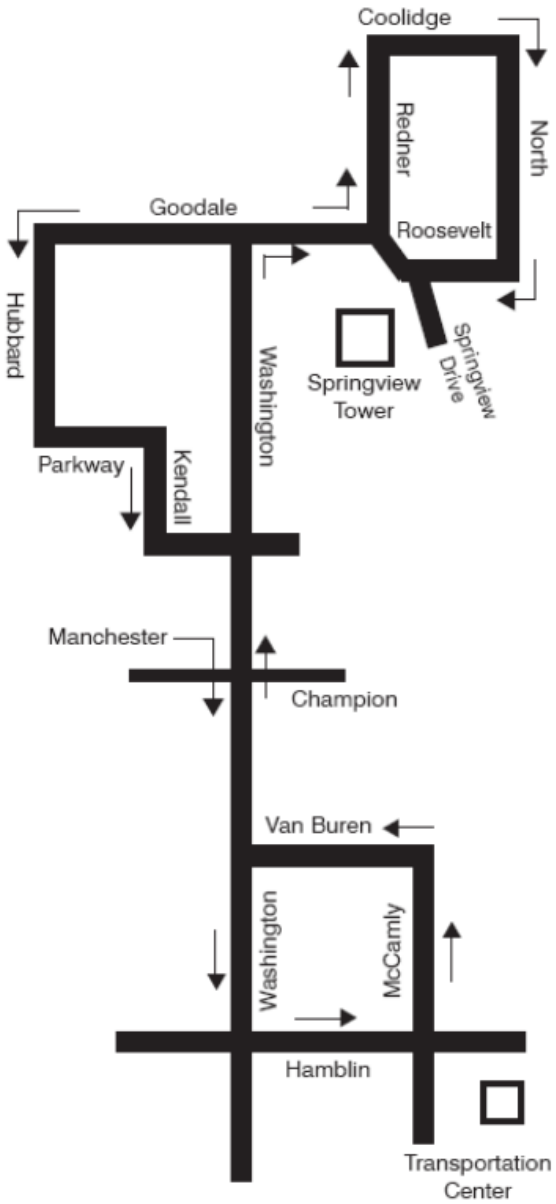
- **Update passenger information.** Route 3E no longer operates south of Kingman Avenue, to avoid entering Emmett Township. However, BCT passenger schedules still show service along Main Street adjacent to Main Street Market, and along Winding Way. This discrepancy can confuse new riders, especially those trying to reach Main Street Market, the only grocery store in neighborhood south of Post Foods and north of E. Columbia Avenue.
- **Provide service to Main Street Market.** As Main Street Market is the only grocery store serving southeast Battle Creek, north of E. Columbia Avenue, it is a critical destination for area residents with limited mobility options. Part of the lot that the grocery store sits on appears to fall within the City of Battle Creek, and part falls within Emmett Township. Service to the store may require an agreement with Emmett Township in order to provide a stop along Main Street.
- **Extend service east along E. Michigan Avenue.** One of the few areas of the Battle Creek region that have the market characteristics to support fixed-route service, but do not currently have service is the E. Michigan Avenue corridor, between Raymond Road and Wattles Road. This area includes several large apartment complexes and mobile home parks that likely include employees of Post Foods. Connecting these communities to the Post Foods plant would likely result in strong ridership. However, these communities are outside the Battle Creek city limits, so service would likely require a funding agreement with Emmett Charter township or Calhoun County.
- **End service in the 5:00 PM hour.** If no other changes are made to Route 3E, service should be cut by approximately an hour, as ridership is very light after 5:00 PM. However, if some of the other changes described above are implements, ridership will likely increase and justify later service hours.

ROUTE 3W: KENDALL – GOODALE

Service Description

Route 3W (**Figure 107**) is a local service operating between the Battle Creek Transportation Center and Springview Tower in north Battle Creek. The route operates on weekdays and Saturdays, primarily along Van Buren Street, Washington Avenue, Goodale Avenue, North Avenue, and Hubbard Street. The route includes two one-way loops, serving the Springview Tower and Parkway Manor Apartments, respectively.

Figure 107 | Route 3W Map



Operating Characteristics

Table 58 | Route 3W Operating Characteristics

Destination	**From**		Battle Creek Transportation Center
	To		Springview Tower
Span	**Weekday**		5:15 AM – 6:43 AM
	Saturday		9:15 AM – 5:13 PM
	Sunday		-
Frequency	**Weekday**	**Peak**	30
		Off-Peak	30
	Saturday		30
	Sunday		-
Daily Operating Cost	**Weekday**		$1,359.86
	Saturday		$805.84
Route Connections			1W, 2E, 2W, 3E, 4N, 4S, 5W
Key Destinations			Downtown Transportation Center, Battle Creek Central High School, US Defense Logistics Agency, Grace Family Health (formerly Family Health Center), Parkway Manor, Springview Tower, Save-A-Lot Supermarket

Service Productivity

Route 3W carries approximately 24.1 passengers per revenue hour on a typical weekday making it the most productive weekday route according to this metric (see **Table 59**). The route has strong on-time performance on weekdays, with 88 percent of timepoints served between zero and five minutes late during a typical weekday (4 percent early and 7 percent late).

Route 3W carries approximately 6 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in 4th place for this metric among the eight BCT routes. Finally, at $4.17 per passenger trip, Route 3W has the lowest weekday operating costs per passenger among BCT routes.

At 13.2 passengers per revenue hour on Saturdays (**Table 60**), Route 3W has a lower productivity than on weekdays, but exceeds the Saturday system average of 9.2. The route carries 3.3 passengers per one-way trip on Saturdays, compared to a Saturday system average of 3.5 passengers per trip. At $7.60 per passenger, Route 3W is substantially more efficient than the $14.47 average fixed-route operating cost per passenger trip for Saturdays.

Table 59 | Route 3W Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1 — 24.1	Average 85% — 88%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9 — 6	Average $6.38 — $4.17

Table 60 | Route 3W Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 — 13.2	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 — 3.3	Average $14.47 — $7.60

Ridership

Route 3W carries approximately 326 passengers on a typical weekday and 106 on an average Saturday. This puts it in 2nd place among BCT routes for ridership on both service day types.

Ridership by Stop

Figure 108 and **Figure 109** summarize weekday passenger activity (boardings and alightings) by stop in the outbound direction. Given the route's multiple directional changes, Save-A-Lot was designated as the transition point between outbound and inbound service. Service up to Save-A-Lot is generally described as northbound, service after Save-A-Lot is referred to as southbound.

Northbound ridership activity is highest at the downtown Transportation Center, near Grace Family Health, along Coolidge Street, and along Roosevelt Avenue.

Figure 110 and **Figure 111** summarize total activity by stop in the southbound direction. In this direction, passenger activity is highest along Roosevelt Street, at the Parkway Manor Apartments, along Manchester Street, and at the downtown Transportation Center.

Figure 108 | Route 3W Weekday Ridership by Stop: Northbound

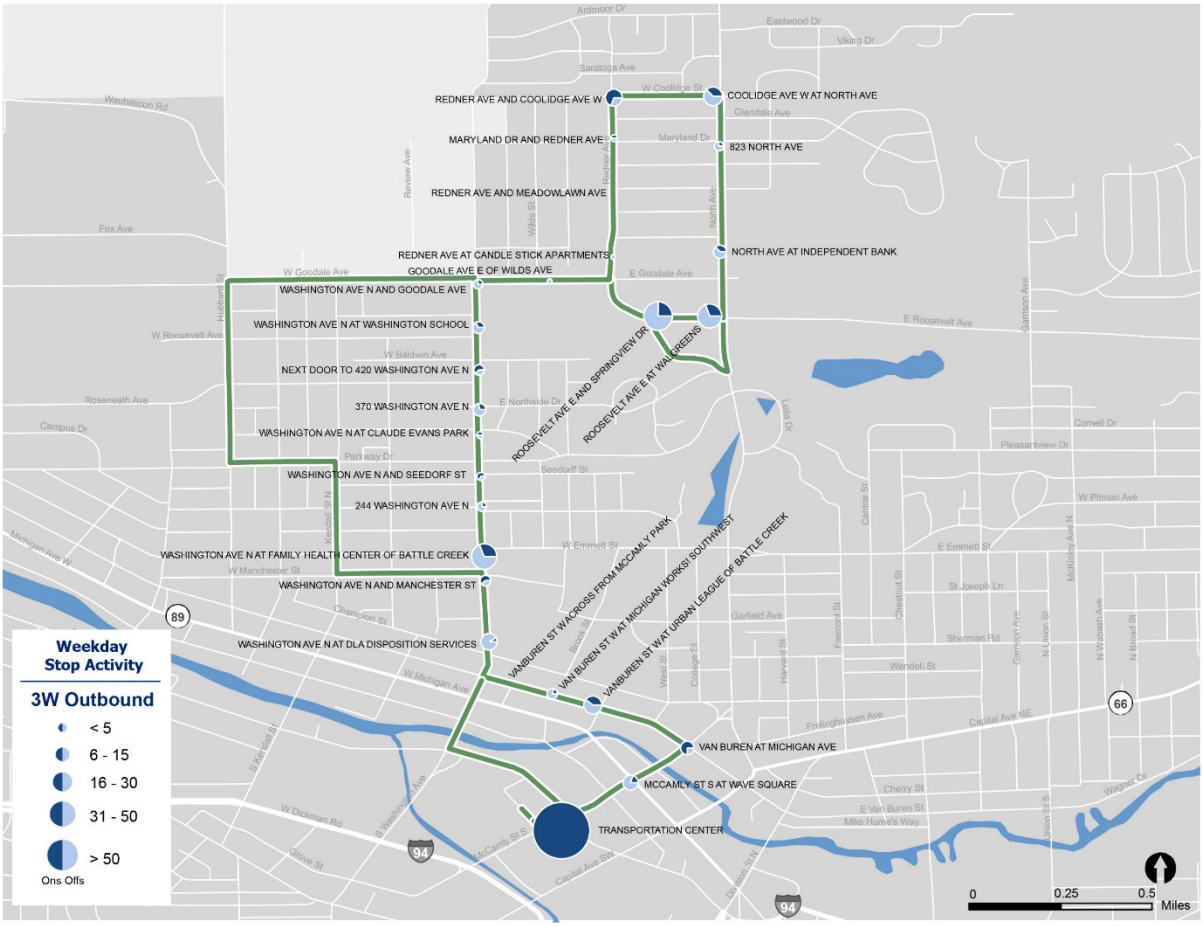


Figure 109 | Route 3W Weekday Boardings and Alightings, by Stop: Northbound

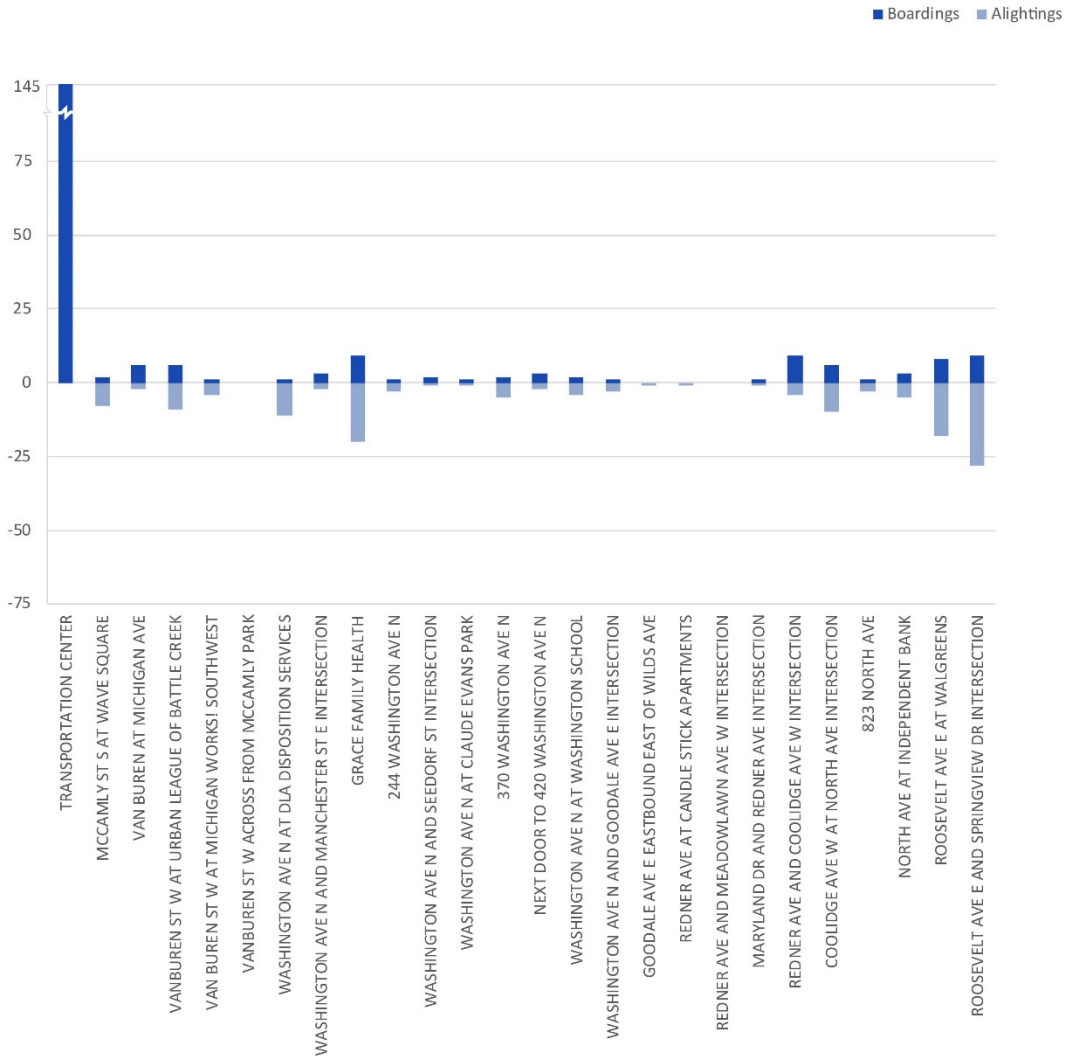


Figure 110 | Route 3W Weekday Ridership by Stop: Southbound

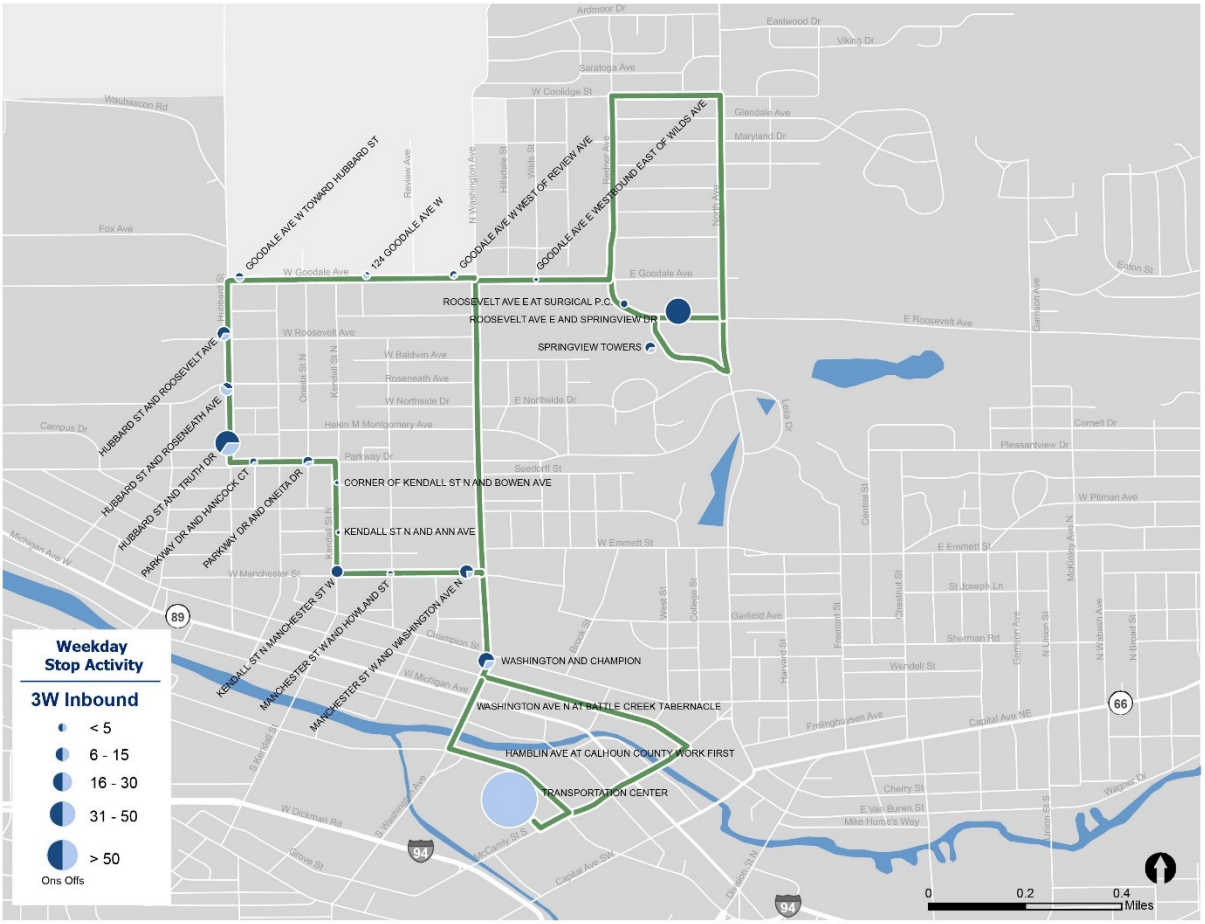
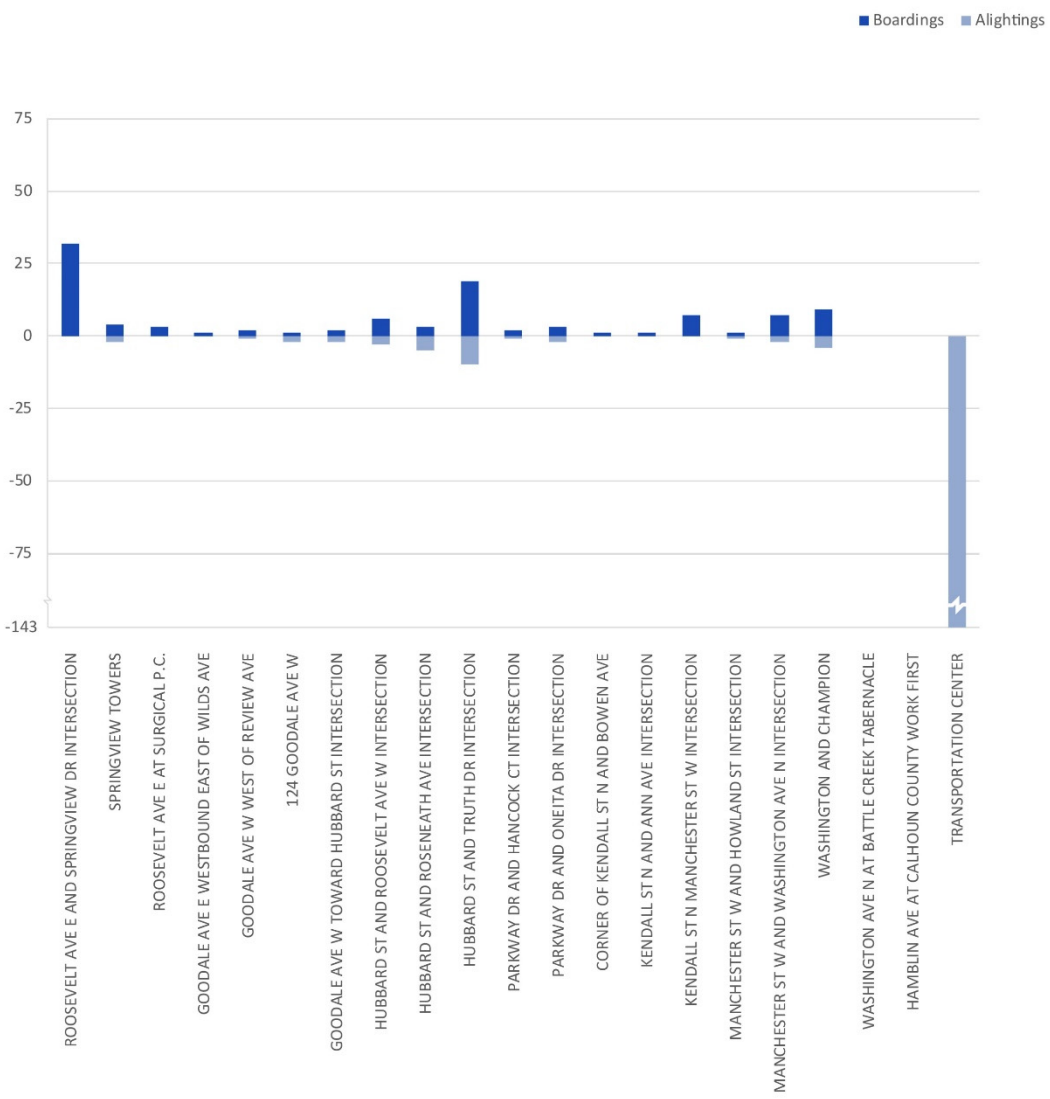


Figure 111 | Route 3W Weekday Boardings and Alightings, by Stop: Southbound



Ridership by Trip

Figure 112 (northbound) and **Figure 113** (southbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 3W trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Route 3W ridership is somewhat reduced during the mid-day, suggesting that a peak/off-peak schedule could improve the route's productivity in terms of ridership per revenue hour and ridership per trip.

Figure 112 | Route 3W Weekday Ridership by Trip: Northbound

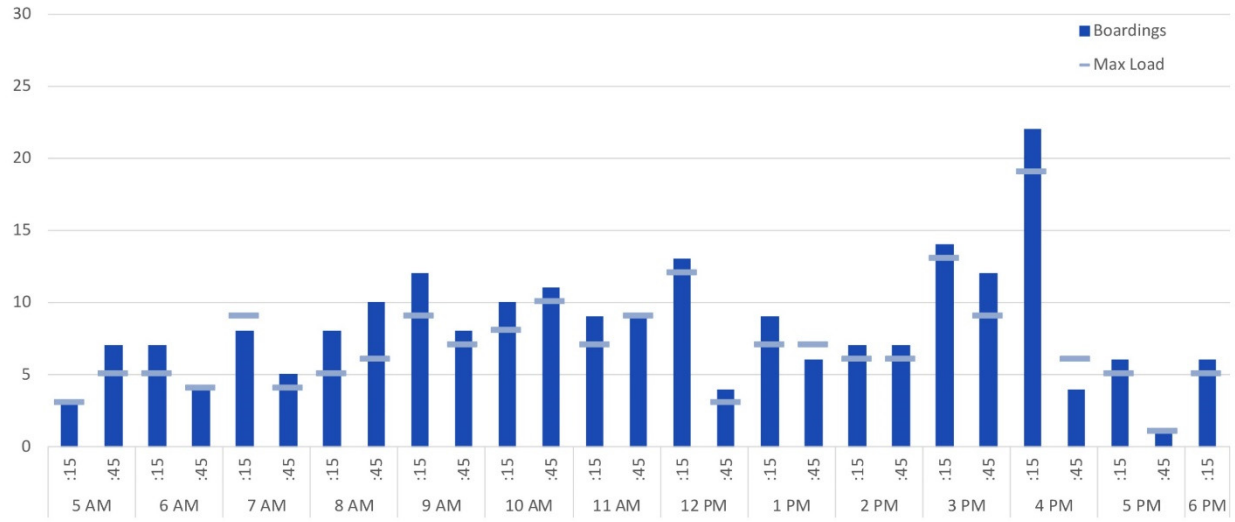
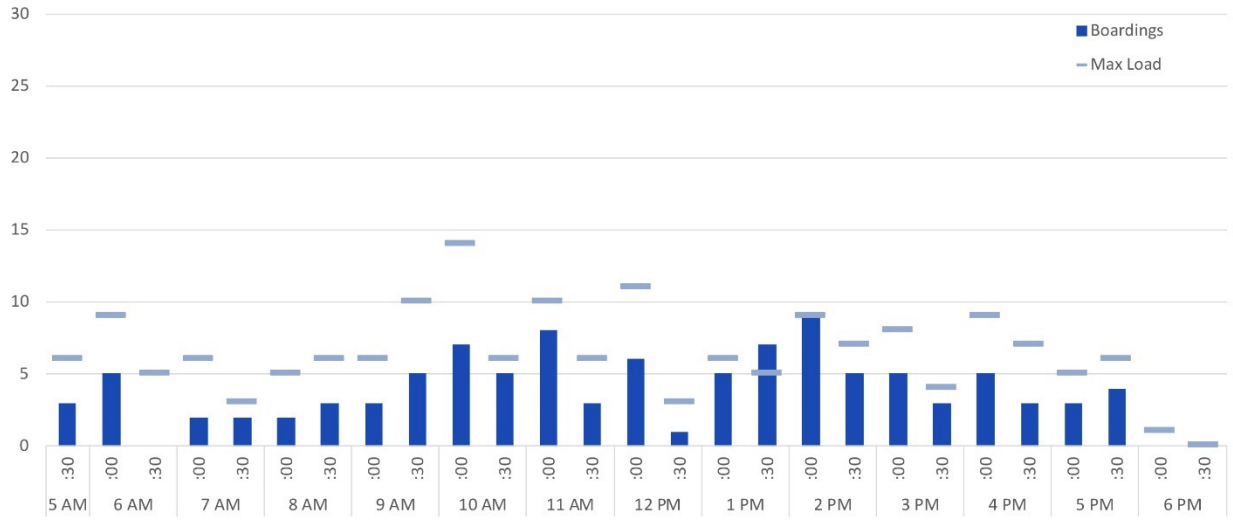


Figure 113 | Route 3W Weekday Ridership by Trip: Southbound



Summary of Observations

Strengths

- Only route serving Parkway Manor
- Easy-to-remember clock-face frequency
- Relatively frequent service
- Well-coordinated connection opportunities in downtown Battle Creek
- High ridership per revenue hour on weekdays and Saturdays
- Relatively low cost per passenger trip on all service days
- Strong on-time performance on weekdays

Weaknesses

- Below-average weekday and Saturday ridership and productivity
- Circuitous alignment with several key route segments served in one direction only.

- No Sunday service

Opportunities

Potential opportunities to strengthen Route 3W are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

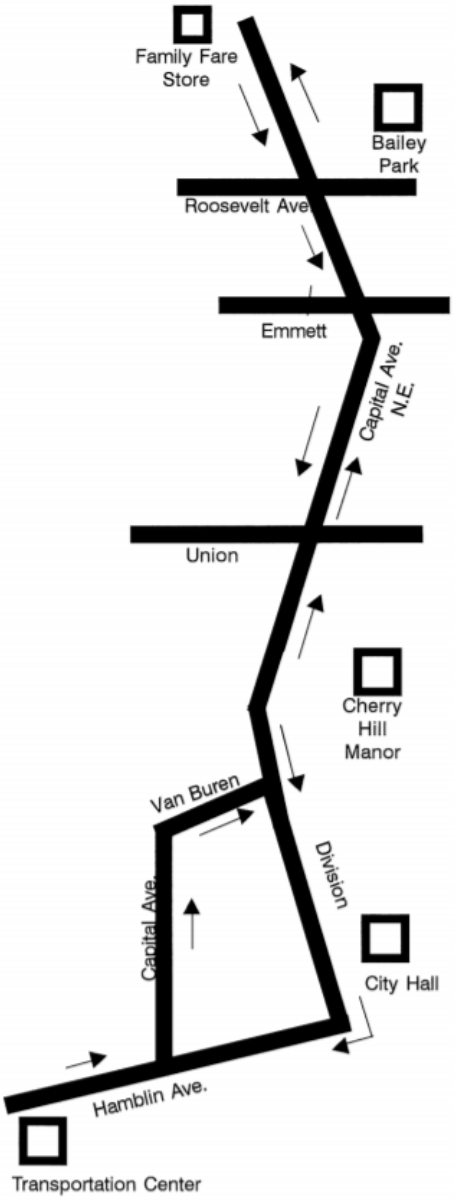
- **Simplify alignment and provide more bi-directional service.** Route 3W is one of the most productive routes in the BCT network, but it has the potentially to attract even more riders if service is simplified and key connections are made more convenient. For example, residents of the Parkway Manor Apartments currently have very little access to retail or grocery destinations. To reach the closest grocery store (Save-A-Lot on Roosevelt Avenue), they must either first travel to downtown Battle Creek, or transfer to a northbound bus near Grace Family Health. Operating both northbound and southbound along Hubbard Street would create bi-directional service along almost the entire route and link Parkway Manor residents to downtown Battle Creek, Grace Family Health, and the retail and grocery destinations along Roosevelt Avenue.
- **Shift service from Kendall Street to Washington Avenue.** If Route 3W operates along the same alignment in both directions, northbound buses could continue north along Washington Avenue before turning west onto Parkway Drive. This would preserve some of the current service along Parkway Drive and also link Parkway Manor to Claude Evans Park.
- **Shift service from Redner Drive to North Avenue.** To maximize bi-directional service along Route 3W, buses traveling east on Goodale Avenue could turn south on Roosevelt to serve Save-A-Lot and Walgreens, and then continue north on North Avenue. Buses could then turn around using Fleetwood Drive, Fenton Street, and North Avenue and return inbound along the same alignment as outbound trips. The approach would also allow for bi-directional service to The Legacy at The Oaks.
- **Reduce service frequency in the mid-day.** Route 3W ridership falls somewhat during the mid-day. If service were operated hourly in the mid-day and every 30-minutes in the peak periods, the route would likely be more efficient in terms of ridership per revenue hour and ridership per trip, while still preserving relatively high frequency when demand is highest.

ROUTE 4N: NE CAPITAL AVENUE

Service Description

Route 4N (**Figure 114**) is a local service operating between the Battle Creek Transportation Center and Family Fare Supermarket in northeast Battle Creek. The route operates on weekdays and Saturdays, primarily along Capital Avenue. Outbound buses directly serve Cherry Hill Manor on every other trip, beginning at 9:45 AM. In addition, W.K. Kellogg School is directly served on one inbound trip on school days only.

Figure 114 | Route 4N Map



Operating Characteristics

Table 61 | Route 4N Operating Characteristics

Destination	**From** **To**		Battle Creek Transportation Center Family Fare Supermarket
Span	**Weekday** **Saturday** **Sunday**		5:15 AM – 6:43 AM 9:15 AM – 5:13 PM -
Frequency	**Weekday**	**Peak** **Off-Peak**	30 30
	Saturday **Sunday**		30 -
Daily Operating Cost	**Weekday** **Saturday**		$1,359.86 $805.84
Route Connections			1W, 2E, 2W, 3E, 3W, 4S, 5W
Key Destinations			Downtown Transportation Center, Battle Creek Central High School, Salvation Army, Family Fare Supermarket (formerly Felpausch)

Service Productivity

Route 4N carries approximately 19.6 passengers per revenue hour on a typical weekday making it the third-most productive weekday route according to this metric (see **Table 62**). The route has strong on-time performance on weekdays, with 90 percent of timepoints served between zero and five minutes late during a typical weekday (7 percent early and 3 percent late).

Route 4N carries approximately 5.4 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in 5th place for this metric among the eight BCT routes. Finally, at $5.13 per passenger trip, Route 4N has a lower weekday operating costs per passenger than the BCT average of $6.38.

At 11.8 passengers per revenue hour on Saturdays (**Table 63**), Route 4N has a lower productivity than on weekdays, but exceeds the Saturday system average of 9.2. The route carries 3 passengers per one-way trip on Saturdays, compared to a Saturday system average of 3.5 passengers per trip. At $8.50 per passenger, Route 4N is substantially more efficient than the $14.47 average fixed-route operating cost per passenger trip for Saturdays.

Table 62 | Route 4N Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1 / 19.6	Average 85% / 90%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9 / 5.4	Average $6.38 / $5.13

Table 63 | Route 4N Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 / 11.8	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 / 3	Average $14.47 / $8.50

Ridership

Route 4N carries approximately 292 passengers on a typical weekday and 95 on an average Saturday. This puts it in 3nd place among BCT routes for ridership on both service day types.

Ridership by Stop

Figure 115 and **Figure 116** summarize weekday passenger activity (boardings and alightings) by stop in the northbound direction. Northbound ridership activity is highest at the downtown Transportation Center and Family Fare Supermarket, but several stops along Capital Avenue have at least 10 boardings and/or alightings per day.

Figure 117 and **Figure 118** summarize total activity by stop in the southbound direction. In this direction, passenger activity is highest at Family Fare Supermarket, near the Crown Chase Apartments and at the downtown Transportation Center.

