City of Rochester

Center City Circulator Study

Final Report

May 2011

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City of Rochester

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CENTER CITY CIRCULATOR STUDY
FINAL REPORT

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1.0 INTRODUCTION

1.1 Background

The City of Rochester conducted a Comprehensive Downtown Parking Study which was completed in 2008. That study concluded that, as a whole, there is adequate parking downtown; however, parking shortages do exist in certain downtown sub-areas. In addition, current and planned development will remove additional parking from already constrained downtown districts. Among the more promising and ambitious recommendations of the report is a transit "shuttle" to connect underutilized parking facilities within and adjacent to downtown with major downtown destinations. Such a transit "shuttle" or "circulator" would help to balance out the existing supply within and adjacent to the CBD, improving overall utilization and at the same time promoting economic development by reducing developer and tenant concerns about parking. The circulator would also support the City's environmental sustainability initiative by maximizing the use of the existing parking supply and changing consumer behavior to reduce vehicle trips within downtown, thereby reducing traffic congestion and emissions. In addition to promoting local economic development, a circulator can also promote tourism and improve the attractiveness of the Downtown for conventions.

The concept of a downtown circulator is not new to Rochester. The EZ Rider system offered two evening/entertainment routes geared toward visitors and tourists. The service was discontinued because the low ridership no longer justified the annual public subsidy. Additionally, the RGRTA used to offer a fare-free zone in the Downtown. This practice was discontinued largely because of the expense and logistical complications of enforcement.

The Rochester Center City Circulator Study was initiated by the City to determine the elasticity of parking demand in Downtown Rochester through a Workforce Transportation Survey and to conduct a feasibility study for the establishment of a Center City Circulator transit service primarily for daily commuters but also to serve downtown residents, tourists, and visitors.

1.2 Study Area

The study area includes the area bounded by the Inner Loop, as well as the High Falls, East End, Corn Hill, and Monroe/Alexander Park districts, and the Central Avenue area near the Amtrak and Greyhound stations as shown on **Figure 1-1**. For purposes of this study, several potential locations for future parking facilities were identified. These locations, depicted in the study area figure, are illustrative of general locations and do not represent specific plans.

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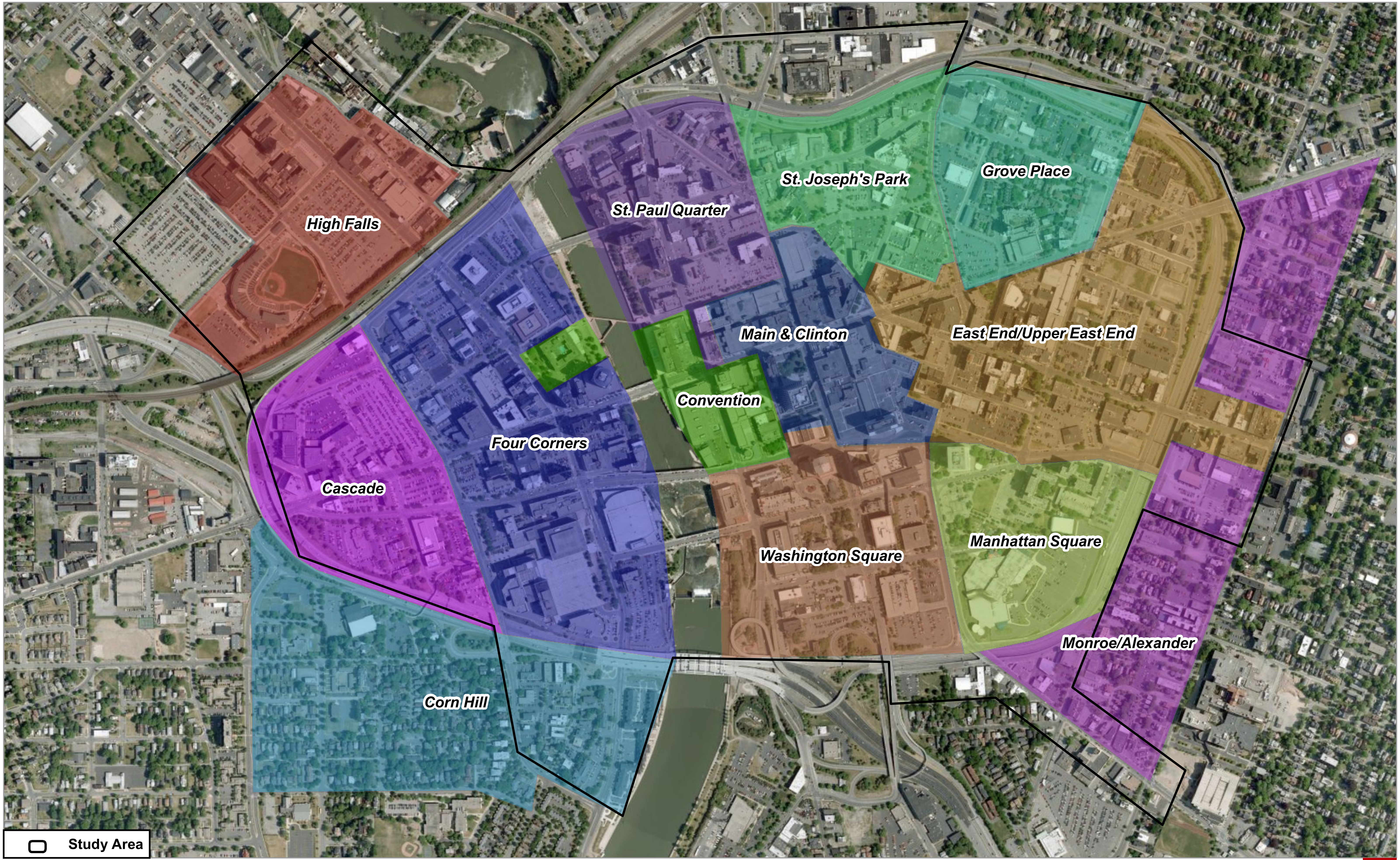

