Alternatives Evaluation Report

Rochester Downtown Circulator

Version 2.0

City of Rochester

Prepared by:

SRF

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Introduction

Purpose of This Report

The purpose of this report is to outline:

- The purpose, need, and goals of the Rochester Downtown Circulator project (referred to in this report as "the circulator" or "the project")
- The transportation alternatives considered
- The criteria for evaluating these alternatives
- The results of the technical evaluation of alternatives

A set of evaluation measures, derived from the purpose, need, and goals for the project, are used to quantify how each alternative performs related to the defined project goals. The results of this evaluation process will be used as the basis for the recommendation on a locally preferred alternative (LPA) for the circulator.

Purpose and Need Statement and Project Goals

The purpose and need for the project were developed in 2018 for the City of Rochester's Transit Circulation Study component of the Destination Medical Center (DMC) Integrated Transit Studies.

Purpose of the Circulator

The purpose of the Rochester Downtown Transit Circulator is to provide high quality downtown public transportation service for residents, commuters, businesses, patients, students, and visitors that will support the City of Rochester and DMC district transportation, economic development, and livability goals and substantially increase public transportation use downtown.

Need for the Circulator

Downtown Rochester is expected to grow dramatically; employment is expected to grow by approximately 65 percent and population by 30 percent. Both the City of Rochester's *Downtown Master Plan* and the *DMC Development Plan* identify a major increase in transit mode share to accommodate this growth and state a goal of carrying 23 to 30 percent of all commuters on transit. As a result, transit ridership on both the local and regional transit systems is expected to nearly double, requiring more transit capacity.

The following five factors contribute to the need for the Downtown Rochester Transit Circulation Project:

1. Growth in local and regional travel associated with the implementation of the *DMC Development Plan*.

2. Limited ability of the existing transportation network to support local and regional economic development priorities.
3. Congested downtown entry points and primary streets resulting from continued reliance on personal automobiles.
4. Parking program and policies that encourage the use of private automobiles.
5. Constrained transit system capacity and need to optimize/coordinate multiple existing services (Rochester Public Transit, Rochester City Lines [RCL], Mayo and private shuttles).

Goals of the Circulator

The following four goals address the purpose and need for the Rochester Downtown Transit Circulator. Specific evaluation criteria for each goal were developed. The evaluation process is described in more detail in the Evaluation section of this report.

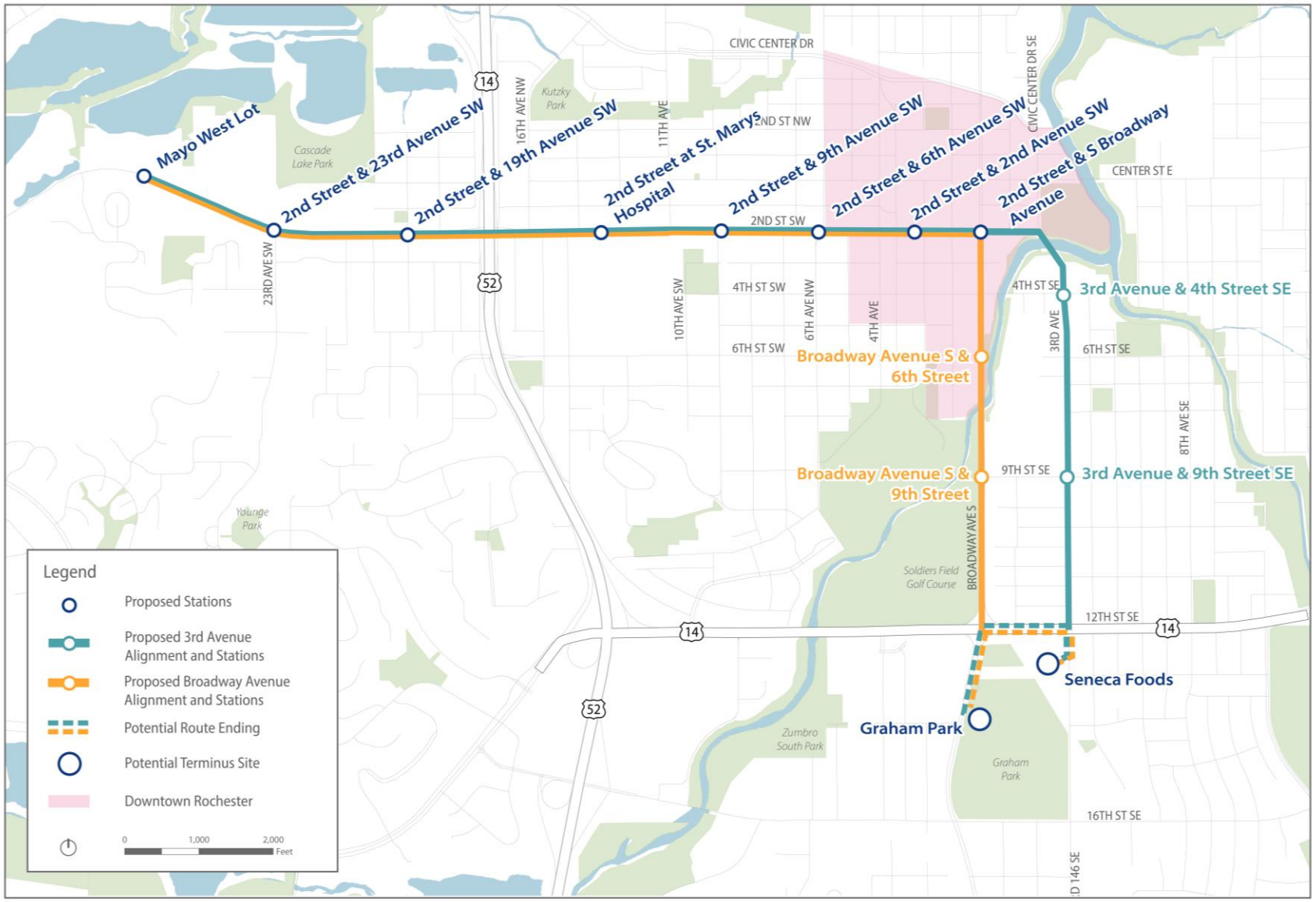
1. Increase transit use among corridor residents, employees, and visitors
2. Catalyze and support housing and economic development along the corridor
3. Plan a cost-effective transitway positioned for implementation
4. Support healthy, active communities and the environment

Alternatives Considered

Route Alignment and Stations

The proposed circulator will travel from the Mayo West Lot to downtown Rochester via 2nd Street SW, making intermediate stops at major intersections, as well as St. Marys Hospital. In downtown Rochester, the circulator will serve stations at 2nd Street & 2nd Avenue SW (Gonda Building) and 2nd Street & S Broadway Ave before proceeding south along either South Broadway or 3rd Avenue SE. The southeast terminus is yet to be determined but will be located at either of two existing park and ride sites in Graham Park, or at the former Seneca Foods site at 3rd Avenue & 12th Street SE. These alignment and terminus options are shown in Figure 1 below.

Figure 1: Rochester Downtown Circulator Alignment and Terminus Options



Transit Modes

For this evaluation, two modes were considered for the Rochester Downtown Transit Circulator: bus rapid transit (BRT) and modern streetcar.

Bus Rapid Transit

BRT is an all-day, frequent, high-capacity transit mode that uses diesel or electrically powered bus vehicles and incorporates many of the characteristics of light rail transit (LRT). BRT can operate in mixed traffic or in dedicated lanes on local streets or highways. Stations are usually spaced ¼ to ½- mile apart. BRT can incorporate transit advantages such as transit signal priority or queue jump lanes and can be complemented with local bus service that stops more frequently. Typical amenities include improved stations and customer information, unique vehicles and branding, and off-board fare collection that allows for faster boarding.

Image 1: MAX BRT in Kansas City, Missouri

Modern Streetcar

Modern streetcars are electrically powered rail vehicles which function best in urban areas with high transit demand. Streetcar lines are typically less than four miles long and operate on city streets in mixed traffic, although they can also operate in exclusive rights-of-way. Streetcars have a lower passenger capacity than LRT systems but have higher passenger capacity than a typical bus. Streetcars usually make stops every few blocks and function more as a part of a local circulation system than a regional transportation system. Streetcars can operate in single-track or double-track configurations.

Image 2: Streetcar in Portland, Oregon

Modern streetcar service is particularly suitable for high-density, mixed-use areas with short average passenger trip lengths, areas where improved transit will benefit a high number of existing riders, and as an attraction for new or infrequent transit users like shoppers or visitors. Modern streetcars have also demonstrated promise for supporting high-density, mixed-use, walkable development in urban cores where people can live without a car and become regular and frequent transit users.

Definition of Alternatives

Consideration of BRT, streetcar, and the two southern alignment options results in four alternatives for evaluation:

- Alternative 1: BRT on 2nd Street and 3rd Avenue
- Alternative 2: BRT on 2nd Street and Broadway
- Alternative 3: Streetcar on 2nd Street and 3rd Avenue
- Alternative 4: Streetcar on 2nd Street and Broadway

Each of the alternatives would have its southern terminus at either Graham Park or at the Seneca Foods site. Concept-level drawings of each alternative are available in Appendix E.

Evaluation

Based on the project's goals and objectives, specific evaluation criteria were identified to quantitatively and qualitatively evaluate alternatives. At this time in the analysis, it is assumed that the defined project goals or individual criteria will not be weighted. Evaluation results for the streetcar and BRT alternatives are shown in Table 1 below. Because the four alternatives share a great deal of the corridor in common, some ratings are very similar, while some criteria will differentiate the alternatives. More detailed information about the evaluation can be found in the appendices.

Table 1: Evaluation of Alternatives

Criteria	Measurement Type	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
Goal 1: Increase transit use among corridor residents, employees, and visitors					
Daily ridership (Opening Year)	Quantitative	High Compatibility 12,650	High Compatibility 11,850	High Compatibility 12,675	High Compatibility 11,875
Transit-dependent population (zero-car and low-income households) within ½ mile of station locations Source: 2012-2016 American Community Survey (Census Transportation Planning Package) *Assumes Graham Park terminus	Quantitative	Medium Compatibility Population: 3,300 Households: 1,900	Medium Compatibility Population: 3,100 Households: 1,700	Medium Compatibility Population: 3,300 Households: 1,900	Medium Compatibility Population: 3,100 Households: 1,700
Connectivity to existing and planned local and regional bus networks	Qualitative	High Compatibility The 3rd Avenue alignment offers good connections to nearby local and regional bus routes and good opportunity for transfers (Graham Park, Fullerton Lot). The Broadway alignment offers good connections to nearby local and regional bus routes and some opportunity for transfers (Graham Park). Broadway Avenue is identified in local plans as a primary transit corridor.	High Compatibility	High Compatibility	High Compatibility
Connections to key destinations	Qualitative	High Compatibility	High Compatibility	High Compatibility	High Compatibility

Criteria	Measurement Type	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
including: • Seneca site • Graham Park • UMR future campus • Soldiers Field Park • Discovery Square • Olmsted Medical Center • Olmsted County Government Center and Rochester City Hall • Rochester Art Center • Mayo Civic Center • Rochester Public Library • Methodist Hospital • UMR existing campus • Plummer Building • Gonda Building • St. Marys Hospital • Mayo West Lot		Alignments are approximately equally matched in providing access to key destinations. The 3rd Avenue alignment provides better access to the Rochester Public Library, Mayo Civic Center, Olmsted County Government Center, and Rochester City Hall, while the Broadway Avenue alignment provides better access to the future UMR campus, Discovery Square, and Soldiers Field Park.			
Travel time	Quantitative	Medium Compatibility Peak: 20 minutes one-way; 40-minutes roundtrip Off-peak: 16 minutes one-way; 32-minute roundtrip	Medium Compatibility Peak: 20 minutes one-way; 40-minutes roundtrip Off-peak: 16 minutes one-way; 32-minute roundtrip	Medium Compatibility Peak: 20 minutes one-way; 40-minutes roundtrip Off-peak: 16 minutes one-way; 32-minute roundtrip	Medium Compatibility Peak: 20 minutes one-way; 40-minutes roundtrip Off-peak: 16 minutes one-way; 32-minute roundtrip
Reliability during weather events	Qualitative	Medium Compatibility	Medium Compatibility	High Compatibility	High Compatibility