Figure 115 | Route 4N Weekday Ridership by Stop: Northbound

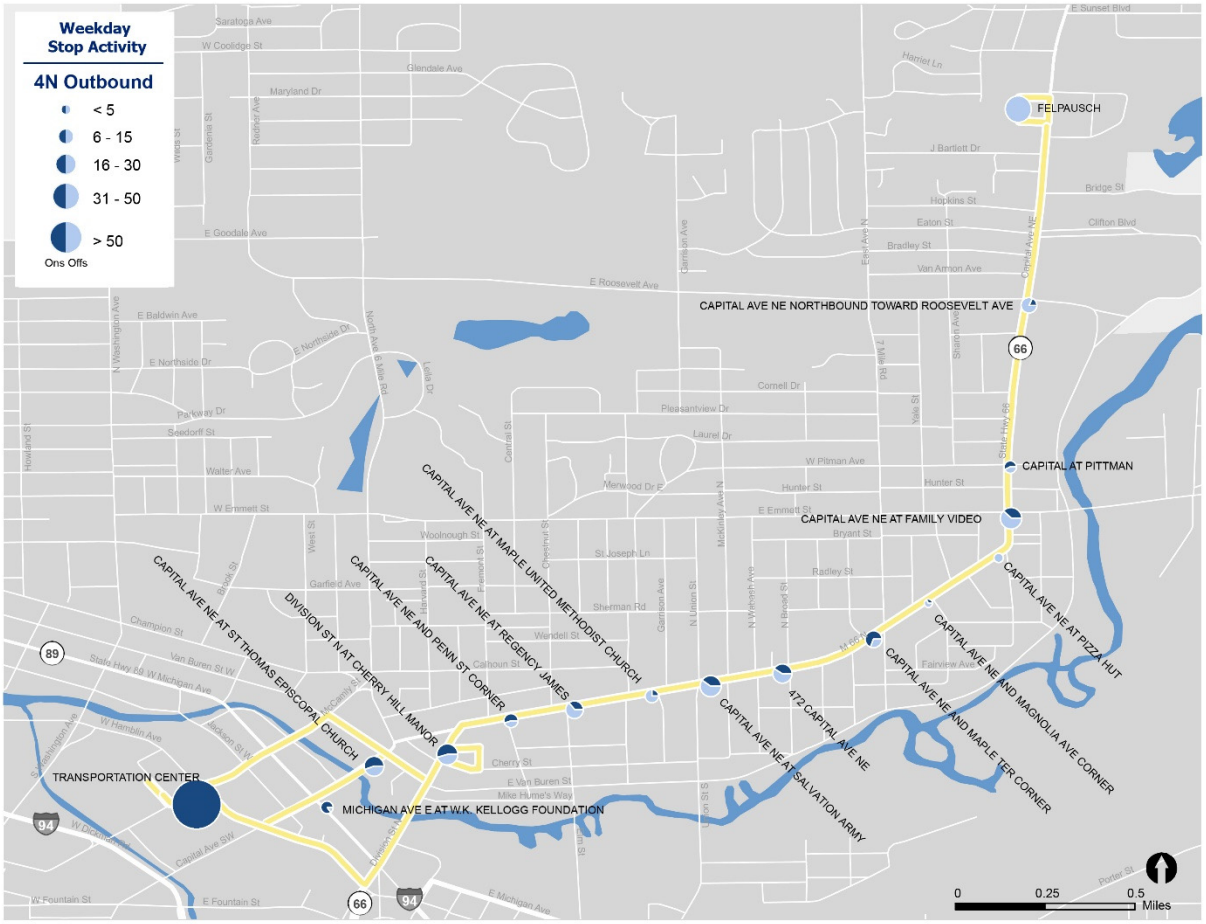


Figure 116 | Route 4N Weekday Boardings and Alightings, by Stop: Northbound

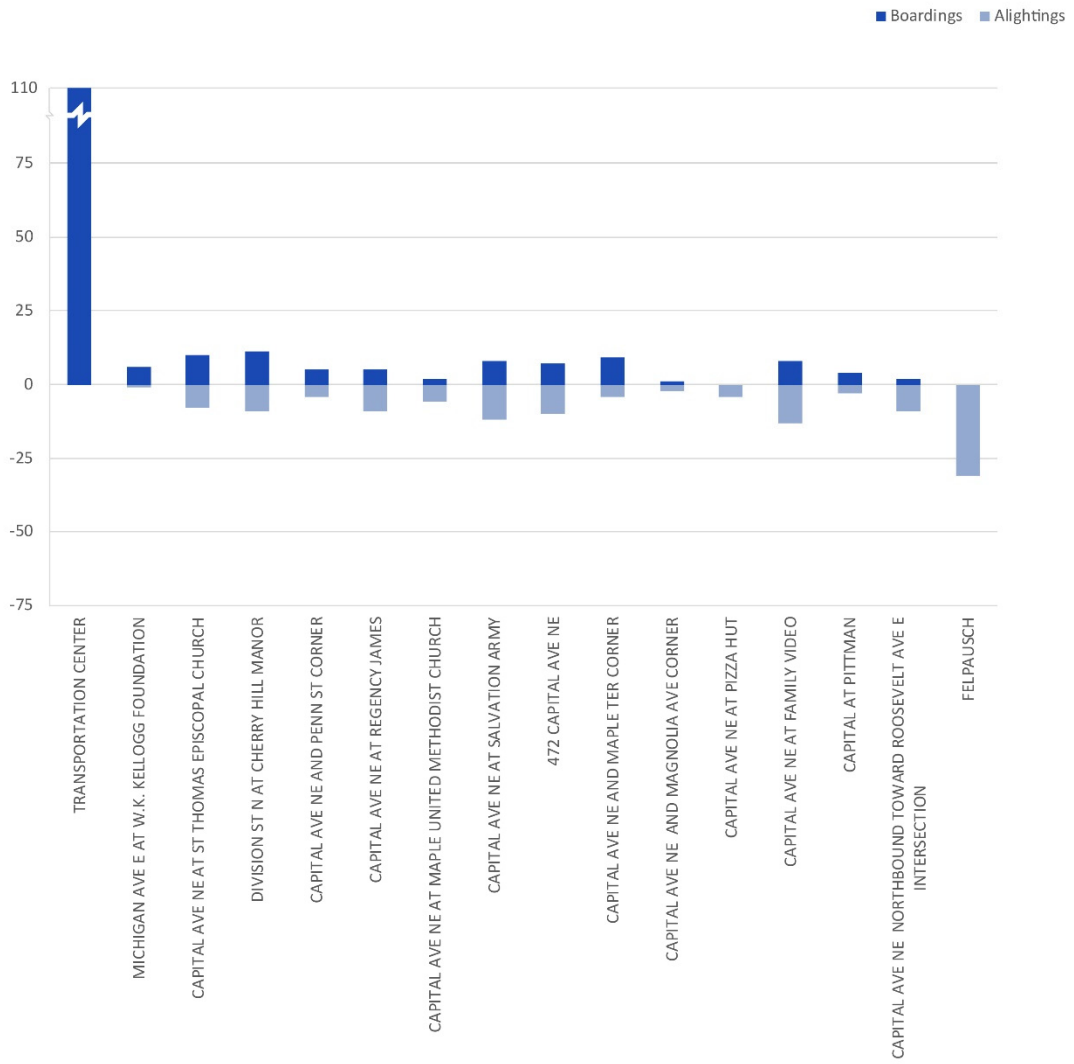
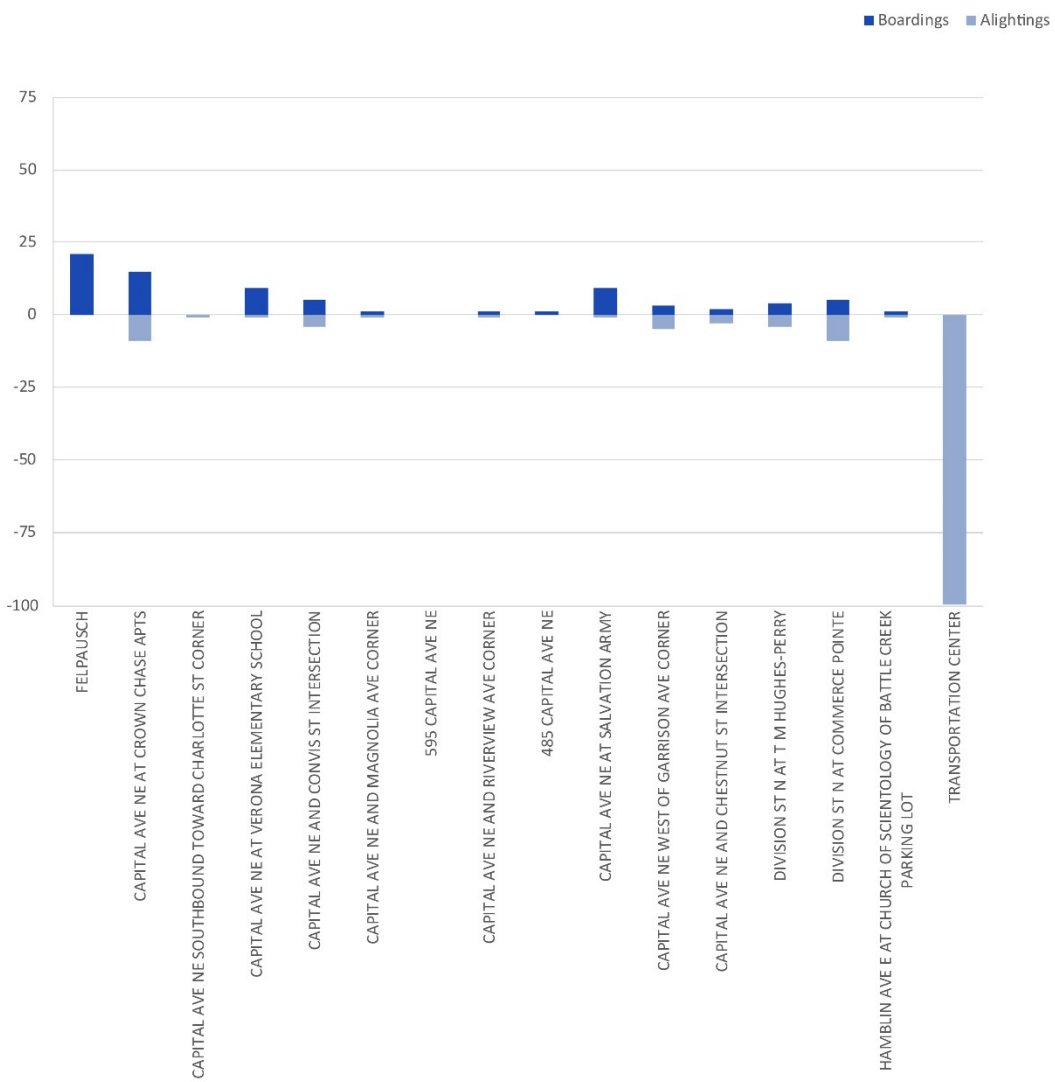


Figure 117 | Route 4N Weekday Ridership by Stop: Southbound

Figure 118 | Route 4N Weekday Boardings and Alightings, by Stop: Southbound



Ridership by Trip

Figure 119 (northbound) and Figure 120 (southbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. No Route 4N trips exceed a maximum load of 22 passengers, the seating capacity of BCT's smallest buses.

Figure 119 | Route 4N Weekday Ridership by Trip: Northbound

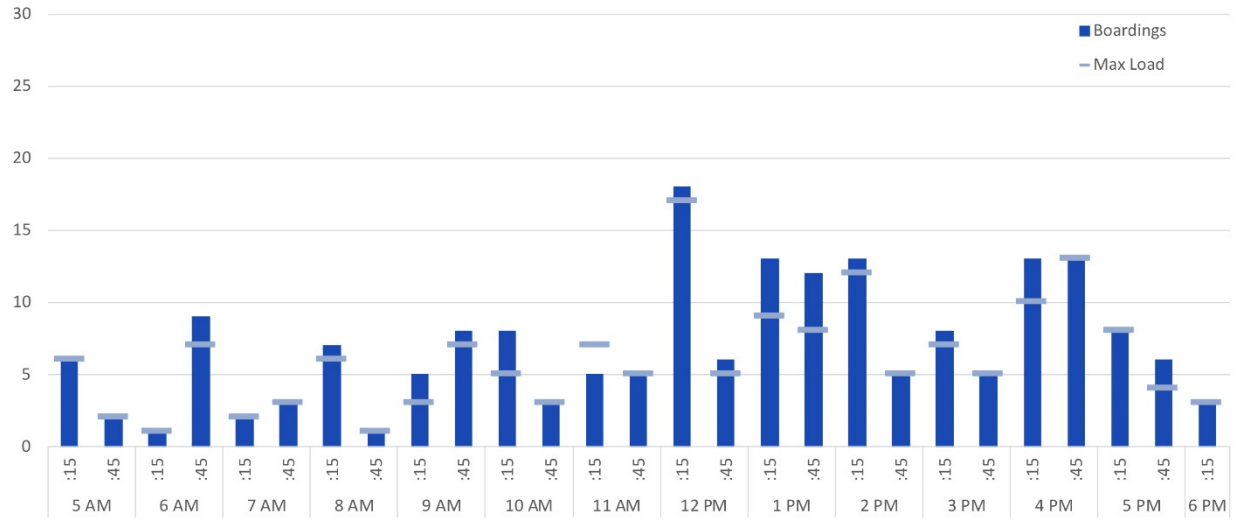
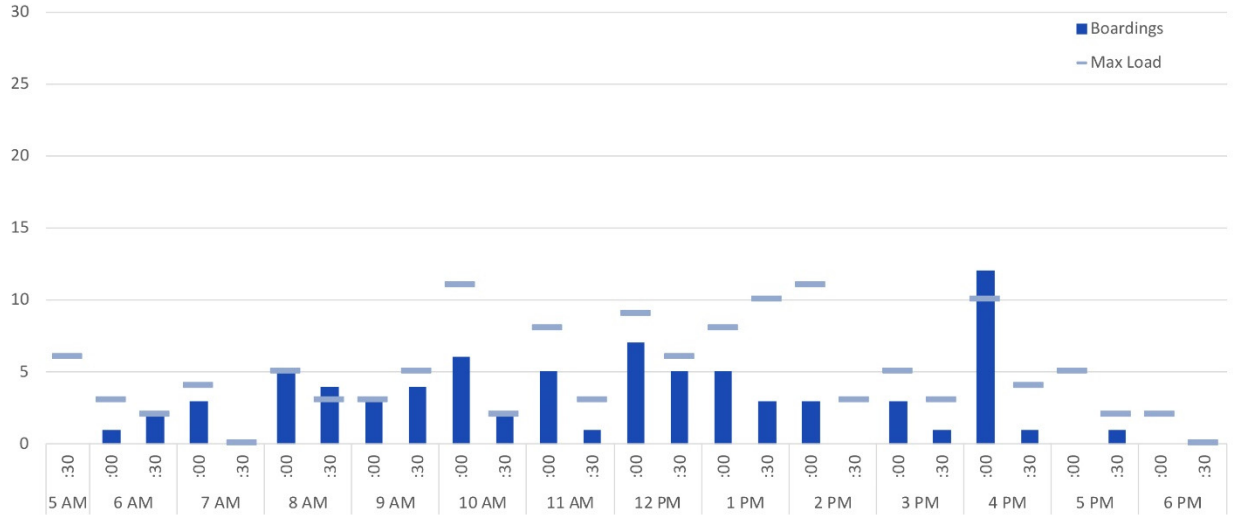


Figure 120 | Route 4N Weekday Ridership by Trip: Southbound



Summary of Observations

Strengths

- Only route serving Capital Avenue N.E. corridor
- Mostly simple and direct service alignment
- Easy-to-remember clock-face frequency
- Well-coordinated connection opportunities in downtown Battle Creek
- Above-average weekday and Saturday ridership per revenue hour
- Strong on-time performance

Weaknesses

- Below-average weekday and Saturday ridership per trip and cost per passenger
- Inconsistent inbound and outbound alignment through downtown
- Time-consuming deviation to serve Cherry Hill Manor, located directly on Division Street

- No Sunday service

Opportunities

Potential opportunities to strengthen Route 4N are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

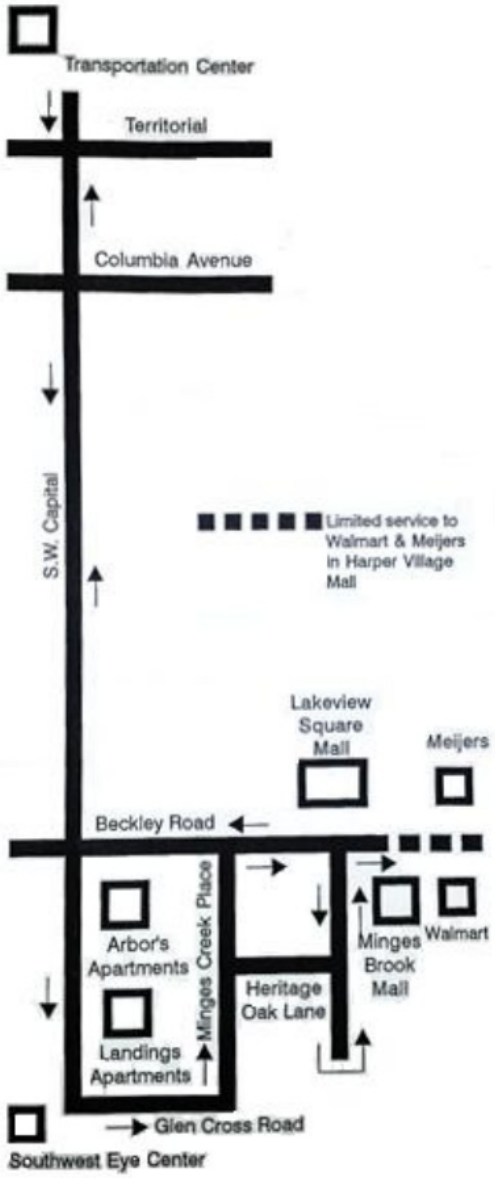
- **Streamline route by eliminating deviation to Cherry Hill Manor.** Route 4N buses deviate from Division Street to provide front-door service to Cherry Hill Manor on every other trip. However, this deviation is provided in the outbound direction only. Without the deviation, outbound buses would still serve Cherry Hill Manor from a stop at the corner of Capital Avenue and Clay Street. This stop is just over 100 ft. from the nearest building entrance, and is already the primary stop for the building on every other trip.
- **Work with Transportation Department to improve pedestrian environment at Division and Cherry Street.** While outbound passengers can safely board Route 4N without having to cross Division Street, inbound passengers do not have a safe crossing environment at either Clay or Cherry Street. The challenge of crossing Division Street may compel some riders from Cherry Hill Manor to board and alight buses traveling northbound only. These riders may be traveling significant distances out-of-direction in order to return to the northbound side of Division Street. A crosswalk at Cherry Street would create a safer environment for transit riders and pedestrians in general, including St. Phillip High School students. A pedestrian-activated flashing light would provide added safety, and would operate only when needed.
- **Operate along a consistent alignment in downtown Battle Creek.** Route 4N utilizes Capital Avenue and Van Buren street when traveling outbound from downtown, but uses Division Street to travel inbound. This approach results in two corridors that are only served in one direction, rather than one corridor that is consistently served in two directions. One trip a day even uses a third alignment (McCamly Street) to serve W.K. Kellogg School. Operating inbound and outbound via Capital Avenue, would simplify the route and provide service within one block of both Capital Avenue and Division Street (via Michigan Avenue).

ROUTE 4S: SW CAPITAL AVENUE

Service Description

Route 4S (**Figure 121**) is a local service operating between the Battle Creek Transportation Center and retail destinations along Beckley Road in south Battle Creek. The route operates on weekdays and Saturdays, primarily along Capital Avenue and Beckley Road. On select trips, buses directly serve Wal-Mart and Meijer rather than Minges Brook Mall, the route's regular end-of-line. Several large apartment complexes south of Beckley Road, including the Arbors, Willow Creek, Teal Run, and the Landings, are served in the outbound direction only.

Figure 121 | Route 4S Map



Operating Characteristics

Table 64 | Route 4S Operating Characteristics

Destination	**From** **To**		Battle Creek Transportation Center Lakeview Mall
Span	**Weekday** **Saturday** **Sunday**		5:15 AM – 6:10 AM 9:15 AM – 5:10 PM -
Frequency	**Weekday**	**Peak** **Off-Peak**	60 60
	Saturday **Sunday**		60 -
Daily Operating Cost	**Weekday** **Saturday**		$1,309.49 $705.11
Route Connections			1W, 2E, 2W, 3E, 3W, 4N, 5W
Key Destinations			Downtown Transportation Center, Family Fare Supermarket, Social Security Administration, Lakeview Square Mall, Target, Walmart, Meijer

Service Productivity

Route 4S carries approximately 22.5 passengers per revenue hour on a typical weekday making it the second-most productive weekday route according to this metric (see **Table 65**). The route has slightly below-average on-time performance on weekdays, with 84 percent of timepoints served between zero and five minutes late during a typical weekday (4 percent early and 12 percent late).

Route 4S carries approximately 10.2 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in first place for this metric among the eight BCT routes. Finally, at $4.94 per passenger trip, Route 4S has a lower weekday operating costs per passenger than the BCT average of $6.38.

At 16 passengers per revenue hour on Saturdays (**Table 66**), Route 4S has a lower productivity than on weekdays, but significantly exceeds the Saturday system average of 9.2. The route carries 8 passengers per one-way trip on Saturdays, compared to a Saturday system average of 3.5 passengers per trip. At $6.30 per passenger, Route 4S is substantially more efficient than the $14.47 average fixed-route operating cost per passenger trip for Saturdays.

Table 65 | Route 4S Weekday Service Productivity Metrics

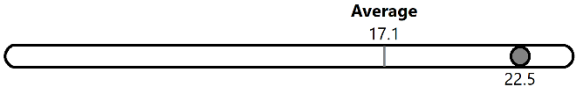
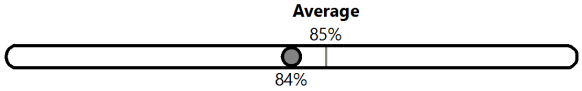
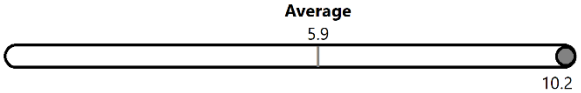
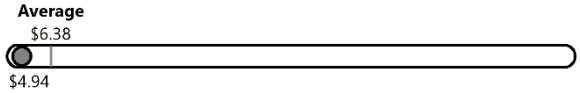
Passengers per Revenue Hour	On-Time Performance
	
Passengers per trip	**Operating Cost per Passenger**
	

Table 66 | Route 4S Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 — 16	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 — 8	Average $14.47 — $6.30

Ridership

Route 4S carries approximately 265 passengers on a typical weekday and 112 on an average Saturday. This puts in 4nd place among BCT routes for weekday ridership and first on Saturdays.

Ridership by Stop

Figure 122 and **Figure 123** summarize weekday passenger activity (boardings and alightings) by stop in the southbound direction. Southbound ridership activity is highest at the downtown Transportation Center, on Capital Avenue near the Social Security Administration, Calvary Chapel, and Heather Hills Drive. However, several other stops along the route have at least 10 boardings and/or alightings per day.

Figure 124 and **Figure 125** summarize total activity by stop in the northbound direction. In this direction, passenger activity is highest at Lakeview Square Mall, Beckley Road near Travelodge and Capital Avenue, at Capital Avenue near the Social Security Administration, near Family Fare Supermarket, at Capital Avenue near Summer Street and at the downtown Transportation Center.

Figure 122 | Route 4S Weekday Ridership by Stop: Southbound

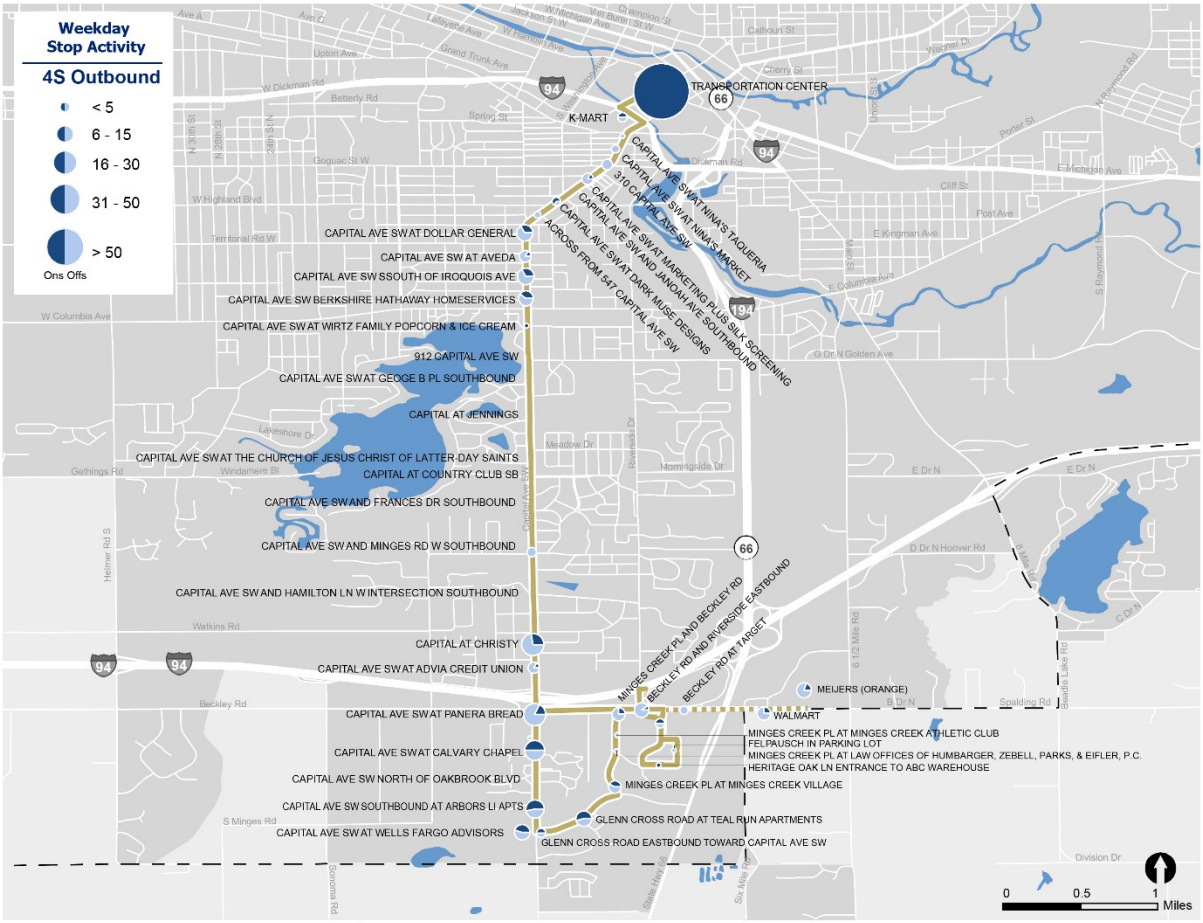


Figure 123 | Route 4S Weekday Boardings and Alightings, by Stop: Southbound

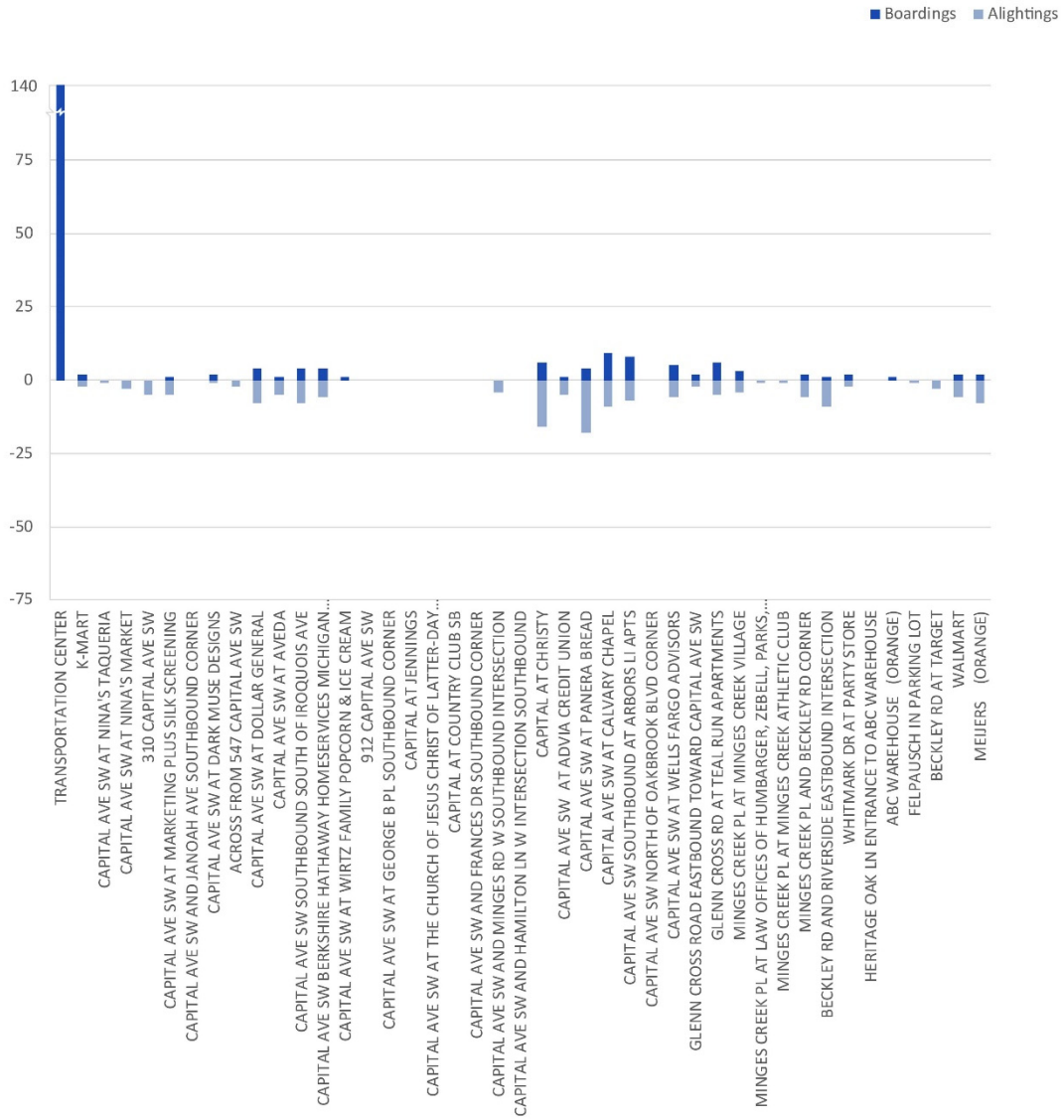


Figure 124 | Route 4S Weekday Ridership by Stop: Northbound

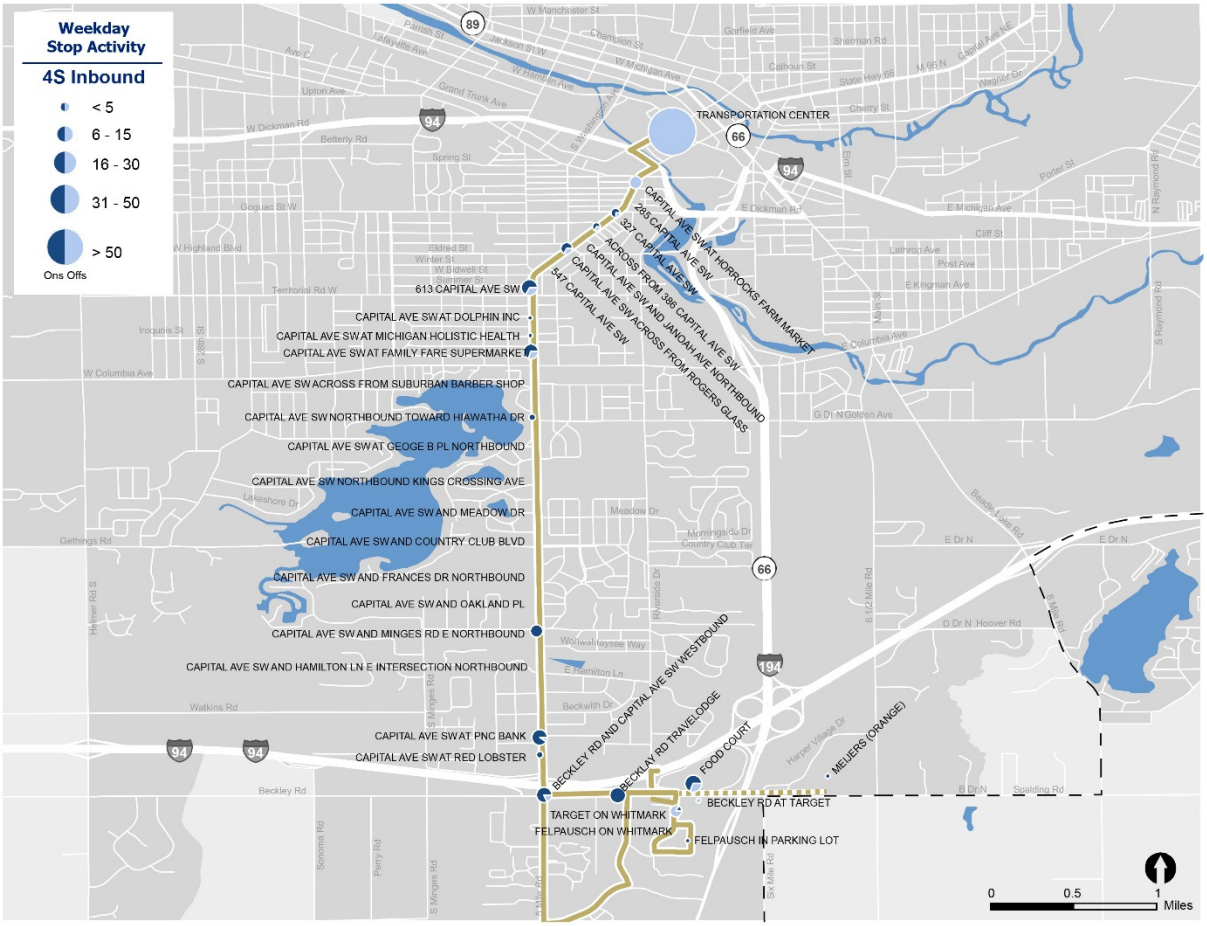
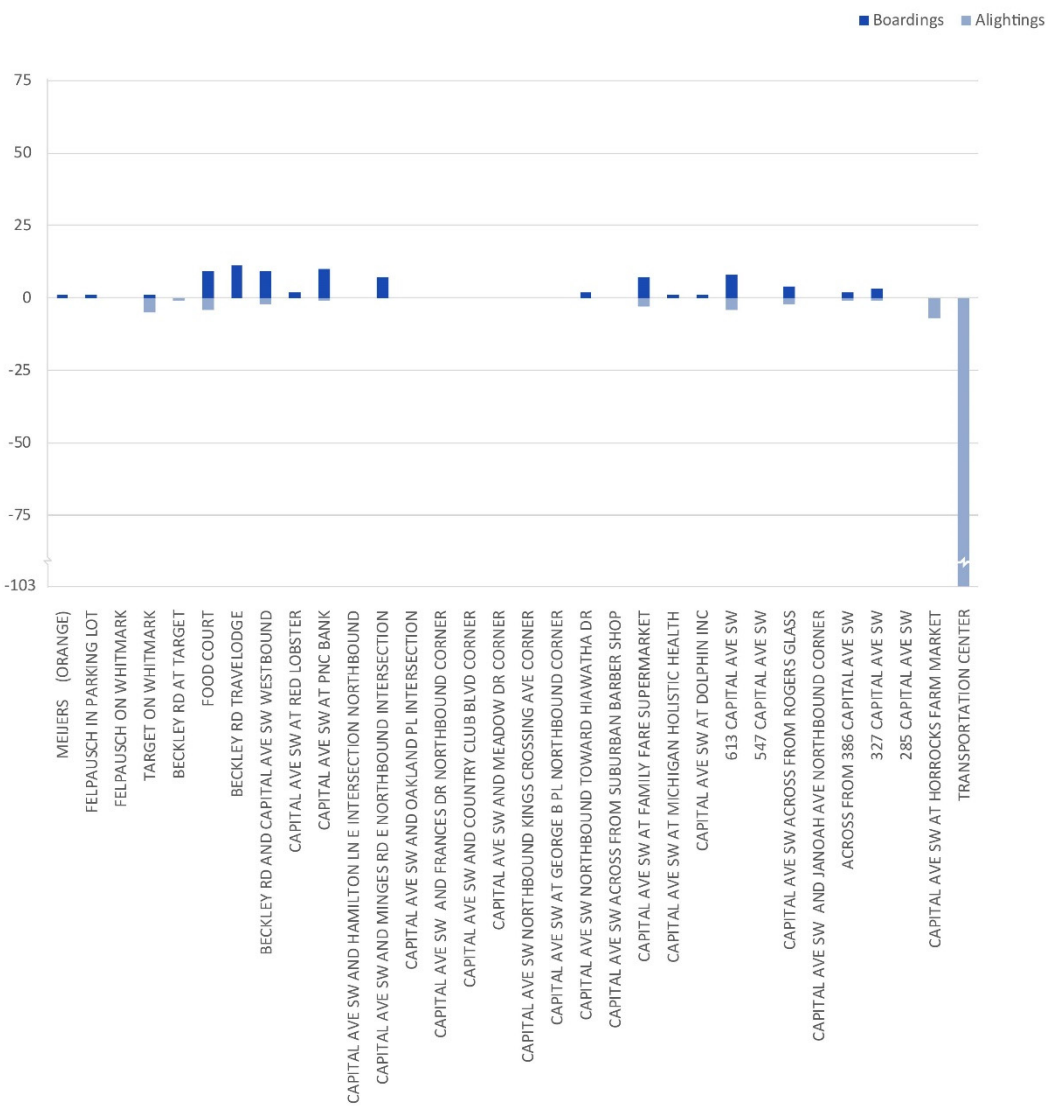


Figure 125 | Route 4S Weekday Boardings and Alightings, by Stop: Northbound



Ridership by Trip

Figure 126 (southbound) and **Figure 127** (northbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. While several trips on Route 4S approach or exceed 22 total passengers carried (the seating capacity of BCT's smallest buses), no trips appear to exceed 22 passengers on board at any one time (maximum load).