Figure 1-1 Study Area

ROCHESTER DOWNTOWN CIRCULATOR

March 2011

MARTIN ALEXIOU BRYSON

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1.3 Stakeholder and Public Involvement

A Project Advisory Committee (PAC) was established at the outset of the study to provide technical and procedural guidance. **Appendix A** features a list of PAC members which includes representatives from the following agencies:

City of Rochester,
Monroe County Department of Transportation,
Rochester Genesee Regional Transportation Authority,
Genesee Transportation Council (GTC), and
Rochester Downtown Development Corporation (RDDC).

Two public meetings were conducted over the course of the study. The goal of the first meeting was to introduce the public to the project, publicize the survey, and solicit opinions, preferences and suggestions regarding commuting and parking, including a shuttle system. The purpose of the second public meeting was to present the findings of the Draft Feasibility Assessment and obtain public feedback. Summaries from the public meetings are provided in **Appendix A.**

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2.0 WORKFORCE TRANSPORTATION SURVEY

2.1 Survey Development and Implementation

The web-based survey was designed to be completed in approximately ten minutes. The survey began with questions to screen and qualify respondents to limit respondents to downtown employees. The survey then asked respondents to describe their most recent trip to downtown, including questions on the number of vehicle occupants, travel time, departure and arrival times, schedule constraints (including employer policies), current parking location and amount of walking time, reasons for not carpooling or using transit, and barriers to using remote parking. These questions were followed with a stated preference experiment in which characteristics of the potential new transit shuttle – cost, vehicle type, and distance from downtown – were systematically varied in order to test a wide range of attribute levels. The survey also included sufficient demographic details to allow for reporting on sample characteristics and collected attitudes regarding transportation demand management (TDM) measures. A copy of the survey is provided in **Appendix B-1.**

The survey questionnaire was programmed using Resource Systems Group's (RSG) IVIS™ system. This system provides a graphical user interface and sophisticated dynamic branching to improve the efficiency and cost-effectiveness of stated preference data collection. Most importantly, it creates stated preference experiments that are completely customized around a trip that the respondent describes so that the alternatives are realistic for the given trip. The survey questionnaire was administered as a web-based instrument through RSG's SurveyCafe.com website.

The survey was active March 8 through March 29, 2010. It was administered by sending a request to downtown employers asking them to forward the link to their employees and encouraging their participation. The e-mail survey request included a letter from the Mayor. The survey database was developed in cooperation with the Rochester Business Alliance (RBA) and Rochester Downtown Development Corporation (RDDC). The RBA database included over 1,000 individual contacts in hundreds of organizations. The RDDC forwarded the mayor's letter to their list of downtown office building owners and managers and their larger database of more than 3,000 individual e-mail addresses. In addition to the e-mail request, the survey was publicized through:

City of Rochester press release,
Flyers posted in downtown parking facilities, and
Business cards distributed at the first public meeting.

Copies of the Mayor's letter, the press release, flyer and business cards are provided in **Appendix B-2.**

2.2 Survey Results

2.2.1 Survey Response

A total of 4,213 survey records were collected as part of this study. These survey records were screened to ensure that all observations included in the model estimation represented realistic choices. Several variables were used for these screening purposes including commuting distance (the distance from the respondent's home to their work location in downtown Rochester), parking distance (distance between parking and work locations), survey duration, and commuting times compared to commuting distances. Examples of unrealistic choices include: if the distance from the parking spot to the employer was greater than 7.5 miles or walking speed was greater than 10 mph, the daily parking cost exceeded $30 per day or the average commuting speed for drivers exceeded 70 mph.