Criteria	Measurement Type	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
		Generally, rail modes are less sensitive to weather than bus modes.			
Goal 2: Catalyze and support housing and economic development along the corridor					
Available land for redevelopment within ½ mile of the station locations	Qualitative	High Compatibility	High Compatibility	High Compatibility	High Compatibility
		Both alignments would serve vacant and underused sites between 4th and 12th Streets SE. The 3rd Avenue alignment would serve potential future redevelopments at Olmsted County Government Center and Rochester City Hall parking sites, Fullerton Lot, Kmart, and Graham Park. The Broadway alignment would serve potential future redevelopments at Discovery Square, UMR Campus, Kmart, Crossroads Center, and Graham Park.			
Foster transit-oriented development • Redevelopment potential and physical form on land within ½ mile of station locations	Qualitative	Medium Compatibility	Medium Compatibility	Medium Compatibility	Medium Compatibility
		3rd Avenue is a lower-volume street with few geographical barriers to building pedestrian-friendly development that fronts the street. Broadway Avenue between 2nd and 9th Streets has strong pedestrian-oriented form and potential to redevelop in the same way. South of 9th Street, Broadway Avenue allows for higher-speed traffic, and river, railroad, and golf course constrain pedestrian-friendly development potential, though the City intends to rebuild Broadway to be pedestrian-friendly.			
Consistency with land use plans including: • Comprehensive Plan • DMC Plan • Downtown Master Plan • Slatterly Park Neighborhood vision	Qualitative	Medium Compatibility	High Compatibility	Medium Compatibility	High Compatibility
		The four long-range plans identify Broadway Avenue as a primary transit corridor with transit-oriented land use while 3rd Avenue is designated as a supportive corridor with less-intensive land uses still conducive to transit.			
Existing population and employment within ½ mile of station locations Source: 2010 Census (population) and 2015 Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (jobs) * Assumes Graham Park terminus	Quantitative	Medium Compatibility Population: 15,700 Jobs: 45,400	Medium Compatibility Population: 14,400 Jobs: 45,400	Medium Compatibility Population: 15,700 Jobs: 45,400	Medium Compatibility Population: 14,400 Jobs: 45,400

Criteria	Measurement Type	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
Future population and employment within ½ mile of station locations Source: population and employment allocations to Transportation Analysis Zones in the Rochester Travel Demand Model * Assumes Graham Park terminus	Quantitative	Medium Compatibility Population: 29,900 Jobs: 97,200	Medium Compatibility Population: 28,500 Jobs: 96,800	Medium Compatibility Population: 29,900 Jobs: 97,200	Medium Compatibility Population: 28,500 Jobs: 96,800
Goal 3: Plan a cost-effective transitway positioned for implementation					
Capital costs (millions)	Quantitative	High Compatibility Graham Park Terminus: $96.1 Seneca Foods Terminus: $94.2	High Compatibility Graham Park Terminus: $98.6 Seneca Foods Terminus: $98.6	Low Compatibility Graham Park Terminus: $383.1 Seneca Foods Terminus: $362.7	Low Compatibility Graham Park Terminus: $360.5 Seneca Foods Terminus: $355.9
Operating and maintenance costs	Quantitative	High Compatibility Annual O&M Cost (2019): $4,041,101	High Compatibility Annual O&M Cost (2019): $4,041,101	Medium Compatibility Annual O&M Cost (2019): $4,744,081	Medium Compatibility Annual O&M Cost (2019): $4,744,081
Cost per rider (cost-effectiveness)	Quantitative	High Compatibility Graham Park Terminus: $2.02 Seneca Foods Terminus: $2.01	High Compatibility Graham Park Terminus: $2.18 Seneca Foods Terminus: $2.18	Low Compatibility Graham Park Terminus: $4.65 Seneca Foods Terminus: $4.45	Low Compatibility Graham Park Terminus: $4.72 Seneca Foods Terminus: $4.67
Technological flexibility	Qualitative	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility

Criteria	Measurement Type	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
		Technological flexibility was rated high under both BRT alternatives because the proposed BRT guideway elements will function regardless of the specific BRT vehicle technologies selected, both in the implementation year and in the future. Technological flexibility was rated as medium under both streetcar alternatives because certain capital elements, including power systems and fixed rail guideways, may last decades and will influence the selection of future vehicle types once implemented. Buses have a 12-year average lifecycle; streetcar vehicles have a 25-year average lifecycle.			
Goal 4: Support healthy, active communities and the environment					
Potential impacts to historic and cultural resources	Qualitative	High Compatibility	High Compatibility	Low Compatibility	Low Compatibility
		Potential impacts to historic and cultural resources were rated low under both streetcar alternatives because of potential visual changes resulting from infrastructure including potential overhead catenary systems.			
Potential impacts to park land	Qualitative	High Compatibility	High Compatibility	High Compatibility	High Compatibility
		There is very little potential for any alternative to impact parkland because regardless of which alternative is chosen, it will operate almost entirely in existing right-of-way.			
Level of right-of-way impacts • Full and partial takes • Commercial and residential takes • Building or vacant land on needed right-of-way	Qualitative	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility
		Both alignments can be largely constructed within existing right-of-way. Some minor strip takings may be needed for temporary grading or sidewalk easements near stations. The streetcar alternatives will also need locations to locate traction power substations and a new operations and maintenance facility at one terminus.			
Pedestrian and bicycle network connectivity and potential impacts	Qualitative	Medium Compatibility	Medium Compatibility	Medium Compatibility	Medium Compatibility
		Though both alignments provide good bicycle connectivity, the Broadway alignment has better bicycle infrastructure and connections to the overall established City bicycle network. 3rd Avenue outperforms the Broadway Avenue alignment in terms of pedestrian connectivity to existing neighborhoods and homes because the river and Soldiers Field create a barrier along the Broadway alignment.			

Appendix A: Ridership Forecast Results

Introduction

Transit ridership estimates have been developed for use in a future Small Starts Application as part of the Federal Transit Administration's (FTA) Capital Investment Grant (CIG) program. Three sets of forecasts were developed:

- Current Year
- Opening Year
- Future (2040) Year

The forecasts for the opening year and future (2040) year scenarios were developed to be used in other aspects of the project, including service development, station placement, and cost estimation. Proposed or anticipated transit-oriented development around stations and general growth of the downtown Rochester area is considered for future year forecasts only. All ridership forecasts consider BRT and streetcar mode alternatives in addition to two alignment alternatives.

Forecast Development

The FTA's CIG program allows for project sponsors to use "warrants" for projects that show strong existing ridership. Warrants allow a sponsor to show project justification and obtain a Medium rating without an in-depth forecasting exercise. In warrants analysis, services replaced by the proposed project and ridership entering the project corridor are included as likely candidates to be carried on the proposed project. As this project has significant existing transit along the proposed corridor, ridership forecasts were developed with the application of warrants in mind. Further documentation on the warrant process can be found on FTA's CIG website.

Existing ridership was summarized using distinct markets: Mayo Clinic employee park and ride, Mayo Clinic shuttle service, existing Rochester Public Transit (RPT) service, and Graham Park Park and Ride. The ridership for the warrant analysis was developed separately to follow FTA guidelines. These markets were estimated according to existing conditions, assumptions of what will be available the opening year of the project, and assumptions of growth using a forecast year of 2040.

The Mayo Clinic currently reserves parking and operates shuttle service for its employees from its West Lot and Fullerton Lot to St. Marys Hospital and the Mayo Gonda Building in the center of downtown Rochester. The use of the former KMART parking lot for Mayo Employees is in negotiation.

In addition to its park and ride shuttles, the Mayo Clinic operate shuttles which serve employees travelling between various Mayo Clinic buildings. Its intercampus shuttle between St. Marys Hospital and the Gonda Building runs on 2nd Street with both proposed project alignments.

The proposed project alignments follow the backbone of existing Rochester Public Transit (RPT) service. High concentrations of employment with significant continued development and limited parking in downtown Rochester necessitate robust transit service to the area.

Graham Park is located at the south-eastern terminus of the circulator project. The site currently houses the Olmsted County Fairgrounds and a Rochester Public Transit park and ride.

Data Collection

Existing route ridership collected by Rochester Public Transit (RPT) was supplemented by in-person counts and video data collected between June 21st, 2019 and June 23rd, 2019. In-person counts completed at the Graham Park site provided park and ride ridership in addition to verifying insignificant prevalence of "park-and-pooling." Cameras were posted at the Mayo Gonda building, Mayo East Lot, and Mayo West Lot to count Mayo Clinic shuttle riders. Total ridership from Graham Park increased from previous study records while Mayo Clinic shuttle ridership has remained consistent.

Project Mode Options

The City of Rochester is considering BRT and streetcar for the project. With most of the transit markets being inelastic commuter markets, the benefit of rail over bus is projected to be minimal. Current RPT riders are the only opening year market assumed to be influenced by selection of streetcar over BRT. A ridership benefit of 15 percent has been applied to the RPT market for the opening year scenario and additionally to the transit village riders at the West Lot for the future (2040) year scenario.

Current Year Forecasts

Table 2 summarizes ridership totals for the current year. Ridership is broken down by market segment and alignment. Assumptions for each market are documented below.

Mayo Clinic Employee Park and Ride (Mayo West Lot, Fullerton Lot, KMART Lot)

Data collection via video counts provide existing ridership from the Mayo Clinic lots. On a representative day, 1,600 passengers used the Mayo Clinic's internal shuttle to travel from the West Employee Parking Lot and 720 passengers travelled from the Fullerton Lot. The split between destinations (St. Marys Hospital and the Mayo Gonda Building) was inferred from data collection.

This market has distinct differences between project ridership on the proposed alignments. The Fullerton Lot will be served by the 3rd Avenue alignment, but not the Broadway Avenue alignment. This analysis assumes that the West Lot shuttles will be eliminated with the opening of the circulator, but that the Fullerton Lot shuttle will only be eliminated with the selection of the 3rd Avenue alignment. However, should the Broadway alignment be selected, the Fullerton shuttle will still benefit from the transit-only lanes on 2nd Street. The ridership to and from the Fullerton Lot can thus be considered in total corridor ridership for FTA's warrant process.

Ridership for this market assumes the following:

- Existing shuttles will be replaced by the circulator.
- The Mayo Clinic will assign employees to park and ride at these facilities, such that they are at capacity.
- No fares will be charged for Mayo employees consistent with current policy. Mayo Clinic offers employees transit passes at no expense to the employee.

Mayo Clinic Shuttle Service

The Intercampus shuttle which runs between the Mayo Gonda Building and the St Marys Hospital carries approximately 3,000 passengers per day, based on counts. The eastbound and westbound daily volumes are approximately equal.

The following assumptions are employed for this market:

- The existing shuttle will be replaced by the circulator and the demand will be served by the circulator.
- No fares will be charged for Mayo employees consistent with current policy. Mayo Clinic offers employees transit passes at no expense to the employee.

Rochester Public Transit

Ridership currently on Rochester Public Transit that could be served by the project was estimated using ride check data from 2015 and scaled to fall 2018 totals. Estimates include riders clearly boarding and alighting within the project corridor. About 360 riders currently make these movements which can be served by the project route alternatives.

The following assumptions are employed for this market:

- Riders were counted if there was a record of boarding and alighting on stops within one quarter mile of the project.
- If a record was found, a return trip was assumed to provide a directionally balanced trip table.

Graham Park Park and Ride

Origin-destination level ridership for the Graham Park area comes from multiple data sources including original data collection and Census Transportation Planning Package commuter flows (CTPP) data.

Rochester Public Transit currently serves the Fairgrounds park and ride located at Graham Park. Data collection verified that 325 people park at the facility resulting in 650 riders. The origin-destination distribution of riders comes from analysis of CTPP data. Destination census block

groups matched to project stations allocated proportions of commuters coming from the south-eastern area around Rochester.

The following assumptions are employed for this market:

- Anyone may park in the park and ride lot (it is not reserved for Mayo Clinic employees).
- Station-level allocation of existing public transit trips in the corridor is based on CTPP commuter flows data.
- Data collected between June 21st and June 23rd, 2019 is representative of typical days.

Other Corridor Ridership

FTA defines two additional classes of ridership that may be counted in their warrants process: ridership boarding in the corridor and riders entering the corridor on existing transit routes which are within one quarter mile of the project and run parallel for the entirety of the route. Ridership boarding in the corridor includes all passengers boarding within one quarter mile of the corridor. Riders entering the corridor includes those riders on-board transit when entering the corridor. Eligible routes include the 3, 4A, 4B, 4D, 4M, 5, 6A, 6B, 6D, 6M, 7, 7A, 7N, 8, 9, 10, 12, 12M, 12N, 15D, 16, 17, 18, 18D, and 19.