Figure 126 | Route 4S Weekday Ridership by Trip: Southbound

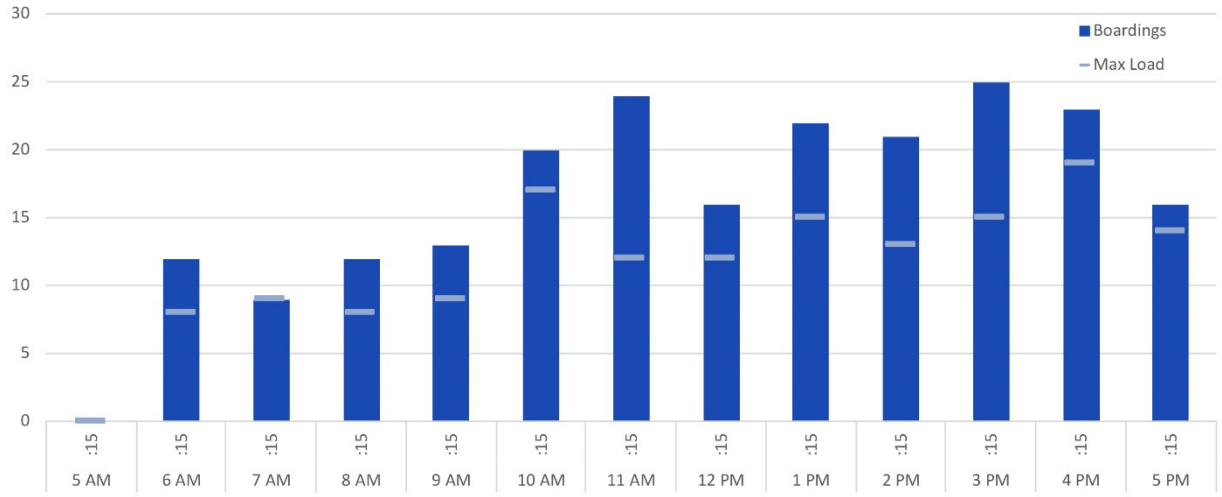
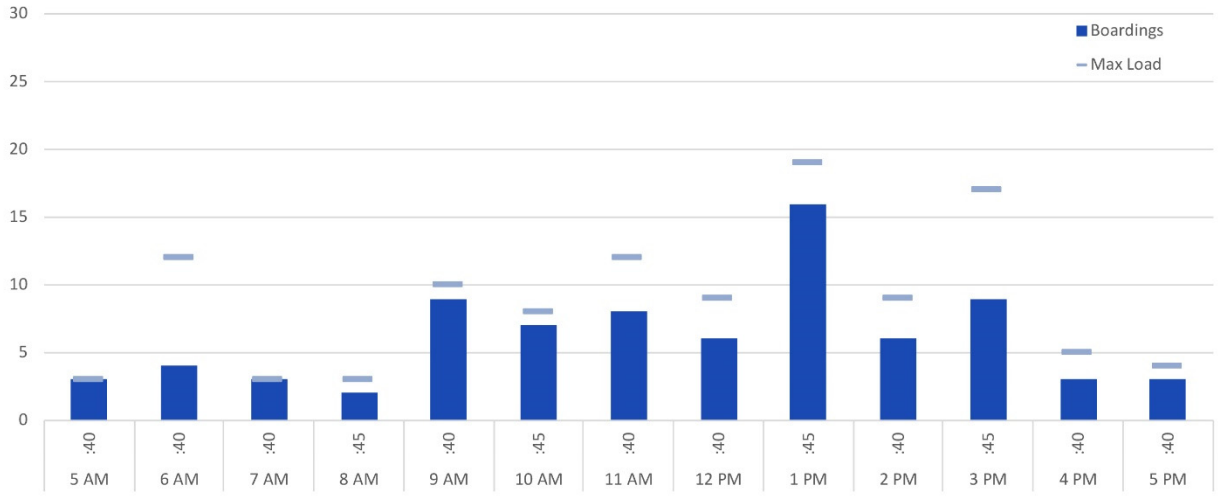


Figure 127 | Route 4S Weekday Ridership by Trip: Northbound



Summary of Observations

Strengths

- Only route serving several key destinations in south Battle Creek, including the Social Security Administration, Walmart, Target, and Lakeview Square Mall
- Mostly simple and direct service alignment (until the end of the route)
- Easy-to-remember clock-face frequency
- Well-coordinated connection opportunities in downtown Battle Creek
- High ridership and productivity on weekdays and Saturdays
- Below-average operating cost per passenger on all service day types

Weaknesses

- Below-average on-time performance on weekdays

- One-way service south of Beckley Road, providing access to retail and grocery destinations for area residents, but making it difficult to get back home
- Limited service to Walmart, a top destination for transit riders in most communities
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 4S are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

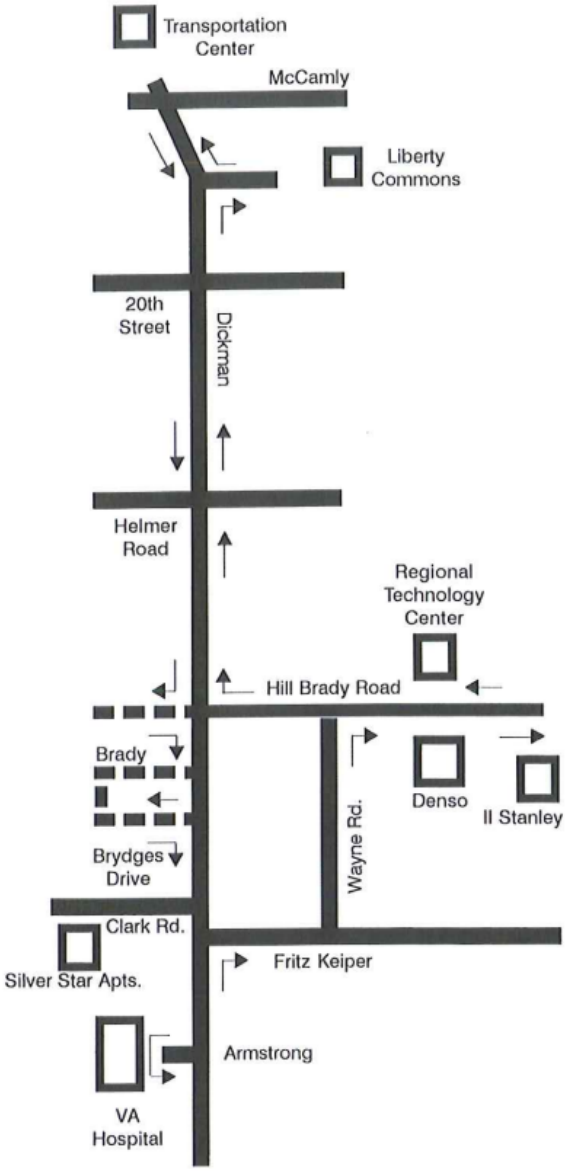
- **Serve Walmart and Meijer on every trip.** In most communities around the country, Walmart is among the top destinations for transit riders. The same would likely be true in Battle Creek if more frequent service were provided to the Walmart. Given that Walmart is located outside the Battle Creek city limits, additional service would likely require a funding agreement with Emmett Charter township or Calhoun County.
- **Alternate direction of route on every other trip.** Route 4S provides one-way service to the many apartment complexes south of Beckley Road. This forces passengers traveling toward downtown to first travel out of direction toward Lakeview Square Mall and Walmart, and makes it very inconvenient for them to return home after visiting these retail destinations. To address this situation the alignment of the route could be reversed every other trip to provide clockwise circulation on one trip and counterclockwise circulation on the next. For example, on one trip, buses would first serve the apartments south of Beckley Road, then Walmart, Meijer, and Lakeview Square Mall, before returning north along Capital Avenue. On the next trip, buses would serve Lakeview Square Mall first, then Walmart, Meijer, and the apartments south of Beckley Road. This would give local residents convenient and bi-directional access to both downtown and the nearby retail and grocery destinations. It could also encourage more commuters and create a park-and-ride opportunity at Lakeview Square Mall as every other trip would travel directly to or from the mall without traveling south of Beckley Road first.
- **Increase service frequency.** Route 4S already has the highest ridership per trip among all BCT routes. Adding more service to Walmart would increase ridership even more. However if the route alternated its circulation direction every other trip, each circulation pattern would only be served once every two hours. By increasing service frequency to every 30 minutes (at least during peak periods), each circulation pattern would be served once an hour, making bi-directional travel convenient for users.

ROUTE 5W: FORT CUSTER – VA HOSPITAL

Service Description

Route 5W (**Figure 128**) is a local service operating between the Battle Creek Transportation Center and the Battle Creek VA Medical Center in west Battle Creek. The route operates on weekdays and Saturdays, primarily along Dickman Road. Outbound buses alternate between directly serving the Silver Star Apartments and Musashi Auto Parts on Brydges Drive. Inbound buses, only, serve the Liberty Commons Apartments on Forest Street. In addition, the 5:45 AM trip, only, operates express from downtown Battle Creek to the Fort Custer Industrial Park.

Figure 128 | Route 5W Map



Operating Characteristics

Table 67 | Route 5W Operating Characteristics

Destination	**From**		Battle Creek Transportation Center
	To		VA Hospital
Span	**Weekday**		5:15 AM – 6:10 AM
	Saturday		9:15 AM – 5:10 PM
	Sunday		-
Frequency	**Weekday**	**Peak**	30
		Off-Peak	30
	Saturday		60
	Sunday		-
Daily Operating Cost	**Weekday**		$1,813.14
	Saturday		$705.11
Route Connections			1W, 2E, 2W, 3E, 3W, 4S, 4N
Key Destinations			Downtown Transportation Center, Fort Custer Industrial Park, Silver Star Apartments, VA Medical Center, Regional Manufacturing Technology Center, I I Stanley Company

Service Productivity

Route 5W carries approximately 19.1 passengers per revenue hour on a typical weekday, making it the 4th-most productive weekday route according to this metric (see Table 68). It has the lowest on-time performance of all the BCT routes with 77 percent of timepoints served between zero and five minutes late during a typical weekday (10 percent early and 13 percent late).

Route 5W carries approximately 9.6 passengers per one-way trip on a typical weekday, compared to the system average of 5.9. This puts the route in 2nd place for this metric among the eight BCT routes. Finally, at $5.27 per passenger trip, Route 5W has a lower weekday operating cost per passenger than the BCT average of $6.38.

At 7.8 passengers per revenue hour on Saturdays (Table 69), Route 5W has a lower productivity than on weekdays and falls below the Saturday system average of 9.2 passengers per hour. The route carries 3.9 passengers per one-way trip on Saturdays, compared to a Saturday system average of 3.5 passengers per trip. At $12.90 per passenger, Route 5W is slightly more efficient than the $14.47 average fixed-route operating cost per passenger trip for Saturdays.

Table 68 | Route 5W Weekday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 17.1 19.1	Average 85% 77%
Passengers per trip	**Operating Cost per Passenger**
Average 5.9 9.6	Average $6.38 $5.27

Table 69 | Route 5W Saturday Service Productivity Metrics

Passengers per Revenue Hour	On-Time Performance
Average 9.2 / 7.8	Not Available
Passengers per trip	**Operating Cost per Passenger**
Average 3.5 / 3.9	Average $14.47 / $12.90

Ridership

Route 5W carries approximately 344 passengers on a typical weekday (ranking first) and 55 on an average Saturday (ranking 5th).

Ridership by Stop

Figure 129 and **Figure 130** summarize weekday passenger activity (boardings and alightings) by stop in the westbound direction. Westbound ridership activity is highest at the downtown Transportation Center, around Hill Brady Road and Dickman Avenue, at the Silver Star Apartments, and at the VA Hospital.

Figure 131 and **Figure 132** summarize total activity by stop in the eastbound direction. In this direction, passenger activity is highest at the VA Hospital, 400 Hill Brady Road, the I I Stanley Company, the Brookside Apartments, the downtown Transportation Center.

Figure 129 | Route 5W Weekday Ridership by Stop: Westbound

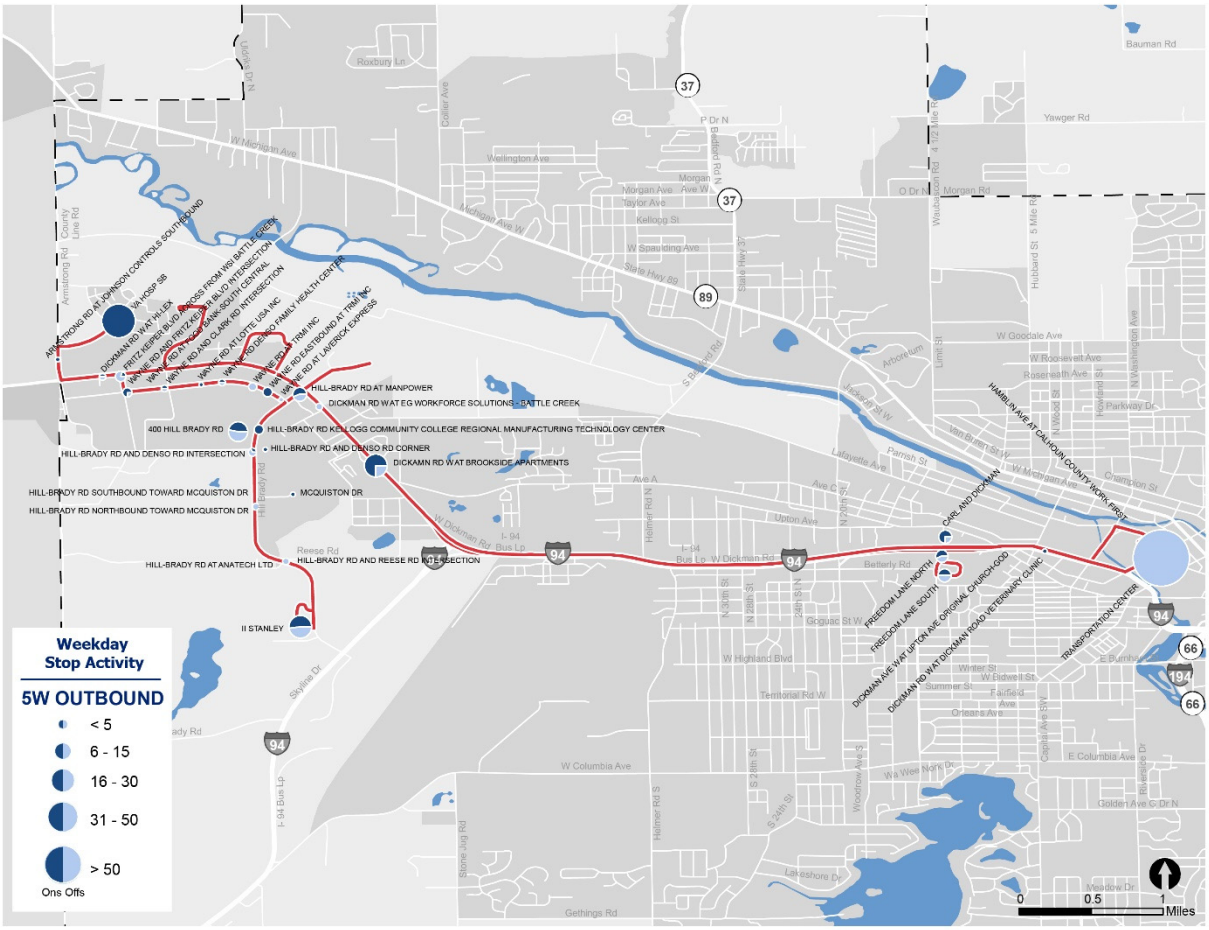


Figure 130 | Route 5W Weekday Boardings and Alightings, by Stop: Westbound

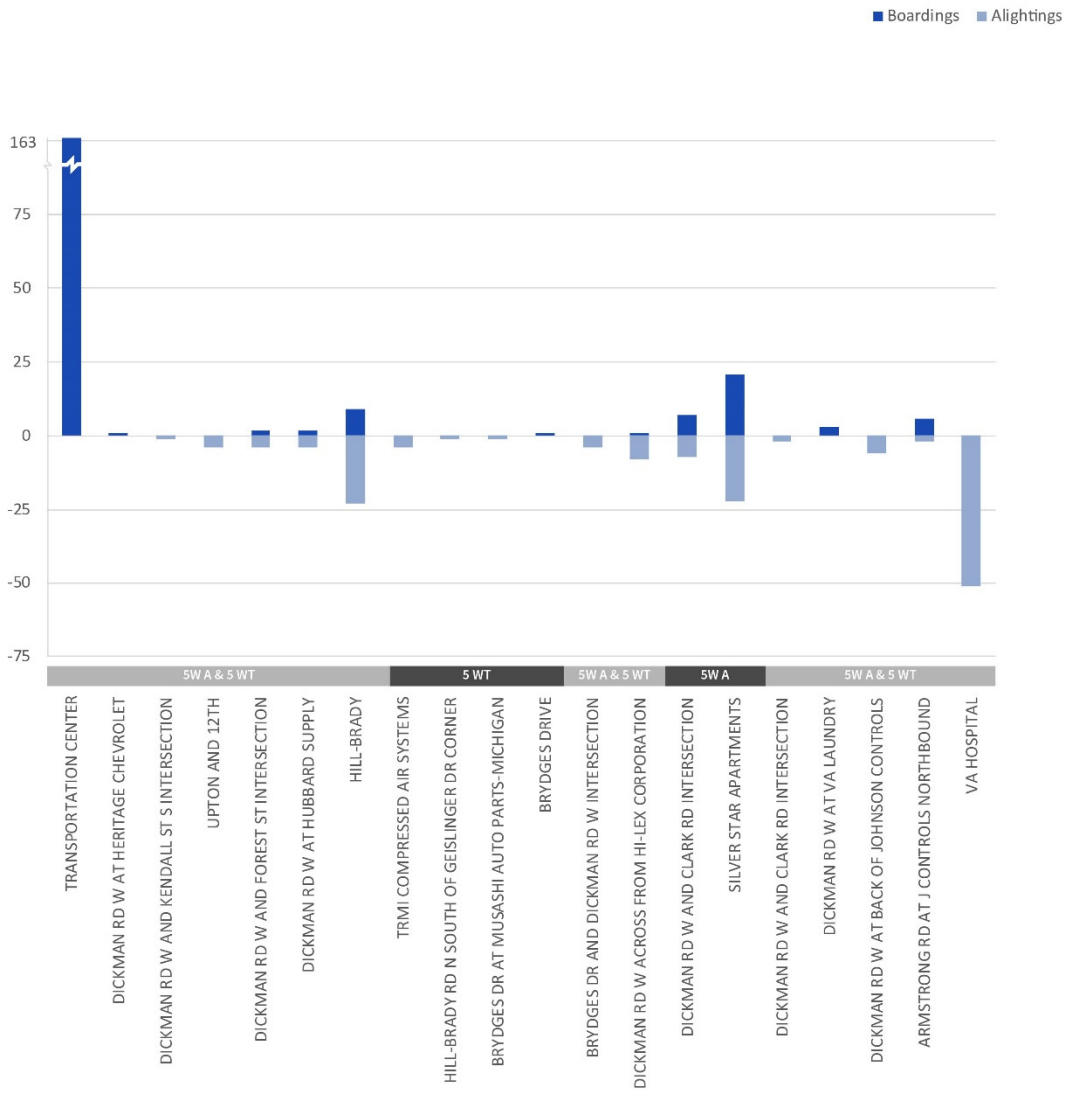


Figure 131 | Route 5W Weekday Ridership by Stop: Eastbound

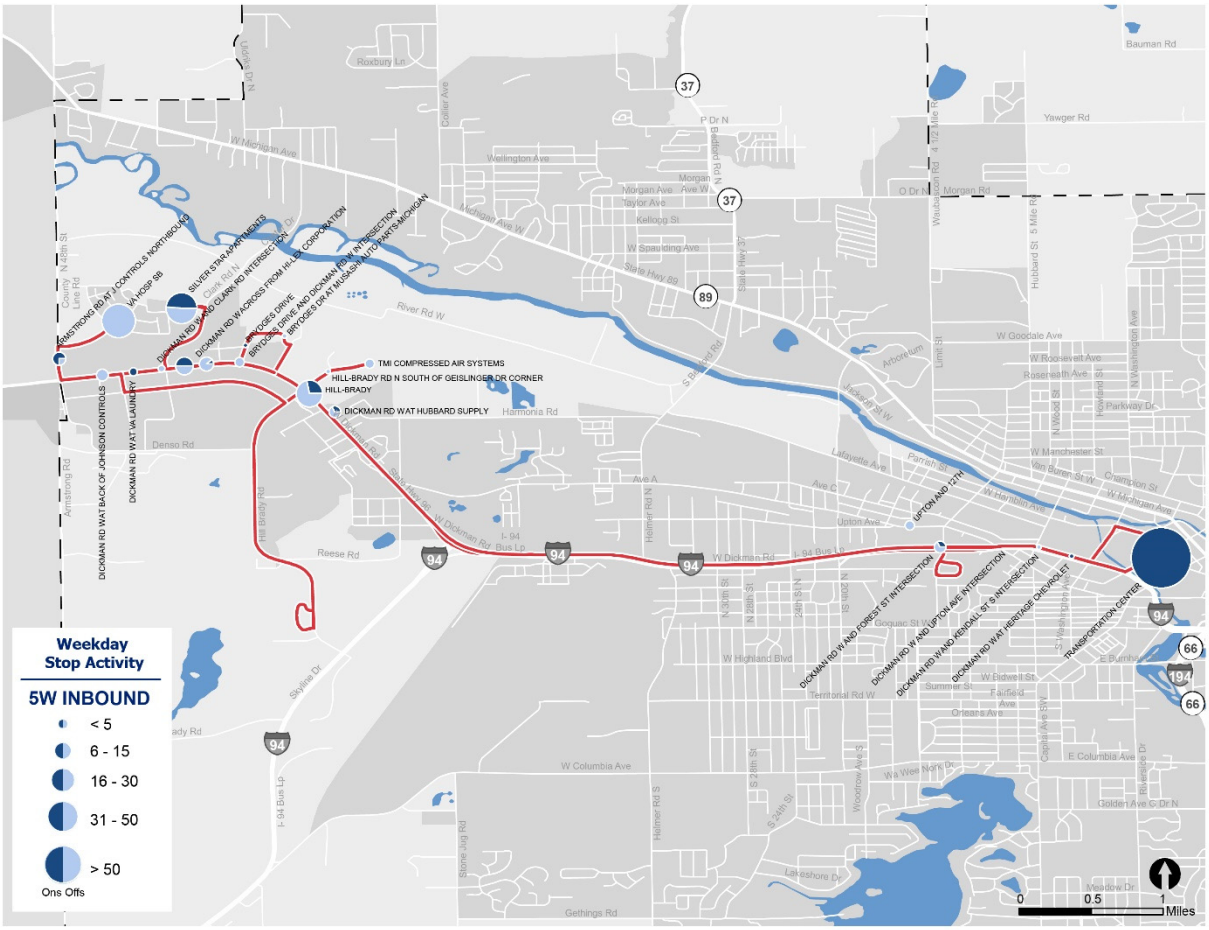
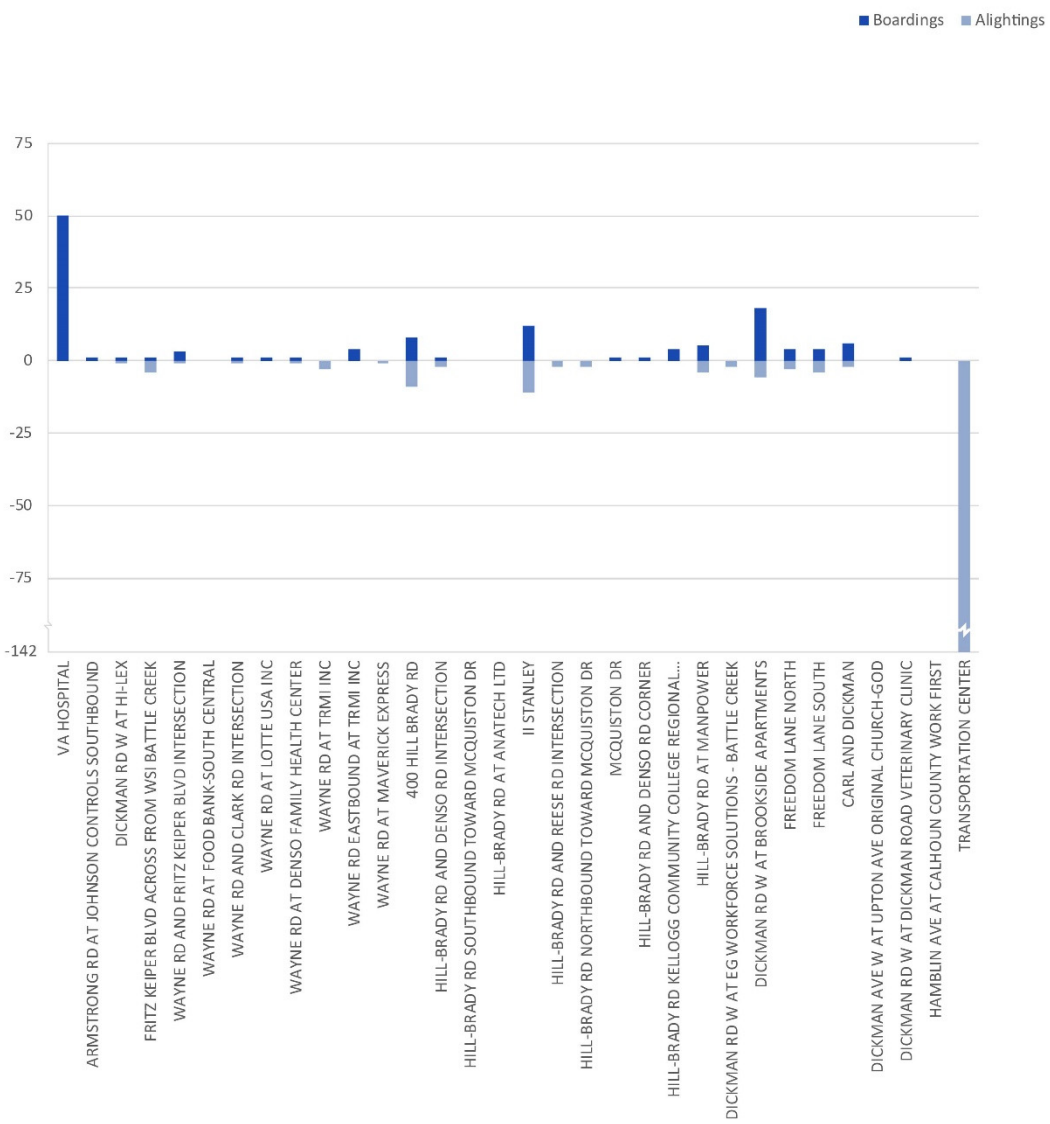


Figure 132 | Route 5W Weekday Boardings and Alightings, by Stop: Eastbound



Ridership by Trip

Figure 133 (westbound) and **Figure 134** (eastbound) show the boardings and maximum load for each trip per direction over the course of a typical weekday. In some cases, the maximum load of a trip exceeds the total number of boardings for the trip. This can occur when riders board a bus traveling in one direction, but then stay on as the bus reverses direction to begin its return trip. During the survey period, two trips exceeded the 22-passengers seating capacity of BCT's smallest buses: the 6:15 AM departure in the westbound direction, and 3:35 PM departure in the eastbound direction. However, neither of these trips exceed the seating capacity of BCT's larger 35-ft. buses.