Survey respondents were also asked basic demographics questions to assess if the survey respondents were representative of the broader Rochester population. Survey respondents were 60% female and 40% male. The average household size of survey respondents was 2.75, slightly higher than the average for the Rochester metropolitan area of 2.49.[1] As shown in Table 2-1, the average number of vehicles per household, for survey respondents, was slightly higher than the area as a whole.

Table 2-1 Distribution of Vehicles per Household

	Survey Respondents	Rochester Metropolitan Area
0 (no vehicles)	0.5 %	9%
1 vehicle	24%	32%
2 vehicles	53%	41%
3 or more vehicles	23%	18%
Total	100%	100%

The household income of survey respondents, presented in Table 2-2, is generally higher than the median household income for the metropolitan area of $48,066[2].

Table 2-2 Household Income

	Percent
Under $25,000	1.7%
$25,000-$49,000	14.7%
$50,000-$74,999	20.3%
$75,000-$99,999	18.2%
$100,000-$149,999	19.4%
$150,000-$199,999	6.3%
$200,000 or more	3.8%
Prefer not to answer	15.6%
Total	100%

[1] American Community Survey Profile, 2003, US Census Bureau, http://www.census.gov/acs/www/Products/Profiles/Single/2003/ACS/Narrative/380/NP38000US6840.htm, accessed April 30, 2010
[2] Ibid

The majority of survey respondents were from Monroe County, with the higher concentrations in zip codes: 14612 (Greece), 14609 (Rochester), 14580 (Webster), and 14450(Fairport/Penfield). The distribution of respondent home zip codes is presented in **Appendix B-3**.

In general, the survey respondents are representative of downtown employees and the broader metropolitan area. The following sections summarize the survey results. A copy of the detailed survey responses is provided in **Appendix B-4.**

2.2.2 Trip Characteristics

The majority (95%) of survey respondents worked full-time and worked downtown Monday through Friday. A breakdown of days worked in downtown is presented in Figure 2-1.

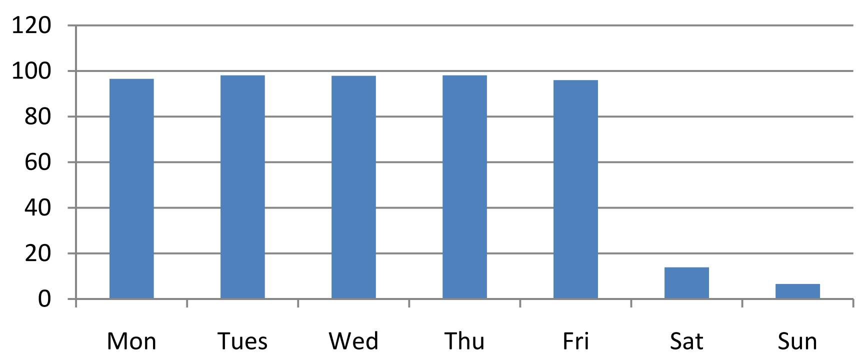

Figure 2-1 Days Worked Downtown

Half of the respondents had a one-way commute between 5 and 15 miles, with 71% of respondents indicating a commute time of 29 minutes or less. The distribution of commute length is presented in Figures 2-2. The distribution of commute time for survey respondents is generally consistent although slightly longer than the 2000 census data for the CBD as presented in Table 2-3.

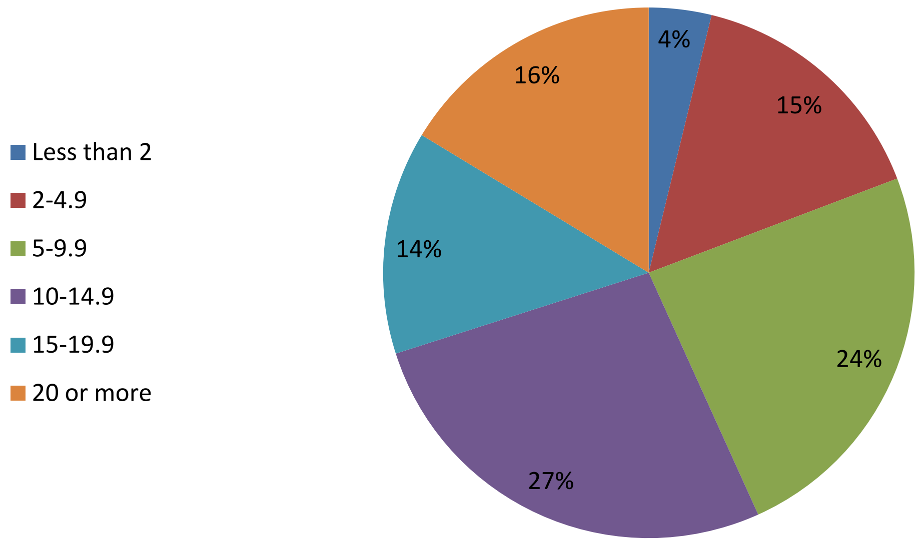

Figure 2-2 One-way Commute in Miles

Table 2-3 Commute Time

	Survey Respondents	**CBD**[3]
Less than 10 minutes	5%	8%
10-19 minutes	27%	37%
20-29 minutes	39%	31%
30-44 minutes	22%	16%
45-59 minutes	5%	4%
1 hour or more	2%	4%
Total	100%	100%