Table 2: Current Year Forecasts

Source	Broadway	3rd
Mayo West Lot	1,600	1,600
Mayo Fullerton Lot	-	725
Mayo KMART Lot	-	-
Graham Park Site	650	650
Total Park and Ride	2,250	2,975
Mayo Shuttle	3,000	3,000
Existing Riders Boarding and Alighting in Corridor	200	275
Total Shuttle	3,200	3,275
Total Ridership on Project	5,450	6,250
Ridership Boarding in Corridor (Other RPT routes)	3,300	3,300
Riders Entering Corridor (Other RPT routes)	3,500	3,500
Mayo Fullerton Lot	725	-
Total (Warrant) Corridor Ridership	7,525	6,800
Total	12,975	13,050

Both alignments have similar ridership for current year. The differences in ridership result from two markets, the Mayo Fullerton Lot park and ride and existing Rochester Public Transit riders. Because the Broadway alignment would not serve the Mayo Fullerton Lot, the estimated 725 riders from the market are not included in the total project ridership; however, it is assumed that if the Broadway alignment is selected, Mayo would continue to operate a shuttle service from Fullerton, so this ridership is included in the total corridor ridership. The difference in existing RPT riders is fewer than 100.

Opening Year Forecasts

Mayo Clinic Employee Park and ride (Mayo West Lot, Fullerton Lot, KMART Lot)

The Mayo Clinic plans to expand its West Lot by building a parking structure. The parking structure will add 3,000 spaces for Mayo Clinic employees and be in use by project opening.

The Mayo Clinic also plans to expand employee parking by using an existing parking lot near a former KMART store. This lot will add an additional 450 parking spaces near the proposed circulator routes.

The following assumptions were employed for this market:

- The Mayo Clinic will assign employees to these facilities such that they are at capacity.

- The split of destination locations (St. Marys and Mayo Gonda Building) will remain the same as in current year.
- This market is not elastic to mode change.

Mayo Clinic Shuttle Service

This market is assumed to completely shift to the project, which will have stops at both St. Marys and the Mayo Gonda Building on both proposed alignments. The existing Mayo Clinic Intercampus shuttle will be discontinued.

The following assumptions were made for this market:

- There will be no change from current year volumes and directionality.
- This market is not elastic to mode change.

Rochester Public Transit

The current number of riders that are boarding and alighting within the proposed circulator corridor is maintained with the assumption that they will use the project in lieu of other, less frequent and less branded routes.

The following assumptions were made for this market:

- There will be no change from current year volumes and directionality.
- This market is elastic to mode change and the streetcar will attract 15 percent more riders than BRT.

Graham Park Park and Ride

Opening-year ridership estimates follow the same methodology of existing ridership estimation. However, the total number of riders comes from the City of Rochester's plans to provide a parking facility at the southeastern terminus of the project with a capacity of 1,000 spaces. Applying the current occupancy rate to the Fairgrounds park and ride, 88 percent, and assuming two transit rides per parked car yields about 1,750 riders per day in opening year.

The following assumptions are employed for this market:

- The City of Rochester will construct a 1,000-space parking facility.
- Occupancy rate of the new parking facility will be the same as the current facility.
- The destination distribution of park and riders will be the same as is assumed for current year (based on CTPP data).
- This market is not elastic to mode change.

Other Corridor Ridership

No changes are assumed to occur for other existing corridor ridership from current year to opening year.

Table 3: Opening Year Forecasts

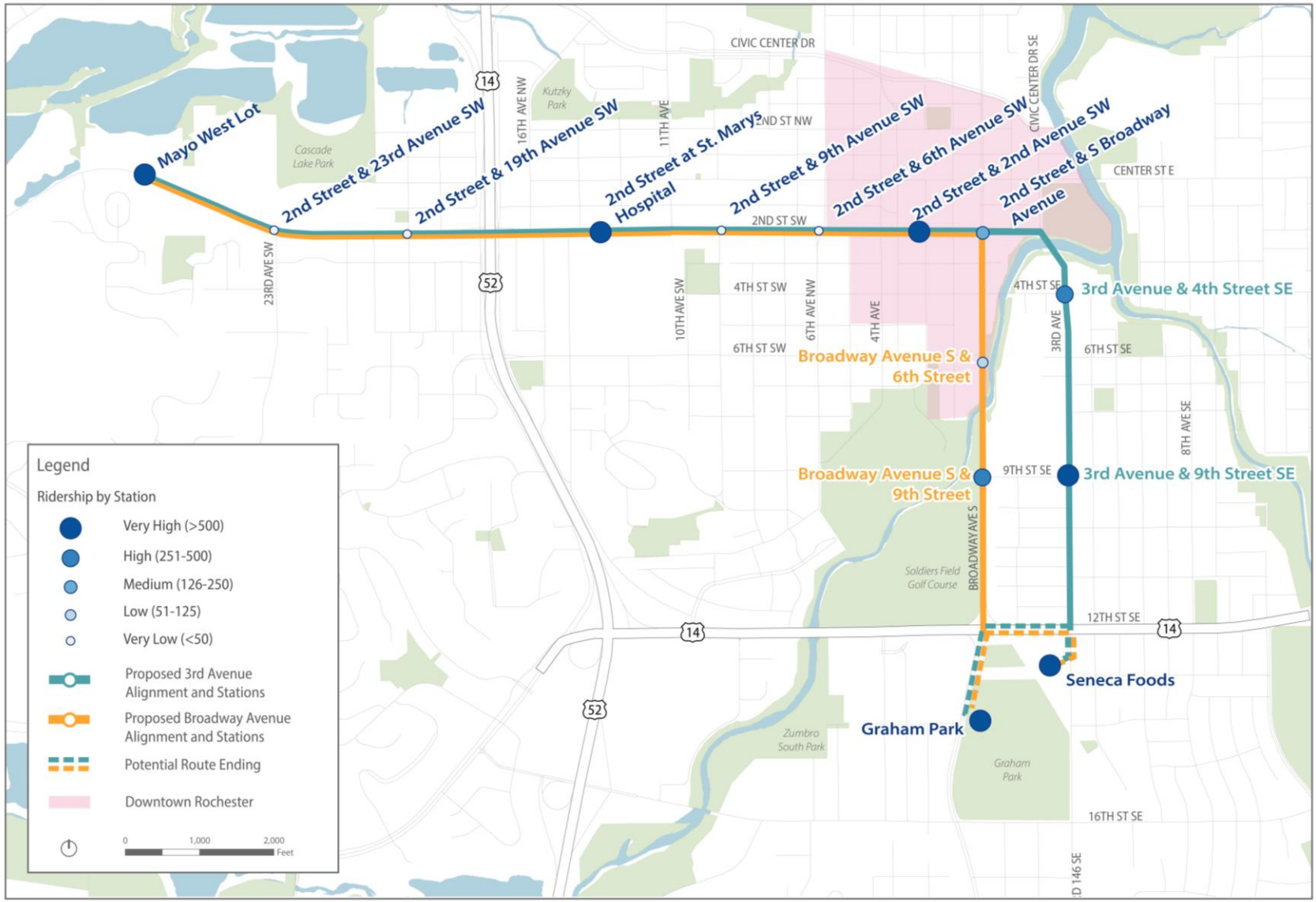
Source	Broadway		3rd	
	BRT	Streetcar	BRT	Streetcar
Mayo West Lot	6,000	6,000	6,000	6,000
Mayo Fullerton Lot	-	-	725	725
Mayo KMART Lot	900	900	900	900
Graham Park Site	1,750	1,750	1,750	1,750
Total Park and Ride	8,650	8,650	9,375	9,375
Mayo Shuttle	3,000	3,000	3,000	3,000
Existing Riders Boarding and Alighting in Corridor	200	225	275	300
Total Shuttle	3,200	3,225	3,275	3,300
Total Ridership on Project	11,850	11,875	12,650	12,675
Ridership Boarding in Corridor	3,300	3,300	3,300	3,300
Riders Entering Corridor	3,500	3,500	3,500	3,500
Mayo Fullerton Lot	725	725	-	-
Total (Warrant) Corridor Ridership	7,525	7,525	6,800	6,800
Total	19,375	19,400	19,450	19,475

As with current year forecasts, there are minimal differences between alignments for opening year and between modes. The similarity between alignments can be attributed to high-ridership stops being consistent across alignments (except for the stop serving the Mayo Fullerton Lot). The consistency across modes is due to the assumed inelasticity of work-trip markets to mode shift.

Station Level Boardings

Stations along the corridor have significantly different numbers of boardings. Figure 2 shows how stations vary for opening year. Estimates of station boardings reflect existing route ridership on RPT, new data collection efforts, and Census Transportation Planning Package (CTPP) commuter flows data.

Figure 2: Station Boardings



Future Year (2040) Forecasts

Table 3 contains 2040 ridership forecasts. Under FTA's Small Starts warrant process, these forecasts are not required, but are included to establish a baseline for how the ridership market around the project could grow. Because much of the ridership comes from park and ride lots with limited capacities, little growth is currently projected for 2040. More detailed information regarding planned development and parking policies in the area could result in higher ridership projections. Any changes that are assumed in future years are described below.

Mayo Clinic Employee Park and Ride (Mayo West Lot, Fullerton Lot, KMART Lot)

In addition to the new parking structure, the Mayo Clinic plans to develop its West Lot into a transit village. Under the current plan, the transit village will have 800 households and 58,000 square feet of retail, commercial, or office space. Assuming half of the households that move in will have downtown jobs and that half will take transit yields ridership of 525.

Currently, there are no adopted plans to redevelop the Fullerton Lot or KMART Lot into transit villages, so there is little potential for ridership growth beyond opening year for the Mayo park and ride market. This could change after the completion of station area plans in 2020. The Mayo Clinic's authority over its employees' commutes will mean all capacity at the new West Lot facility and the existing Fullerton and KMART lots will be full for opening year.

The following assumptions are employed for this market:

- Half of the new development in the transit village will commute to downtown Rochester on the circulator.
- No future development at Fullerton or KMART Lot.

Mayo Clinic Shuttle Service

The ridership between these two locations is driven by the growth of the Mayo Clinic. Therefore, the market has been developed using growth targets from the Mayo Clinic. In particular, St. Marys Hospital is assumed to grow by 25 percent.

The following assumptions are employed for this market:

- This ridership grows by 25 percent, consistent with employment growth at St. Marys Hospital.

Rochester Public Transit

Rochester has aggressive targets for population and employment growth with both roughly doubling in downtown by 2040. This analysis conservatively assumes future ridership will follow this trend given peak-period congestion and parking limitations already in place.

The following assumption is employed for this market:

- Growth consistent with socioeconomic growth assumptions for the City of Rochester.

Graham Park Park and Ride

In addition to plans for additional parking capacity at the Graham Park site, the city of Rochester has plans to add amenities including a transportation hub and retail space. Because the details of these plans will be developed at a future stage of the project, no additional ridership estimates have been generated for future years.

The following assumptions are employed for this market:

- No additional demand from opening year (facility at capacity).

Table 4: 2040 Ridership Forecasts

Source	Broadway		3rd	
	BRT	Streetcar	BRT	Streetcar
Total Park and Ride	8,650	8,650	9,375	9,375
Total Shuttle	4,150	4,200	4,275	4,350
Transit-Oriented Development	525	600	525	600
Total Ridership on Project	13,325	13,450	14,175	14,325

Appendix B: Capital Costs

This section describes the assumptions regarding the alternatives necessary to prepare the capital cost estimates. In conjunction with the conceptual design drawings, these assumptions represent the basis of the capital cost estimates.

Capital cost estimates were developed to include the one-time expenditure required to build the system and include costs associated with the guideway, track, stations, structures, signalization and communications systems, support facilities, vehicles, and right-of-way acquisition. "Soft costs" for items such as engineering, construction services, project management, surveys, testing, insurance, legal, permits and owner's costs are also included as part of the overall capital cost. Contingencies, allocated and unallocated, are applied to the capital cost to account for uncertainty in both the estimating process and the scope of the project.

At this early study stage, there was not enough definition or detail to prepare true construction cost estimates for the various alternatives under consideration. Rather, the capital cost estimates were developed using representative typical unit costs or allowances on a per unit basis that were consistent with the level of alternatives definition. Capital cost estimates will need to be refined if additional studies are conducted to further the design of the corridor.

Methodology

Capital cost estimates were prepared using the format and procedures currently required for project evaluation by the Federal Transit Administration (FTA). The FTA methodology includes the use of standard cost categories (SCC) and groupings for organization of the data, and detailed spreadsheets for development of annualized capital costs.

The FTA SCC organization for capital cost estimates was developed for application to many different types of transit improvements, and on project phases ranging from alternatives analysis to final design and construction. The capital cost elements for the Rochester Downtown Circulator are organized into the FTA SCC format as indicated in Table 5.