Figure 133 | Route 5W Weekday Ridership by Trip: Westbound

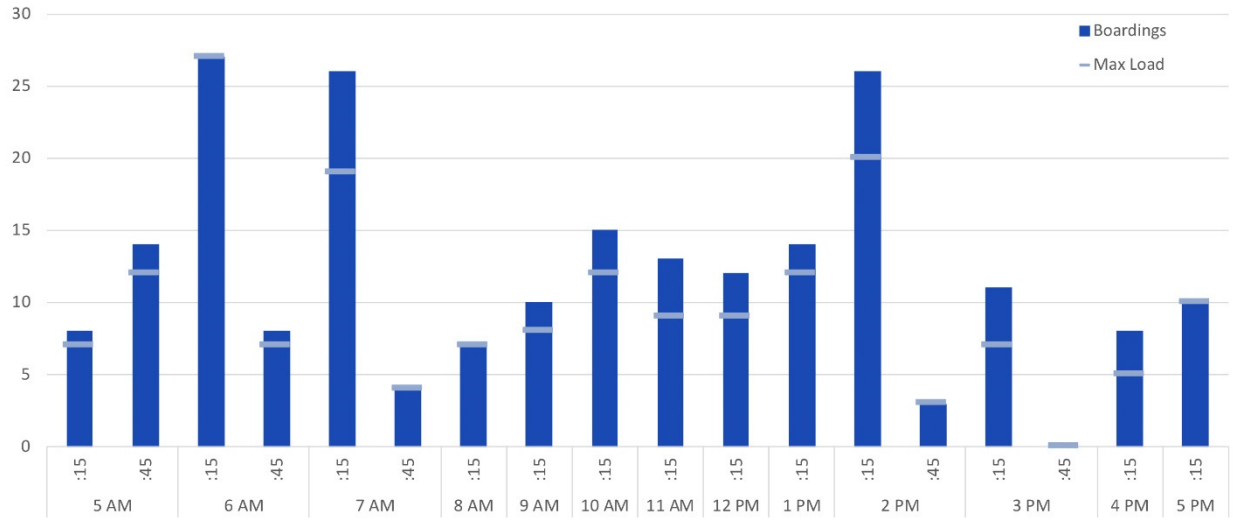
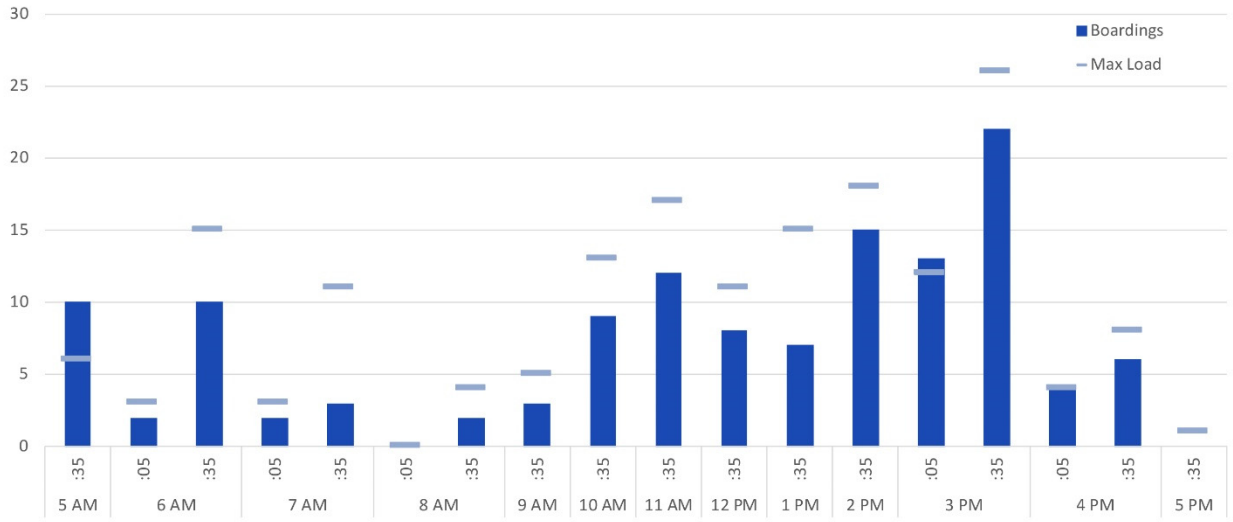


Figure 134 | Route 5W Weekday Ridership by Trip: Eastbound



Summary of Observations

Strengths

- Only route serving W. Dickman Road corridor and several key destinations including the VA Hospital and Fort Custer Industrial Park
- Easy-to-remember clock-face frequency
- Relatively frequent service during peak periods
- Well-coordinated connection opportunities in downtown Battle Creek
- High ridership per revenue hour on weekdays
- High ridership per passenger trip on weekdays
- Relatively low cost per passenger trip on all service days

Weaknesses

- Poor on-time performance on weekdays

- Below-average passengers per revenue hour on Saturdays
- Long stretch of Dickman Road, between downtown and Brookside Apartments, has few stops and low ridership
- Significant deviations required to serve Musashi Auto Parts, Silver Star Apartments, and I I Stanley
- No Sunday service

Opportunities

Potential opportunities to strengthen Route 5W are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving a route.

- **Shift service north of airport from Dickman Road to Avenue A in Springfield.** Route 5W has the highest weekday ridership among BCT routes, but a long stretch of the route between downtown and Brookside Abatements has few stops and low ridership. The lack of stops can be attributed to the fact that this stretch of Dickman Road runs partially through the City of Springfield. However, even if this were not the case, the density and land-use along Dickman Road, near W.K. Kellogg Airport is not particularly favorable for generating transit ridership. However, Avenue A in Springfield serves several schools, apartment complexes, and the Avenue A Mobile Home Estates, which are far more conducive to transit service. As Avenue A is outside the Battle Creek city limits, service in the corridor would likely require a funding agreement with the City of Springfield.
- **Expand hours of service.** The first Route 5W eastbound trip in the morning has higher ridership than the trip that follows it. Similarly, the last westbound trip in the evening is higher than the trip that precedes it. Ridership spikes on the first or last trip of the day usually points to pent up demand for even earlier or later service. In the case of Route 5W, these spikes might reflect Fort Custer-area workers going to or coming from an evening shift that may begin after bus service ends or before morning service begins. Closer collaboration between BCT and Fort Custer-area employers can identify how much earlier and/or later service should operate to accommodate the most common shift-change times. Additionally, this collaboration may encourage employers to structure their shifts to better align with transit service schedules.
- **Redesign passenger information materials to improve clarity.** Route 5W is a fairly complex route with alternating alignments, one-way route segments, and an express trip. The current schedule for Route 5W (and other BCT routes) does not include features that many transit systems use to make routing and schedule information easier for user to understand. For example, many systems use alpha-numeric time-point labels on maps and schedules to clearly define the alignment and progression of the route and to allow users to more quickly locate scheduled time-points on the route map. Another technique that is an industry best-practice is to show schedules as two separate directional tables rather than a single round-trip table. This allows users to more easily understand when and where each inbound and outbound trip begins and ends. Employing these tools can make passenger materials more informative for existing riders and less intimidating for prospective transit users.
- **Provide more direct service to Liberty Commons Apartments.** The Liberty Commons Apartments have strong ridership potential, but are currently served on inbound Route 5W trips only. This means that a Liberty Commons resident traveling from downtown has to either get off the bus on the westbound side of Dickman and try to make their way across the separated arterial road with no crosswalks, or ride all the way west to the end of the route before returning east to Liberty Commons. To improve access to this community, Route 5W could follow an alignment similar to the current Route 2W to Spring Street, and then continue along Spring Street to Carl Avenue and the Liberty Commons Apartments. From Carl Avenue, the route could turn west onto Bitterly Road and north onto 20th Street to reach a signalized intersection with Dickman Road. This alignment could be followed in the inbound and outbound direction to provide better and more regular service to Liberty Commons.
- **Serve Silver Star Apartments from William Shafter Circle.** While the Silver Star Apartments are a popular destination on Route 5W, service to the complex requires a significant deviation from Dickman Road and forces Silver Star Apartment residents to travel further west before they can begin a trip east toward downtown Battle Creek. If Route 5W buses circled through the VA campus via William Shafter Circle, they would both improve coverage throughout the campus, and provide access to the Silver Star Apartments from just across the apartment complexes west side parking lot. This could allow the route to serve both the VA and Silver Star Apartments with a single deviation off Dickman Road.
- **Split route into two variants serving either the VA or I I Stanley Company.** Destinations that require significant deviations off a primary corridor are better served as end-of-line destinations than mid-route

destinations. The way Route 5W is currently designed, passengers who board at the VA must travel all the way to the I I Stanley Company before returning to Dickman and continuing on toward downtown. If the route were split into two, one variant could serve the VA and Silver Star Apartments with a single loop and then return toward downtown. The second variant could turn south from Dickman Road onto Fritz Keiper Boulevard and then east on Denso Road to Hill Brady Road. After serving I I Stanley, buses would return along the same alignment through the Fort Custer Industrial Park and then proceed east on Dickman Road toward downtown Battle Creek.

PAGE INTENTIONALLY LEFT BLANK

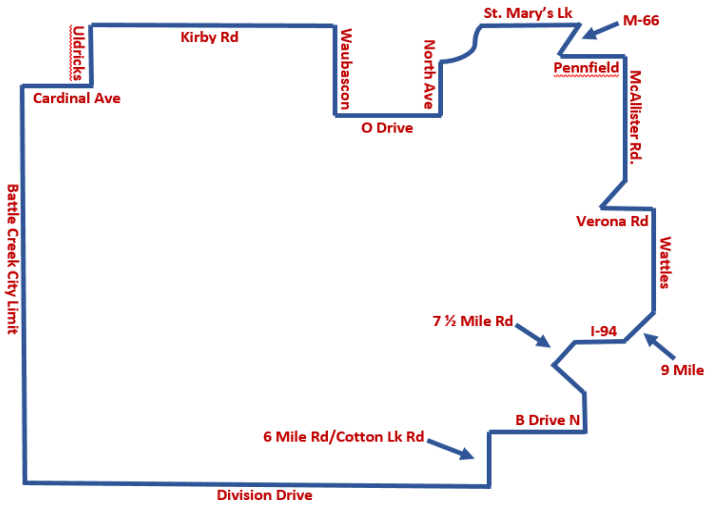
APPENDIX B: TELE-TRANSIT PROFILE

Service Description

Tele-Transit is a door-to-door, demand response transportation service providing both ADA service complementing BCT fixed-route service, and general public demand response service beyond the ADA-mandated ¾ mile buffer around fixed-route service. Service priority is given to ADA-eligible trip requests, which are guaranteed. Non-ADA trips are provided based on availability.

Tele-Transit operates from Monday through Friday from 5:15 AM to 12:00 AM, and on Saturday from 9:15 AM to 5:00 PM. Shown in **Figure 135**, the service area includes the City of Battle Creek, City of Springfield, and limited portions of Bedford, Emmett, and Pennfield Townships.

Figure 135 | Tele-Transit Service Area



Operating Characteristics

Table 70 | Tele-Transit Operating Characteristics

Service Area		■ City of Battle Creek ■ City of Springfield ■ Limited portions of Bedford, Emmett, and Pennfield Townships
Span	**Weekday**	5:15 AM – 12:00 AM
	Saturday	9:15 AM – 5:00 PM
	Sunday	-
Annual Cost (FY16-17)		$1,251,865

Service Productivity

Table 71 summarizes several key service productivity metrics for Tele-Transit service. In FY2016-17, Tele-Transit carried 2.43 passengers per hour and 0.23 passengers per mile. On average, Tele-Transit costs the agency $47.07 per trip, $11.04 per mile, and $114.42 per hour to operate. According to Tele-Transit manifests, almost all Tele-Transit ridership is comprised of ADA-eligible and senior passengers who ride for a reduced fare. Only five percent of riders, or five passengers per day, pay the regular fare. Low farebox recovery, coupled with a 75-square mile service area, results in the service's high cost and low productivity.

Table 71 | Tele-Transit FY16-17 Annual Service Productivity Metrics

Passengers per Hour		2.43
Passengers per Mile		0.23
Average Cost	**Per Trip**	$47.07
	Per Mile	$11.04
	Per Hour	$114.42

Scheduling and Dispatch

BCT uses the Trapeze system for scheduling and dispatching Tele-Transit vehicles. The agency faces the challenge of accommodating both ADA trips (a legal obligation) and general public trips in the same system.

Order-takers and dispatchers use Trapeze effectively, entering new trip requests into the system and making an effort to schedule runs in accordance with customers' desired travel time parameters. If a trip cannot be scheduled within a requested pickup or delivery time window, the dispatcher attempts to find another convenient time for the customer. In addition, should the system be overloaded or constrained during a specific time period, dispatchers preemptively communicate this information to customers.

The need to handle ADA service requirements limits scheduling of new subscription trips, which a supervisor must approve. New subscription trip requests must both easily fit into vehicle schedules, allow for sufficient slack to handle new ADA trips, and maintain vehicle productivity. BCT attempts to accommodate recurring medical-based trips with subscriptions, including non-ADA trips. Due to the recurrent nature of ADA and medical-based trips, approximately 37 percent of all system trips are based on subscriptions. In the past, this relatively high percentage of subscription trips has led to a high denial rate for new trips.

To accommodate as many requests as possible, BCT coordinates Trapeze scheduling using a time window of 15 minutes before and 15 minutes after requested pickup times. Customers are informed of this window and instructed to be ready 15 minutes prior to the agreed-upon time. They are also informed that a vehicle may arrive as late as 15 minutes after the scheduled time. Using knowledge of regional travel times, dispatchers sometimes convert requested destination arrival time requests into scheduled pickup times. Dispatchers make every effort to schedule arrivals in advance of customer-specified medical or other appointments.

As long as the vehicle arrives within a 15-minute window, regardless of the agreed-upon pickup time, BCT's policy specifies that drivers must wait for a customer for five minutes before departing. For example, if a vehicle arrives 10 minutes prior to the agreed-upon time, waits five minutes, and fails to make contact with the customer, the operator may leave the pick-up location before the originally agreed-upon pickup time and consider the customer a "no-show" (see section below). While this issue does not occur often, it happens with enough frequency to be considered a problem.

Each evening, the dispatcher coordinates with the Trapeze batch scheduler to generate an improved schedule for the following day that respects time windows of existing trip assignments. BCT completes initial batch scheduling two weeks in advance to ensure that subscription trips are included in vehicle runs. The settings for real-time and batch optimization are established by the Operations Supervisor and permit some violations of the trip scheduling constraints. Each morning, the dispatcher reviews batch scheduling plans for the day and enters any cancellations into the schedule. The dispatcher also uses Trapeze's dispatching functionality to balance loads on vehicles. BCT's cancellation rate prior to a trip day of service is 19 percent; on the day of service, it is six percent.

Trip Denials and No-Shows

The Tele-Transit dispatch center only tracks trip denials for customers who are ADA-eligible. However, through Trapeze, BCT tracks requested trips that remain unscheduled due to a lack of capacity. During the week of Oct. 2-7, 2017, BCT recorded 181 unscheduled trips, all of which were presumably denials. This figure is consistent with the dispatchers' estimations of at least 20 trip denials per day. In all, over this same week, BCT recorded 815 total trip requests, signifying that 22 percent of trips were denied. However, the system's "true" denial rate is likely higher as denied subscription trips are currently not tracked.

When formally booked, same-day and next-day trips are denied more frequently (45 percent of the time). However, a more common scenario involves callers merely asking dispatchers if a trip might be available on the same or next day, only to be told no and thereby declining to formally request a trip. If such "denials" are included in BCT statistics, it is likely that Tele-Transit cannot accommodate 50 percent or more of all same-day/next-day trip requests. Aware that service availability on Tele-Transit is limited at all times, and especially during afternoons and evenings, BCT's regular ridership base is generally able to manage its expectations about obtaining a same-day or next-day trip.

Finally, passenger "no-shows" occur, but not very often. "No-shows" and cancellations at the door – which have a negative impact on performance – represent approximately six percent of trips scheduled to be delivered at the start of the day. Tele-Transit customers generally understand the risk of losing their ability to use the service if they regularly fail to appear for a trip, or cancel frequently.

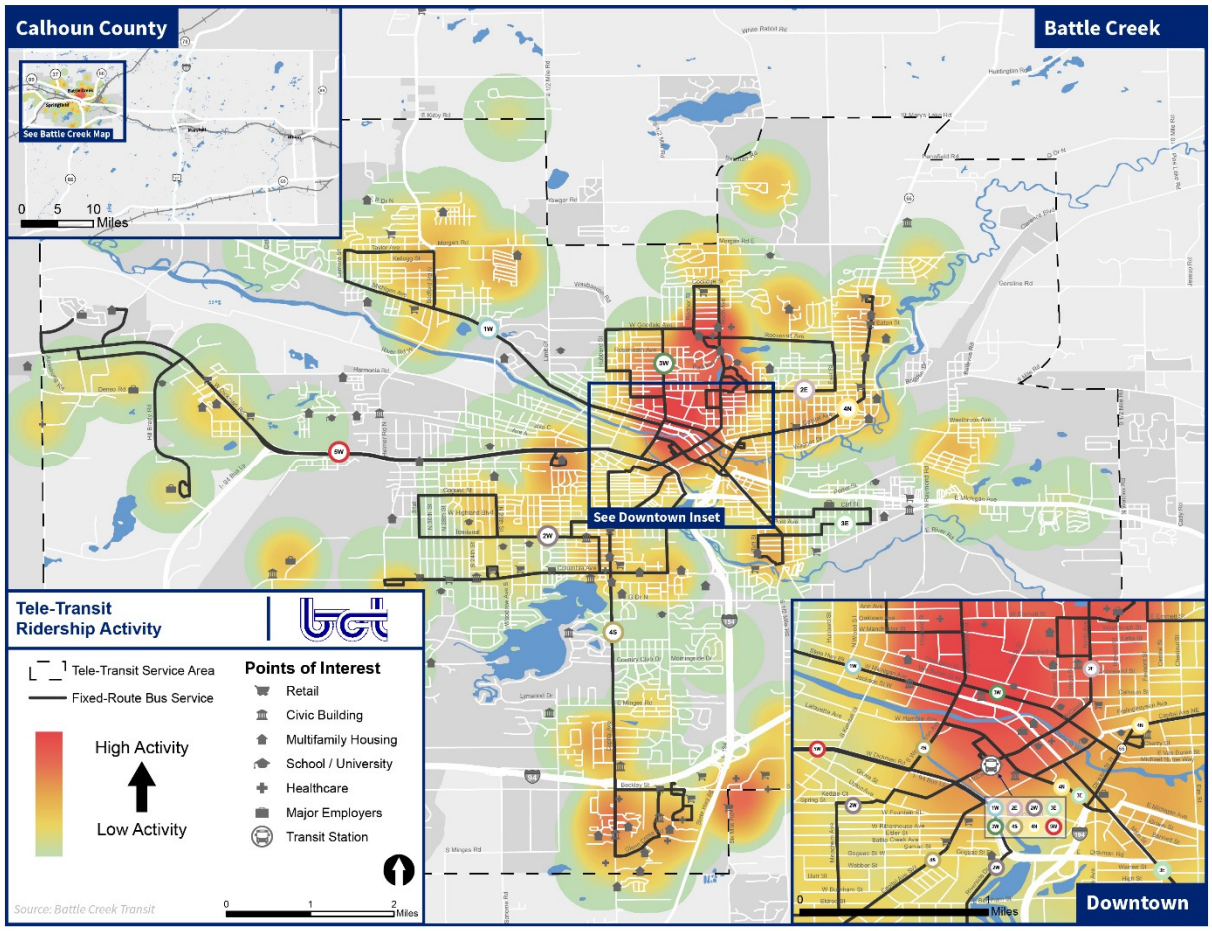
Ridership

Ridership Activity

During FY2016-2017, the Tele-Transit service carried 26,597 total riders. Approximately 25 to 30 percent of Tele-Transit customers use wheelchairs or walkers. **Figure 136** shows a heatmap of Tele-Transit ridership activity based on ridership data recorded in drivers' manifests between October 2 and October 7, 2017. During this period, ridership was especially concentrated in an area including downtown Battle Creek, Bronson Battle Creek Hospital, Kellogg Community College, and several retail and multi-family housing communities near North Avenue and Roosevelt Avenue. It is noteworthy that other pockets of relatively high ridership correspond to areas where fixed-route service is not provided, or is not provided well. These include the Beckley Road corridor, the mobile home parks near Bedford Road and O Road, and the Liberty Commons Apartments.

Based on information from drivers' manifests, there are several major Tele-Transit trip generators, including the VA Medical Center, Denso Manufacturing, Walmart, Meijer, and Bronson Battle Creek Hospital. Most late-night trips are work-related, picking up workers at the end of their shifts at a major employment site.

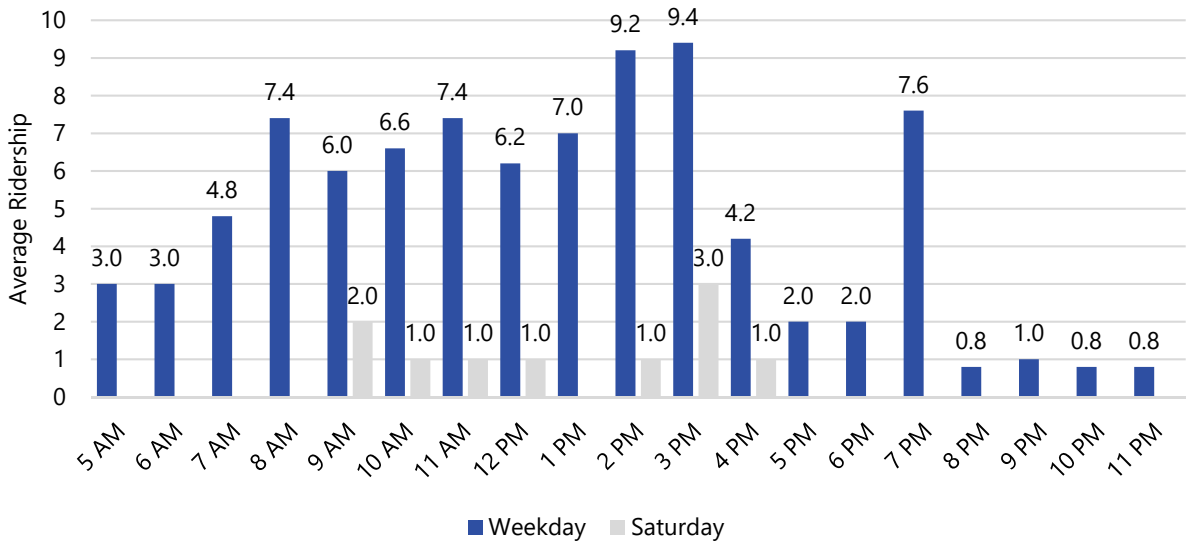
Figure 136 | Tele-Transit Ridership Trends: October/November 2017



Ridership per Service Hour

Based on pickup times, **Figure 137** shows average ridership per service hour on weekdays and Saturday between October 2 and October 7, 2017. On weekdays, ridership peaks during the 2:00 and 3:00 PM hours and declines during early morning and late evening hours. On Saturday, ridership – although significantly lower than on weekdays – also peaks during the 3:00 PM hour.

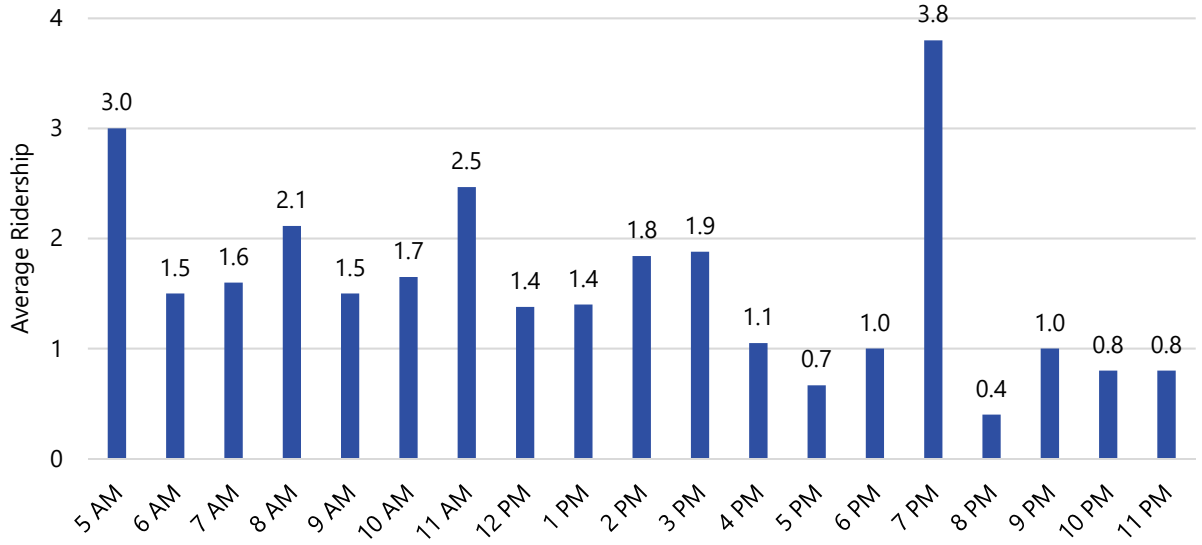
Figure 137 | Tele-Transit Ridership per Hour: October 2-7, 2017



Ridership per Vehicle Hour

Assessing ridership per vehicle hour in comparison to ridership per service hour sheds light on the productivity of a service and how well vehicle capacity aligns with ridership demand over the course of a day. **Figure 138** shows weekday Tele-Transit ridership per vehicle hour. Over the course of a weekday, Battle Creek Transit operates anywhere from one to five Tele-Transit vehicles, with the number of vehicles peaking between 12:30 and 4:00 PM. Weekday ridership per vehicle hour peaks at 3.8 during the 7:00 PM hour, when only two vehicles are typically in operation. On Saturdays, ridership per vehicle hour is identical to that of ridership per service hour, as there is only one Tele-Transit vehicle in service.

Figure 138 | Tele-Transit Weekday Ridership per Vehicle Hour: October 2-6, 2017



Summary of Observations

Strengths

- Provides demand-response transit coverage beyond the ADA-mandated ¾ mile buffer from fixed-route service
- Context-focused fare structure that recognizes areas and times of transit need with limited other options

Weaknesses

- Generally a low-ridership operation, with fewer than 100 trips per service day, and 2.43 riders per revenue hour
- High cost per passenger trip due to low productivity
- Unpredictable availability for non-ADA riders
- Very low ridership on Saturdays
- 15-minute pickup window, coupled with 5-minute wait times, results in some missed trips when vehicle departs without passenger before scheduled pickup time.

Opportunities

Potential opportunities to strengthen Battle Creek Transit's Tele-Transit service are listed below. Some suggestions may be contradictory, as there is usually more than one approach to improving demand response service.

- **Expand fixed-route service to areas with high Tele-Transit ridership**. Some Tele-Transit ridership is concentrated in such a way that it could be served with an expansion of fixed-route service. This includes the Beckley Road corridor, the mobile home parks near Bedford Road and O Road, and the Liberty Commons Apartments. Shifting this ridership to fixed-route service would both improve fixed-route service productivity and help reduce the Tele-Transit denial rate.
- **Address missed trips through the use of automated notification technology.** Trapeze offers a module that enables passengers to be notified when their vehicle is a few minutes away from their pickup location. Notifications can be sent via a recorded phone call or text message. This or similar technology would allow Tele-Transit to maintain its 15-minute time window prior to scheduled pickup times but avoid missed trips when a vehicle departs five minutes after arrival, but before the scheduled pickup time. The notification system increases the likelihood that a passenger is ready at the time of vehicle arrival and dwell time is minimized.
- **Consider contracting out some service, under certain conditions, in order to reduce operating costs.** Conditional contracting typically relies on non-dedicated vehicles such as taxis, ride-hailing services such as Lyft (which appears to be available in Battle Creek as part of the Kalamazoo service area), or private operators such as the planned job-access service for 2nd and 3rd shift workers in Battle Creek. The supplemental providers could be used to service outlying and low-density areas, or lower-ridership times of day, allowing Tele-Transit to focus on areas and times with the highest ridership demand. It could also be used to "bulk up" the Tele-Transit fleet when demand is particularly high.
- **Focus Tele-Transit on ADA service only, and provide subsidies for qualified general public trips taken on privately provided services such as taxis and ride-hailing services.** Using multiple types of arrangements, BCT could subsidize qualified trips and define which trips are considered qualified. Customers would book their own transportation on these services by phoning a call center or using a smartphone or web-based app. This approach has been implemented in several communities around the country and in Canada. There are multiple approaches to how to provide the subsidy to the passenger and how to limit the cost to the public agency. A common approach is that qualified users receive a discounted fare which the public agency supplements with its own payments to the service provider to make up the difference. There is typically a maximum subsidy per trip with the passenger having to pay anything greater. For example, if the maximum allowable subsidy is $3, but trip costs $6, the passenger would be responsible for all costs beyond the $3 subsidy. In addition, there are typically restrictions placed on the number of trips or total amount of monthly subsidy that is available to a user, and rules might also be imposed on the types of trips that are eligible for subsidy. For example, subsidized trips might be restricted to medical trips, social service trips, job access trips, and lifeline trips for seniors to get to retail and other destinations. There is a large range of possible options for organizing such user-side subsidy schemes that rely on privately operated transportation services.

APPENDIX C: MISSION, VISION, AND VALUE STATEMENT EXAMPLES

Mission

Overview

A mission is the fundamental purpose of the organization, and explains why an organization exists. A mission statement is important because any decision made should fit within the organization's reason for existence.

Examples

Transit agencies across the county each have their own unique mission statements. Examples from other organizations that were used to guide Battle Creek Transit in the development of its mission include:

- To provide the community with public transportation services that are dependable, convenient, safe, cost effective, and accessible for all (Metro – Kalamazoo, MI)
- We deliver quality, affordable transit service that link people, jobs and communities (CTA – Chicago, IL)
- To provide valued transit service that is safe, dependable and easy to use (Tri-Met – Portland, OR)

Vision

Overview

A vision is a picture or image of the future an organization seeks to create. A vision statement is important because it does not address the why or how but rather the what.

Examples

Transit agencies across the county each have their own unique vision statements. Examples from other organizations that were used to guide Battle Creek Transit in the development of its vision include:

- It is the vision of the Metro System to act as mobility managers in offering public transportation choices to all citizens (Metro – Kalamazoo, MI)
- To do our part in making our community the best place to live in the country (Tri-Met – Portland, OR)
- RTA – Cleveland, OH
  - We will be…
    - The transportation mode of choice for those with transportation options, and the lifeline for those dependent upon our services.
    - Recognized as a transportation industry leader and viewed as the most well-run public agency in the United States. RTA will be a top-flight organization with a first-class image.
    - An employer of choice in Northeastern Ohio, attracting, developing, motivating and retaining an outstanding and diverse workforce.
    - A champion for sustainable transportation, not only in reducing miles driven by private automobiles, but also by reducing waste and emissions and conserving resources. We will achieve the triple bottom line -- people, profit and planet.
  - We will have…
    - A sustainable financial position by securing local, state and federal funding to maintain a realistic operating and capital plan. Expenses will be controlled and a minimum 30-day operating reserve will be maintained.
    - An increasing impact as a regional transportation authority by increasing our regional influence, improving efficiency and the coordination of services.
  - We will…
    - Upgrade and manage technology and technology systems to best serve our customers, and achieve or exceed the efficiencies these systems were designed to supply.

- Achieve an infrastructure state of good repair, including the systematic replacement of our buses and trains. We will ensure execution of an effective asset management system.
- Fund, plan, coordinate, execute and deliver quality projects on time and on budget.
- Continually improve the quality of our services and enhance the value of RTA to the community.

Values

Overview

A value is a description of what the organization believes in and how it behaves. A value statement is important because it drives an organization's behavior and choices.

Examples

Transit agencies across the county each have their own unique value statement(s). Examples from other organizations that were used to guide Battle Creek Transit in the development of its value(s) include:

- Do the right thing, by being responsive, inclusive and accountable. (Tri-Met – Portland, OR)
- CTA – Chicago, IL
  - We will accomplish our mission with a diverse workforce that is:
    - Courteous - We will create a pleasant environment for ourselves and our customers.
    - Innovative - We will seek out and encourage employees who initiate change, improvement, learning and advancement of our goals.
    - Motivated - We will meet each task with spirit, enthusiasm and a sense of pride to be second to none.
    - Professional - We will provide transit service with the highest standards of quality and safety for our customers and ourselves.
    - Reliable - We will be dependable for our customers and fellow employees, and will maintain the highest standards of trust.
    - Results-Oriented - We will focus on getting the job done and will derive personal satisfaction from the service we provide.
- RTA – Cleveland, OH
  - Safety:
    - The safety of our passengers, our employees and the general public is always our top priority.
  - Ethics and Integrity:
    - We are dedicated to the highest ethical standards, including uncompromising honesty and integrity in our daily activities.
  - Service Excellence:
    - We will provide safe, clean, reliable, on-time, courteous service that our customers and the community will view as outstanding.
  - Fiscal Responsibility:
    - We are committed to manage every taxpayer and customer-generated dollar as if it were coming from our own pocket.
  - Teamwork:
    - We believe in teamwork and will foster a spirit of cooperative effort within RTA and with our partners.
  - Responsibility and Accountability:
    - Every individual is accountable. Meeting our individual responsibilities will ensure that collectively, RTA is a high-performing organization. We will meet all regulations and commitments and continually strive to improve.
  - Respect:
    - We will treat all members of the RTA family, our customers and the general public with dignity and respect.

APPENDIX D: MISSION, VISION, AND VALUES SURVEY SUMMARY

Mission Statement Preference

QUESTION: Of these two potential mission statements, which do you prefer? Please choose one.

Table 72 | Mission Statement Preference

Mission Statement	Number	Percent
Deliver dependable, high quality, cost effective, safe, and accessible public transportation services that enhance people's quality of life and connect them to jobs and communities.	1	14%
To provide the community with dependable, high quality, cost effective, safe, and accessible public transportation services that connect people, jobs, and communities and enhance Battle Creek's livability.	6	86%

Vision Statement Preference

QUESTION: Of these two potential vision statements, which do you prefer? Please choose one.