[3] 2000 Census Transportation Planning Package

Arrival and departure times, as presented in Figure 2-3, are concentrated between 7 and 9am and 4 and 6 pm. The concentration of arrival and departure times allows for improved transit during these peak periods as well as the potential to target carpools as an alternative to driving alone.

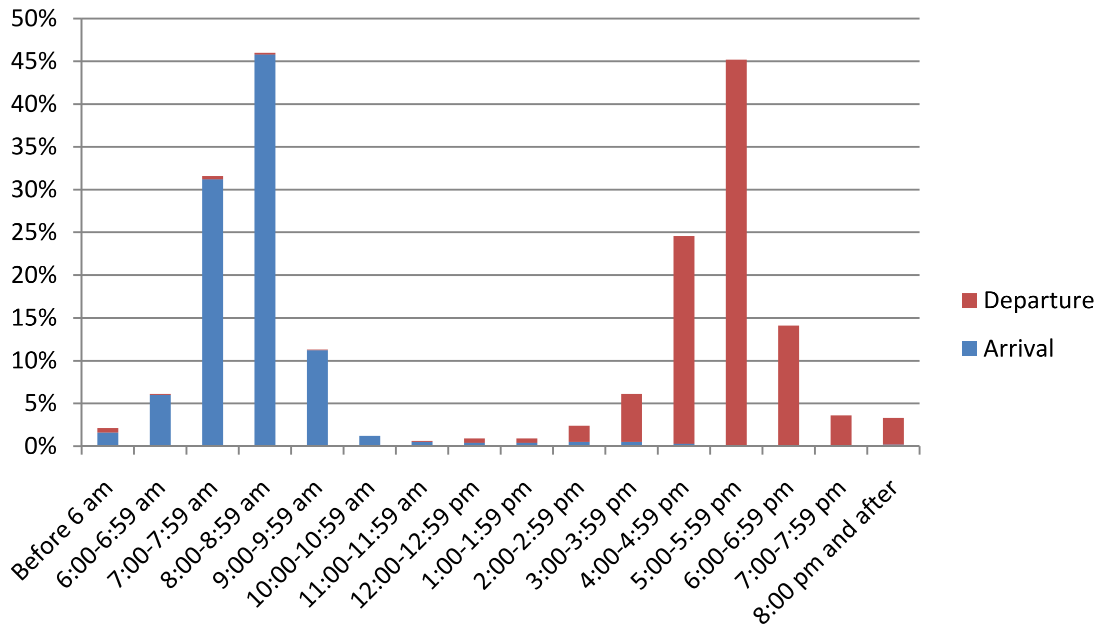

Figure 2-3 Arrival and Departure Times

Respondents indicated that they had little flexibility to vary their arrival and departure times which would allow them to accommodate alternatives modes of transportation. 65% indicated that their job or personal situation requires them to arrive and depart at specific times. Another 10% indicated that their job has highly variable or unpredictable hours.

2.2.3 Mode Share

Driving alone was the primary travel mode (87%) followed by carpool (5%) and transit (4%). The distribution of travel modes by respondents is depicted in Figure 2-4.