Table 5: FTA SCC Capital Cost Estimate Organization

SCC Description	Description
SCC 10	Guideway Guideway grading and drainage; retaining walls, bridges and tunnels; trackwork; busway construction
SCC 20	Stations Construction of station platforms, enclosures, canopies and fixtures; elevators, escalators and stairs

SCC 30	Support Facilities Operations, maintenance, and storage facilities
SCC 40	Sitework and Special Conditions Demolition, clearing, and excavation; utilities and utility relocation; hazardous soil and water remediation; environmental mitigation; reconstruction of roadways, intersections and non-guideway structures; pedestrian and bicycle accommodations, sidewalks and trails; landscaping, fencing and lighting, park and ride facilities
SCC 50	Systems Train control signals; roadway grade crossing protection; traction power substations; overhead catenary system; communication systems; central control hardware and software; automated fare collection systems; roadway traffic signals
SCC 60	Right of way Acquisition of right of way or easements for guideway, stations, and other facilities; relocation of existing households and businesses
SCC 70	Vehicles Streetcar vehicles, bus rapid transit (BRT) or standard buses, and non-revenue vehicles, spare parts
SCC 80	Professional Services Preliminary engineering; final design; project management for design and construction; construction administration and management; insurance; legal, permits review fees; surveys, testing, investigation, inspection; agency force account work
SCC 90	Unallocated Contingency Overall project contingency and reserves
SCC 100	Finance Changes Estimated expenses for local financing of project activities prior to Federal funding

The level of detail of the capital cost estimates corresponds with the current level of the Rochester Downtown Circulator definition. The level of estimating detail typically increases as the project progresses through the various phases of development during the transit study, environmental impact studies, preliminary engineering, and eventually into final design.

As the level of design detail increases, more and more items are specifically estimated, leading to lower contingency costs in the estimate. Ideally, such project design and cost estimating maturation will not materially change the overall total capital cost estimate but will make the estimate far more specific in nature.

The Rochester Downtown Circulator capital cost estimates were developed using a segmented and tiered approach. Developing construction and right-of-way costs, SCC 10-60, included dividing the corridor into two segments and calculating construction and right-of-way costs for each segment separately, some of which may be common to multiple alternatives. Line items for each of these estimates were categorized into individual SCC's and summarized for each alternative.

The methodology differs for corridor-wide capital cost elements such as vehicles and support facilities, and for "soft costs" such as professional services and unallocated contingencies. Cost

estimates for those elements are identified and added after the individual segment estimates are combined for each full corridor alternative.

Assumptions

The capital cost estimates are based upon several important assumptions derived from various sources. These assumptions include capital cost parameters applied at certain steps during the process, unit prices for the various capital cost line items, and specific quantity, location, and design information taken from each of the alternatives.

Parameters

Capital cost parameters are necessary assumptions that are not related to the specific location or design features of the corridor or the alternatives under consideration. The Rochester Downtown Circulator capital cost estimates are based upon the following parameters:

- Base Year – Year 2019
- Allocated Contingencies – Allocated contingencies are contingencies that are associated with individual cost estimate categories. These contingencies are intended to compensate for unforeseen items of work, quantity fluctuations, and variances in unit costs that develop as the project progresses through the various stages of design development. The level of allocated contingency applied to each cost category reflects the relative potential variability of those estimates. The following allocated contingencies will be used for the capital cost estimates:
    - SCC 10 - SCC 50: Infrastructure – 20-30%
    - SCC 60: Right-of-Way – 30%
    - SCC 70: Vehicles – 10%
    - SCC 80: Professional Services – 0%
- Unallocated Contingency – An unallocated contingency of 20 percent is included in the capital cost estimates. This contingency is applied to the total estimated capital cost for each alternative and is added to any specific estimating contingencies that are included or allocated to the various cost categories.
- Escalation Factor – An annual escalation factor of 3.5 percent is used to inflate capital cost estimates from the base year to the forecast year.

Unit Prices

Unit prices (base year) for the various capital cost elements were developed using several references and resources. Primary sources for unit price assumptions include:

- Kansas City Streetcar
- C Line BRT (Metro Transit)
- Gold Line BRT Engineering (Metro Transit)

- Rush Line BRT Engineering (Ramsey County)
- Counties Transit Improvement Board Program of Projects
- MnDOT Average Bid Prices for Awarded Projects

The unit price assumptions from these sources were reviewed to determine applicability to the Rochester Downtown Circulator alternatives and compatibility with the methodology and format being used. In all cases the unit prices are adjusted to base year dollars using the annual escalation factor.

Typical unit costs that were used for the Rochester Downtown Circulator estimate are identified in the following section. Additional unit costs, as necessary, were added into the estimate based on the conceptual design.

SCC 10 – Guideway

The Guideway SCC includes all civil and structural costs directly associated with construction of the guideway structures, roadbed, and pavement or track.

The principal guideway components of each individual alternative are represented by a limited number of typical cross sections along the entire route. In addition to typical section costs, assumptions about significant guideway structures are identified and quantified for each alternative.

Typical guideway unit cost line items include:

- At-grade guideway (route-foot)
- Bridge modification or reconstruction (square foot)
- BRT roadway (route-foot) (arterial)
- Streetcar track (route-foot)

With construction of rail on city streets, many cities opt to relocate under-street utilities so that they are accessible for maintenance without disruption to transit service. Few utilities are located under Broadway Avenue, so utility relocation would be minimal. There are utilities under 3rd Avenue that the City may choose to relocate if streetcar on 3rd Avenue is the preferred alternative.

SCC 20 – Stations

SCC 20 includes construction costs for station platforms, ramps, platform fixtures, canopies, and passenger amenities.

The station elements of each alternative are defined and quantified for each individual BRT or modern streetcar station and include typical platforms and pedestrian/bicycle access elements within the station.

Typical platform size for BRT and modern streetcar stations is assumed to be 80 feet long by 10 feet wide.

Typical unit cost line items in this category include:

- Streetcar station platforms (station)
- BRT station platforms (station)

SCC 30 – Support Facilities

The Support Facilities SCC includes the capital cost of operations, maintenance, and storage facilities for the corridor. For the modern streetcar alternative, it is assumed that a new operations and maintenance facility will be constructed within the Seneca site or within a Graham Park redevelopment. An area of 1.7 – 1.9 acres and 21,100 – 21,700 square feet was used to estimate a footprint of the modern streetcar operations and maintenance site and building, respectively.

The requirements for BRT support facilities are dependent on the type of vehicle, the size of the fleet, and the maintenance needs of the system. The BRT alternatives will be assumed to use low-floor electric buses. It is assumed that existing facilities could be modified and expanded to meet the need. If modifications to an existing facility or construction of a new facility is determined to be required, capital costs would be included as part of the BRT alternative.

SCC 40 – Sitework and Special Conditions

The Sitework and Special Conditions SCC includes estimated costs for all other construction activities that are not accounted for in the Guideway, Stations, Support Facilities, or Systems categories.

Assumed quantities for the various items in this category are determined from the conceptual design of each alternative. Typical Sitework and Special Conditions Unit Cost line items include:

- Utility relocation allowance (route-foot)
- Soil and water remediation allowance (route-foot)
- Environmental mitigation allowance (route-foot)
- Roadway construction (square foot)
- Roadway structures (square foot)
- Trails and sidewalks (square foot)
- Fencing (linear foot)
- Lighting allowance (route-foot)
- Landscaping allowance (route-foot)
- Traffic Control Allowance (lump sum)

SCC 50 – Systems

The Systems SCC includes capital costs for train control signals; communication systems; central control hardware and software; traction power substations; overhead catenary systems; underground duct banks; automated fare collection; grade crossing protection; and roadway traffic signal systems.

The systems elements assumed for the BRT alternative are based upon the requirements of the corresponding operating environment, with service characteristics similar to streetcar.

For each of the modes included, the systems elements include passenger communication systems and automated fare collection systems at each station, a communication backbone, and allowances for some type of central control and monitoring system. Traffic signal system upgrades are assumed at some intersections along the guideway to accommodate transit signal priority.

In addition, the modern streetcar alternative includes quantities for typical grade crossings and substations, and allowances for systems duct banks, train control signals, overhead catenary systems, and corrosion control requirements. Typical systems unit cost line items include:

- Duct bank allowance (route-foot)
- Train control signal allowance (route-foot)
- Grade crossing protection (each)
- Traffic signals (each)
- Traction power substations (each)
- Overhead catenary system allowance (route-foot)
- Corrosion control allowance (route-foot)
- Communications backbone allowance (route-foot)
- Station communications (station)
- Automated fare collection (station)
- Central control allowance (route-foot)

SCC 60 – Right-of-Way

The Right-of-Way SCC includes costs for acquisition of right-of-way needed for construction and operation of the project. For the Rochester Downtown Circulator, right-of-way requirements are anticipated along portions of the corridor, at stations, at traction power substations, and at the operations and maintenance facility. However, the specific needs and actual costs will not be known until detailed design is underway.

For this study, it is assumed that minimal right-of-way acquisitions are needed within the corridor for guideway and station construction for either the BRT or modern streetcar concepts. Some additional minor acquisitions will be needed in the modern streetcar concept for traction power substation sites adjacent to the corridor.

Typical right-of-way unit cost line items include:

- ROW Allowance (route mile)
- Relocations (lump sum)

SCC 70 – Vehicles

The Vehicles SCC includes costs for streetcar vehicles, BRT buses, and standard buses. It also includes an allowance for other service vehicles to support operations and maintenance.

The vehicle requirements for BRT and streetcar service are specified in the operating plans for the various alternatives. The mainline BRT vehicles are assumed to be low-floor 60-foot electric buses, and the streetcar vehicles are assumed to be modern streetcar vehicles. The quantities for all vehicles were adjusted to reflect a spare ratio of not less than 20 percent.

Typical vehicle unit cost line items include:

- Streetcar rail vehicle (each)
- Low-floor 60-foot articulated bus (each)

SCC 80 – Professional Services

Cost estimates for the Professional Services SCC are generated by applying assumed rates to different categories of the estimate.

Table 6 lists the professional services assumptions to be incorporated into the capital cost estimates.

Table 6: Professional Services Estimated Rates

Description	Construction
Preliminary Engineering	3%
Final Design	8%
Project Management for Design and Construction	6%
Construction Administration and Management	6%
Insurance	1%
Legal: Permits: Review fees by Other Agencies	2%
Surveys, Testing, Investigation, Inspection	2%
Start up	2%
Total	30%

Modern Streetcar Capital Costs

The following table summarizes the total costs of each of the potential modern streetcar options.

Table 7: Modern Streetcar Capital Costs

Alternative	Cost Year of Expenditure 2024	Cost Per Mile 2024
Mayo West to Graham Park (3rd Avenue)	$383.1 M	$97.6 M
Mayo West to Graham Park (Broadway Avenue)	$360.5 M	$98.5 M
Mayo West to Seneca (3rd Avenue)	$362.7 M	$101.6 M
Mayo West to Seneca (Broadway Avenue)	$355.9 M	$100.1 M

BRT Capital Costs

The following table summarizes the total costs of each of the potential BRT options.

Table 8: BRT Capital Costs

Alternative	Cost Year of Expenditure 2023	Cost Per Mile 2023
Mayo West to Graham Park (3rd Avenue)	$96.1 M	$25.8 M
Mayo West to Graham Park (Broadway Avenue)	$98.6 M	$29.1 M
Mayo West to Seneca (3rd Avenue)	$94.2 M	$27.4 M
Mayo West to Seneca (Broadway Avenue)	$98.6 M	$29.4 M

Cost Per Rider

Consistent with FTA cost estimating practices, an average useful life was assigned to the various elements of the project using the SCC categories shown in Table 9.

Table 9: Assumed Lifespan of Project Elements

SCC Category	Average Lifespan Assumption
SCC 10 – Guideway	20 years
SCC 20 – Stations	70 years
SCC 30 – Support Facilities	50 years
SCC 40 – Sitework and Special Conditions	50 years
SCC 50 – Systems	25 years
SCC 60 – Right of Way	125 years
SCC 70 – Vehicles	12 years (buses); 25 years (streetcars)
SCC 80 – Professional Services SCC 90 - Contingency	Costs are allocated to SCC categories 10, 20, 30, 40, 50, and 60 and are prorated based on the magnitude of each category.

The cost of each SCC project element was annualized using a two percent discount rate and current year dollars. The formula was: 0.02/(1-(1+0.02)^-Years). The annualized cost of each SCC category was summed to reach a total annual capital cost for each alternative.

Total annualized capital cost for each alternative was then added to the total annual operating cost for each alternative and divided by the annual number of riders. Annual ridership was calculated assuming 100 percent of forecast daily ridership on 261 weekdays each year, and 60 percent of forecast daily ridership on 104 weekend days per year.