Table 73 | Vision Statement Preference

Mission Statement	Number	Percent
To do our part to provide residents, visitors, and employees transportation options in our community.	4	57%
To be the preferred public transportation provider in our community.	3	43%

Potential Value Preference

QUESTION: Of the following potential Values, check yes or no if you think these should be included? Please give an answer for each one.

Table 74 | Values Preference

Mission Statement	Yes	No
Sustainable: We commit to a sustainable business model that includes environment and fiscal responsibility, business continuity, and succession planning	7	0
Accountable: We are dedicated to public service and strive for excellence and customer satisfaction	6	1
Equitable: We will treat all our customers and employees fairly and equally.	6	1
Courteous and Clean: We will create a pleasant environment for our customers and employees.	6	1

Mission Statement	Yes	No
Safe: We commit to creating a safe and responsible environment for our employees, our customers, and our community.	7	0
Timely: We will provide reliable service to our customers.	6	1
Appealing: We will provide high quality transit service and amenities to our customers.	4	3
Accessibility: We will build regional partnerships to expand accessibility to transit	7	0
Disney-way: BCT is committed every day to serving our community and each other with integrity, using honesty in each interaction and treating all people with respect.	6	1
Collaborative: We will inspire and motivate one another through effective communication, collaboration, and partnership	5	2

APPENDIX E: STAKEHOLDER AND PUBLIC MEETINGS SUMMARY

Battle Creek Transit hosted five in-person outreach activities in March 2018. These included interviews with Battle Creek Transit (BCT) drivers, dispatchers, and supervisors, as well as two public meetings, a working meeting with the Public Transportation Committee, and a meeting of the Project Planning Group consisting of key stakeholders. Each meeting began with a formal presentation by Foursquare ITP staff that focused on the strengths and weaknesses of the existing system, opportunities for improvement, and threats to the successful implementation or long-term sustainability of those improvements.

During the presentation, attendees were encouraged to comment on the opportunities and threats presented. A full summary of the comments received during the March stakeholder and public meetings are provided below. Comments are organized by meeting type and are preceded by the question that they address.

Public Meetings #1 & #2

Public Meetings were held from 5:30 to 7:30 PM on March 12th and from 10:00 to 12:00 PM on March 13th, 2018 at the Department of Public Works (DPW) in Battle Creek. To encourage and facilitate participation, a shuttle from the downtown transfer center to the DPW was provided for both meetings. A total of 17 residents attended the two public meetings (10 on the 12th and seven on the 13th). The following comments are representative of feedback received at both meetings.

Opportunities

Route 1W

- Arbor Point Townhomes has a lot of ridership potential, but they find other means to get to work because the system isn't reliable. For these areas, the bus system span of service needs to be longer.
  - This area used to be served, along with the two trailer parks in Bedford Hills, but because of budget constraints service to these areas was discontinued.
- Need to continue to serve the assisted living facility on Bedford Road.
- Need to serve the Urbandale Plaza, if there was a park and ride in that area it would create ridership.
- There are issues with the current route making a left turn at the un-signalized intersection of Lamora and Michigan Avenue.

Route 2E

- Really liked the extension to the Family Fare presented in Scenario 1.
- Tele-Transit might not be the solution for those neighborhoods with discontinued service.
- On North Avenue there are a lot of AFC homes, especially between Goodale Avenue and Garfield Avenue.
- More people are getting off the bus at the apartment area as opposed to Emmett Street.

Route 2W

- Columbia Plaza, where the route currently goes through is terrible.
- A lot of people on this route go to ALDI and to the Dollar Tree.
- It is tough to cross 20th Street to go to ALDI, and that stretch of Columbia Avenue doesn't have sidewalks.
- Consider using Woodrow Avenue to connect Territorial Road and Columbia Avenue.
- Still consider serving the portions of Columbia Avenue that would no longer be served.

Route 3W

- Consider allowing route deviations into Springview Towers when people call.
- On North Avenue there are a lot of AFC homes, especially between Goodale Avenue and Garfield Avenue.
- Sam's N Supermarket (outside the city limits) would be served.

Route 3E

- The Woman's Cooperative, near the Georgetown Estates, would be served with new alignment.

- Don't like Scenario 2, would want the route to continue down Post Avenue.
- Would like to understand how can we serve a market beyond the city limits. In order to go into the Emmett Township, they need to improve the roads. Also, the PTC needs to make the decision on whether Emmett Township contributes with additional funding.

Route 4N

- The bus needs to go into the middle of the road to let off wheelchairs at Cherry Hill Manor on Division Street. People take the route downtown and loop back so they can be dropped off on the same side of the road as Cherry Hill Manor.
- In combination with Route 2E, there would be two routes serving the Family Fare. This could turn into a transfer point.

Route 4S

- The route is too long as it is, so it is understandable to cut the Walmart out.
- Social Security office is over by Target, there is an eye clinic, mental health facility, and the Brickyard out there as well.
- The Lakeview Square Mall is a major stop. Possibly have them go into the service drive and drop people off. The mall won't let Battle Creek Transit go to the front door or use the front drive.
- They would like some type of stop on the opposite side of the street to go to Michaels or Kohl's, or have a stop closer to McDonalds on the northside of the street.
- Walmart could be an opportunity for a park and ride, also possibly across the street at the strip mall.
- Would like to see service to Walmart on every trip, this is very appealing.
- Battle Creek Transit does not serve Leroy Township at all.

Route 5W

- There is no service to Stewart Industries, people want to go out to the factory.
- The manufacturers need early morning trips.
- For Scenario 2, it might make sense to call the different branches by two different route numbers.

Route 6W

- Would need to make clear how people would get downtown.
- Would like to see a similar route consideration in the area of Capital Avenue SW.

General Scenario Comments

- Likes the idea of hourly service to provide additional service coverage.
- On Saturday Battle Creek Transit doesn't provide service during the 12pm hour, they should provide frequency at the top of every hours.
- Consider one day a week to have the service stay out later or every day.
- Would like to see Sunday service.
- Need more Tele-Transit service at night.

Threats

Infrastructure

- Sometimes drivers won't pick up people with carts in the snow; wants to institute a program where men can shovel the bus stop and ride for free.
- For the Cherry Hill bus stop, why not move the bus stop closer to Van Buren Street.

Resources

- Could lose a lot of passengers if you increased fares.
- Like the idea of daily/monthly passes.
- People with younger children, who might be paying less themselves, have to pay full fare for the kids. Having a different cost for children than for adults might be the solution. Would like to see a student pass.
- Biggest problem with trains is right downtown. Might want to consider moving the transfer center to the old K-Mart. The City doesn't own that property though. Currently, all the routes can go up and over Washington Avenue.
- With multiple wheelchairs it takes at least 10 minutes and throws the whole schedule out the window.

Community Support

- The Battle Creek Transit website should have a search bar where you put in your address and it pulls up all the routes that serve your area.
- Should use local artists to do the design of bus wraps.
- Should look into local companies advertising on the buses.
- Every bus stop should have a pair across the street.
- Having bus stop signs in strategic spots that detail the frequency/span of a route.
- Service needs to run later in the evening and on Sunday.
- Issues with buses not waiting for transfers.
- The system needs a lot more bus stop amenities, and some are broken and need to be fixed.
- Mystery rider program might be a good idea.

Stakeholder Meetings

Two focus group meetings (Project Planning Group and the Public Transportation Committee) were held. The Planning Group meeting was held on March 12th and the Public Transportation Committee meeting was held on March 13th, 2018 at the Department of Public Works in Battle Creek. The first meeting included representatives of the following groups:

- Battle Creek Area Transportation Study
- Calhoun County
- Community Action - Agency of South Central Michigan
- City of Battle Creek
- Battle Creek Unlimited
- Summit Pointe Chamber of Commerce
- Aequitas Mobility Services

The second meeting consisted of members of the Public Transportation Committee. The following comments are representative of feedback received at both meetings.

Opportunities

Route 1W

- The Family Fare complex has a Dollar General, a discussion should be had with the economic development team to consider what could go into some of the empty businesses around the Family Fare.

Route 2W

- There is an opportunity to work with other parts of the city to make the area more walkable on Columbia Avenue.

Route 2E

- Two destinations missing: Northpoint Woods (large Senior Facility, a block north of the Save-A-Lot, served by another route); Summit Point has a recovery center by the Springview Towers (just north, served by another route).
- The Annex has a lot of students living there and is right next to Springview Towers.

Route 3W

- Battle Creek High School students need to get to the career center, and Kellogg Community College.
- Bank and Credit Union on the route are critical destinations.
- Bailey Park Apartments also needs to be served.
- Open to considering Tele-Transit going into Springview Towers and fixed route staying on the main road.

Route 3E

- Encouraged a discussion with Emmett Township to fix the roads.

Route 4N

- K-Pep is on the other side of the river. It would be good to serve this area, they house 70-75 people out there, and also there is Williamsburg Apartments and a nursing home.

- The Division Street is a state road, and they won't allow additional crosswalks.
- This year they will also downsize Capital Avenue NE to two lanes and a center turn lane.

Route 4S
- No comments.

Route 5W
- No comments.

Route 6W
- In Scenario 1, there should be a stop at the Burma Center, this could be a good activity generator.
- To increase service to Bedford and Springfield Townships, they need to increase the funding.
- Neither the Route 5W or 6W touches the pockets around the Musashi Auto Parts which has some density.

General Scenario Comments
- Need to consider what generates more access and revenue for the system.
- Need to consider which scenario leads to a more self-sufficient operation. The expanded service scenario is less appealing in the short term in terms of needing more vehicles and a 10 percent increase in operating costs.
- Need to consider travel time and ridership impacts of each scenario.

Threats

Jurisdictional Boundaries
- There should be consideration for retail areas outside of the city limits, but also pedestrian access and condition of streets.

Infrastructure
- Improvements at each bus stop should be detailed, in order to make it possible to create an improvement plan.
  - Could the Cherry Hill Manor bus stop be at Van Buren Street?
  - Bus Only Lanes should be considered along Dickman straight out to Fort Custer.

Resources
- Can Battle Creek Transit become more sustainable with raising fares.
- 39 percent of operating costs reimbursed by MDOT.

Marketing
- Bus wraps should incorporate advertising.

Mission/Vision/Value Statements

In addition to the strengths, weaknesses, opportunities and threats discussion the Stakeholder group on March 12th was asked to provide input on the Mission, Vision and Values statements being developed for Battle Creek Transit. The sections below summarize the comments received.

Mission

The mission defines the fundamental purpose of the organization. Key themes identified by the group to be included were:
- Connecting to a community
- Linking jobs and community
- Dependability
- Quality of life
- Cost effective, safe, accessible
- High quality service

Vision
The vision is a picture or image of the future the organization seeks to create. The stakeholder group created the following statement:

- Aspire to be the preferred, trusted, public transportation system to connect all to our community.

Values
Values describe what the organization believes in and how it behaves, it is used to drive an organization's behavior and choices. Key values identified by the group were:

- Sustainable
- Accountable
- Equitable
- Courteous and clean
- Safe
- Timely
- Appealing
- Accessible
- Disney-way
- Collaborative

Frontline Staff Meetings

Two meetings, one with transit leadership staff and one with transit drivers, dispatchers, and maintenance staff at the BCT Facility, were held on March 13th, 2018. The following comments are representative of feedback received at both meetings.

Opportunities

Route 1W
- Michigan gets very busy, like the Scenario 2 better than Scenario 1.
- Can't run the current route in 30 minutes.

Route 2E
- Like the idea of connecting to the Family Fare and connecting with Route 4N.
- There are three apartment complexes by Garrison Avenue.
- East Avenue has a bus stop with some ridership.
- Liked Scenario 1 better.
- At Emmett Street there is low ridership.
- The Career Center is not a destination, could be a transition but the route should go to Family Fare.

Route 2W
- Going up the hill on Riverside Drive in the winter can be difficult.
- Worried about the stop at Columbia Avenue and 20th Street, too much traffic going in and out of the plaza.
- There is a lot of ridership on Meachem Avenue.
- There are apartments on Goguac Street.
- There is a lot of ridership at the Veterans home, and an Alcoholics Anonymous club.

Route 3W
- Really like not going into Springview Tower.
- Skeptical of going to hourly.

Route 3E
- The roads in Emmett Township need to be improved.
- The alternating loops is too confusing.

Route 4N
- Like the idea of not going into Cherry Hill Manor.

Route 4S
- People work at motels and other destinations east of the Meijer.

Route 5W
- Won't be able to access Liberty Commons from Dickman in the opposite direction.
- They used to
- Think Scenario 2 is confusing, this could eliminate the tripper.

Route 6W
- This route would be busy in the morning and the afternoon, the rest of the day it would be empty
- This would provide a lot of relief to the Tele-Transit service

General Scenario Comments
- Really like the being able to go back and forth (bi-directional) along a road.
- The biggest thing that we heard is that we want longer hours.

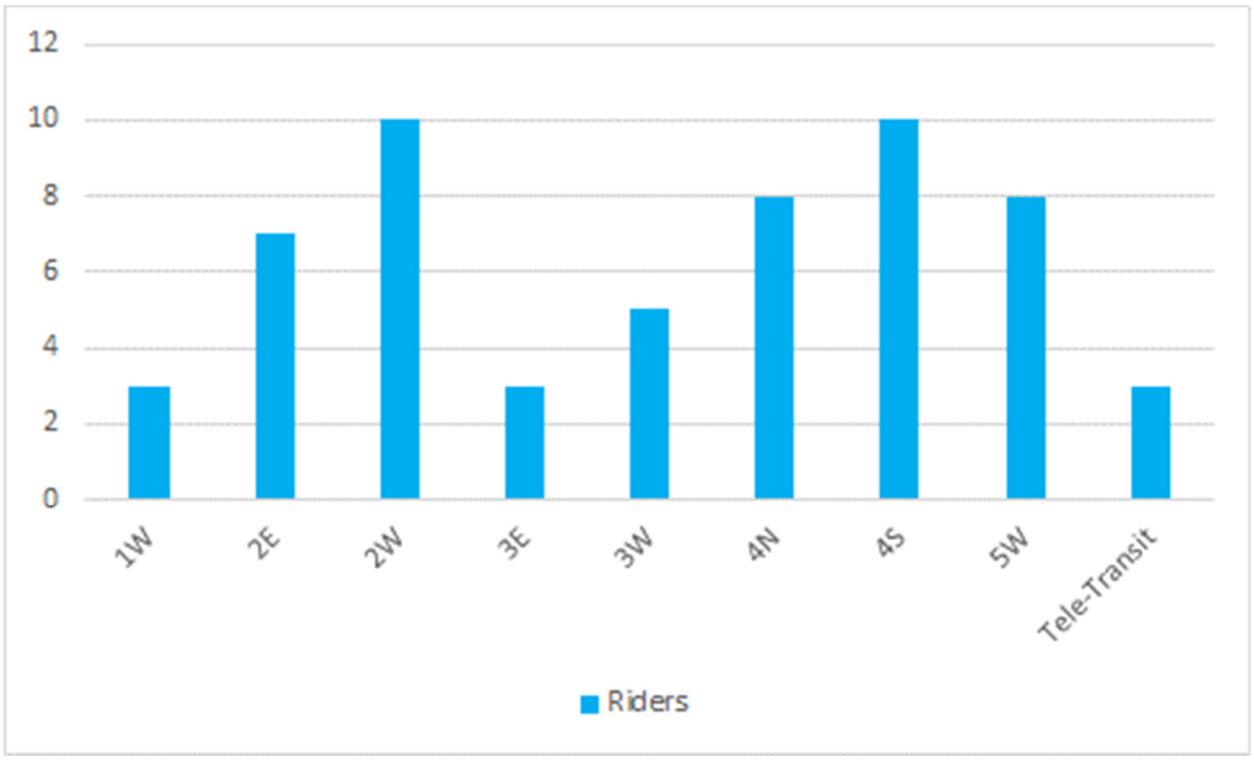
Alternatives Survey

A survey was administered, both online and in hard copy, from March 20 to April 19, 2018. It provided two potential alternatives for transit riders to evaluate, and asked riders to choose the most useful from a list of potential transit improvements. It received 28 responses total, including both paper and electronic submissions.

Routes Used

Survey takers were asked about which BCTA routes they typically use. The results of this question are broken down in **Figure 139**. The 2W and the 4S were the routes that respondents most commonly reported using, with each used by 36% of survey respondents. Least ridden routes were the 1W, the 3E, and Tele-Transit services, with each used by just 11% of respondents. A slim majority of respondents (15 of 28) reported regularly using multiple BCTA routes, while a quarter (7 of 28) reported not regularly using any BCTA services.

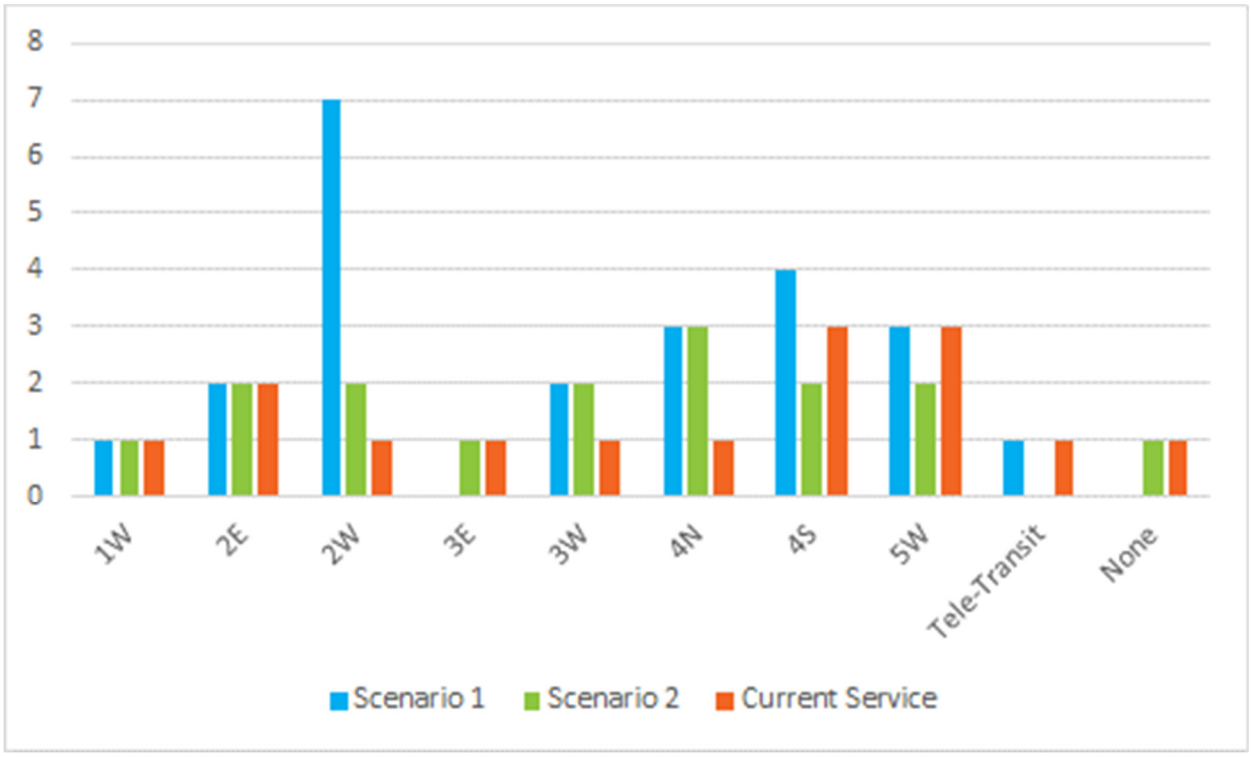
Figure 139 | Breakdown of Route Usage among Survey Respondents



Alternatives Preferred

21 of the 28 participants (75%) chose either Scenario 1, Scenario 2, or current service. These options are shown on **Figure 140**. Of those who chose an option, a plurality (48%) chose Scenario 1, while 24% chose Scenario 2 and 29% chose current service. Breaking these responses down by the routes each survey participant rides reveals important trends, as shown in Figure 140. The two routes that the most respondents reported riding, the 2W and the 4S, were also the most heavily in favor of Scenario 1. Scenario 1 was preferred by 70% of 2W riders and 44% of 4S riders (one 4S rider did not state a preference). None of the other routes saw overwhelming support for either scenario or existing service, with the number of riders supporting each alternative tied or within one in every case. This shows that the support for Scenario 1 over Scenario 2 and Current Service was driven primarily by 2W and 4S riders.

Figure 140 | Breakdown of Scenario Preferences by Route Usage



In the survey, respondents were also given the opportunity to comment on each scenario. Some of the comments were not specifically about the scenario: many respondents used these as an open-ended opportunity to provide feedback on service more generally. These comments are grouped separately.

Comments on Scenario 1:

- "Seems easier for disabled people to use"
- "3W should stay as is. Will it go by Champion and Washington?"
- "I've taken the 2E and 4N routes many times where I live. It makes sense to eliminate the Emmet and East Ave South of Roosevelt because of low ridership. The proposed route would help me because I normally have to walk from Garrison and Roosevelt area to Pennfield Family Fare. The 4N route could be scaled to an hourly route in my opinion because most of the people it seems connect to hourly bus routes anyways or they go to Pennfield Family Fare."
- "I like the connectivity between routes."
- "While I feel this is the best, I get the feeling that this is a very small band aid being put on a huge wound. This county is so poorly served by the Transit Authority in this county. I look at what Kalamazoo, Grand Rapids, Lansing or Traverse City have in place and we are an embarrassment to the state. We either need smarter people coming up with a strategy or look at a different organization to resolve our issues."
- "Would like to see service in Springfield again"

- "All busses would need to leave downtown at the same time. We don't want to wait 30 minutes for connection as we do now."
- "Like service to Bedford, and also service up North Ave to Oakridge"
- "2E: Like it going to family fare complex 3E: Prefer scenario 1 6W: if service outside the city a possibility, great!"
- "Why are they not going to serve Benttree?"

Comments on Scenario 2:

- "I don't understand 4S. It is important to keep 4N on a 30-minute frequency."
- "Better than current service due to bilateral options."
- "I don't like the different alternate routes, the A/B thing."
- "2W should stay one hour 3W as is."
- "Like that few changes--makes things less hectic to get back and forth."
- "Like service change in post addition to Cliff/Columbia/Main, like circuit at south end—Walmart/Beckley/Capital/Glenn Cross"
- "1W: preserving service on a portion of west michigan to 20th street 4s--alternating service for apartments 5W--alternating service for VA/ft. custer."

General comments:

- "There should be a Secret (Shopper) Bus Person to check out the quality of Bus Driver to Customers."
- "Share Center--Paul runs the mens groups to volunteer to shovel bus stops and could ride bus free to bus stops to shovel. Each person can get a free bus card for each bus stop that he shoveled."
- "My opinion is that a hybrid of the two scenarios is better. A few suggestions: Routes should be odd number north/south and even number east/west. Route preferences are: 1W: scenario 2 2E: scenario 1 2W: both 3W: scenario 1 3E: scenario 1 for the purpose of reducing confusion 4N: both 4S: scenario 1 5W: need to see how it works in ft custer industrial park 6W: I like it but needs to address the burma center if possible and need to see how it flows through the park."
- "Need a more direct route from NW quadrant to Ft. Custer industrial park. Many workers who need transit service live there. Current scenarios take 2 hours end to end. Need to reduce to 1 hour if possible. Need discussion on payment options, app with bus arrival info, extend service time on either end to accommodate shift work, placement of stops in relation to intersections, lights, and employers."
- "Don't raise rates over $1.50. It's a really good idea to have "daily or "weekly" fares, but you should be able to buy them on any bus. What about buying/using smaller buses?"
- "It seems to make fiscal sense to improve pedestrian street crossings, to limit the need to make loops through housing complexes."
- "Create special runs on all election days from low income neighborhoods to every polling location."
- "Walkability study? What's the percent increase in ridership with two scenarios?"
- "We want to have longer times on the service. Having the stops cleared free of snow during the winter months. Having Sunday runs."
- "Really my only issue is the times but I do understand why just wish it would be more frequent. Won't necessarily stop me though."
- "Buses just need to run later."

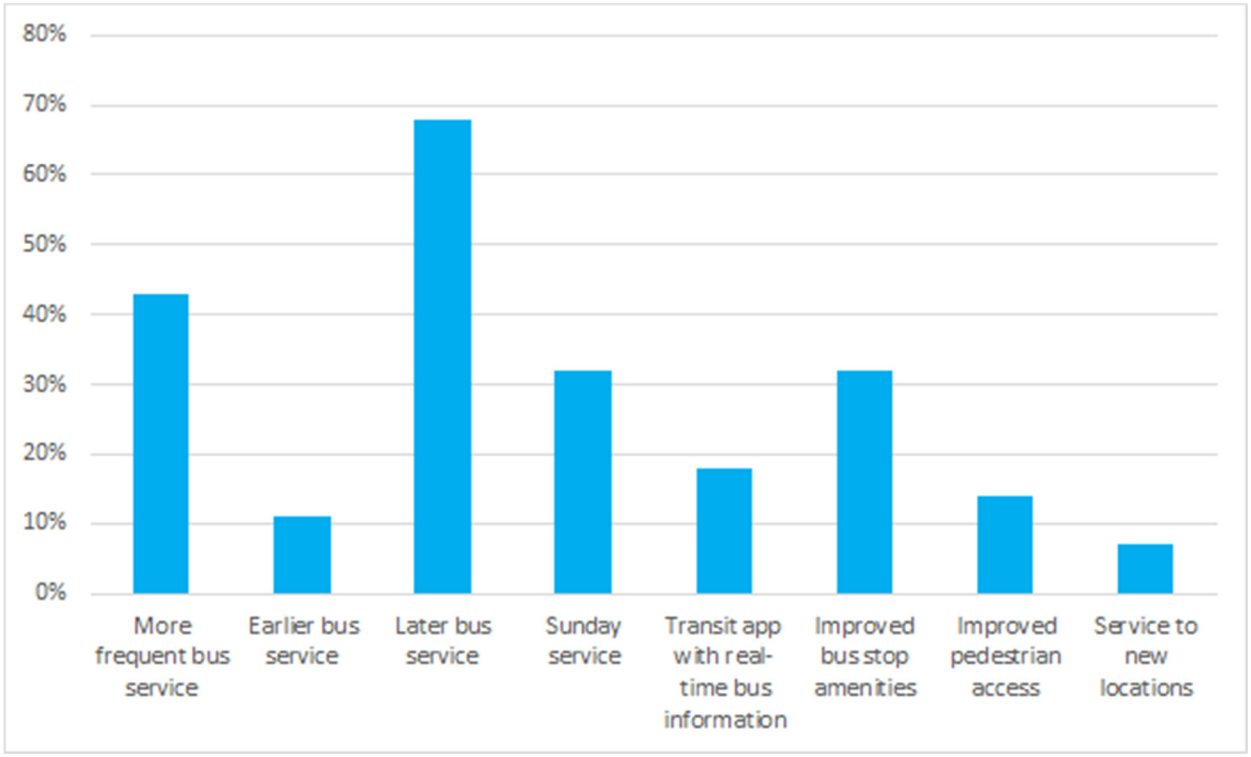
Transit Improvement Prioritization

At the end of the survey, respondents were given a list of eight potential transit improvements and allowed to choose up to three that would be most important to them. These improvements included:

- More frequent bus service
- Earlier bus service
- Later bus service
- Sunday service
- Transit app with real-time bus arrival information
- Improved bus stop amenities
- Improved pedestrian access
- Service to new locations (those who chose this option were asked to list the locations they would like to have service to.)

The results of this question can be seen in **Figure 141**. Later bus service was by far the most popular choice, cited by 68% of respondents. After that was more frequent bus service, which was selected by 43% of respondents. Service to new areas was the least popular choice, selected by only 7% of respondents. The new areas they suggested to extend service to include, “More frequent stops at Walmart and Meijer” and “Calhoun County”. These results indicate that survey takers are generally satisfied with the geographic extent of BCTA service and are primarily concerned with improving its frequency and span of service.

Figure 141 | Results of Transit Improvement Prioritization Question



PAGE INTENTIONALLY LEFT BLANK

APPENDIX F: ROUTE SCHEDULES

Table 75 | Route 1W Weekday Schedule

	1W Outbound								1W Inbound						
Distance						6.2								6.2	
Estimated Speed						15	Recovery							15	Recovery
Travel Time (calc)						0:24								0:24	
Travel Time (tested)		0:05	0:04	0:05	0:04	0:04	0:05			0:06	0:04	0:05	0:04	0:05	0:09
Block	Transportation Center	West Michigan & Jordan	Jackson & North 20th (Arbor Pointe)	Urbandale Plaza	Stringham & West Michigan	Taylor & Bedford			Taylor & Bedford	Michigan & Stringham	Urbandale Plaza	N 20th & Jackson (Arbor Pointe)	Angell & West Michigan	Transportation Center	
1	5:15A	5:20A	5:24A	5:29A	5:33A	5:37A	5:42A		5:42A	5:48A	5:52A	5:57A	6:01A	6:06A	6:15A
1	6:15A	6:20A	6:24A	6:29A	6:33A	6:37A	6:42A		6:42A	6:48A	6:52A	6:57A	7:01A	7:06A	7:15A
1	7:15A	7:20A	7:24A	7:29A	7:33A	7:37A	7:42A		7:42A	7:48A	7:52A	7:57A	8:01A	8:06A	8:15A
1	8:15A	8:20A	8:24A	8:29A	8:33A	8:37A	8:42A		8:42A	8:48A	8:52A	8:57A	9:01A	9:06A	9:15A
1	9:15A	9:20A	9:24A	9:29A	9:33A	9:37A	9:42A		9:42A	9:48A	9:52A	9:57A	10:01A	10:06A	10:15A
1	10:15A	10:20A	10:24A	10:29A	10:33A	10:37A	10:42A		10:42A	10:48A	10:52A	10:57A	11:01A	11:06A	11:15A
1	11:15A	11:20A	11:24A	11:29A	11:33A	11:37A	11:42A		11:42A	11:48A	11:52A	11:57A	12:01P	12:06P	12:15P
1	12:15P	12:20P	12:24P	12:29P	12:33P	12:37P	12:42P		12:42P	12:48P	12:52P	12:57P	1:01P	1:06P	1:15P
1	1:15P	1:20P	1:24P	1:29P	1:33P	1:37P	1:42P		1:42P	1:48P	1:52P	1:57P	2:01P	2:06P	2:15P
1	2:15P	2:20P	2:24P	2:29P	2:33P	2:37P	2:42P		2:42P	2:48P	2:52P	2:57P	3:01P	3:06P	3:15P
1	3:15P	3:20P	3:24P	3:29P	3:33P	3:37P	3:42P		3:42P	3:48P	3:52P	3:57P	4:01P	4:06P	4:15P
1	4:15P	4:20P	4:24P	4:29P	4:33P	4:37P	4:42P		4:42P	4:48P	4:52P	4:57P	5:01P	5:06P	5:15P
1	5:15P	5:20P	5:24P	5:29P	5:33P	5:37P	5:42P		5:42P	5:48P	5:52P	5:57P	6:01P	6:06P	6:15P
1	6:15P	6:20P	6:24P	6:29P	6:33P	6:37P									
														Total Revenue Hours: 13:22	

Table 76 | Route 2Wa and Route 3Ea Weekday Schedule

	2Wa Outbound							2Wa Inbound					
Distance					**4.3**							**4.3**	
Estimated Speed					**16**	**Recovery**						**16**	**Recovery**
Travel Time (calc)					**0:16**							**0:16**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:03**	**0:01**			**0:03**	**0:04**	**0:04**	**0:03**	**0:02**
Block	Transportation Center	Dickman Rd & Riverside Dr	Riverside Dr & Columbia Ave	Columbia Ave & 20th St	Meijer			Meijer	Columbia Ave & 20th St	Territorial Ave & Capital Ave	Riverside Dr & Dickman Rd	Transportation Center	
1	5:15A	5:18A	5:21A	5:25A	5:28A	5:29A		5:29A	5:32A	5:36A	5:40A	5:43A	5:45A
1	6:15A	6:18A	6:21A	6:25A	6:28A	6:29A		6:29A	6:32A	6:36A	6:40A	6:43A	6:45A
1	7:15A	7:18A	7:21A	7:25A	7:28A	7:29A		7:29A	7:32A	7:36A	7:40A	7:43A	7:45A
1	8:15A	8:18A	8:21A	8:25A	8:28A	8:29A		8:29A	8:32A	8:36A	8:40A	8:43A	8:45A
1	9:15A	9:18A	9:21A	9:25A	9:28A	9:29A		9:29A	9:32A	9:36A	9:40A	9:43A	9:45A
1	10:15A	10:18A	10:21A	10:25A	10:28A	10:29A		10:29A	10:32A	10:36A	10:40A	10:43A	10:45A
1	11:15A	11:18A	11:21A	11:25A	11:28A	11:29A		11:29A	11:32A	11:36A	11:40A	11:43A	11:45A
1	12:15P	12:18P	12:21P	12:25P	12:28P	12:29P		12:29P	12:32P	12:36P	12:40P	12:43P	12:45P
1	1:15P	1:18P	1:21P	1:25P	1:28P	1:29P		1:29P	1:32P	1:36P	1:40P	1:43P	1:45P
1	2:15P	2:18P	2:21P	2:25P	2:28P	2:29P		2:29P	2:32P	2:36P	2:40P	2:43P	2:45P
1	3:15P	3:18P	3:21P	3:25P	3:28P	3:29P		3:29P	3:32P	3:36P	3:40P	3:43P	3:45P
1	4:15P	4:18P	4:21P	4:25P	4:28P	4:29P		4:29P	4:32P	4:36P	4:40P	4:43P	4:45P
1	5:15P	5:18P	5:21P	5:25P	5:28P	5:29P		5:29P	5:32P	5:36P	5:40P	5:43P	5:45P