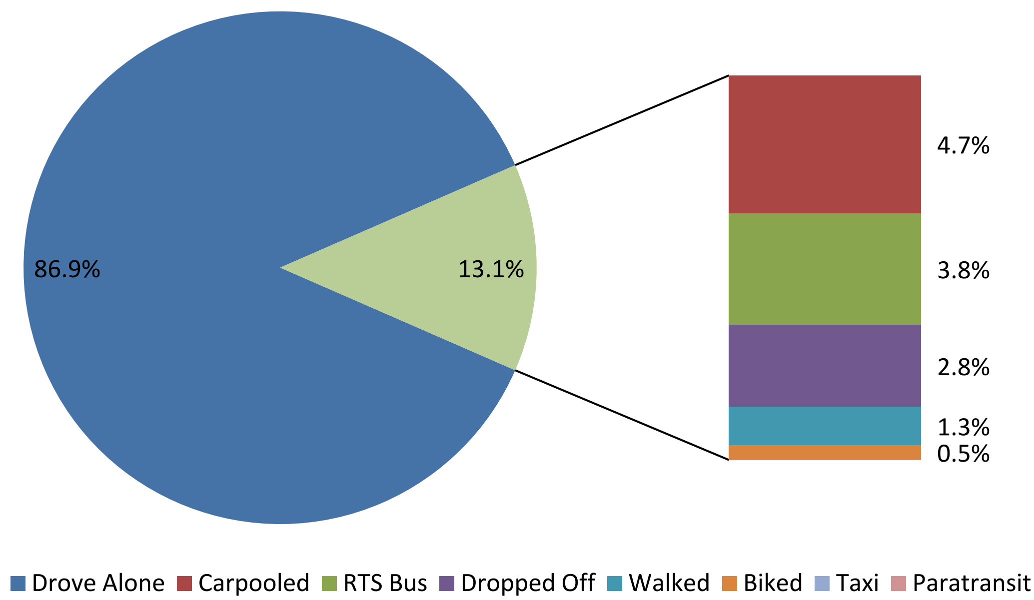

Figure 2-4 Travel Mode

The following table provides a comparison of mode share documented by survey respondents as compared to 2000 census data for the central business district and the Rochester metropolitan area:

Table 2-4 Mode Share Comparison

	Survey Respondents	CBD[4]	Metropolitan Area[5]
Drive alone	86.9%	80.2%	83%
Carpool/Dropped off	7.5%	10.3%	8%
Transit	3.8%	6.4%	2%
Bike/Walk	1.8%	3.0%	3%
Other		0.1%	4%
Total	100%	100%	100%

Survey respondents were more likely to have driven alone which is expected since those driving alone would have the greatest interest in a survey on transportation and parking.

[4] Ibid.
[5] American Community Survey Profile, 2003, US Census Bureau, http://www.census.gov/acs/www/Products/Profiles/Single/2003/ACS/Narrative/380/NP38000US6840.htm, accessed April 30, 2010

Of those respondents who carpooled or were dropped off, 89% had vehicle occupancy of 2 people, 9% had vehicle occupancy of 3 people and 2% had 4 or more people. Vehicle occupants included their spouse or partner (59%) or other downtown workers (29%).

Of the respondents who used RTS bus, 58% walked to the bus stop, 37% drove to the bus stop and 5% were dropped off or carpooled to the stop. Respondents who used RTS were asked for the route used. In general, most routes were only used by a few respondents (refer to **Appendix B-4**). The most frequently mentioned routes were:

- Route 92, Perinton/Bushnells Basin/Eastview Mall/Lyons (18)
- Route 1, Park/Lake (15)
- Route 21, East Rochester/Fairport (15)
- Route 30, Webster/Xerox via Empire/Creek (14)
- Route 91, Henrietta/Suburban Plaza/Avon/Rush/Lima/Honeoye Falls (11)
- Route 96, Hilton/Hamlin/Clarkson (11)

Since respondents were asked what mode of travel they used the previous day, they were also asked if they had used another travel mode in the last 6 months. Over half the respondents did not use another mode. The distribution of other travel modes used in the last 6 months is presented in Table 2-5. Respondents were able to select all that apply.

Table 2-5 Other Travel Modes in Last 6 Months

	Count	Percent
No Other Mode	2,261	53.7%
Drove Alone	416	9.9%
Carpooled	483	11.5%
RTS Bus	388	9.2%
Dropped Off	1,074	25.5%
Walked	142	3.4%
Biked	145	3.4%
Taxi	19	0.5%
Paratransit	2	0.0%

Note: Percent column is based on share of total 4,213 survey responses.

All survey respondents were asked the frequency they used each mode of travel. The modes used consistently are drove alone and paratransit. The majority of respondents only used another mode occasionally (less than 1 day per week). This data is summarized in Table 2-6:

Table 2-6 Percent Travel Frequency by Mode

	Days per Week						
	More than 5 days	5 days	4 days	2-3 days	1 day	Less than 1 day	Total
Drove Alone	10.7%	68.5%	5.2%	6.8%	2.5%	6.4%	100%
Carpooled	0.9%	16.7%	6.7%	12.2%	5.4%	57.9%	100%
RTS Bus	1.1%	20.5%	7.1%	12.6%	9.0%	49.6%	100%
Dropped Off	0.8%	5.0%	1.7%	5.9%	5.9%	80.8%	100%
Walked	4.0%	13.6%	4.0%	17.7%	12.1%	48.5%	100%
Biked	0.6%	4.8%	7.2%	26.9%	16.2%	44.3%	100%
Taxi	0%	0%	0%	0%	25%	75%	100%
Paratransit	0%	66.7%	0%	0%	0%	33.3%	100%

2.2.4 Parking

75% of survey respondents park in a public parking garage or lot, 21% park in an employer owned facility, 3% park on-street and 1% did not know what type of facility they park in. The 2008 Comprehensive Downtown Parking Study conducted by Walker Parking Consultants documented that only 57% of the downtown parking supply is in public garages and lots so the survey responses are slightly skewed toward public facilities. The distribution of parking locations is presented in **Appendix B-3.**

As presented in Figure 2-5, the majority of respondents pay the full cost of parking. Although 34% of respondents' employers paid for some or all of their parking costs, only 10% of employers offered benefits for alternative travel modes.