Table 10: Cost Per Rider

	Alternative 1: BRT on 3rd Avenue	Alternative 2: BRT on Broadway	Alternative 3: Streetcar on 3rd Avenue	Alternative 4: Streetcar on Broadway
Cost per rider	Graham Park Terminus: $2.02 Seneca Foods Terminus: $2.01	Graham Park Terminus: $2.18 Seneca Foods Terminus: $2.18	Graham Park Terminus: $4.65 Seneca Foods Terminus: $4.45	Graham Park Terminus: $4.72 Seneca Foods Terminus: $4.67

Other Assumptions

In preparation of these estimates it was necessary to make some assumptions during the creation of the conceptual plans. These assumptions include:

- Does not include costs of the 2nd Street Reconstruction Project.
- Does not include costs of any tunnel or separate transit center north of 2nd Street at St. Marys.
- Does not include any costs associated with parking at the Mayo West Transit Village.
- Does not include any costs associated with parking at the Graham Park Transit Village.
- Does not include any costs associated with parking at the Seneca Site.
- One mile of the modern streetcar route would be served with off-wire technology.
- 2023 year of expenditure for BRT and 2024 year of expenditure for modern streetcar.

Appendix C: Transit Service Plan & Operations and Maintenance Costs

Circulator Service Plan

Based on the proposed alignment and station locations, as well as expected ridership, the following service plan has been developed for both BRT and streetcar alternatives. During peak hours, both BRT and streetcar alternatives would operate every 5 minutes in order to provide sufficient capacity for the 1,200 passengers per hour expected to use the service. For the purposes of this analysis, 60-foot BRT vehicles are assumed to carry 100 passengers each, while streetcar vehicles can carry upward of 120 passengers depending on size and model. At a given service frequency, streetcar vehicles can be expected to offer greater capacity, with more room for ridership growth.

Table 11: Circulator Service Plan

Service Alternative	Vehicle Capacity	Peak Headways & Span	Off-Peak Headways & Span
Bus Rapid Transit (BRT)	100 passengers (60 seats); 1200 passengers per hour	Weekday Peak Hours: Every 5 minutes (6-9 AM, 3-6 PM)	Weekday Off-Peak: Every 10 minutes (5 AM – 11 PM, except peak) Weekend: Every 10 minutes (8 AM – 11 PM, Sat/Sun)
Modern Streetcar	120+ passengers (30 seats); 1440+ passengers per hour	Weekday Peak Hours: Every 5 minutes (6-9 AM, 3-6 PM)	Weekday Off-Peak: Every 10 minutes (5 AM – 11 PM, except peak) Weekend: Every 10 minutes (8 AM – 11 PM, Sat/Sun))

Circulator Operating Costs

Each service alternative was also analyzed for travel time, vehicle requirements, and total annual operating cost using a standard transit service planning methodology. Given the similar characteristics of BRT and streetcar alignments along 2nd Avenue SW, Broadway Avenue, and 3rd Avenue SE, travel times, frequency, and span of service for each alternative are estimated to be the same. Assumptions are as follows:

Table 12: Operating Cost Assumptions

Service Parameter	Assumption
End-to-End Travel Time	20 minutes (peak) 16 minutes (off-peak)

Average Operating Speed	12 miles per hour (peak) 15 miles per hour (off-peak)
Layover	15% of roundtrip travel time (minimum 5 minutes)
Span of Service	18 hours (weekdays); 15 hours (weekends)
Weekdays per year	255
Weekend days per year	110 (including 6 holidays)

Operating costs, however, vary depending upon the mode of transit service selected. Streetcar operations and maintenance (O&M) costs are estimated at $138.96 per hour based on a fully-allocated cost model (including overhead expenses), compared to $118.37 per hour for BRT.

The preliminary service plans for BRT and streetcar alternatives (on both Broadway Avenue and 3rd Avenue SE) currently call for the same frequency and span of service, so any difference in total annual operating cost is based on the higher hourly cost rate for streetcar operations and maintenance. If larger and higher-capacity vehicles were ultimately selected, streetcars could potentially operate at reduced frequency compared to BRT vehicles, allowing for some reduction in overall streetcar O&M costs.

Table 13: Circulator Operating Costs

Service Alternative	Cost per Revenue Hour	Peak Buses / Vehicles	Annual Revenue Hours	Annual Operating Cost
Bus Rapid Transit (BRT)	$118.37	10 (plus spares)	34,140	$4,041,101
Modern Streetcar	$138.96	10 (plus spares)	34,140	$4,744,081

Note: Operations and maintenance (O&M) cost rates of $118.37 and $138.96 for BRT and streetcar, respectively, were based on previous analysis included in the 2014 Rochester ITS plan, with a 3% annual increase to account for inflation. All costs are shown in 2019 dollars.

Changes to Local Transit Routes

When pursuing a major capital investment such as BRT or streetcar, it is a best practice for transit agencies to conduct a full systemwide operations analysis or transit development plan (TDP) to determine how local services should be revised to complement the new transitway. A successful TDP would develop plans for near-term and long-term changes based on detailed ridership analysis and a robust public outreach process. In the meantime, a preliminary analysis of existing transit routes suggests potential revisions for the purpose of cost estimation.

Methodology

Alongside the implementation of the circulator, it is recommended that Rochester Public Transit (RPT) revise existing fixed-route bus service to reduce duplication and offer new and improved connections to customers.

This service plan reflects the following priorities:

1. Identify routes that require immediate service changes, including the following:
    a. **Eliminate** routes that duplicate planned Circulator service.
    b. **Truncate** local routes that travel through Circulator terminus stations en route to downtown.
2. Identify routes that share the circulator corridor but serve regional travel:
    a. **Reduce or eliminate local stops** for express and commuter routes along 2nd Street.
3. Identify potential restructuring opportunities on other routes, including the following:
    a. **Routes that substantially overlap** with planned Circulator service.
    b. **Routes that could terminate** at Circulator stations along the corridor, such as the Fullerton Lot.
4. Recommend that service changes be developed through an agency wide TDP process.

Routes with Immediate Changes Required

Routes that are proposed for elimination or alignment changes are listed in Table 14 below.

Table 14: Routes with Immediate Changes Required

Route	Current Service	Service Recommendation
Route 6D	Weekday rush-hour loop between Fairgrounds (Graham Park) Park & Ride, Downtown, and St Marys via Broadway and 2nd Street SW.	Eliminate (replaced by circulator).
Route 6A	Weekday rush-hour route serving south Rochester via Broadway Ave S.	Consolidate with Routes 6M and 6B; terminate at Graham Park.
Route 6B	Weekday rush-hour route serving south Rochester via 3rd Avenue SE.	Consolidate with Routes 6M and 6A; terminate at Graham Park.
Route 6M	Weekday midday route serving downtown and far south Rochester via 3rd Avenue SE and Broadway Ave S.	Consolidate with Routes 6A and 6B; terminate at Graham Park.

Route 8	Weekday bi-directional service to west Rochester via 2nd Street SW.	Restructure route to terminate at Mayo West.

Routes Proposed for Limited-Stop Operation

Routes proposed for limited-stop operation along 2nd Street SW (to reduce conflict with Circulator service and resulting delays) are listed in Table 15.

Table 15: Routes Proposed for Limited-Stop Operation

Route	Current Service	Service Recommendation
Route 12	Weekday route serving northwest Rochester via Highway 52 and frontage roads. Bi-directional service on 2nd Street SW between Gonda and Highway 52. Rush hour service and one midday trip.	Reduce/eliminate local stops along 2nd Street SW. Retain stops at Gonda, 7th, and Saint Marys.
Route 12M	Weekday route serving northwest Rochester (including Mayo NW Family Medicine) via Hwy 52 and frontage roads. Bi-directional service along 2nd Street SW between Gonda and Highway 52. AM and midday service only.	Reduce/eliminate local stops along 2nd Street SW. Retain stops at Gonda, 7th, and Saint Marys.
Route 18	Weekday rush-hour route providing reverse-commute service from Downtown to IBM (northwest Rochester). Peak-direction service on 2nd Street SW between Gonda and 11th Ave.	Reduce/eliminate local stops along 2nd Street SW. Retain stops at Gonda, 7th, and Saint Marys.
Route 18D	Weekday rush-hour route serving Downtown, Saint Marys, and the IBM Park & Ride (northwest Rochester). Bi-directional service on 2nd Street SW between Gonda and Highway 52.	Reduce/eliminate local stops along 2nd Street SW. Retain stops at Gonda, 7th, and Saint Marys.
Route 19	Weekday rush-hour route serving northwest Rochester via 2nd Street SW, Highway 52, and 55th Street NW. Bi-directional service on 2nd Street SW from Downtown to Highway 52. One midday trip provided.	Reduce/eliminate local stops along 2nd Street SW. Retain stops at Gonda, 7th, and Saint Marys.

Future Restructuring Opportunities

The following routes overlap with segments of the circulator corridor, offering potential opportunities for future restructuring:

Table 16: Future Restructuring Opportunities

Route	Current Service	Service Recommendation
Route 3	Weekday route serving downtown and east Rochester, including 4th Street SE and RCTC.	No changes; could consider terminating at Fullerton lot if needed.
Route 4A	Weekday rush-hour loop serving downtown and near southeast areas of Rochester	No changes; could consider terminating at Fullerton lot if needed.

Route 4B	Weekday rush-hour loop serving downtown and near southeast areas of Rochester via Broadway Avenue S.	No changes; could consider terminating at Fullerton lot or Graham Park if needed.
Route 4M	Weekday midday loop serving downtown and southeast areas of Rochester.	No changes; could consider consolidating with other Route 4 variants and terminate at Fullerton lot if needed.
Route 5	Weekday loop serving downtown and south/southeast Rochester via 11th Ave and 8th Ave SE.	No changes; could consider terminating at Fullerton lot if needed.
Route 7A	Weekday loop between Downtown, Saint Marys, and south Rochester / Crossroads College via Broadway, 2nd Avenue SW, and 2nd Street SW.	Restructure route to eliminate service on 2nd Street (terminate at Saint Marys or Gonda Building).
Route 7N	Weekday evening loop between Saint Marys, Downtown, and 48th Street SE via 2nd Street SW, 3rd Ave SE, and Broadway Ave S.	Consider restructuring (combine with other evening routes).
Route 7	Weekday loop between Downtown, Saint Marys, and south Rochester via 2nd Avenue SW, 2nd Street SW, and Salem Road.	Consider restructuring to eliminate service on 2nd Street (terminate at Saint Marys or Gonda Building).
Route 16	Weekday route serving downtown and northeast Rochester via 4th Street SE, 11th Avenue NE, and Viola Road.	No changes; could consider terminating at Fullerton lot.

Given the number of existing routes that overlap with the proposed circulator alignment, it is highly recommended that Rochester Public Transit conduct a TDP to identify and prioritize service changes that can reduce duplication and reallocate service to other corridors once the circulator is implemented. A robust transit development plan would include detailed analysis of existing transit ridership and travel patterns (including a travel survey), as well as extensive public outreach to identify and prioritize service improvements. Due to the extent of service currently operated on 2nd Street SW, a full bus network restructuring may be advised.

Summary of Operations and Maintenance Costs

Estimated annual operations and maintenance costs for the project range from approximately $4.0 million for BRT to $4.7 million for streetcar. These O&M costs vary based on the mode of transit selected, but costs for a given transit mode (BRT or streetcar) are estimated to be the same for either alignment option (Broadway Avenue or Third Avenue SE).

Additionally, proposed changes to RPT local bus service would save approximately $1.05 million, yielding a total overall increase in operating costs of $3.0 million (BRT) to $3.7 million (streetcar).

Table 17: Summary of Annual Operations and Maintenance Costs

Transit Service		Cost Drivers	Unit Cost	Existing	BRT	Streetcar
				- Number of Units -		
Circulator Service	**BRT**	Peak Buses[1]	--		10	
		Annual Revenue Hours[2]	$118.37		34,140	
	Streetcar	Peak Streetcar Vehicles[1]	--			10
		Annual Revenue Hours[2]	$138.96			34,140
	Circulator Operating Cost				**$4,041,101**	**$4,744,081**
RPT Local Service	**Route 6D**	Peak Buses[1]	--	2		
		Annual Revenue Hours[2]	$102.93	3,060		
		Operating Cost		**$314,976**		
	Routes 6A, 6B, 6M	Peak Buses[1]	--	5	2	2
		Annual Revenue Hours[2]	$102.93	5,865	7,650	7,650
		Operating Cost		**$603,705**	**$787,441**	**$787,441**
	Route 8	Peak Buses[1]	--	2	1	1
		Annual Revenue Hours[2]	$102.93	12,827	3,825	3,825
		Operating Cost		**$1,320,276**	**$393,720**	**$393,720**
	RPT Local Operating Cost			**$2,238,957**	**$1,181,161**	**$1,181,161**
Total Operating Cost (Estimated)				**$2,238,957**	**$5,222,262**	**$5,925,242**
Change from Existing				**–**	**$2,983,305**	**$3,686,285**

[1] Peak vehicle counts do not include spares.
[2] O&M costs for all services are given as fully allocated costs per hour.