***Buses serving Route 2Wa also serve Route 3Ea (see following page)**

*Buses serving Route 3Ea also serve Route 2Wa (see previous page)

	3Ea Outbound						3Ea Inbound				
Distance				**2.7**						**2.7**	
Estimated Speed				**14**	**Recovery**					**14**	**Recovery**
Travel Time (calc)				**0:11**						**0:11**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:00**			**0:04**	**0:03**	**0:05**	**0:08**
Block	Transportation Center	Capital & Michigan	Main St &Cliff St	Cliff St & Hannah St			Cliff St & Hannah St	Columbia Ave & Main St	Michigan Ave & Capital Ave	Transportation Center	
1	5:45A	5:48A	5:51A	5:55A	5:55A		5:55A	5:59A	6:02A	6:07A	6:15A
1	6:45A	6:48A	6:51A	6:55A	6:55A		6:55A	6:59A	7:02A	7:07A	7:15A
1	7:45A	7:48A	7:51A	7:55A	7:55A		7:55A	7:59A	8:02A	8:07A	8:15A
1	8:45A	8:48A	8:51A	8:55A	8:55A		8:55A	8:59A	9:02A	9:07A	9:15A
1	9:45A	9:48A	9:51A	9:55A	9:55A		9:55A	9:59A	10:02A	10:07A	10:15A
1	10:45A	10:48A	10:51A	10:55A	10:55A		10:55A	10:59A	11:02A	11:07A	11:15A
1	11:45A	11:48A	11:51A	11:55A	11:55A		11:55A	11:59A	12:02P	12:07P	12:15P
1	12:45P	12:48P	12:51P	12:55P	12:55P		12:55P	12:59P	1:02P	1:07P	1:15P
1	1:45P	1:48P	1:51P	1:55P	1:55P		1:55P	1:59P	2:02P	2:07P	2:15P
1	2:45P	2:48P	2:51P	2:55P	2:55P		2:55P	2:59P	3:02P	3:07P	3:15P
1	3:45P	3:48P	3:51P	3:55P	3:55P		3:55P	3:59P	4:02P	4:07P	4:15P
1	4:45P	4:48P	4:51P	4:55P	4:55P		4:55P	4:59P	5:02P	5:07P	5:15P
1	5:45P	5:48P	5:51P	5:55P	5:55P		5:55P	5:59P	6:02P	6:07P	

Total Revenue Hours (for Routes 2Wa and 3Ea): 12:52

Table 77 | Route 2Wb and Route 3Eb Weekday Schedule

	2Wb Outbound							2Wb Inbound					
Distance					**4.3**							**4.3**	
Estimated Speed					**16**	**Recovery**						**16**	**Recovery**
Travel Time (calc)					**0:16**							**0:16**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:03**	**0:01**			**0:03**	**0:03**	**0:05**	**0:03**	**0:02**
Block	Transportation Center	Dickman Rd & Riverside Dr	Territorial Ave & Capital Ave	20th St & Columbia Ave	Meijer			Meijer	Columbia Ave & 20th St	Riverside Dr & Columbia Ave	Dickman Rd & Riverside Dr	Transportation Center	
2													
2	5:45A	5:48A	5:51A	5:55A	5:58A	5:59A		5:59A	6:02A	6:05A	6:10A	6:13A	6:15A
2	6:45A	6:48A	6:51A	6:55A	6:58A	6:59A		6:59A	7:02A	7:05A	7:10A	7:13A	7:15A
2	7:45A	7:48A	7:51A	7:55A	7:58A	7:59A		7:59A	8:02A	8:05A	8:10A	8:13A	8:15A
2	8:45A	8:48A	8:51A	8:55A	8:58A	8:59A		8:59A	9:02A	9:05A	9:10A	9:13A	9:15A
2	9:45A	9:48A	9:51A	9:55A	9:58A	9:59A		9:59A	10:02A	10:05A	10:10A	10:13A	10:15A
2	10:45A	10:48A	10:51A	10:55A	10:58A	10:59A		10:59A	11:02A	11:05A	11:10A	11:13A	11:15A
2	11:45A	11:48A	11:51A	11:55A	11:58A	11:59A		11:59A	12:02P	12:05P	12:10P	12:13P	12:15P
2	12:45P	12:48P	12:51P	12:55P	12:58P	12:59P		12:59P	1:02P	1:05P	1:10P	1:13P	1:15P
2	1:45P	1:48P	1:51P	1:55P	1:58P	1:59P		1:59P	2:02P	2:05P	2:10P	2:13P	2:15P
2	2:45P	2:48P	2:51P	2:55P	2:58P	2:59P		2:59P	3:02P	3:05P	3:10P	3:13P	3:15P
2	3:45P	3:48P	3:51P	3:55P	3:58P	3:59P		3:59P	4:02P	4:05P	4:10P	4:13P	4:15P
2	4:45P	4:48P	4:51P	4:55P	4:58P	4:59P		4:59P	5:02P	5:05P	5:10P	5:13P	5:15P

***Buses serving Route 2Wb also serve Route 3Eb (see following page)**

*Buses serving Route 3Eb also serve Route 2Wb (see previous page)

	3Eb Outbound						3Eb Inbound				
Distance				**2.7**						**2.7**	
Est. Speed				**14**	**Recovery**					**14**	**Recovery**
Travel Time (calc)				**0:11**						**0:11**	
Travel Time (tested)		**0:03**	**0:05**	**0:02**	**0:00**			**0:04**	**0:03**	**0:05**	**0:08**
Block	Transportation Center	Capital & Michigan	Main St & Columbia Ave	Columbia Ave & Hannah St			Columbia Ave & Hannah St	Cliff St & Main St	Michigan Ave & Capital Ave	Transportation Center	
2	5:15A	5:18A	5:23A	5:25A	5:25A		5:25A	5:29A	5:32A	5:37A	5:45A
2	6:15A	6:18A	6:23A	6:25A	6:25A		6:25A	6:29A	6:32A	6:37A	6:45A
2	7:15A	7:18A	7:23A	7:25A	7:25A		7:25A	7:29A	7:32A	7:37A	7:45A
2	8:15A	8:18A	8:23A	8:25A	8:25A		8:25A	8:29A	8:32A	8:37A	8:45A
2	9:15A	9:18A	9:23A	9:25A	9:25A		9:25A	9:29A	9:32A	9:37A	9:45A
2	10:15A	10:18A	10:23A	10:25A	10:25A		10:25A	10:29A	10:32A	10:37A	10:45A
2	11:15A	11:18A	11:23A	11:25A	11:25A		11:25A	11:29A	11:32A	11:37A	11:45A
2	12:15P	12:18P	12:23P	12:25P	12:25P		12:25P	12:29P	12:32P	12:37P	12:45P
2	1:15P	1:18P	1:23P	1:25P	1:25P		1:25P	1:29P	1:32P	1:37P	1:45P
2	2:15P	2:18P	2:23P	2:25P	2:25P		2:25P	2:29P	2:32P	2:37P	2:45P
2	3:15P	3:18P	3:23P	3:25P	3:25P		3:25P	3:29P	3:32P	3:37P	3:45P
2	4:15P	4:18P	4:23P	4:25P	4:25P		4:25P	4:29P	4:32P	4:37P	4:45P
2	5:15P	5:18P	5:23P	5:25P	5:25P		5:25P	5:29P	5:32P	5:37P	

Total Revenue Hours (for Routes 2Wb and 3Eb): 12:22

Table 78 | Route 2E and Route 3W Weekday Schedule

	2E Outbound							2E Inbound					
Distance					**3.1**							**3.0**	
Estimated Speed					**14**	**Recovery**						**14**	**Recovery**
Travel Time (calc)					**0:13**							**0:12**	
Travel Time (tested)		**0:03**	**0:03**	**0:03**	**0:04**	**0:00**			**0:03**	**0:03**	**0:03**	**0:03**	**0:05**
Block	Transportation Center	North Ave & Calhoun St	Emmett Ave & North Ave	Springview Dr & Roosevelt Ave	North Ave & Coolidge			North Ave & Coolidge	Roosevelt Ave & Springview Dr	North Ave & Emmett St	North Ave & Calhoun St	Transportation Center	
1													
2	5:45A	5:48A	5:51A	5:54A	5:58A	5:58A		5:58A	6:01A	6:04A	6:07A	6:10A	6:15A
1	6:15A	6:18A	6:21A	6:24A	6:28A	6:28A		6:28A	6:31A	6:34A	6:37A	6:40A	6:45A
2	6:45A	6:48A	6:51A	6:54A	6:58A	6:58A		6:58A	7:01A	7:04A	7:07A	7:10A	7:15A
1	7:15A	7:18A	7:21A	7:24A	7:28A	7:28A		7:28A	7:31A	7:34A	7:37A	7:40A	7:45A
2	7:45A	7:48A	7:51A	7:54A	7:58A	7:58A		7:58A	8:01A	8:04A	8:07A	8:10A	8:15A
1	8:15A	8:18A	8:21A	8:24A	8:28A	8:28A		8:28A	8:31A	8:34A	8:37A	8:40A	8:45A
2	8:45A	8:48A	8:51A	8:54A	8:58A	8:58A		8:58A	9:01A	9:04A	9:07A	9:10A	9:15A
1	9:15A	9:18A	9:21A	9:24A	9:28A	9:28A		9:28A	9:31A	9:34A	9:37A	9:40A	
2	9:45A	9:48A	9:51A	9:54A	9:58A	9:58A		9:58A	10:01A	10:04A	10:07A	10:10A	10:15A
2	10:45A	10:48A	10:51A	10:54A	10:58A	10:58A		10:58A	11:01A	11:04A	11:07A	11:10A	11:15A
2	11:45A	11:48A	11:51A	11:54A	11:58A	11:58A		11:58A	12:01P	12:04P	12:07P	12:10P	12:15P
2	12:45P	12:48P	12:51P	12:54P	12:58P	12:58P		12:58P	1:01P	1:04P	1:07P	1:10P	1:15P
2	1:45P	1:48P	1:51P	1:54P	1:58P	1:58P		1:58P	2:01P	2:04P	2:07P	2:10P	2:15P

	2E Outbound							2E Inbound					
2	2:45P	2:48P	2:51P	2:54P	2:58P	2:58P		2:58P	3:01P	3:04P	3:07P	3:10P	3:15P
1	3:15P	3:18P	3:21P	3:24P	3:28P	3:28P		3:28P	3:31P	3:34P	3:37P	3:40P	3:45P
2	3:45P	3:48P	3:51P	3:54P	3:58P	3:58P		3:58P	4:01P	4:04P	4:07P	4:10P	4:15P
1	4:15P	4:18P	4:21P	4:24P	4:28P	4:28P		4:28P	4:31P	4:34P	4:37P	4:40P	4:45P
2	4:45P	4:48P	4:51P	4:54P	4:58P	4:58P		4:58P	5:01P	5:04P	5:07P	5:10P	5:15P
1	5:15P	5:18P	5:21P	5:24P	5:28P	5:28P		5:28P	5:31P	5:34P	5:37P	5:40P	5:45P

***Buses serving Route 2E also serve Route 3W (see following page)**

***Buses serving Route 3W also serve Route 2E (see previous page)**

	3W Outbound						3W Inbound					
Distance					**3.7**						**3.7**	
Estimated Speed					**14**	**Recovery**					**14**	**Recovery**
Travel Time (calc)					**0:15**						**0:15**	
Travel Time (tested)		**0:04**	**0:03**	**0:04**	**0:03**	**0:00**		**0:04**	**0:04**	**0:04**	**0:03**	**0:01**
Block	Transportation Center	Van Buren St & Washington Ave	Washington Ave & Parkway Dr	Hubbard St & Goodale Ave	Roosevelt Ave & North Ave		Roosevelt Ave & North Ave	Goodale Ave & Hubbard St	Parkway Dr & Washington Ave	Washington Ave & Van Buren St	Transportation Center	
1	5:45A	5:49A	5:52A	5:56A	5:59A	5:59A	5:59A	6:03A	6:07A	6:11A	6:14A	6:15A
2	6:15A	6:19A	6:22A	6:26A	6:29A	6:29A	6:29A	6:33A	6:37A	6:41A	6:44A	6:45A
1	6:45A	6:49A	6:52A	6:56A	6:59A	6:59A	6:59A	7:03A	7:07A	7:11A	7:14A	7:15A
2	7:15A	7:19A	7:22A	7:26A	7:29A	7:29A	7:29A	7:33A	7:37A	7:41A	7:44A	7:45A
1	7:45A	7:49A	7:52A	7:56A	7:59A	7:59A	7:59A	8:03A	8:07A	8:11A	8:14A	8:15A
2	8:15A	8:19A	8:22A	8:26A	8:29A	8:29A	8:29A	8:33A	8:37A	8:41A	8:44A	8:45A
1	8:45A	8:49A	8:52A	8:56A	8:59A	8:59A	8:59A	9:03A	9:07A	9:11A	9:14A	9:15A
2	9:15A	9:19A	9:22A	9:26A	9:29A	9:29A	9:29A	9:33A	9:37A	9:41A	9:44A	9:45A
1												
2	10:15A	10:19A	10:22A	10:26A	10:29A	10:29A	10:29A	10:33A	10:37A	10:41A	10:44A	10:45A
2	11:15A	11:19A	11:22A	11:26A	11:29A	11:29A	11:29A	11:33A	11:37A	11:41A	11:44A	11:45A
2	12:15P	12:19P	12:22P	12:26P	12:29P	12:29P	12:29P	12:33P	12:37P	12:41P	12:44P	12:45P
2	1:15P	1:19P	1:22P	1:26P	1:29P	1:29P	1:29P	1:33P	1:37P	1:41P	1:44P	1:45P

	3W Outbound							3W Inbound					
2	2:15P	2:19P	2:22P	2:26P	2:29P	2:29P		2:29P	2:33P	2:37P	2:41P	2:44P	2:45P
2	3:15P	3:19P	3:22P	3:26P	3:29P	3:29P		3:29P	3:33P	3:37P	3:41P	3:44P	3:45P
1	3:45P	3:49P	3:52P	3:56P	3:59P	3:59P		3:59P	4:03P	4:07P	4:11P	4:14P	4:15P
2	4:15P	4:19P	4:22P	4:26P	4:29P	4:29P		4:29P	4:33P	4:37P	4:41P	4:44P	4:45P
1	4:45P	4:49P	4:52P	4:56P	4:59P	4:59P		4:59P	5:03P	5:07P	5:11P	5:14P	5:15P
2	5:15P	5:19P	5:22P	5:26P	5:29P	5:29P		5:29P	5:33P	5:37P	5:41P	5:44P	
1	5:45P	5:49P	5:52P	5:56P	5:59P	5:59P		5:59P	6:03P	6:07P	6:11P	6:14P	
Total Revenue Hours (Routes 2E and 3W): 18:53													

Table 79 | Route 4N Weekday Schedule

	4N Outbound							4N Inbound					
Distance					**3.4**							**3.4**	
Estimated Speed					**15**	**Recovery**						**15**	**Recovery**
Travel Time (calc)					**0:13**							**0:13**	
Travel Time (tested)		**0:05**	**0:03**	**0:03**	**0:02**	**0:00**			**0:02**	**0:03**	**0:03**	**0:06**	**0:03**
Block	Transportation Center	Van Buren St. & Division St	Capital Ave & East Ave	Capital Ave & Roosevelt Ave	Capital Square Plaza			Capital Square Plaza	Capital Ave & Roosevelt Ave	Capital Ave & East Ave	Division St & Van Buren St	Transportation Center	
1	5:15A	5:20A	5:23A	5:26A	5:28A	5:28A		5:28A	5:30A	5:33A	5:36A	5:42A	5:45A
1	5:45A	5:50A	5:53A	5:56A	5:58A	5:58A		5:58A	6:00A	6:03A	6:06A	6:12A	6:15A
1	6:15A	6:20A	6:23A	6:26A	6:28A	6:28A		6:28A	6:30A	6:33A	6:36A	6:42A	6:45A
1	6:45A	6:50A	6:53A	6:56A	6:58A	6:58A		6:58A	7:00A	7:03A	7:06A	7:12A	7:15A
1	7:15A	7:20A	7:23A	7:26A	7:28A	7:28A		7:28A	7:30A	7:33A	7:36A	7:42A	7:45A
1	7:45A	7:50A	7:53A	7:56A	7:58A	7:58A		7:58A	8:00A	8:03A	8:06A	8:12A	8:15A
1	8:15A	8:20A	8:23A	8:26A	8:28A	8:28A		8:28A	8:30A	8:33A	8:36A	8:42A	8:45A
1	8:45A	8:50A	8:53A	8:56A	8:58A	8:58A		8:58A	9:00A	9:03A	9:06A	9:12A	9:15A
1	9:15A	9:20A	9:23A	9:26A	9:28A	9:28A		9:28A	9:30A	9:33A	9:36A	9:42A	9:45A
1	9:45A	9:50A	9:53A	9:56A	9:58A	9:58A		9:58A	10:00A	10:03A	10:06A	10:12A	10:15A
1	10:15A	10:20A	10:23A	10:26A	10:28A	10:28A		10:28A	10:30A	10:33A	10:36A	10:42A	10:45A
1	10:45A	10:50A	10:53A	10:56A	10:58A	10:58A		10:58A	11:00A	11:03A	11:06A	11:12A	11:15A
1	11:15A	11:20A	11:23A	11:26A	11:28A	11:28A		11:28A	11:30A	11:33A	11:36A	11:42A	11:45A
1	11:45A	11:50A	11:53A	11:56A	11:58A	11:58A		11:58A	12:00P	12:03P	12:06P	12:12P	12:15P
1	12:15P	12:20P	12:23P	12:26P	12:28P	12:28P		12:28P	12:30P	12:33P	12:36P	12:42P	12:45P
1	12:45P	12:50P	12:53P	12:56P	12:58P	12:58P		12:58P	1:00P	1:03P	1:06P	1:12P	1:15P
1	1:15P	1:20P	1:23P	1:26P	1:28P	1:28P		1:28P	1:30P	1:33P	1:36P	1:42P	1:45P
1	1:45P	1:50P	1:53P	1:56P	1:58P	1:58P		1:58P	2:00P	2:03P	2:06P	2:12P	2:15P
1	2:15P	2:20P	2:23P	2:26P	2:28P	2:28P		2:28P	2:30P	2:33P	2:36P	2:42P	2:45P

	4N Outbound							4N Inbound					
1	2:45P	2:50P	2:53P	2:56P	2:58P	2:58P		2:58P	3:00P	3:03P	3:06P	3:12P	3:15P
1	3:15P	3:20P	3:23P	3:26P	3:28P	3:28P		3:28P	3:30P	3:33P	3:36P	3:42P	3:45P
1	3:45P	3:50P	3:53P	3:56P	3:58P	3:58P		3:58P	4:00P	4:03P	4:06P	4:12P	4:15P
1	4:15P	4:20P	4:23P	4:26P	4:28P	4:28P		4:28P	4:30P	4:33P	4:36P	4:42P	4:45P
1	4:45P	4:50P	4:53P	4:56P	4:58P	4:58P		4:58P	5:00P	5:03P	5:06P	5:12P	5:15P
1	5:15P	5:20P	5:23P	5:26P	5:28P	5:28P		5:28P	5:30P	5:33P	5:36P	5:42P	5:45P
1	5:45P	5:50P	5:53P	5:56P	5:58P	5:58P		5:58P	6:00P	6:03P	6:06P	6:12P	
													Total Revenue Hours: 12:57

Table 80 | Route 4Sa and Route 4sb Weekday Schedule

	4Sa Outbound							4Sa Inbound					
Distance					**6.6**							**6.7**	
Estimated Speed					**15**	**Recovery**						**15**	**Recovery**
Travel Time (calc)					**0:26**							**0:26**	
Travel Time (tested)		**0:06**	**0:04**	**0:03**	**0:06**	**0:03**			**0:10**	**0:05**	**0:04**	**0:08**	**0:11**
Block	Transportation Center	Capital Ave & Columbia Ave	Capital Ave & Minges Rd	Capital Ave & Beckley Rd	Harper Village			Harper Village	Glenn Cross Rd & Capital Ave	Capital Ave & Minges Rd	Capital Ave & Columbia Ave	Transportation Center	
1	5:15A	5:21A	5:25A	5:28A	5:34A	5:37A		5:37A	5:47A	5:52A	5:56A	6:04A	6:15A
1	7:15A	7:21A	7:25A	7:28A	7:34A	7:37A		7:37A	7:47A	7:52A	7:56A	8:04A	8:15A
1	9:15A	9:21A	9:25A	9:28A	9:34A	9:37A		9:37A	9:47A	9:52A	9:56A	10:04A	10:15A
1	11:15A	11:21A	11:25A	11:28A	11:34A	11:37A		11:37A	11:47A	11:52A	11:56A	12:04P	12:15P
1	1:15P	1:21P	1:25P	1:28P	1:34P	1:37P		1:37P	1:47P	1:52P	1:56P	2:04P	2:15P
1	3:15P	3:21P	3:25P	3:28P	3:34P	3:37P		3:37P	3:47P	3:52P	3:56P	4:04P	4:15P
1	5:15P	5:21P	5:25P	5:28P	5:34P	5:37P		5:37P	5:47P	5:52P	5:56P	6:04P	

***Buses serving Route 4Sa also serve Route 4sb (see following page)**

*Buses serving Route 4sb also serve Route 4sa (see previous page)

	4Sb Outbound							4Sb Inbound					
Distance					6.6							6.7	
Estimated Speed					15	Recovery						15	Recovery
Travel Time (calc)					0:26							0:26	
Travel Time (tested)		0:06	0:04	0:04	0:07	0:06			0:07	0:03	0:04	0:08	0:11
Block	Transportation Center	Capital Ave & Columbia Ave	Capital Ave & Minges Rd	Capital Ave & Glenn Cross Rd	Harper Village			Harper Village	Beckley Rd & Capital Ave	Capital Ave & Minges Rd	Capital Ave & Columbia Ave	Transportation Center	
1	6:15A	6:21A	6:25A	6:29A	6:36A	6:42A		6:42A	6:49A	6:52A	6:56A	7:04A	7:15A
1	8:15A	8:21A	8:25A	8:29A	8:36A	8:42A		8:42A	8:49A	8:52A	8:56A	9:04A	9:15A
1	10:15A	10:21A	10:25A	10:29A	10:36A	10:42A		10:42A	10:49A	10:52A	10:56A	11:04A	11:15A
1	12:15P	12:21P	12:25P	12:29P	12:36P	12:42P		12:42P	12:49P	12:52P	12:56P	1:04P	1:15P
1	2:15P	2:21P	2:25P	2:29P	2:36P	2:42P		2:42P	2:49P	2:52P	2:56P	3:04P	3:15P
1	4:15P	4:21P	4:25P	4:29P	4:36P	4:42P		4:42P	4:49P	4:52P	4:56P	5:04P	5:15P
1													

Total Revenue Hours (Routes 4sa and 4sb): 12:49

Table 81 | Route 5Wa Weekday Schedule

	5Wa Outbound							5Wa Inbound						
Distance						**8.2**							**8.2**	
Estimated Speed						**18**	**Recovery**						**18**	**Recovery**
Travel Time (calc)						**0:27**							**0:27**	
Travel Time (tested)		**0:04**	**0:03**	**0:05**	**0:05**	**0:07**	**0:06**		**0:09**	**0:05**	**0:04**	**0:03**	**0:03**	**0:06**
Block	Transportation Center	Washington & Upton	Carl & Betterly	Dickman & Helmer	Dickman & Clark	William Shafter Cir & Paul Lambers		William Shafter Cir & Paul Lambers	Dickman & Clark	Dickman & Helmer	Betterly & Carl	Upton & Washington	Transportation Center	
1	5:15A	5:19A	5:22A	5:27A	5:32A	5:39A	5:45A	5:45A	5:54A	5:59A	6:03A	6:06A	6:09A	6:15A
1	6:15A	6:19A	6:22A	6:27A	6:32A	6:39A	6:45A	6:45A	6:54A	6:59A	7:03A	7:06A	7:09A	7:15A
1	7:15A	7:19A	7:22A	7:27A	7:32A	7:39A	7:45A	7:45A	7:54A	7:59A	8:03A	8:06A	8:09A	8:15A
1	8:15A	8:19A	8:22A	8:27A	8:32A	8:39A	8:45A	8:45A	8:54A	8:59A	9:03A	9:06A	9:09A	9:15A
1	9:15A	9:19A	9:22A	9:27A	9:32A	9:39A	9:45A	9:45A	9:54A	9:59A	10:03A	10:06A	10:09A	10:15A
1	10:15A	10:19A	10:22A	10:27A	10:32A	10:39A	10:45A	10:45A	10:54A	10:59A	11:03A	11:06A	11:09A	11:15A
1	11:15A	11:19A	11:22A	11:27A	11:32A	11:39A	11:45A	11:45A	11:54A	11:59A	12:03P	12:06P	12:09P	12:15P
1	12:15P	12:19P	12:22P	12:27P	12:32P	12:39P	12:45P	12:45P	12:54P	12:59P	1:03P	1:06P	1:09P	1:15P
1	1:15P	1:19P	1:22P	1:27P	1:32P	1:39P	1:45P	1:45P	1:54P	1:59P	2:03P	2:06P	2:09P	2:15P
1	2:15P	2:19P	2:22P	2:27P	2:32P	2:39P	2:45P	2:45P	2:54P	2:59P	3:03P	3:06P	3:09P	3:15P
1	3:15P	3:19P	3:22P	3:27P	3:32P	3:39P	3:45P	3:45P	3:54P	3:59P	4:03P	4:06P	4:09P	4:15P
1	4:15P	4:19P	4:22P	4:27P	4:32P	4:39P	4:45P	4:45P	4:54P	4:59P	5:03P	5:06P	5:09P	5:15P
1	5:15P	5:19P	5:22P	5:27P	5:32P	5:39P	5:45P	5:45P	5:54P	5:59P	6:03P	6:06P	6:09P	
													Total Revenue Hours:	**12:54**

Table 82 | Route 5Wb Weekday Schedule

	5Wb Outbound							5Wb Inbound						
Distance						7.7							7.7	
Estimated Speed						18	Recovery						18	Recovery
Travel Time (calc)						0:25							0:25	
Travel Time (tested)		0:04	0:03	0:05	0:03	0:05	0:10		0:05	0:03	0:04	0:03	0:03	0:12
Block	Transportation Center	Washington & Upton	Carl & Betterly	Dickman & Helmer	Dickman & Hill Brady	Hill Brady & Logstics Dr		II Stanley	Hill Brady & Dickman	Dickman & Helmer	Betterly& Carl	Upton & Washington	Transportation Center	
2	5:45A	5:49A	5:52A	5:57A	6:00A	6:05A	6:15A	6:15A	6:20A	6:23A	6:27A	6:30A	6:33A	6:45A
2	6:45A	6:49A	6:52A	6:57A	7:00A	7:05A	7:15A	7:15A	7:20A	7:23A	7:27A	7:30A	7:33A	7:45A
2	7:45A	7:49A	7:52A	7:57A	8:00A	8:05A	8:15A	8:15A	8:20A	8:23A	8:27A	8:30A	8:33A	8:45A
2	8:45A	8:49A	8:52A	8:57A	9:00A	9:05A	9:15A	9:15A	9:20A	9:23A	9:27A	9:30A	9:33A	
2														
2														
2														
2														
2														
2	2:45P	2:49P	2:52P	2:57P	3:00P	3:05P	3:15P	3:15P	3:20P	3:23P	3:27P	3:30P	3:33P	3:45P
2	3:45P	3:49P	3:52P	3:57P	4:00P	4:05P	4:15P	4:15P	4:20P	4:23P	4:27P	4:30P	4:33P	4:45P
2	4:45P	4:49P	4:52P	4:57P	5:00P	5:05P	5:15P	5:15P	5:20P	5:23P	5:27P	5:30P	5:33P	
														Total Revenue Hours: 6:36

Table 83 | Route 1W Saturday Schedule

	1W Outbound								1W Inbound						
Distance						**6.2**								**6.2**	
Estimated Speed						**15**	**Recovery**							**15**	**Recovery**
Travel Time (calc)						**0:24**								**0:24**	
Travel Time (tested)		**0:05**	**0:04**	**0:05**	**0:04**	**0:04**	**0:05**			**0:06**	**0:04**	**0:05**	**0:04**	**0:05**	**0:09**
Block	Transportation Center	West Michigan & Jordan	Jackson & North 20th (Arbor Pointe)	Urbandale Plaza	Stringham & West Michigan	Taylor & Bedford			Taylor & Bedford	Michigan & Stringham	Urbandale Plaza	N 20th & Jackson (Arbor Pointe)	Angell & West Michigan	Transportation Center	
1	9:15A	9:20A	9:24A	9:29A	9:33A	9:37A	9:42A		9:42A	9:48A	9:52A	9:57A	10:01A	10:06A	10:15A
1	10:15A	10:20A	10:24A	10:29A	10:33A	10:37A	10:42A		10:42A	10:48A	10:52A	10:57A	11:01A	11:06A	11:15A
1	11:15A	11:20A	11:24A	11:29A	11:33A	11:37A	11:42A		11:42A	11:48A	11:52A	11:57A	12:01P	12:06P	12:15P
1	12:15P	12:20P	12:24P	12:29P	12:33P	12:37P	12:42P		12:42P	12:48P	12:52P	12:57P	1:01P	1:06P	1:15P
1	1:15P	1:20P	1:24P	1:29P	1:33P	1:37P	1:42P		1:42P	1:48P	1:52P	1:57P	2:01P	2:06P	2:15P
1	2:15P	2:20P	2:24P	2:29P	2:33P	2:37P	2:42P		2:42P	2:48P	2:52P	2:57P	3:01P	3:06P	3:15P
1	3:15P	3:20P	3:24P	3:29P	3:33P	3:37P	3:42P		3:42P	3:48P	3:52P	3:57P	4:01P	4:06P	4:15P
1	4:15P	4:20P	4:24P	4:29P	4:33P	4:37P									
														Total Revenue Hours: 7:22	

Table 84 | Route 2Wa and Route 3Ea Saturday Schedule

	2Wa Outbound							2Wa Inbound					
Distance					**4.3**							**4.3**	
Estimated Speed					**16**	**Recovery**						**16**	**Recovery**
Travel Time (calc)					**0:16**							**0:16**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:03**	**0:01**			**0:03**	**0:04**	**0:04**	**0:03**	**0:02**
Block	Transportation Center	Dickman Rd & Riverside Dr	Riverside Dr & Columbia Ave	Columbia Ave & 20th St	Meijer			Meijer	Columbia Ave & 20th St	Territorial Ave & Capital Ave	Riverside Dr & Dickman Rd	Transportation Center	
1	9:15A	9:18A	9:21A	9:25A	9:28A	9:29A		9:29A	9:32A	9:36A	9:40A	9:43A	9:45A
1	10:15A	10:18A	10:21A	10:25A	10:28A	10:29A		10:29A	10:32A	10:36A	10:40A	10:43A	10:45A
1	11:15A	11:18A	11:21A	11:25A	11:28A	11:29A		11:29A	11:32A	11:36A	11:40A	11:43A	11:45A
1	12:15P	12:18P	12:21P	12:25P	12:28P	12:29P		12:29P	12:32P	12:36P	12:40P	12:43P	12:45P
1	1:15P	1:18P	1:21P	1:25P	1:28P	1:29P		1:29P	1:32P	1:36P	1:40P	1:43P	1:45P
1	2:15P	2:18P	2:21P	2:25P	2:28P	2:29P		2:29P	2:32P	2:36P	2:40P	2:43P	2:45P
1	3:15P	3:18P	3:21P	3:25P	3:28P	3:29P		3:29P	3:32P	3:36P	3:40P	3:43P	3:45P
1	4:15P	4:18P	4:21P	4:25P	4:28P	4:29P		4:29P	4:32P	4:36P	4:40P	4:43P	

***Buses serving Route 2Wa also serve Route 3Ea (see following page)**

*Buses serving Route 3Ea also serve Route 2Wa (see previous page)

	3Ea Outbound						3Ea Inbound				
Distance				**2.7**						**2.7**	
Estimated Speed				**14**	**Recovery**					**14**	**Recovery**
Travel Time (calc)				**0:11**						**0:11**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:00**			**0:04**	**0:03**	**0:05**	**0:08**
Block	Transportation Center	Capital Ave & Michigan Ave	Main St &Cliff St	Cliff St & Hannah St			Cliff St & Hannah St	Columbia Ave & Main St	Michigan Ave & Capital Ave	Transportation Center	
1	9:45A	9:48A	9:51A	9:55A	9:55A		9:55A	9:59A	10:02A	10:07A	10:15A
1	10:45A	10:48A	10:51A	10:55A	10:55A		10:55A	10:59A	11:02A	11:07A	11:15A
1	11:45A	11:48A	11:51A	11:55A	11:55A		11:55A	11:59A	12:02P	12:07P	12:15P
1	12:45P	12:48P	12:51P	12:55P	12:55P		12:55P	12:59P	1:02P	1:07P	1:15P
1	1:45P	1:48P	1:51P	1:55P	1:55P		1:55P	1:59P	2:02P	2:07P	2:15P
1	2:45P	2:48P	2:51P	2:55P	2:55P		2:55P	2:59P	3:02P	3:07P	3:15P
1	3:45P	3:48P	3:51P	3:55P	3:55P		3:55P	3:59P	4:02P	4:07P	4:15P
1											