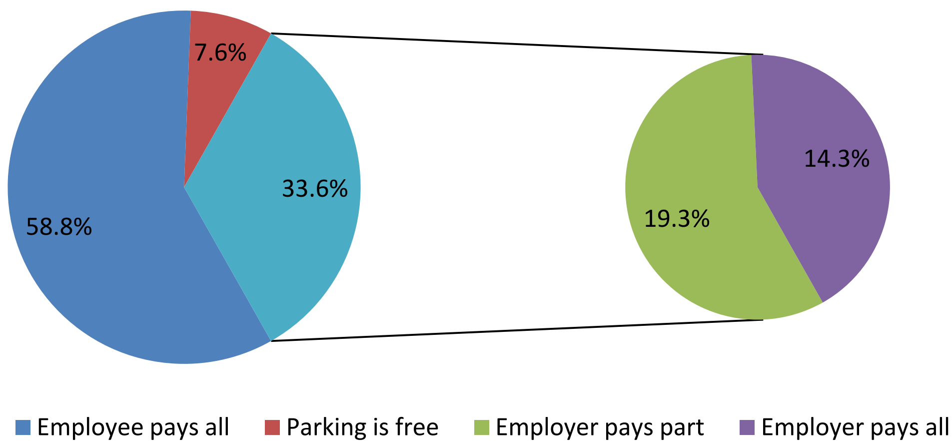

Figure 2-5 Who Pays for Parking

Respondents were asked the cost of parking either as a daily or monthly cost. Monthly costs were equated to daily costs with the assumption that a month includes 20 business days. The parking cost paid by survey respondents was fairly well distributed as shown in Table 2-7. The average daily cost was $4.73 and the median daily cost was $3.50. As a comparison the monthly rate in most City-owned garages ($79) equates to a daily rate of $3.95. Approximately 1/3 of respondents pay more than the City rate, just less than 1/3 pay the City rate and the remaining 1/3 pay less than the City rate.

Table 2-7 Parking Cost

Daily Cost	Monthly Cost	Percent
Do not pay for parking		13.8%
Less than $1.00	Less than $20.00	0.6%
$1.00-$1.99	$20.00-$39.99	3.6%
$2.00-$2.99	$40.00-$59.99	18.5%
$3.00-$3.99	$60.00-$79.99	31.0%
$4.00-$4.99	$80.00-$99.99	17.4%
$5.00-$5.99	$100-$119.99	13.8%
$10.00 or greater	$120.00 or greater	1.3%
Total		100%

Note: There were some inconsistencies in responses to questions so that the share an employee pays varies from Fig. 2-5 to Table 2-7.

2.2.5 Stated Preference Experiment

The survey asked 8 stated preference exercises. Each stated preference exercise asked respondents to evaluate 4 different options for making their commute trip to work under varying circumstances and then to choose the option they would most prefer. Figure 2-6 contains a screenshot of a stated preference experiment shown in the survey. The results of these experiments were used to support the estimation of a parking mode choice model which was incorporated into an Excel-based forecasting model for employee parking in the Rochester Downtown area.

Figure 2-6 Example Screenshot of Stated Preference Experiment

Sample and Weighting

The 4,213 survey records received were screened to ensure that all observations included in the model estimation represented realistic choices. Several variables were used for these screening purposes including commuting distance (the distance from the respondent's home to their work location in downtown Rochester), parking distance (distance between parking and work locations), survey duration, and commuting times compared to commuting distances. Only respondents who drove alone or carpooled to the downtown area in the last 6 months were included in the model estimation. Employees who have not driven to or parked downtown are assumed to be committed to their current mode (bike, walk, transit, dropped-off) and therefore would not be a potential user of the parking or a downtown circulator. Based on this review, 3,697 respondents were used in preparing this choice model.

It was observed that the sample collected was skewed towards City/public garage and lot users when compared to the parking inventory in the 2008 Comprehensive Downtown Parking Study conducted by Walker Parking Consultants. To correct for this over-sampling of City/public parking users, the sample was weighted in the forecasting model to the parking distribution from the 2008 study. The weight calculation can be found in Table 2-8.