Impact on Bus Lane Capacity

As part of the development of the circulator service plan, existing and proposed peak-hour bus movements along the 2nd Street corridor were analyzed for their impact on the proposed BRT guideway, as well as total roadway capacity.

Existing Bus Service on 2nd Street

Analysis of existing transit schedules shows that 2nd Street SW currently carries 40 to 44 buses per hour in peak service, including both Rochester Public Transit and Rochester City Lines. Under this proposed preliminary service plan, the circulator will provide an additional 12 roundtrips per hour along 2nd Street, while Rochester Public Transit service will be reduced by 1 to 5 buses per hour. As a result, the proposed service plan calls for 51 buses per hour in each direction during the AM peak, with 48 to 53 buses per hour per direction in the PM peak.

Table 18: Peak-Hour Bus Volumes on 2nd Street SW (Existing and Proposed)

Provider / Service Type		Peak-Hour Bus Volumes			
		AM Eastbound	AM Westbound	PM Eastbound	PM Westbound
Existing Service	Rochester Public Transit	26	40	37	28
	Rochester City Lines	14	4	4	14
	Existing Service Total	**40**	**44**	**41**	**42**
Proposed Service (Opening Day)	Circulator	12	12	12	12
	Rochester Public Transit	25	35	32	27
	Rochester City Lines	14	4	4	14
	Proposed Service Total	**51**	**51**	**48**	**53**

Source: Rochester Public Transit and Rochester City Lines public timetables; Rochester Downtown Circulator service plan.

Bus Lane Capacity Recommendations

According to existing guidelines recommended by the Transit Cooperative Research Program (TCRP), streets that carry 30-40 buses per hour and/or 1,200 passengers per hour during peak service are considered appropriate for a curbside bus lane, provided that at least two lanes are available for other traffic in the same direction. In central business districts (CBD), streets that carry 50-80 buses per hour and/or 2,000 passengers per hour are appropriate for bus lanes, regardless of additional lanes available for other traffic. Based on these criteria, central Rochester is currently an appropriate market for curbside bus lanes. When implemented, the proposed transitway will

improve travel speeds for both the circulator and local buses in the 2nd Street corridor, with the potential to increase the peak-hour carrying capacity of the roadway.

Table 19: Recommended Busway Treatments by Bus/Passenger Volume

Treatment	Minimum One-Way Peak-Hour Volume		Related Land Use and Transportation Factors
	Bus	Passenger	
Bus streets or malls	80-100	3,200 – 4,000	Commercially oriented frontage.
CBD curb bus lanes, main street	50-80	2,000 – 3,000	Commercially oriented frontage
Curb bus lanes, normal flow	30-40	1,200 – 1,600	At least 2 lanes available for other traffic in same direction.
Median bus lanes	60-90	2,400 – 3,600	At least 2 lanes available for other traffic in same direction; ability to separate vehicular turn conflicts from buses.
Contraflow bus lanes, short segments	20-30	800 – 1,200	Allow buses to proceed on normal route, turn around, or bypass congestion on bridge approach.
Contraflow bus lanes, extended	40-60	1,600 – 2,400	At least 2 lanes available for other traffic in opposite direction. Signal spacing greater than 500-ft (150-m) intervals.

Source: Levinson, Adams, and Hoey; NCHRP Report 414; TCRP Transit Capacity and Quality of Service Manual, 3rd Edition (2013).
Shaded rows indicate current and proposed bus volumes on 2nd Street SW.

Appendix D: Land Use, Economic Development, and Connectivity

Connectivity and Reliability

A key component of a successful transit investment is providing convenient access to destinations where people want or need to go, such as employment centers, libraries, hospitals, and parks. Connections to highly-visited destinations were a crucial part of the evaluation of the four proposed circulator alternatives. As design advances on the circulator project, station accessibility will be considered in much more detail. Station design and vehicle specifications will incorporate universal design principles to enable people with a wide range of abilities to use the transit service.

It is also important to consider transit reliability in harsh climates such as Rochester's.

Connections to Key Destinations

Methods

Access was evaluated for each alternative using the distance a rider would have to walk from the nearest transit station to the following major destinations:

- Former Seneca Foods site
- Future University of Minnesota Rochester campus
- Gonda Building
- Graham Park
- Olmsted County Government Center and Rochester City Hall
- Olmsted Medical Center
- Mayo Civic Center
- Mayo West Lot
- Methodist Hospital
- Plummer Building
- Rochester Art Center
- Rochester Public Library
- Soldiers Field Park
- St. Marys Hospital
- University of Minnesota Rochester existing campus

In addition to distance, the existing pedestrian environment and potential future changes to it were considered as factors influencing the access provided by each alternative.

Results

Both alignments are approximately equally matched in providing access to key destinations in and near downtown Rochester, as shown in Table 20. The 3rd Avenue alignment provides better access to the Rochester Public Library, Mayo Civic Center, Olmsted County Government Center, and Rochester City Hall, while the Broadway Avenue alignment provides better access to the future University of Minnesota Rochester campus, Discovery Square, and Soldiers Field Park. Access to Graham Park and the former Seneca Foods site are dependent on the terminal routing of the alignment rather than the selection of 3rd Avenue or Broadway Avenue.

Table 20: Access to Key Destinations by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Access to key destinations	High Compatibility	High Compatibility	High Compatibility	High Compatibility

Ridership During Weather Events

Methods

Data and research regarding transit on-time performance during weather events are not readily available because of confounding factors including weather on previous days, temperature, temperature, and time of day; as such, reliability during weather events was not assessed for this analysis. Research on transit ridership by mode was instead consulted in order to identify which mode might be perceived as more reliable during weather events.

Results

In "The Impact of Weather on Transit Ridership in Chicago", a case study of ridership in the Chicago Transit Authority system, researchers found that ridership increases in good weather and falls in inclement weather, and that rail ridership is less sensitive to weather than bus ridership (Guo, Z., Wilson, N., and Rahbee, A., 2007). Because Chicago and Rochester have similar climates, it is assumed that similar ridership trends would be present in Rochester with both rail and bus transit available. Expected ridership consistency during weather events for each alternative is summarized in Table 21.

Table 21: Ridership During Weather Events by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Reliability during weather events	Medium Compatibility	Medium Compatibility	High Compatibility	High Compatibility

Land Use and Economic Development

In addition to serving a community's transportation needs, transitway developments often precede investments in other development. Research has found that streetcar and BRT projects alike often catalyze private development. The ability of a project to stimulate new economic activity, especially activity that is supportive of transit, and generate revenue is an important factor in considering new transit investments.

Existing and planned land uses comprise a key component of successful transit investments and can support transit-oriented development and redevelopment. Intensive uses, such as multifamily housing and sidewalk-facing retail, are typically more transit-supportive than less intense or dense uses, such as detached single-family homes or big-box retail with vast parking lots fronting the street.

Potential for Redevelopment

Methods

The following sites were identified as potential redevelopment sites within the project area:

- Olmsted County Government Center and Rochester City Hall parking lot
- Fullerton Lot
- KMART Lot
- Graham Park
- Discovery Square
- UMR campus
- Crossroads Center
- Seneca Foods site

Alternatives were evaluated for the service provided to each site.

Results

Both alignments would serve vacant and underused sites between 4th Street SE and 12th Street SE. The 3rd Avenue alignment would serve the Olmsted County Government Center and Rochester City Hall parking lot, the Fullerton Lot, Kmart, and Graham Park or Seneca Foods. The Broadway alignment would serve Discovery Square, UMR, Kmart, Crossroads Center, and Graham Park or Seneca Foods. If the Soldiers Field Golf Course is reconsidered as a development site, the Broadway alignment would serve that site, as well. The redevelopment potential in the study area for each alignment is summarized in Table 22.

Table 22: Potential for Redevelopment by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Potential for redevelopment	High Compatibility	High Compatibility	High Compatibility	High Compatibility

Potential for Transit-Oriented Development

Methods

The potential for transit-oriented development proximate to each alignment was evaluated based on the urban form in each area and the opportunities and challenges presented by the physical environment. This included an examination of the existing built form, streetscape, and opportunities for redevelopment, as well as physical barriers to development, such as bodies of water and railroads.

Results

Under current conditions, 3rd Avenue is more hospitable to transit-oriented development than Broadway Avenue, though the City intends to rebuild Broadway to be more pedestrian-friendly. 3rd Avenue is a lower-volume street with few geographical barriers to building pedestrian-friendly retail that fronts the street, however neighborhoods to the east of 3rd Avenue are stable and not considered candidates for high-density development.

North of 9th Street, Broadway Avenue has strong pedestrian-oriented form and existing development fronts the street, but south of 9th Street, the speed limit on Broadway increases to 40 mph and the street is not pedestrian-friendly. Soldiers Field Golf Course constrains the potential for transit-oriented development to the west, and the railroad tracks limit zero-lot-line development to the east. With the intent to transition Broadway into a different kind of street, the two alignments offer similar potential to foster transit-oriented development, summarized in Table 23.

Table 23: Potential to Foster Transit-Oriented Development by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Potential to foster transit-oriented development	Medium Compatibility	Medium Compatibility	Medium Compatibility	Medium Compatibility

Land Use

Methods

To assess whether the alternatives were consistent with existing land use plans, the following four long-range plans were consulted:

- Planning 2 Succeed: Rochester Comprehensive Plan 2040
- DMC Development Plan
- Downtown Master Plan
- Slatterly Park Vision

Future land use was considered supportive of transit if it allowed for intensive uses and/or a mixture of uses. Transit was considered inconsistent with land use plans if they identified future uses such as low-density residential, big-box retail, or similar auto-oriented development. Proposed zoning changes that have not been implemented were not included in this analysis.

Results

The Broadway Avenue alignment is more consistent with land use plans than the 3rd Avenue alignment whether BRT or streetcar is chosen. Each of the four long-range plans identify Broadway Avenue as a primary transit corridor with transit-oriented land use while 3rd Avenue is designated as a supportive corridor with less-intensive land uses still conducive to transit. The consistency of each alternative with existing land use plans is summarized in Table 24 below.

Table 24: Support for Each Alternative in Existing Land Use Plans

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Consistency with land use plans	Medium Compatibility	High Compatibility	Medium Compatibility	High Compatibility

Transit Dependent Households

Multiple data sources have been combined to estimate the number of transit-dependent households within one half mile of station areas. Census data and Census Transportation Planning Package (CTPP) data, processed from the 2012-2016 American Community Survey, provide number of households and population at block-level and number of low-income and zero-car households at the block-group level, respectively.

Number of households and population at the block level is readily available from the U. S. Census. However, specific demographic and socio-economic data is not available at the block level.

CTPP data from the American Association of Station Highway and Transportation Officials (AASHTO) is a special tabulation of certain census data. For this analysis, household counts of income level by number of vehicles owned was extracted at the block group level. Low income individuals have been defined as those living beneath 150 percent of the federal poverty level.

Due to the scale of proposed station areas, the importance of having block-level estimates is important. To obtain an estimate for transit-dependent households at the block level, the proportion

of transit-dependent households and population was computed at the census block group level. This proportion was then applied to all blocks within the block group.

Geospatial software was used to "clip" blocks falling within each proposed project alignment. For blocks that fall only partially within the station area, population and households were reduced proportionally to area removed from the block. For example, if 75 percent of the area of a block with 20 households and population 40 fell within a station area, 15 households and 30 people were included in the total.

Existing Population and Employment

Current population and employment were obtained from the U.S. Census Bureau (2010). In particular, 2015 Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics data provides number of jobs at the block level.

Blocks falling within each proposed project alignment were clipped using geospatial software. For blocks that fall only partially within the station area, population and households were reduced proportionally to area removed from the block. For example, if 75 percent of the area of a block with 20 jobs and population 40 fell within a station area, 15 jobs and 30 people were included in the total.

Future (2040) Population and Employment

Future population and employment projections were calculated from socio-economic data at the transportation analysis zone level within the city of Rochester's travel demand model. Population was calculated from the number of housing units projected to exist in 2040. The ratio of existing population to households in proposed station areas was assumed to remain constant to 2040. Employment estimates were produced from the estimated square footage of certain land uses including commercial, retail, and Mayo Clinic land uses among others. A jobs to thousand square foot ratio of three was applied.

Geospatial software was used to "clip" transportation analysis zones falling within each proposed project alignment. For transportation analysis zones that fall only partially within the station area, population and jobs were reduced proportionally to area removed from the transportation analysis zone.