Total Revenue Hours (for Routes 2Wa and 3Ea): 7:28

Table 85 | Route 2Wb and Route 3Eb Saturday Schedule

	2Wb Outbound							2Wb Inbound					
Distance					**4.3**							**4.3**	
Estimated Speed					**16**	**Recovery**						**16**	**Recovery**
Travel Time (calc)					**0:16**							**0:16**	
Travel Time (tested)		**0:03**	**0:03**	**0:04**	**0:03**	**0:01**			**0:03**	**0:03**	**0:05**	**0:03**	**0:02**
Block	Transportation Center	Dickman Rd & Riverside Dr	Territorial Ave & Capital Ave	20th St & Columbia Ave	Meijer			Meijer	Columbia Ave & 20th St	Riverside Dr & Columbia Ave	Dickman Rd & Riverside Dr	Transportation Center	
1													
1	9:45A	9:48A	9:51A	9:55A	9:58A	9:59A		9:59A	10:02A	10:05A	10:10A	10:13A	10:15A
1	10:45A	10:48A	10:51A	10:55A	10:58A	10:59A		10:59A	11:02A	11:05A	11:10A	11:13A	11:15A
1	11:45A	11:48A	11:51A	11:55A	11:58A	11:59A		11:59A	12:02P	12:05P	12:10P	12:13P	12:15P
1	12:45P	12:48P	12:51P	12:55P	12:58P	12:59P		12:59P	1:02P	1:05P	1:10P	1:13P	1:15P
1	1:45P	1:48P	1:51P	1:55P	1:58P	1:59P		1:59P	2:02P	2:05P	2:10P	2:13P	2:15P
1	2:45P	2:48P	2:51P	2:55P	2:58P	2:59P		2:59P	3:02P	3:05P	3:10P	3:13P	3:15P
1	3:45P	3:48P	3:51P	3:55P	3:58P	3:59P		3:59P	4:02P	4:05P	4:10P	4:13P	4:15P

***Buses serving Route 2Wb also serve Route 3Eb (see following page)**

*Buses serving Route 3Eb also serve Route 2Wb (see previous page)

	3Eb Outbound						3Eb Inbound				
Distance				**2.7**						**2.7**	
Est. Speed				**14**	**Recovery**					**14**	**Recovery**
Travel Time (calc)				**0:11**						**0:11**	
Travel Time (tested)		**0:03**	**0:05**	**0:02**	**0:00**			**0:04**	**0:03**	**0:05**	**0:08**
Block	Transportation Center	Capital Ave & Michigan Ave	Main St &Cliff St	Cliff St & Hannah St			Cliff St & Hannah St	Columbia Ave & Main St	Michigan Ave & Capital Ave	Transportation Center	
1	9:15A	9:18A	9:23A	9:25A	9:25A		9:25A	9:29A	9:32A	9:37A	9:45A
1	10:15A	10:18A	10:23A	10:25A	10:25A		10:25A	10:29A	10:32A	10:37A	10:45A
1	11:15A	11:18A	11:23A	11:25A	11:25A		11:25A	11:29A	11:32A	11:37A	11:45A
1	12:15P	12:18P	12:23P	12:25P	12:25P		12:25P	12:29P	12:32P	12:37P	12:45P
1	1:15P	1:18P	1:23P	1:25P	1:25P		1:25P	1:29P	1:32P	1:37P	1:45P
1	2:15P	2:18P	2:23P	2:25P	2:25P		2:25P	2:29P	2:32P	2:37P	2:45P
1	3:15P	3:18P	3:23P	3:25P	3:25P		3:25P	3:29P	3:32P	3:37P	3:45P
1	4:15P	4:18P	4:23P	4:25P	4:25P		4:25P	4:29P	4:32P	4:37P	

Total Revenue Hours (for Routes 2Wb and 3Eb): 7:22

Table 86 | Route 2E and Route 3W Saturday Schedule

	2E Outbound							2E Inbound					
Distance					**3.1**							**3.0**	
Estimated Speed					**14**	**Recovery**						**14**	**Recovery**
Travel Time (calc)					**0:13**							**0:12**	
Travel Time (tested)		**0:03**	**0:03**	**0:03**	**0:04**	**0:00**			**0:03**	**0:03**	**0:03**	**0:03**	**0:05**
Block	Transportation Center	North Ave & Calhoun St	Emmett Ave & North Ave	Springview Dr & Roosevelt Ave	North Ave & Coolidge Ave			North Ave & Coolidge Ave	Roosevelt Ave & Springview Dr	Harvard St & Emmett St	North Ave & McCamly St	Transportation Center	
1													
1	10:15A	10:18A	10:21A	10:24A	10:28A	10:28A		10:28A	10:31A	10:34A	10:37A	10:40A	10:45A
1	11:15A	11:18A	11:21A	11:24A	11:28A	11:28A		11:28A	11:31A	11:34A	11:37A	11:40A	11:45A
1	12:15P	12:18P	12:21P	12:24P	12:28P	12:28P		12:28P	12:31P	12:34P	12:37P	12:40P	12:45P
1	1:15P	1:18P	1:21P	1:24P	1:28P	1:28P		1:28P	1:31P	1:34P	1:37P	1:40P	1:45P
1	2:15P	2:18P	2:21P	2:24P	2:28P	2:28P		2:28P	2:31P	2:34P	2:37P	2:40P	2:45P
1	3:15P	3:18P	3:21P	3:24P	3:28P	3:28P		3:28P	3:31P	3:34P	3:37P	3:40P	3:45P
1	4:15P	4:18P	4:21P	4:24P	4:28P	4:28P		4:28P	4:31P	4:34P	4:37P	4:40P	4:45P

***Buses serving Route 2E also serve Route 3W (see following page)**

***Buses serving Route 3W also serve Route 2E (see previous page)**

	3W Outbound							3W Inbound					
Distance					**3.7**							**3.7**	
Estimated Speed					**14**	**Recovery**						**14**	**Recovery**
Travel Time (calc)					**0:15**							**0:15**	
Travel Time (tested)		**0:04**	**0:03**	**0:04**	**0:03**	**0:00**			**0:04**	**0:04**	**0:04**	**0:03**	**0:01**
Block	Transportation Center	Van Buren St & Washington Ave	Washington Ave & Parkway Dr	Hubbard St & Goodale Ave	Roosevelt Ave & North Ave			Roosevelt Ave & North Ave	Goodale Ave & Hubbard St	Parkway Dr & Washington Ave	Washington Ave & Van Buren St	Transportation Center	
1	9:45A	9:49A	9:52A	9:56A	9:59A	9:59A		9:59A	10:03A	10:07A	10:11A	10:14A	10:15A
1	10:45A	10:49A	10:52A	10:56A	10:59A	10:59A		10:59A	11:03A	11:07A	11:11A	11:14A	11:15A
1	11:45A	11:49A	11:52A	11:56A	11:59A	11:59A		11:59A	12:03P	12:07P	12:11P	12:14P	12:15P
1	12:45P	12:49P	12:52P	12:56P	12:59P	12:59P		12:59P	1:03P	1:07P	1:11P	1:14P	1:15P
1	1:45P	1:49P	1:52P	1:56P	1:59P	1:59P		1:59P	2:03P	2:07P	2:11P	2:14P	2:15P
1	2:45P	2:49P	2:52P	2:56P	2:59P	2:59P		2:59P	3:03P	3:07P	3:11P	3:14P	3:15P
1	3:45P	3:49P	3:52P	3:56P	3:59P	3:59P		3:59P	4:03P	4:07P	4:11P	4:14P	4:15P
1	4:45P	4:49P	4:52P	4:56P	4:59P	4:59P		4:59P	5:03P	5:07P	5:11P	5:14P	

Total Revenue Hours (Routes 2E and 3W): 7:30

Table 87 | Route 4N Saturday Schedule

	4N Outbound							4N Inbound					
Distance					**3.4**							**3.4**	
Estimated Speed					**15**	**Recovery**						**15**	**Recovery**
Travel Time (calc)					**0:13**							**0:13**	
Travel Time (tested)		**0:05**	**0:03**	**0:03**	**0:02**	**0:00**			**0:02**	**0:03**	**0:03**	**0:06**	**0:03**
Block	Transportation Center	Van Buren St. & Division St	Capital Ave & East Ave	Capital Ave & Roosevelt Ave	Capital Square Plaza			Capital Square Plaza	Capital Ave & Roosevelt Ave	Capital Ave & East Ave	Division St & Van Buren St	Transportation Center	
1	9:15A	9:20A	9:23A	9:26A	9:28A	9:28A		9:28A	9:30A	9:33A	9:36A	9:42A	9:45A
1	9:45A	9:50A	9:53A	9:56A	9:58A	9:58A		9:58A	10:00A	10:03A	10:06A	10:12A	10:15A
1	10:15A	10:20A	10:23A	10:26A	10:28A	10:28A		10:28A	10:30A	10:33A	10:36A	10:42A	10:45A
1	10:45A	10:50A	10:53A	10:56A	10:58A	10:58A		10:58A	11:00A	11:03A	11:06A	11:12A	11:15A
1	11:15A	11:20A	11:23A	11:26A	11:28A	11:28A		11:28A	11:30A	11:33A	11:36A	11:42A	11:45A
1	11:45A	11:50A	11:53A	11:56A	11:58A	11:58A		11:58A	12:00P	12:03P	12:06P	12:12P	12:15P
1	12:15P	12:20P	12:23P	12:26P	12:28P	12:28P		12:28P	12:30P	12:33P	12:36P	12:42P	12:45P
1	12:45P	12:50P	12:53P	12:56P	12:58P	12:58P		12:58P	1:00P	1:03P	1:06P	1:12P	1:15P
1	1:15P	1:20P	1:23P	1:26P	1:28P	1:28P		1:28P	1:30P	1:33P	1:36P	1:42P	1:45P
1	1:45P	1:50P	1:53P	1:56P	1:58P	1:58P		1:58P	2:00P	2:03P	2:06P	2:12P	2:15P
1	2:15P	2:20P	2:23P	2:26P	2:28P	2:28P		2:28P	2:30P	2:33P	2:36P	2:42P	2:45P
1	2:45P	2:50P	2:53P	2:56P	2:58P	2:58P		2:58P	3:00P	3:03P	3:06P	3:12P	3:15P
1	3:15P	3:20P	3:23P	3:26P	3:28P	3:28P		3:28P	3:30P	3:33P	3:36P	3:42P	3:45P
1	3:45P	3:50P	3:53P	3:56P	3:58P	3:58P		3:58P	4:00P	4:03P	4:06P	4:12P	4:15P
1	4:15P	4:20P	4:23P	4:26P	4:28P	4:28P		4:28P	4:30P	4:33P	4:36P	4:42P	4:45P
1	4:45P	4:50P	4:53P	4:56P	4:58P	4:58P		4:58P	5:00P	5:03P	5:06P	5:12P	
													Total Revenue Hours: 7:57

Table 88 | Route 4Sa and Route 4sb Saturday Schedule

	4Sa Outbound							4Sa Inbound					
Distance					**6.6**							**6.7**	
Estimated Speed					**15**	**Recovery**						**15**	**Recovery**
Travel Time (calc)					**0:26**							**0:26**	
Travel Time (tested)		**0:06**	**0:04**	**0:03**	**0:06**	**0:03**			**0:10**	**0:05**	**0:04**	**0:08**	**0:11**
Block	Transportation Center	Capital Ave & Columbia Ave	Capital Ave & Minges Rd	Capital Ave & Beckley Rd	Harper Village			Harper Village	Glenn Cross Rd & Capital Ave	Capital Ave & Minges Rd	Capital Ave & Columbia Ave	Transportation Center	
1	9:15A	9:21A	9:25A	9:28A	9:34A	9:37A		9:37A	9:47A	9:52A	9:56A	10:04A	10:15A
1	11:15A	11:21A	11:25A	11:28A	11:34A	11:37A		11:37A	11:47A	11:52A	11:56A	12:04P	12:15P
1	1:15P	1:21P	1:25P	1:28P	1:34P	1:37P		1:37P	1:47P	1:52P	1:56P	2:04P	2:15P
1	3:15P	3:21P	3:25P	3:28P	3:34P	3:37P		3:37P	3:47P	3:52P	3:56P	4:04P	4:15P

***Buses serving Route 4Sa also serve Route 4sb (see following page)**

*Buses serving Route 4sb also serve Route 4sa (see previous page)

	4Sb Outbound							4Sb Inbound					
Distance					6.6							6.7	
Estimated Speed					15	Recovery						15	Recovery
Travel Time (calc)					0:26							0:26	
Travel Time (tested)		0:06	0:04	0:04	0:07	0:06			0:07	0:03	0:04	0:08	0:11
Block	Transportation Center	Capital Ave & Columbia Ave	Capital Ave & Minges Rd	Capital Ave & Glenn Cross Rd	Harper Village			Harper Village	Beckley Rd & Capital Ave	Capital Ave & Minges Rd	Capital Ave & Columbia Ave	Transportation Center	
1	10:15A	10:21A	10:25A	10:29A	10:36A	10:42A		10:42A	10:49A	10:52A	10:56A	11:04A	11:15A
1	12:15P	12:21P	12:25P	12:29P	12:36P	12:42P		12:42P	12:49P	12:52P	12:56P	1:04P	1:15P
1	2:15P	2:21P	2:25P	2:29P	2:36P	2:42P		2:42P	2:49P	2:52P	2:56P	3:04P	3:15P
1	4:15P	4:21P	4:25P	4:29P	4:36P	4:42P		4:42P	4:49P	4:52P	4:56P	5:04P	

Total Revenue Hours (Routes 4sa and 4sb): 7:49

Table 89 | Route 5Wa Saturday Schedule

	5Wa Outbound							5Wa Inbound						
Distance						**8.2**							**8.2**	
Estimated Speed						**18**	**Recovery**						**18**	**Recovery**
Travel Time (calc)						**0:27**							**0:27**	
Travel Time (tested)		**0:04**	**0:03**	**0:05**	**0:05**	**0:07**	**0:06**		**0:09**	**0:05**	**0:04**	**0:03**	**0:03**	**0:06**
Block	Transportation Center	Washington & Upton	Carl & Betterly	Dickman & Helmer	Dickman & Clark	William Shafter Cir & Paul Lambers		William Shafter Cir & Paul Lambers	Dickman & Clark	Dickman & Helmer	Betterly& Carl	Upton & Washington	Transportation Center	
1	9:15A	9:19A	9:22A	9:27A	9:32A	9:39A	9:45A	9:45A	9:54A	9:59A	10:03A	10:06A	10:09A	10:15A
1	10:15A	10:19A	10:22A	10:27A	10:32A	10:39A	10:45A	10:45A	10:54A	10:59A	11:03A	11:06A	11:09A	11:15A
1	11:15A	11:19A	11:22A	11:27A	11:32A	11:39A	11:45A	11:45A	11:54A	11:59A	12:03P	12:06P	12:09P	12:15P
1	12:15P	12:19P	12:22P	12:27P	12:32P	12:39P	12:45P	12:45P	12:54P	12:59P	1:03P	1:06P	1:09P	1:15P
1	1:15P	1:19P	1:22P	1:27P	1:32P	1:39P	1:45P	1:45P	1:54P	1:59P	2:03P	2:06P	2:09P	2:15P
1	2:15P	2:19P	2:22P	2:27P	2:32P	2:39P	2:45P	2:45P	2:54P	2:59P	3:03P	3:06P	3:09P	3:15P
1	3:15P	3:19P	3:22P	3:27P	3:32P	3:39P	3:45P	3:45P	3:54P	3:59P	4:03P	4:06P	4:09P	4:15P
1	4:15P	4:19P	4:22P	4:27P	4:32P	4:39P	4:45P	4:45P	4:54P	4:59P	5:03P	5:06P	5:09P	
														Total Revenue Hours: 7:54

PAGE INTENTIONALLY LEFT BLANK

APPENDIX G: RIDERSHIP IMPACT FACTORS

Table 90 | Weekday Ridership Estimate Impact Factors

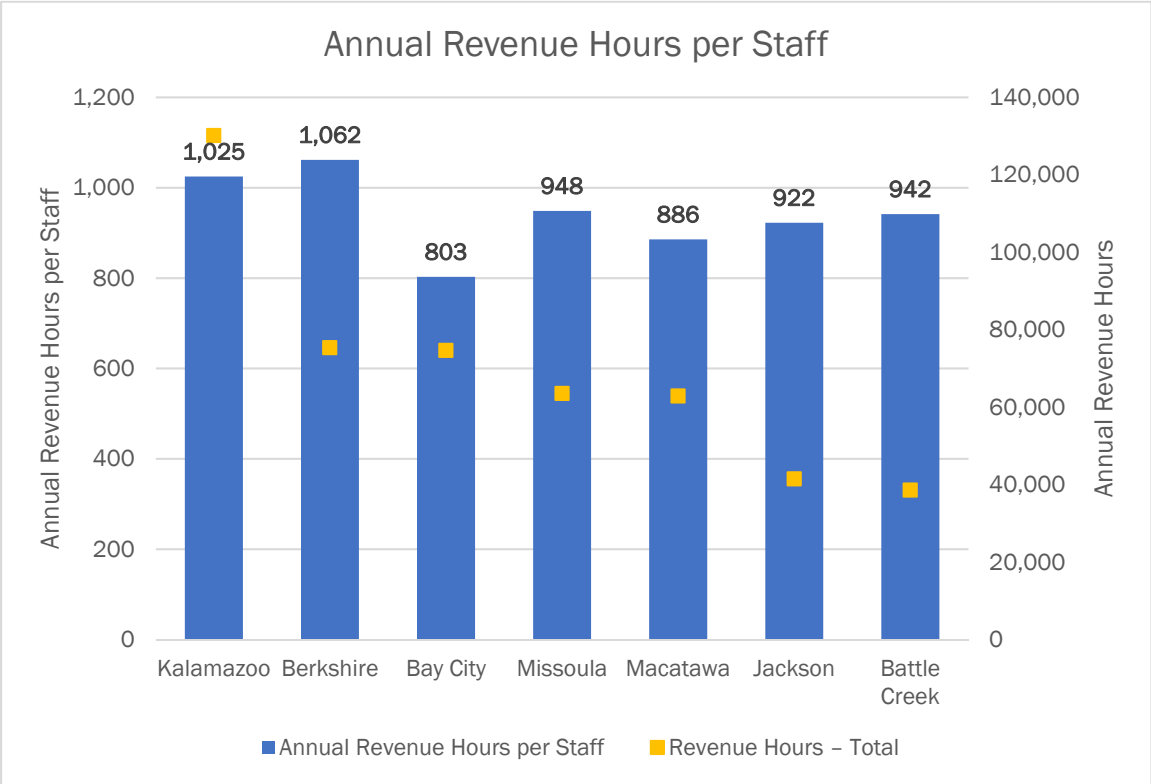
	Impact Factor & Original Coefficient				
	Increase Frequency	*Straighten Route/More Direct*	*Establish Repeating Headways*	*Establish Clock-Face Headways*	*Decrease Frequency*
	0.5	0.1	0.02	0.03	-0.5
Proposed Route	*Multiplier:*				
1W	--	1	--	--	--
2E	0.5	1	--	--	--
2W	1	1	--	--	--
3E	--	1	--	--	--
3W	--	1	--	--	0.5
4N	--	1	--	--	--
4S	--	1	--	--	--
5W	--	1	--	--	--

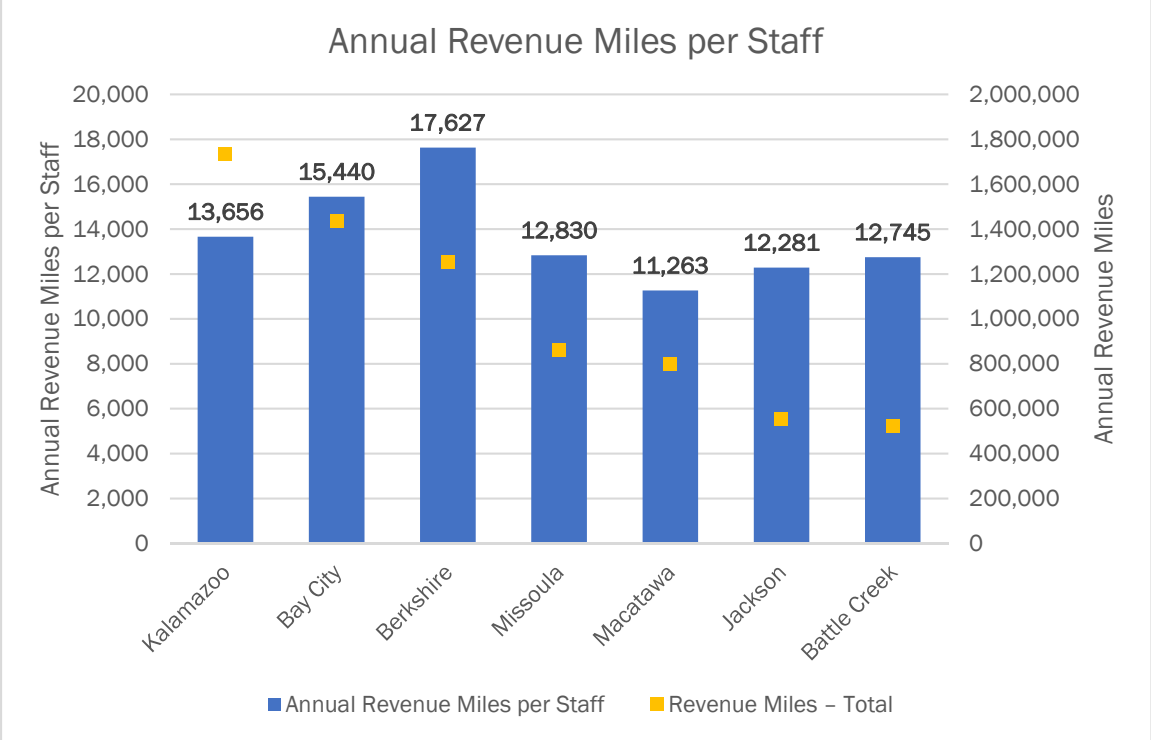
Table 91 | Saturday Ridership Estimate Impact Factors

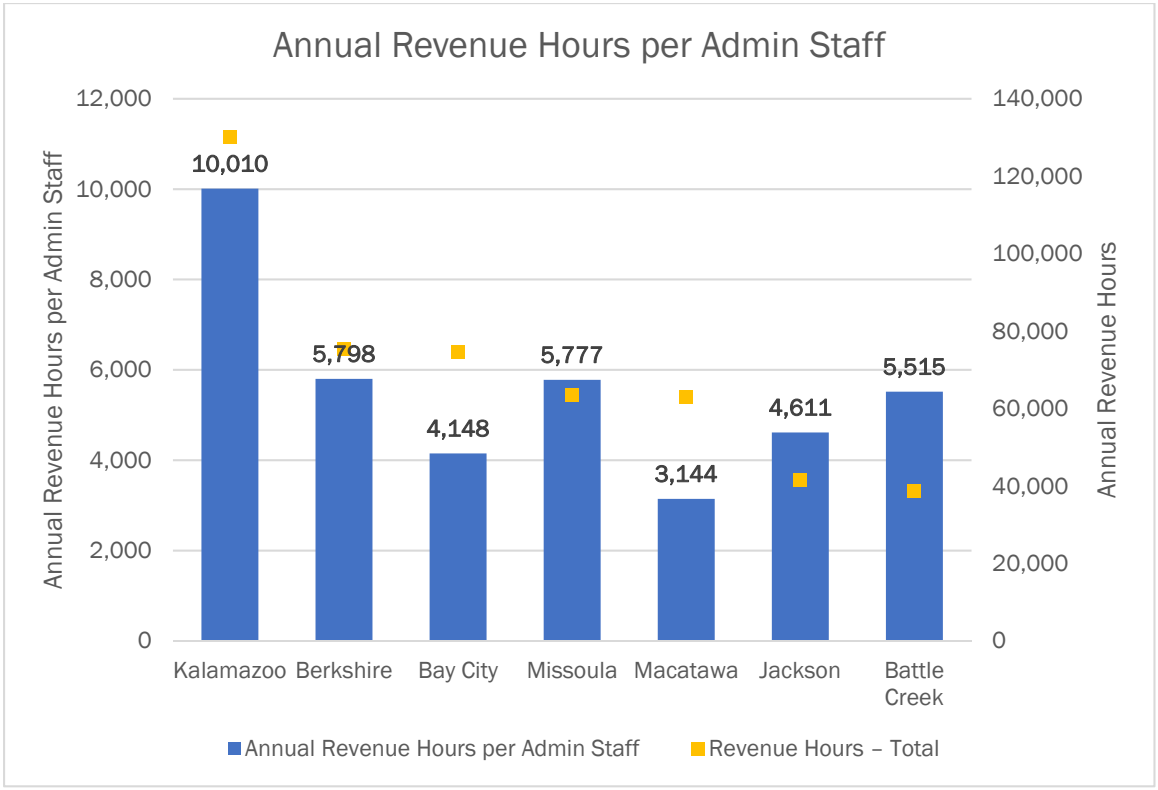
	Impact Factor & Original Coefficient				
	Increase Frequency	*Straighten Route/More Direct*	*Establish Repeating Headways*	*Establish Clock-Face Headways*	*Decrease Frequency*
	0.5	0.1	0.02	0.03	-0.5
Proposed Route	*Multiplier:*				
1W	--	1	--	--	--
2E	--	1	--	--	1
2W	1	1	--	--	--
3E	--	1	--	--	--
3W	--	1	--	--	1
4N	--	1	--	--	--
4S	--	1	--	--	--
5W	--	1	--	--	--