Table 2-8 Weight Calculations

Parking Location	2010 Study (a)	2008 Study (b)	Weight = Column (b)/Column (a)
City/Public Garage	55.0%	42.8%	0.778
City/Public Lot	20.3%	14.2%	0.702
Private Garage	11.5%	5.5%	0.483
Private Lot	9.9%	31.0%	3.140
Off-Street	3.4%	6.4%	1.900

Model Estimation

Statistical analysis and discrete choice model estimation were carried out using the stated preference survey data. The statistical estimation and specification testing were completed using a conventional maximum likelihood procedure that estimated a set of coefficients for a multinomial logit (MNL) model. The coefficients provide information about the relative importance of each of the attributes such as parking cost that affect parking mode choice.

Alternatives and Attributes

Each respondent was presented with 8 stated preference experiments where they were asked to choose between 4 options for making their commute trip from home to Downtown Rochester. These 4 options were:

1.0 Drive and park where they currently do
2.0 Drive and park at a peripheral lot and take a shuttle bus
3.0 Take RTS bus
4.0 Travel an alternative method like walk, bike, or get dropped off

For each experiment, the details of each of the 4 options were varied in parking price, travel time and season of year. For respondents who chose the alternative method (option

#4) at least once over the course of the 8 experiments a follow-up question was asked to get at their preferred alternative travel mode.

Model Specification
A primary component of discrete choice model estimation is to test multiple utility equation structures using trip characteristics, demographic variables, and the variables included in the stated preference experiments (parking cost, travel time, and season of year). These model specifications were developed to determine whether characteristics of the respondents' commute or demographic information significantly influenced their choices in the stated preference exercises.

The utility equations, coefficient values, standard errors, t-statistics and p-values are presented for the final discrete choice model in **Appendix B-5**. The statistics included for each model are the number of observations, Log Likelihood at zero and at convergence, the number of estimated parameters, Rho-Squared (a model fit measure), and adjusted Rho-Squared (another model fit measure that incorporates the number of estimated parameters).

Forecasting Model
Using the above choice model, the probability of using each of the parking options under specific conditions can be calculated. To test the effect of different parking pricing scenarios on overall parking, an Excel-based forecasting model was developed; screenshots of the model are provided in **Appendix B-5**. This forecasting model applies the choice model described above to the weighted survey sample thereby calculating a respondent-level preference (or utility) for each alternative. These utilities can be converted to respondent-level probabilities using the multinomial logit model structure.[6] The forecasting model inputs are season of the year, various parking costs, and various travel times. The documentation included with the forecasting model Excel file provides more detailed discussion of the model inputs.

Additionally, the forecasting model has been calibrated to existing conditions based on the results of the Census Transportation Planning Package (CTPP) for the City of Rochester. CTPP provides information on worker-flows between home and work. To calibrate the model, the CTPP data were first aggregated to overall commute shares to the Downtown Rochester area (Drive, Transit and Other). Next, the new shuttle alternative was made unavailable in the forecasting model since it is a new service and no calibration data are available for it. Finally, the mode-specific constants for the remaining alternatives were then adjusted in an iterative manner so predicted share from the

[6] The multinomial logit model has the general form $p(i) = \frac{e^{U_i}}{\sum_{AllModes} e^{U_j}}$ where *p(i)* is the probability that mode *i* will be chosen and U_i is the "utility" of mode *i*, a function of service and other variables. See, for example, M. E. Ben-Akiva and S. R. Lerman, *Discrete Choice Analysis*, MIT Press, 1985, for details on the model structure and statistical estimations procedures.

forecasting model for each alternative matched the aggregated shares found in the CTPP data.

Summary of Model Results

The choice model results indicate that there are many aspects of a traveler's trip or demographics that can influence their choice on parking in Downtown Rochester. The most important of these aspects is the frequency of current mode use. This is an inertia effect and measures the familiarity and comfort with their current travel mode to downtown and the traveler's reluctance to switch from this mode. For example, a person who uses the RTS service 4 or more days a week is much more likely to want to continue using RTS than someone who only uses it once a week. This inertia is captured in the frequency coefficients listed in **Appendix B-5.**

In addition to inertia, other characteristics of a traveler are important. Travelers who are reimbursed by their employers for their parking fees are less sensitive to those parking fees than those who pay the whole parking fee directly out of their pocket. A traveler's gender is also an important determinant for choosing RTS as research has shown females are less likely to want to use this bus service than males.

Trip characteristics such as commuting and parking distances are also important in travelers' decisions. Travelers who make long commutes are less willing to switch from their current parking location to the new downtown circulator shuttle service than travelers who make shorter commutes. Travelers who make long walks from their current parking location to their employer are more likely to change the location where they park from their current location. Also, if a respondent currently enjoys free parking in Downtown Rochester, they are less likely to be willing to use the new downtown circulator shuttle service.