Community and Environment

This section discusses the existing Section 4(f) and Section 6(f) parks, trails, and recreation areas located in the study area, as well as pedestrian and bicycle connectivity. Because of their high level of protection, Section 4(f) and 6(f) resources are important assets to consider when developing a transitway. Given that all transit users are pedestrians at some point in their trip and that transit and bicycle infrastructure can be used together to enhance the ease of traveling by both transit and bicycle, it is also important to consider bicycle and pedestrian connectivity from each station.

Historic and Cultural Resources

Regulatory Framework

Section 4(f)

The Section 4(f) legislation, as established under the Department of Transportation Act of 1966 (40 USC 303, 23 USC 138), provides protection for historic sites (publicly or privately owned) from conversion to transportation use. Conversion to transportation use is not allowed unless all prudent and feasible alternatives to the Section 4(f) use and all possible planning activities to minimize harm have been considered.

Section 106

Like Section 4(f), Section 106 of the National Historic Preservation Act of 1966 (Section 106) also mandates consideration of a project's effect on historic sites. Projects that apply to receive federal funds must comply with Section 106 and with other applicable federal mandates. To comply with Section 106, potential impacts to historic properties (those listed in or eligible for listing in the NRHP) must be accounted for during project planning and design. Section 106 requires federal agencies to consider the effects of their actions on historic properties before undertaking a project.

During future project phases, Section 106 analysis provides a determination of effects caused by the project alternatives. Possible determinations are: (1) no historic properties affected; (2) no adverse effects to historic properties; or (3) adverse effect to historic properties. A determination of "adverse effect" is made if a project has the potential to alter characteristics that make a property historically significant. Adverse effects can be direct or indirect and include all immediate and reasonably foreseeable effects to the property.

The Section 106 determinations are a critical part of determining the applicability of Section 4(f) and the outcome of Section 4(f) evaluation. However, at the alternatives analysis level both the Section 4(f) and Section 106 analysis of historic resources only focuses on identifying known historic resources in the Circulator Transit Corridor and discussing potential effects to those resources. Lastly, determining any adverse effects of historic resources under Section 106 and determining any use of historic resources under Section 4(f) will take place during the official NEPA process in further study phases.

Methods

Listings from the National Register of Historic Places were used to identify historic and cultural resources within a half mile of each proposed alignment. A baseline assessment was conducted to determine the potential impacts to cultural and historic resources and impacts associated with each proposed alternative. The assessment identified the number of historic properties that could be potentially impacted by each of the proposed alternatives. Then, the likelihood for adverse effects under Section 106 and use under Section 4(f) use was assessed by reviewing the proposed concept plans for each alternative. It should be noted that this analysis focused on known historic sites

within the corridor to aid in evaluating the alternatives but does not include a systematic survey to identify or evaluate any unknown sites along the corridor. Further investigation to determine potential adverse effects to historic properties that may be affected by the proposed project would be part of future stages of the project to support the NEPA and Section 106/Section 4(f) processes.

Analysis and Results

Cultural and historic resources in proximity to the study area are shown in Figure 3. Again, it is important to note that this analysis focused on known historic sites along the corridor but does not include a systematic survey to identify or evaluate any unknown (i.e., non-listed) cultural or historic resources along the corridor.

The following ten buildings and structures are listed on the National Register and located within the study area:

- 1914 Building
- Plummer Building
- Avalon Hotel
- Dr. Donald C. Balfour House
- Chateau Dodge Theatre
- Dr. William J. Mayo House
- Rochester Armory
- Rochester Public Library
- St. Marys Hill Park Water Tower
- Timothy A. Whiting House

Additionally, the Pill Hill Historic District is located partially within the study area. To inform a comparison of the Circulator alternatives, the resources identified above were reviewed for their likelihood to be affected by the project. This analysis considered how elements of the alternatives, such as overhead catenary systems, station locations, and bridge modifications, might affect cultural resources. The analysis assessed the potential need for property acquisition or permanent easements. The analysis also considered potential changes to indirect effects such as visual quality, development/ redevelopment, and noise levels resulting from the alternatives to determine if any rose to a level of significance that would impair the activities, features, and attributes that quality these resources for protection under Section 106/Section 4(f).

Impacts that were rated "low compatibility" were those that may result in acquisition or are more likely to experience a direct impact from the alternative. Impacts rated "medium compatibility" are those that are less likely to be acquired or may experience an indirect impact from the alternative.

Finally, impacts rated "high compatibility" are those that have a low likelihood of acquisition for implementation of the alternative and are unlikely to experience any direct or indirect impacts resulting from its implementation. The Avalon Hotel, Dr. Donald C. Ballfour House, Dr. William J. Mayo House, the Rochester Armory, St. Marys Hill Park Water Tower and Timothy A. Whiting House are not within 500 feet from the centerline of the listed alternatives; therefore, were not included in the analysis. Results of this analysis are shown in Table 25.

Table 25: Potential Impacts to Historic and Cultural Resources

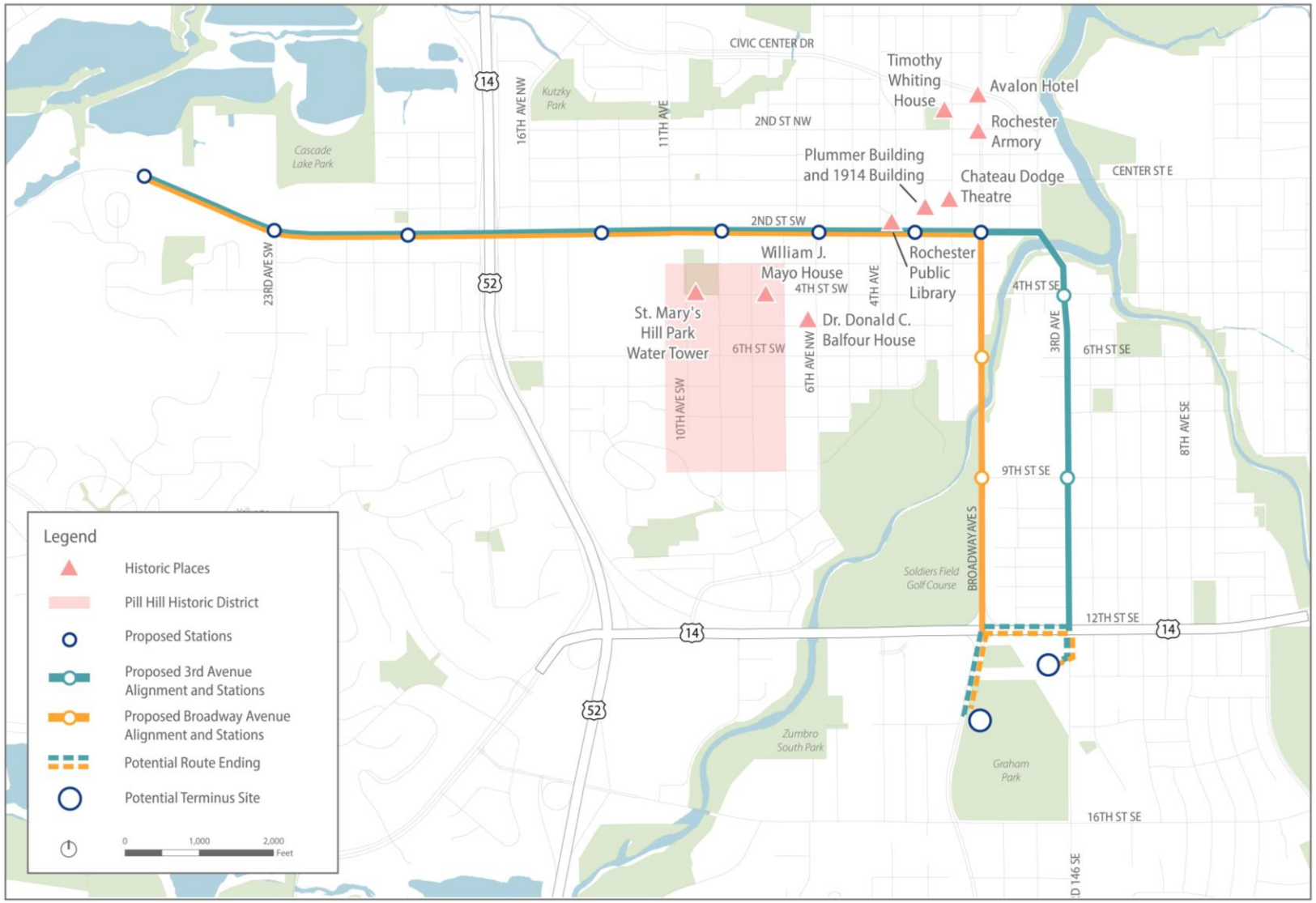
Historic Resource	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
1914 Building and Plummer Building	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility
Chateau Dodge Theatre	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility
Rochester Public Library	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility

The streetcar alternatives were rated as medium compatibility because of potential visual changes resulting from infrastructure including overhead catenary systems. While wireless streetcar technology is available and could be used to mitigate potential impacts, the applicability of the technology would need to be evaluated in more detail in the future. All other historic resources are rated highly, meaning they are expected to have few or no potential impacts resulting from any of the four alternatives. The aggregate potential impact to historic and cultural impacts under each alternative is summarized in Table 26.

Table 26: Potential Impacts to Historic and Cultural Resources by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Potential to impact historic or cultural resources	High Compatibility	High Compatibility	Medium Compatibility	Medium Compatibility

Figure 3: Historic and Cultural Resources in the Study Area



Parkland

Regulatory Framework

Section 4(f) legislation as established under the Department of Transportation Act of 1966 (40 USC 303, 23 USC 138) provides protection for publicly owned parks, recreation areas, historic sites, wildlife, and/or waterfowl refuges from conversion to transportation use. Conversion to transportation uses is not allowed unless all prudent and feasible alternatives to the Section 4(f) use and all possible planning activities to minimize harm have been considered.

A "use" of a Section 4(f) property occurs when: (1) Land is permanently incorporated into a transportation facility (i.e., direct use); (2) There is temporary occupancy of land that is adverse in terms of the Section 4(f) statute's preservation purposes; or (3) there is a constructive use of a Section 4(f) property (i.e., indirect use). Constructive use occurs when the proximity impacts of a project on an adjacent or nearby Section 4(f) property, after incorporation of impact mitigation, are so severe that the activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired.

Note that parks, recreation areas, and wildlife refuges are discussed in this section of the report, and historic sites protected under Section 4(f) are discussed in the previous section titled "Cultural and Historic Resources."

Section 6(f) of the Land and Water Conservation Act covers outdoor recreation properties planned, developed, or improved with funds from the Land and Water Conservation Fund (LAWCON). These properties cannot be converted to other uses unless replacement land of equal fair market value and equivalent usefulness is provided.

Methods

Maps and databases from the Department of Natural Resources, along with U.S. Fish and Wildlife Service maps, were reviewed to confirm that no state or federal wildlife and waterfowl refuges are present within the study area.

Local parks and trails were mapped using data provided by the City of Rochester. Aerial photography was examined and compared to city comprehensive plans and park maps to identify local parks and trails. Identified parks and trails were then checked against a current list of LAWCON-funded properties.

An inventory of parks and trails located near the study area was identified through this analysis. For purposes of the park and trail analysis, the potential impact area was defined as approximately 100 feet on either side of the center line of both alternatives. The identified parks and trails were then analyzed for the likelihood of Section 4(f) use by reviewing the proposed concept plans for each alternative.