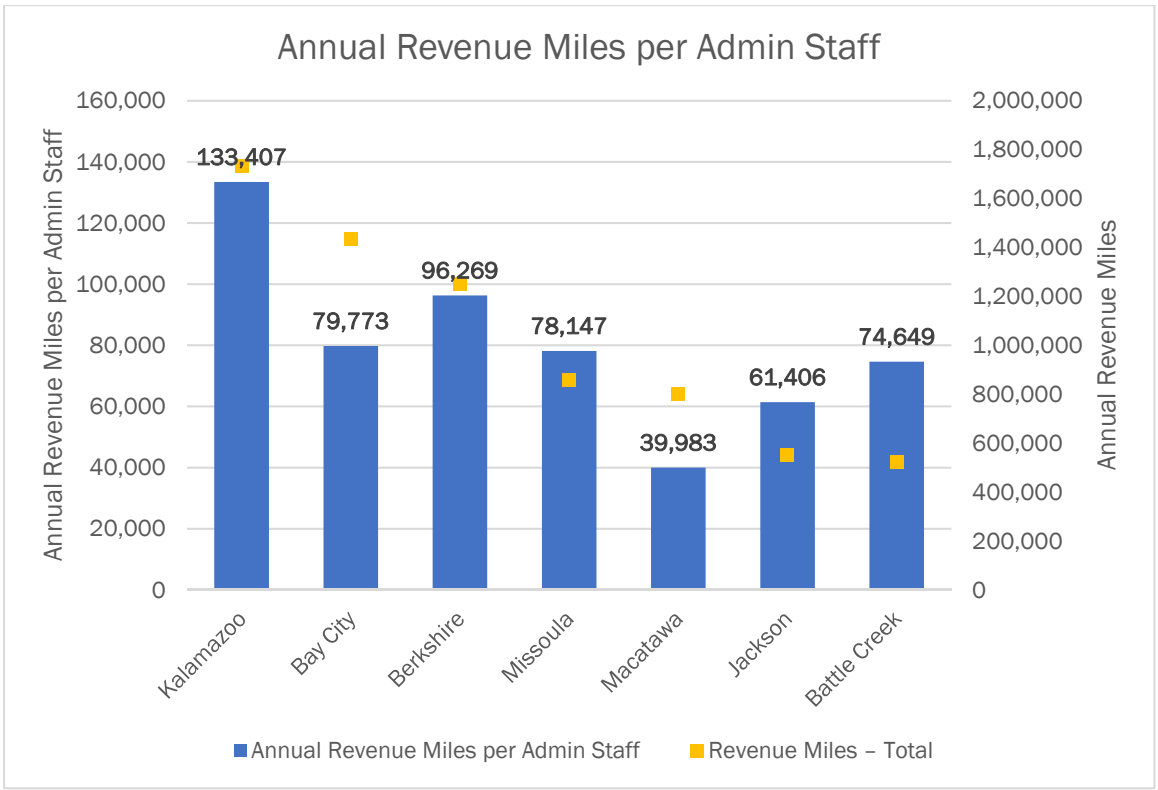
PAGE INTENTIONALLY LEFT BLANK

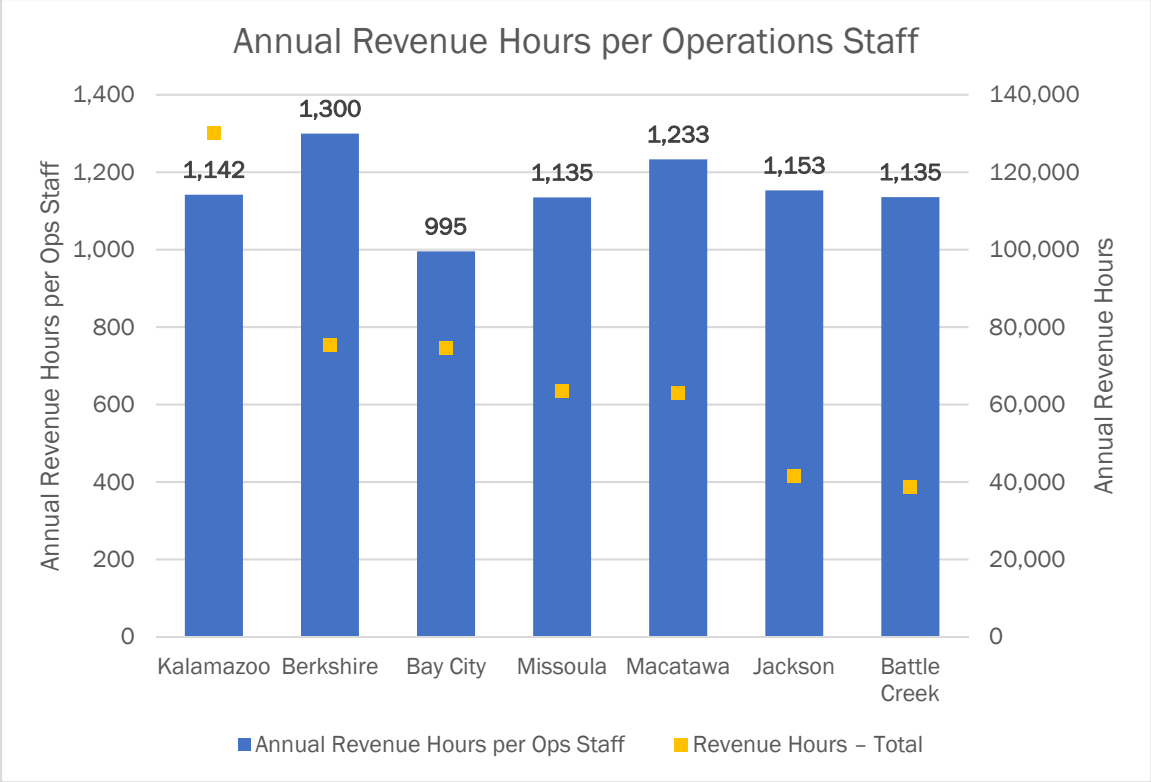
APPENDIX H – GRAPHS FOR EACH METRIC

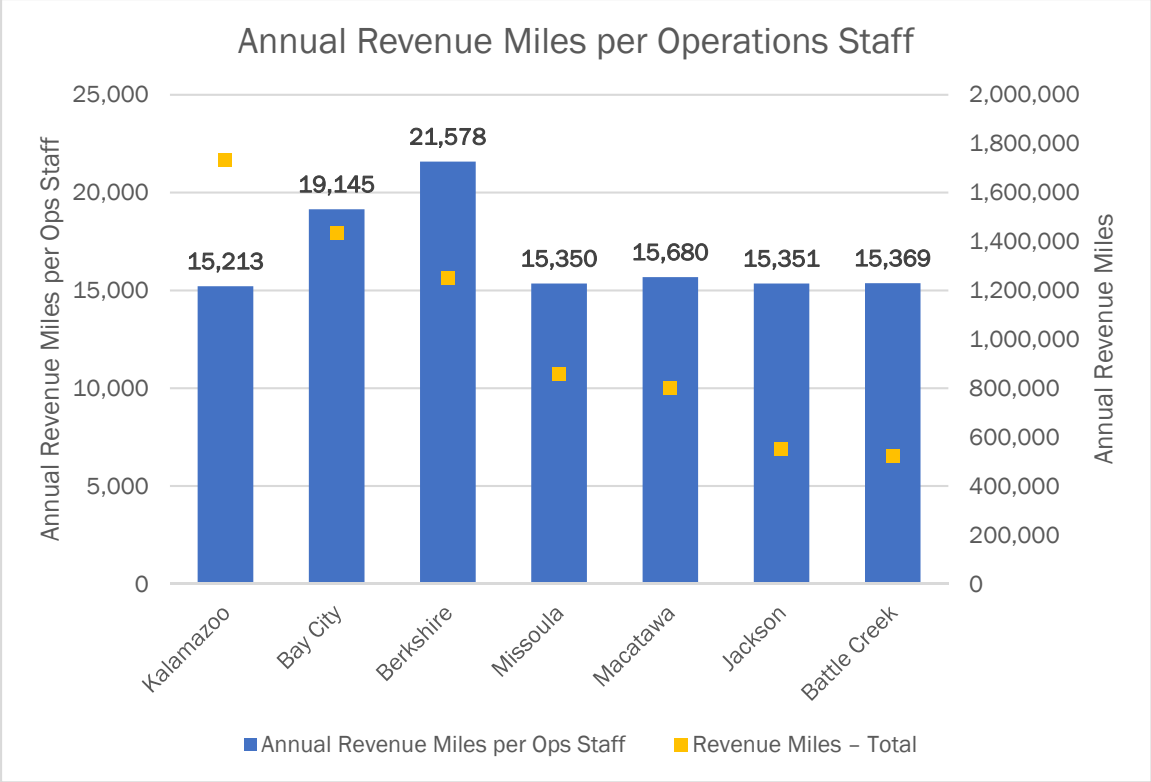


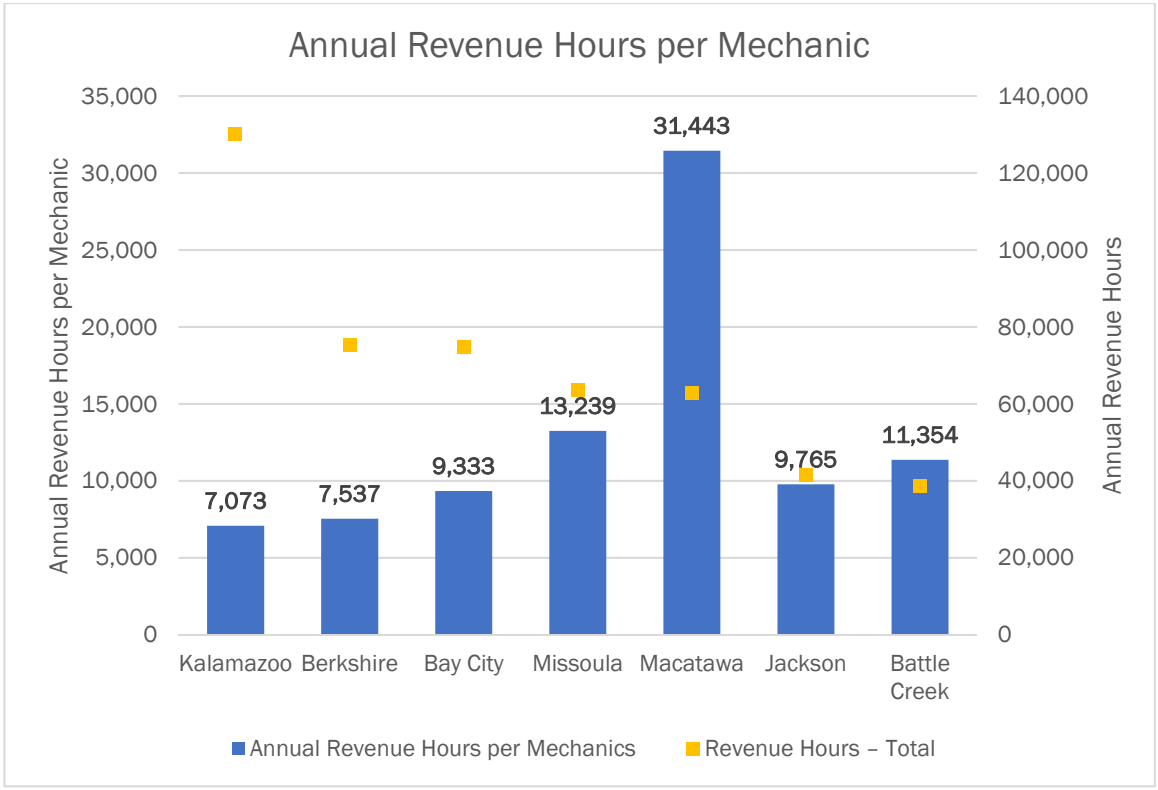


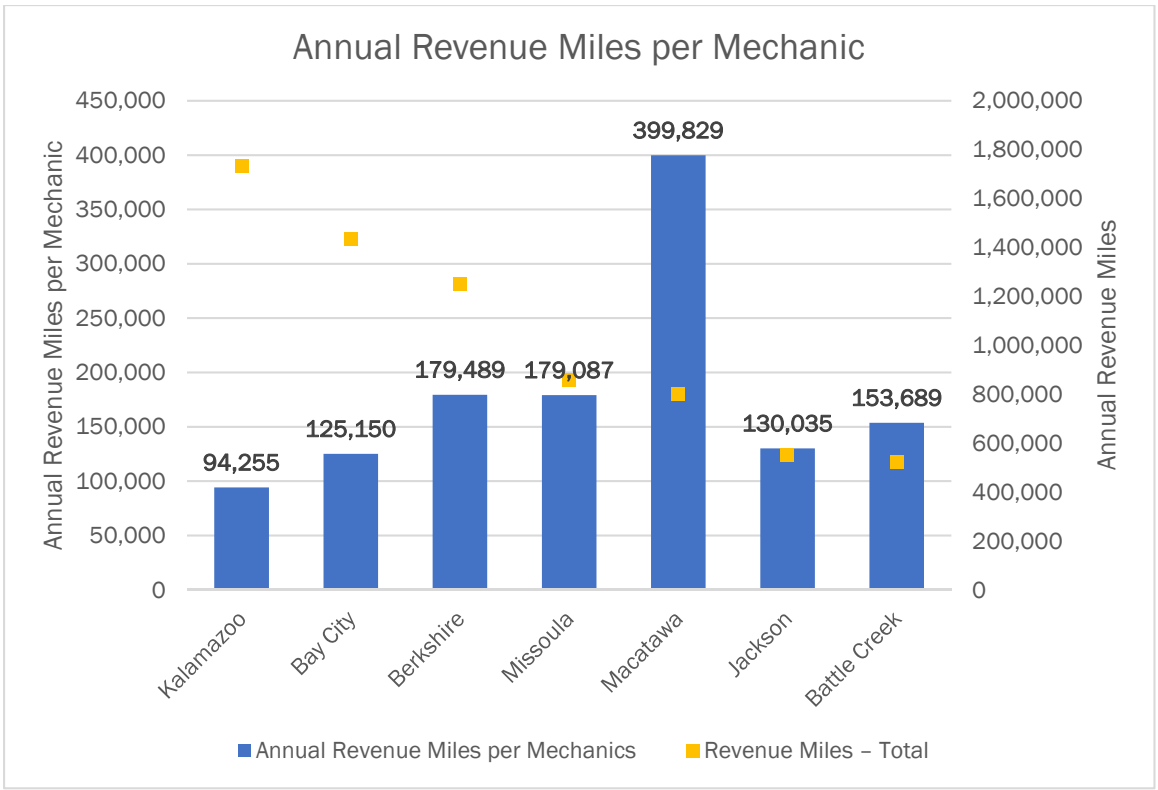

Annual Revenue Hours per Admin Staff
12,000
10,000
8,000
6,000
4,000
2,000
0
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Annual Revenue Hours per Admin Staff
Annual Revenue Hours
10,010
5,798
4,148
5,777
3,144
4,611
5,515
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Admin Staff
Revenue Hours – Total

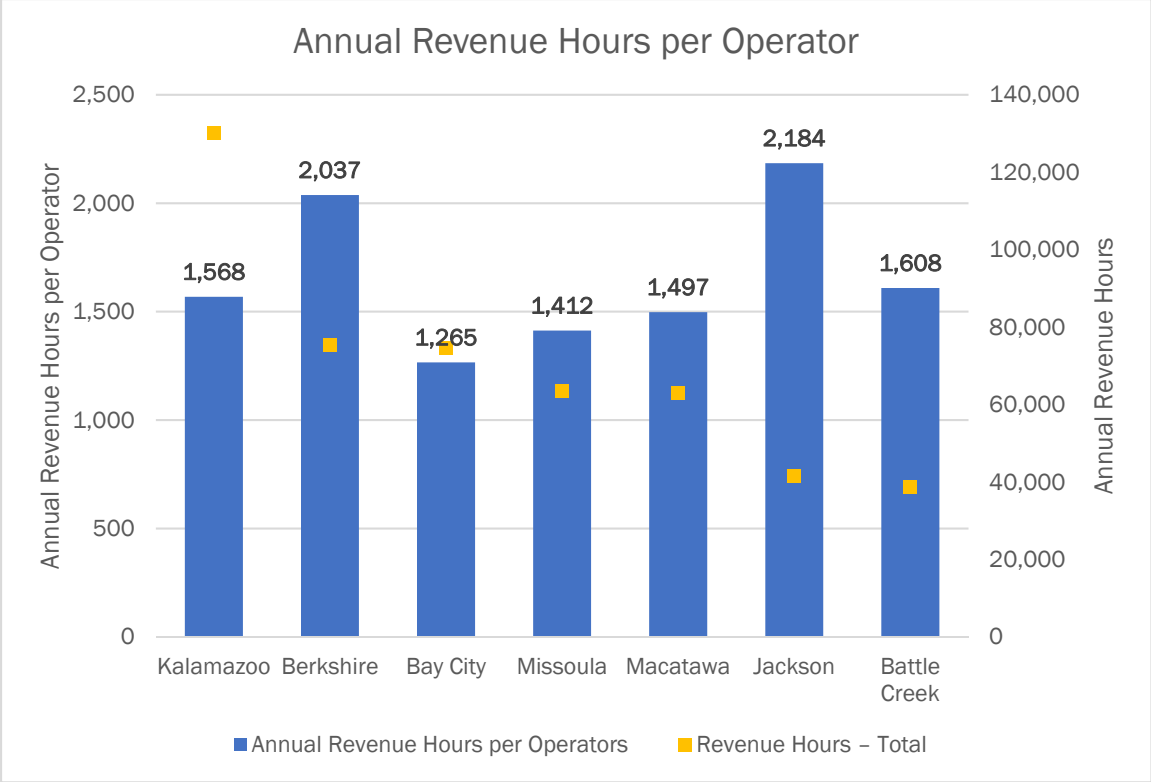

Annual Revenue Miles per Admin Staff
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Annual Revenue Miles per Admin Staff
Annual Revenue Miles
133,407
79,773
96,269
78,147
39,983
61,406
74,649
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Admin Staff
Revenue Miles – Total

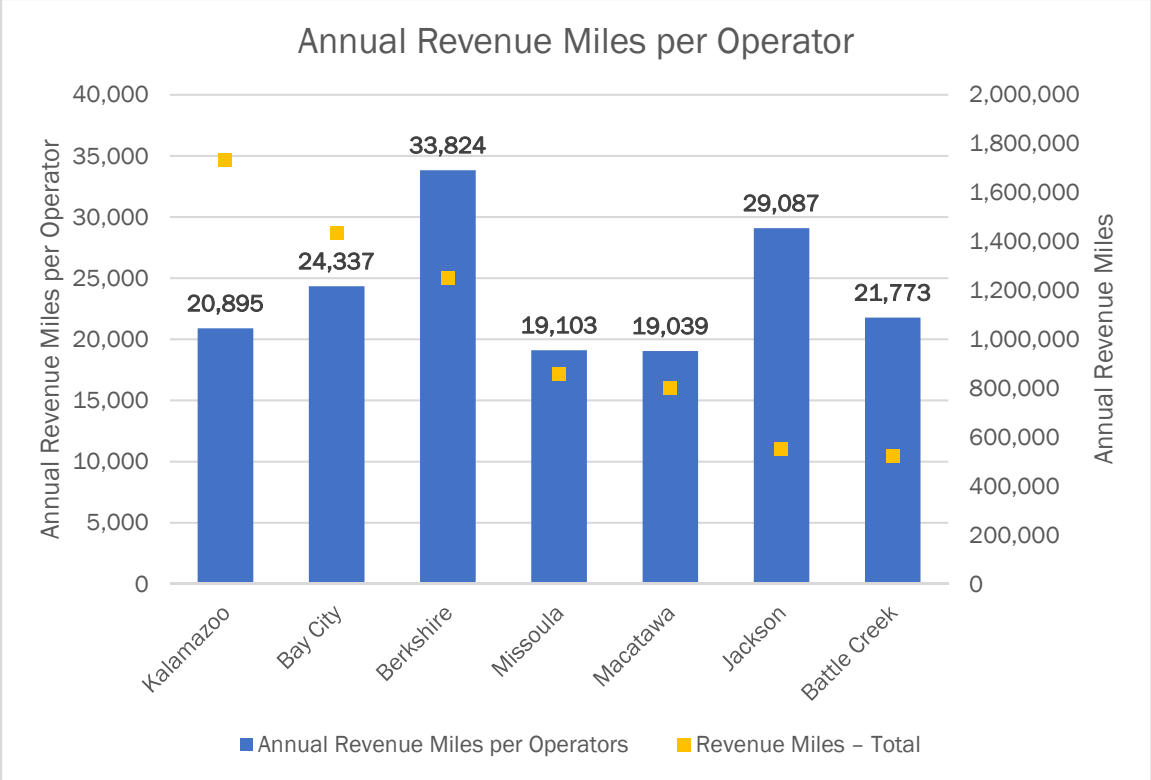

Annual Revenue Hours per Operations Staff
1,400
1,200
1,000
800
600
400
200
0
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Annual Revenue Hours per Ops Staff
Annual Revenue Hours
1,142
1,300
995
1,135
1,233
1,153
1,135
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Ops Staff
Revenue Hours – Total

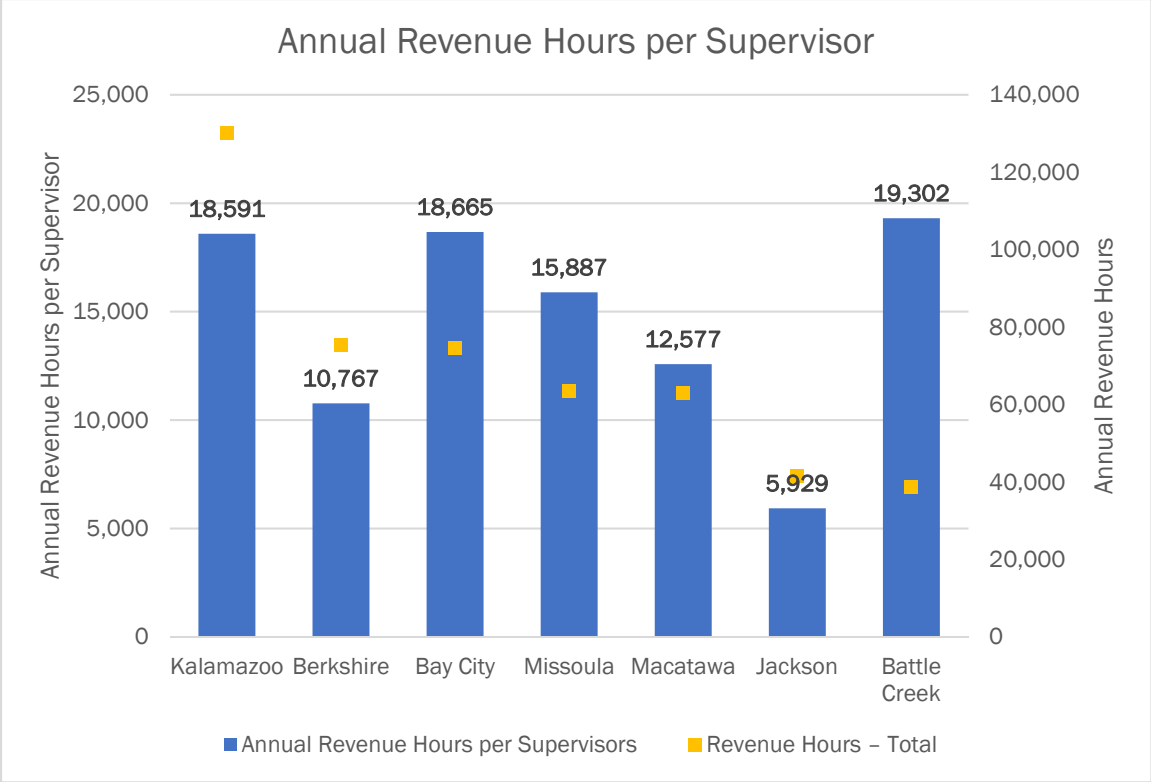

Annual Revenue Miles per Operations Staff
25,000
20,000
15,000
10,000
5,000
0
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Annual Revenue Miles per Ops Staff
Annual Revenue Miles
15,213
19,145
21,578
15,350
15,680
15,351
15,369
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Ops Staff
Revenue Miles – Total

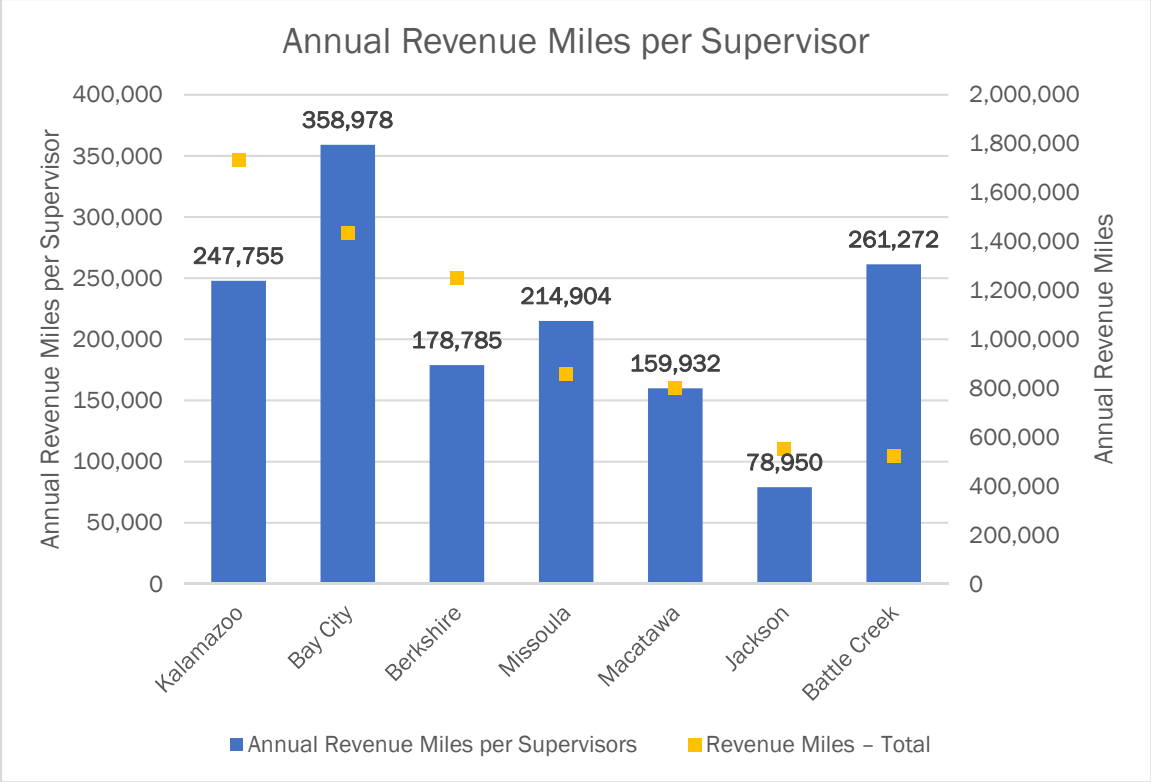

Annual Revenue Hours per Mechanic
Annual Revenue Hours per Mechanic
Annual Revenue Hours
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
7,073
7,537
9,333
13,239
31,443
9,765
11,354
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Mechanics
Revenue Hours – Total

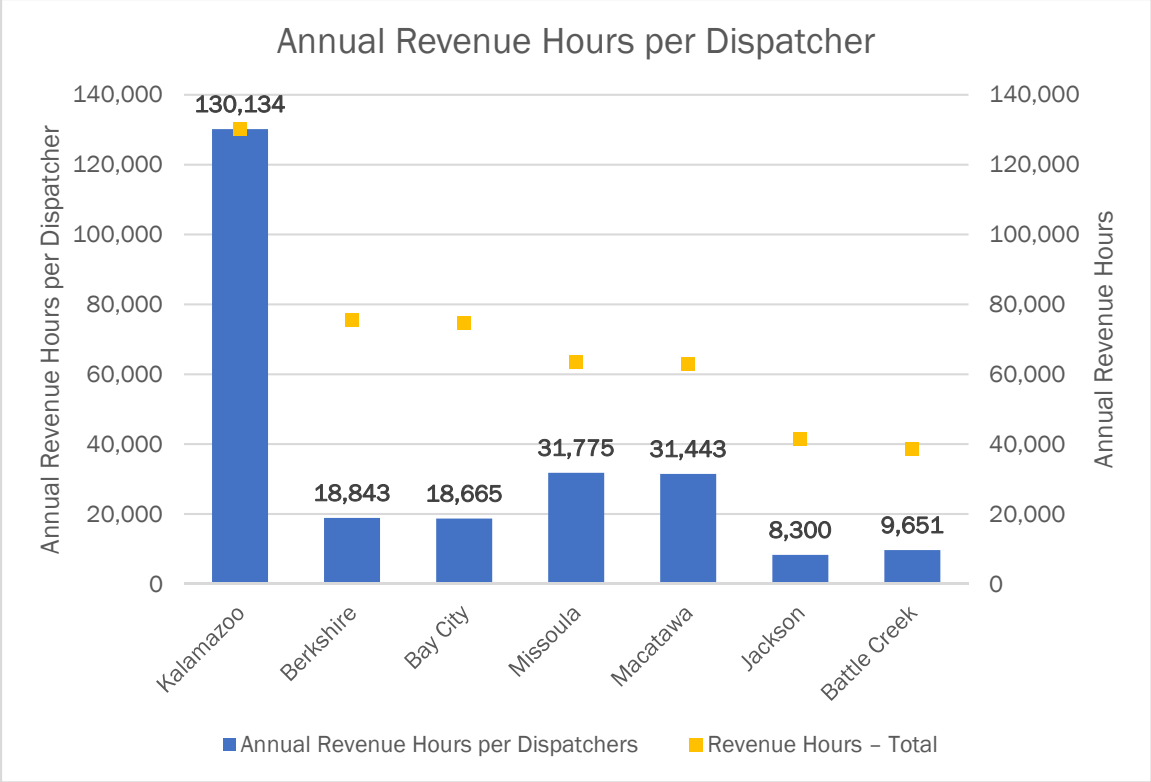

Annual Revenue Miles per Mechanic
Annual Revenue Miles per Mechanic
Annual Revenue Miles
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
94,255
125,150
179,489
179,087
399,829
130,035
153,689
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Mechanics
Revenue Miles – Total

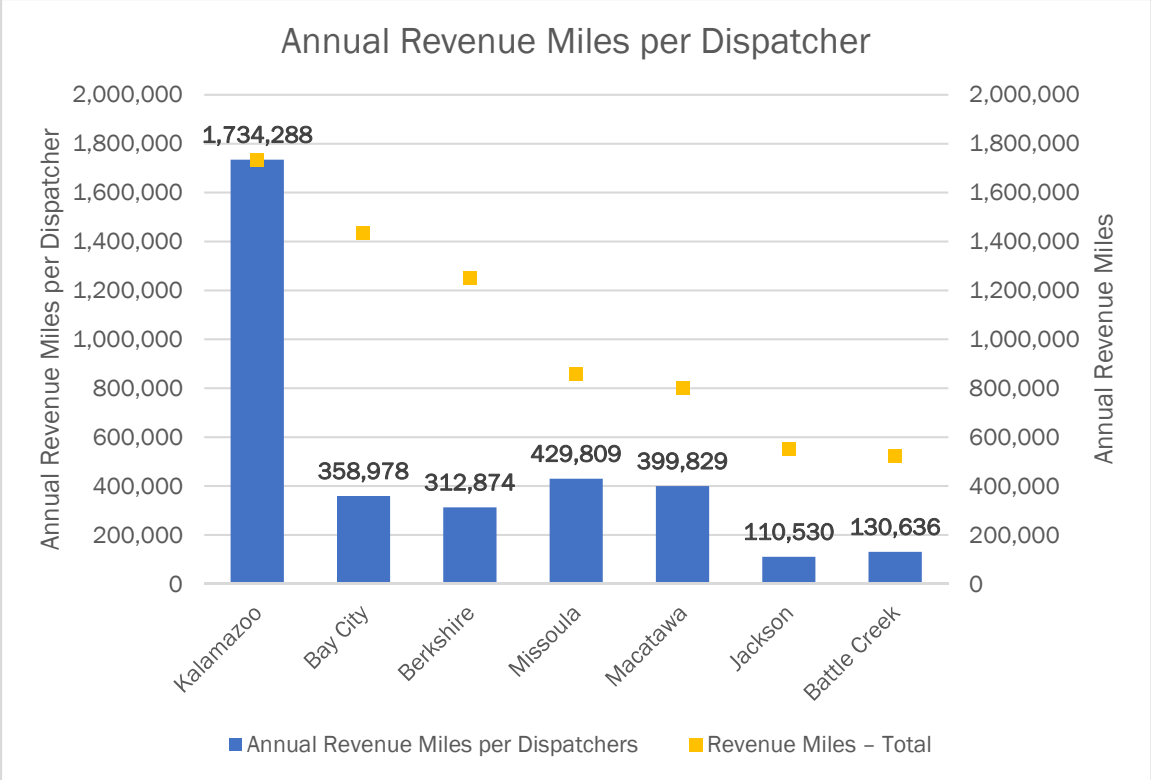

Annual Revenue Hours per Operator
2,500
2,000
1,500
1,000
500
0
Annual Revenue Hours per Operator
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Annual Revenue Hours
1,568
2,037
1,265
1,412
1,497
2,184
1,608
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Operators
Revenue Hours – Total


Annual Revenue Miles per Operator
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Annual Revenue Miles per Operator
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Annual Revenue Miles
20,895
24,337
33,824
19,103
19,039
29,087
21,773
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Operators
Revenue Miles – Total


Annual Revenue Hours per Supervisor
25,000
20,000
15,000
10,000
5,000
0
Annual Revenue Hours per Supervisor
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Annual Revenue Hours
18,591
10,767
18,665
15,887
12,577
5,929
19,302
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Supervisors
Revenue Hours – Total


Annual Revenue Miles per Supervisor
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Annual Revenue Miles per Supervisor
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Annual Revenue Miles
247,755
358,978
178,785
214,904
159,932
78,950
261,272
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Supervisors
Revenue Miles – Total


Annual Revenue Hours per Dispatcher
Annual Revenue Hours per Dispatcher
Annual Revenue Hours
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
130,134
18,843
18,665
31,775
31,443
8,300
9,651
Kalamazoo
Berkshire
Bay City
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Hours per Dispatchers
Revenue Hours – Total


Annual Revenue Miles per Dispatcher
Annual Revenue Miles per Dispatcher
Annual Revenue Miles
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
1,734,288
358,978
312,874
429,809
399,829
110,530
130,636
Kalamazoo
Bay City
Berkshire
Missoula
Macatawa
Jackson
Battle Creek
Annual Revenue Miles per Dispatchers
Revenue Miles – Total

PAGE INTENTIONALLY LEFT BLANK

APPENDIX I – MECHANIC STAFFING ANALYSIS BASED ON TCRP RESEARCH FINDINGS

Overview

The Transit Cooperative Research Program (TCRP) Report 184: *Maintenance Technician Staffing Levels for Modern Public Transit Fleets (2016)*[21] is the most comprehensive study that has been done in the U.S. to look at the level of bus fleet maintenance staffing. The report analyzes the factors which transit agencies consider when making maintenance staffing-level decisions, including the composition of the vehicle fleet, vehicle mileage and age, the type of bus service being provided (express versus local, urban versus rural), and the desired spare ratio.

The authors of the report admit that they were unable to identify a straightforward formula or calculation in widespread use within the transit industry to help determine the size of an agency's maintenance staff. The number of variables and each agency's unique situation makes it extremely difficult to draw any universal principles which can be easily applied to other agencies.

The authors, however, were able to survey a wide range of transit agencies and report their average staffing-levels. This can act as a guide for putting BCT's current maintenance staffing-level in context and helping administrators determine the optimal staffing level for BCT.

Assumptions

In order to complete this analysis, BCT staff provided a few basic data points including the number of in-house vehicle mechanics, vehicle fleet size, and systemwide revenue miles and hours. A set of assumptions was then used to estimate the number of maintenance hours currently available to be spent on vehicle maintenance, including the following:

1. Each mechanic spends 15 percent of his/her time on issues not related to vehicle maintenance, including snow removal, transit center maintenance, inventory management, or facility maintenance.
2. Mechanics work 40 hour per week.
3. Mechanics receive 31 days of vacation and holidays.
4. Full-Time Equivalent (FTE) position is equal to 1,840 hours per year.

Battle Creek Transit Compared to Benchmarks

Using these assumptions, Battle Creek's existing capacity to perform vehicle maintenance (expressed by total available maintenance hours and FTE's) was compared to the size of its fleet and levels of service (expressed by Vehicles Operated in Maximum Service, annual revenue hours, and annual revenue miles). The resulting metrics were then compared to the average for similarly sized transit agencies, as reported in TCRP Report 184. A range of possible values was used in order to reflect the wide array of values that the researchers uncovered at different agencies. **Table 92Error! Reference source not found.** summarizes the results, with the rightmost column indicating whether BCT falls within the typical range for each metric.

BCT falls within the typical range for 50 percent of the 12 metrics that were examined. For the remaining 50 percent, BCT errs on the side of excess capacity: more available maintenance capacity per unit than similarly sized transit agencies. Even for those metrics where BCT operates within the average range, the numbers tend to be closer to the "more-capacity-per-unit" end of the range. This suggests that, in general, BCT has more maintenance capacity than other similarly sized agencies, although not at unreasonable levels.

[21] The report is available for download at: http://www.trb.org/Publications/Blurbs/173927.aspx.

Table 92 | Maintenance Staffing Metrics – Battle Creek Transit Compared to Industry Average

Maintenance Staffing Metric	Average for Agencies with Fewer Than 50 Buses	Typical Range (About 70% of agencies fall in this range)	Battle Creek Transit	Within Range?
Vehicles Maintained per Technician	8.1	3.7 - 12.4	5.9	Yes
Vehicle Miles per Technician	278,509	188,716 - 368,301	154,361	No
Vehicle Hours per Technician	16,975	11,435 - 22,514	11,403	No
FTE Technicians per Vehicle	0.15	.09 - .21	0.17	Yes
FTE Technicians per 10,000 Vehicle Miles	0.04	.03 - .05	0.06	No
FTE Technicians per 1,000 Vehicle Hours	0.06	.04 - .08	0.09	No
Annual Total Maintenance Hours per Vehicle	237	135 - 339	311	Yes
Annual Total Maintenance Hours per 10,000 Vehicle Miles	63	34 - 92	119	No
Annual Total Maintenance Hours per 1,000 Vehicle Hours	102	61 - 143	161	No
Annual Revenue Miles per Vehicle	36,056	25,956 - 46,155	26,127	Yes
Annual Revenue Hours per Vehicle	2,379	1,559 - 3,199	1930	Yes
Average Miles per Hour in Operation	15.8	12.3 - 19.24	14	Yes

TCRP Report 184 found a small level of positive correlation between the size of an agency's vehicle fleet and the number of technician hours available from staffing levels. The larger the vehicle fleet, the more FTE hours they had available to work on maintenance-related tasks. The researchers suggest that this may be due to the fact that larger agencies are more capable of performing heavy repair work in-house, the fleet composition is likely to be more diverse, or that simply more funding is available to hire maintenance staff. BCT's maintenance staffing levels also reflect that they perform a significant amount of heavy repair work in-house, rather than contracting out the work to outside entities. The only maintenance tasks that are not performed by BCT technicians are alignment repairs and major body work. This heavy workload for a relatively small agency may help explain why BCT has more maintenance capacity than other similarly sized agencies.

The researchers also point out, however, that despite this correlation, a wide range of values was observed for agencies of all sizes. It is not unusual, in other words, for BCT to have slightly more maintenance capacity on staff than similarly sized agencies. There are many other variables which factor into deciding appropriate staffing levels for maintenance technicians, including the age and vehicle composition of the fleet, the agency's adopted operating spare ratio, and the built environment of the service area. None of these variables have a clear, one-way correlation to staffing levels, but collectively they play a role in creating the need for maintenance work. Using the guidelines, averages, and ranges provided in TCRP Report 184, each agency must decide what level of maintenance staffing is appropriate for their specific system.