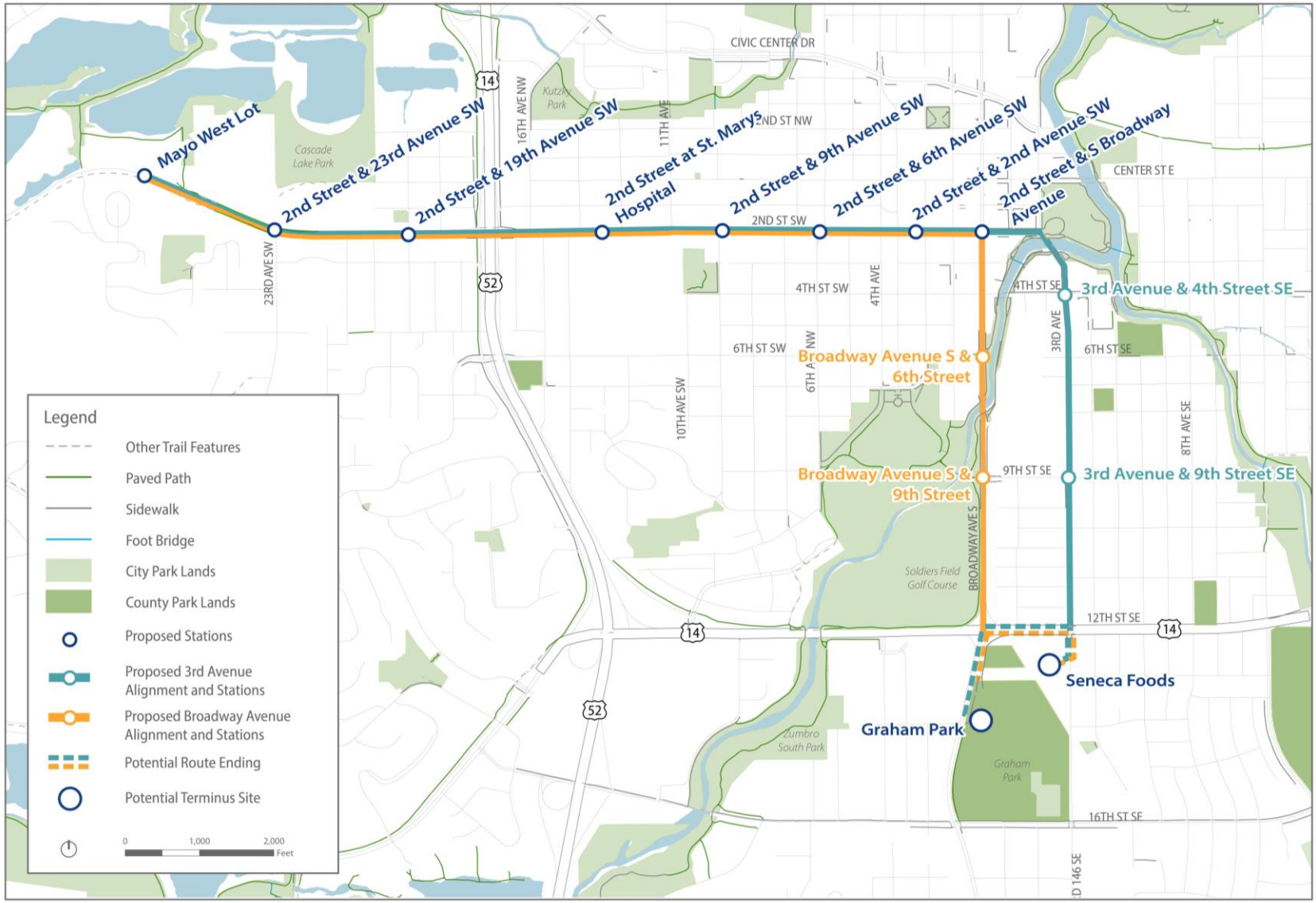
Results

All alternatives are rated "high" because regardless of which alternative is chosen, it will operate almost entirely in existing right-of-way and is not likely to require parkland. Parks, related recreational resources, and the two alignment alternatives are shown in Figure 4.

Table 27: Potential Impacts to Parkland by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Potential to impact parkland	High Compatibility	High Compatibility	High Compatibility	High Compatibility

Figure 4: Route Alternatives and Park Resources



Pedestrian and Bicycle Connectivity

Methods

The ArcGIS Network Analyst tool and its transportation infrastructure data were used to evaluate pedestrian connectivity within a 10-minute walkshed of each station proposed for 3rd Avenue and for Broadway Avenue. Stations west of 2nd Street were excluded from the analysis because bicycle and pedestrian connectivity to each are the same for each alternative. Because there is not a Network Analyst tool specific to bicycle infrastructure, connectivity for cyclists was approximated by considering available facilities that connect to 3rd Avenue and Broadway. Pedestrian and bicycle connectivity were assumed to be constant for each alignment regardless of transit mode choice.

Results

The walkshed around the 3rd Avenue alignment is larger than the Broadway Avenue alignment, as shown in Figure 5 and Figure 6Table 28. The railroad and South Fork Zumbro River present significant barriers to pedestrian accessibility for both alignments, and the Soldier's Field Golf Course presents a major barrier on the Broadway alignment.

Bicycle facilities are present along Broadway south of 6th Street SW; there are no bicycle facilities along 3rd Avenue.

Table 28: Pedestrian and Bicycle Connectivity by Alternative

Criterion	3rd Avenue BRT	Broadway Avenue BRT	3rd Avenue Streetcar	Broadway Avenue Streetcar
Bicycle and pedestrian connectivity	Medium	Medium	Medium	Medium

Vehicular Traffic

Impacts to vehicular traffic as a result of implementing the alternatives were not explored in this early phase of planning. The streetcar and BRT alternatives would operate in mixed traffic for short segments, but both modes would use a business-access and transit (BAT) lane for most of their length. The BAT lane is exclusive to transit vehicles; other vehicles may use it only to make right turns. The impact of this arrangement on vehicular traffic will be analyzed as the project advances in its design.

Figure 5: 3rd Avenue Alignment 10-Minute Walkshed and Bikeshed

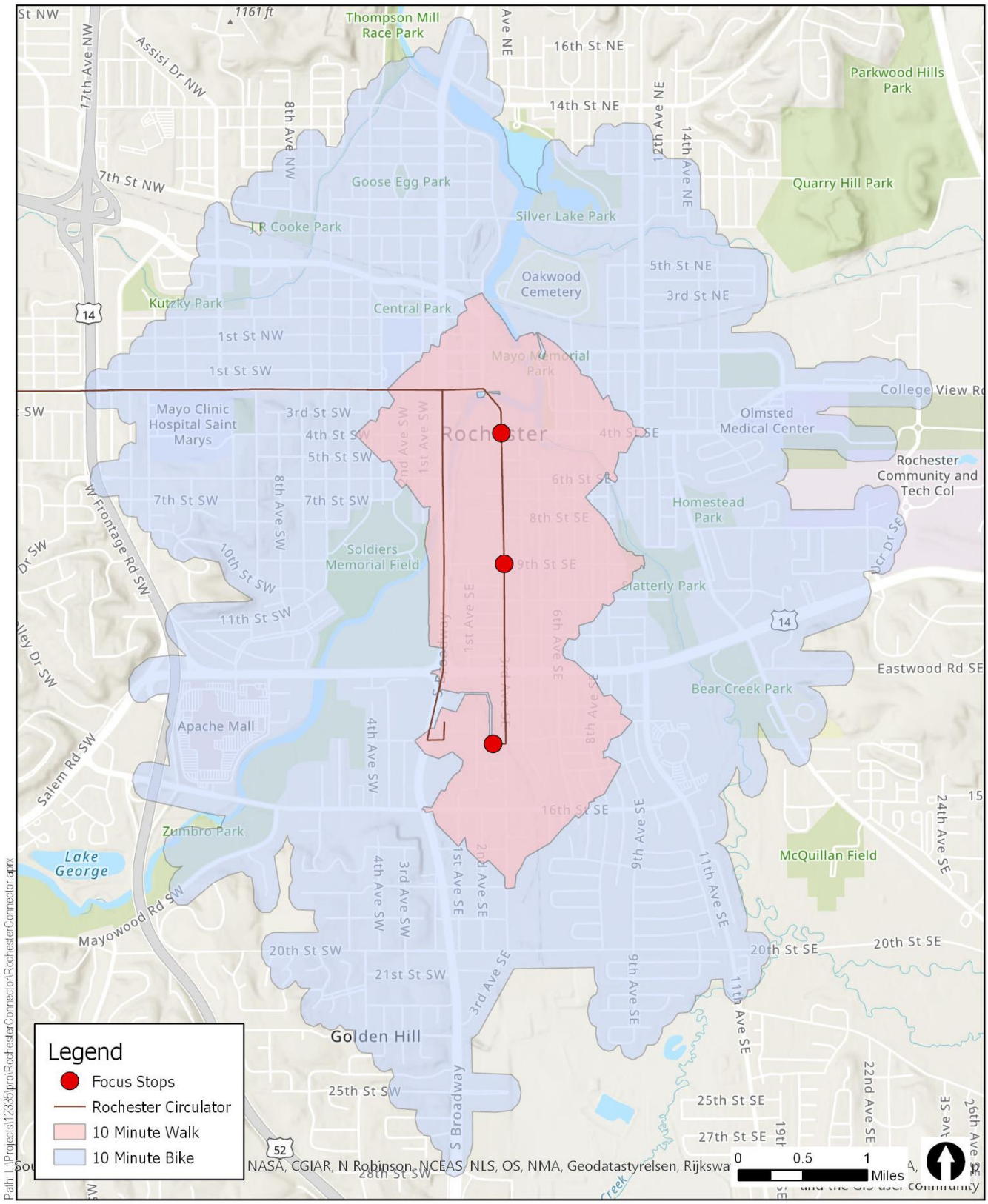
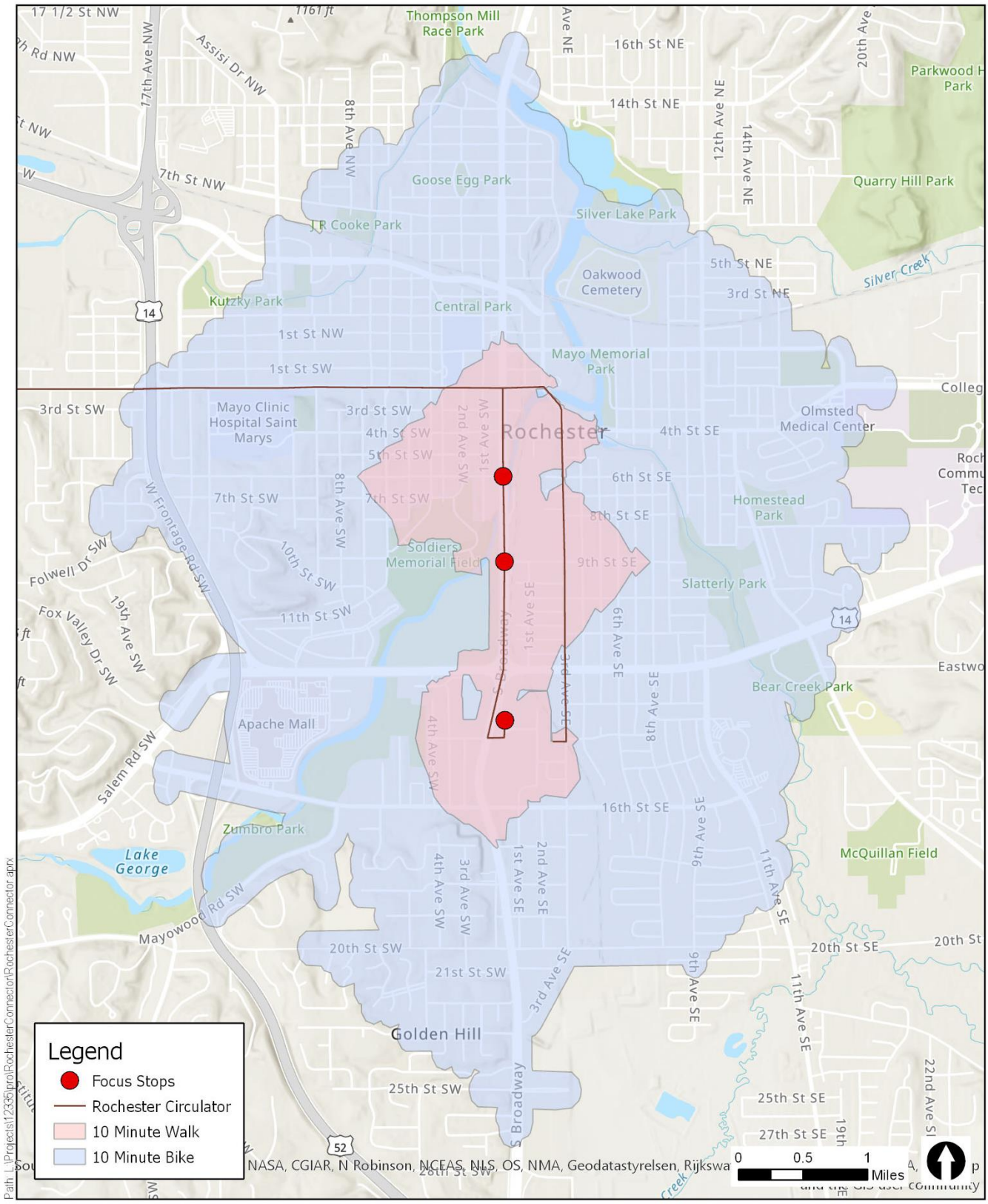


Figure 6: Broadway Avenue Alignment 10-Minute Walkshed and Bikeshed



Appendix E: Concept Drawings for each Alternative