Characteristics of the proposed circulator service are also considered by potential users. The frequency of shuttles and the average travel time to get from the shuttle lot to the final destination are important to travelers using the new service. Finally, the season of the year can affect a traveler's choice of parking in Downtown Rochester. Parking utilization is highest during the winter months and lowest during the summer months.

According to the stated preference choice in the survey, a reasonable share of downtown employees would use a new downtown parking circulator shuttle. However, the share of employees that would use the system is affected by parking price, shuttle frequency, shuttle ride times, and season of the year. How much each of these factors influence the shift to a circulator system is reflected in the elasticities presented in Table 2-9.

Table 2-9 Table of Elasticities

Elasticities	Garage/Lot Price	Shuttle Price	Shuttle Travel Time	Shuttle Frequency
Current Parking	-2%	2%	1%	0%
Shuttle	3%	-6%	-2%	1%
RTS	2%	2%	1%	0%
Other	1%	1%	0%	0%

The two most significant factors are cost of parking and shuttle and commuting distance. Negative elasticities represent the fact that as the value of the parameter (cost, distance or time) increases, the probability that the employee would use that mode decreases. So here, a 10% increase in the public parking garage/lot price would result in a 2% decrease in the current parking mode share while increasing the shuttle share by 3%. A 10% increase in the shuttle parking price would result in a 6% decrease in the use of the shuttle service.

Table 2-10 provides a brief summary of how the model can be used to evaluate how these factors affect potential ridership. In Scenario 1, a parking lot with shuttle system is established that has a $1.00 daily cost and an average travel time to workplace of 7 minutes. Due to its location, it would add an average of 10 minutes onto an employee's commute time from home. Without, increasing parking costs at existing parking garages and lots, the new system would only capture approximately 20% of downtown parkers. As documented in Scenario 2, if the cost at existing parking facilities is increased by $2.00 per day and the overall commute time is reduced by 8 minutes (combined shuttle and auto commute), the potential shuttle system share would increase to approximately 25%. In Scenario 3, reducing the daily cost of the shuttle system to $0.50 and keeping all other variables constant only produces a minor increase in shuttle system use. Scenario 4 is provided as an example to show how behavior shifts by season. Employees are more willing to use the shuttle system in summer (29.5%) than winter (25.7%) with all other variables constant. A shift from summer to spring has little effect on shuttle system use; however, employees are more willing to shift from their current parking to alternative modes such as walking or bicycling in the summer versus spring.

Scenarios 5 and 6 are provided to show how the travel behavior would change based on an increase in existing parking costs or a reduction in commute time from home. In Scenario 5, a shuttle system is created that maintains the total commute time by reducing the home to parking commute by 4 minutes while establishing an average shuttle time of 5 minutes. In this Scenario, the existing daily parking cost is increased by $2.00 per day and the shuttle system ridership potential is approximately 32% of total downtown parkers. In Scenario 6, the existing parking cost does not change but the total commute time is reduced by 5 minutes resulting in a shuttle system ridership potential of approximately 31% of total downtown parkers. Based on the model, either increases in daily parking cost or reductions in travel time can be used to encourage employees to shift from their current parking to a shuttle system.

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Table 2-10 – Parking Model Results

Model Inputs	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**
Season	Winter	Winter	Winter	Summer	Spring	Spring
Daily Increase in Garage Cost	$0.00	$2.00	$2.00	$2.00	$2.00	$0.00
Daily Increase in Lot Cost	$0.00	$2.00	$2.00	$2.00	$2.00	$0.00
Shuttle Lot Cost	$1.00	$1.00	$0.50	$0.50	$0.50	$0.50
Shuttle Time	7 min.	5 min.	5 min.	5 min.	5 min.	5 min.
Additional Commute Time	10 min.	4 min.	4 min.	4 min.	-4 min.	-10 min.
Additional RTS Time	20 min.	20 min.	20 min.	20 min.	20 min.	20 min.
Shuttle Frequency	12/hour	12/hour	12/hour	12/hour	12/hour	12/hour
Model Outputs						
Maintain Current Parking	66.9%	62.4%	61.5%	52.8%	52.8%	54.4%
Use Shuttle Parking	20.6%	24.6%	25.7%	29.5%	31.7%	31.0%
Ride RTS	4.9%	5.1%	5.1%	5.4%	5.2%	4.8%
Use Other Mode	7.6%	7.8%	7.7%	12.3%	10.2%	9.8%

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2.2.6 Transportation Demand Management

If survey respondents did not select a parking or transit option at least once in the Stated Preference section, they were asked to indicate their preferred alternative commute mode; the results are summarized in Figure 2-7. The preferred alternative is to get dropped off (34%) followed by bike (21%). For the 20% of respondents who selected "other", the most common write-in responses include telecommute or find alternative employment outside of downtown.

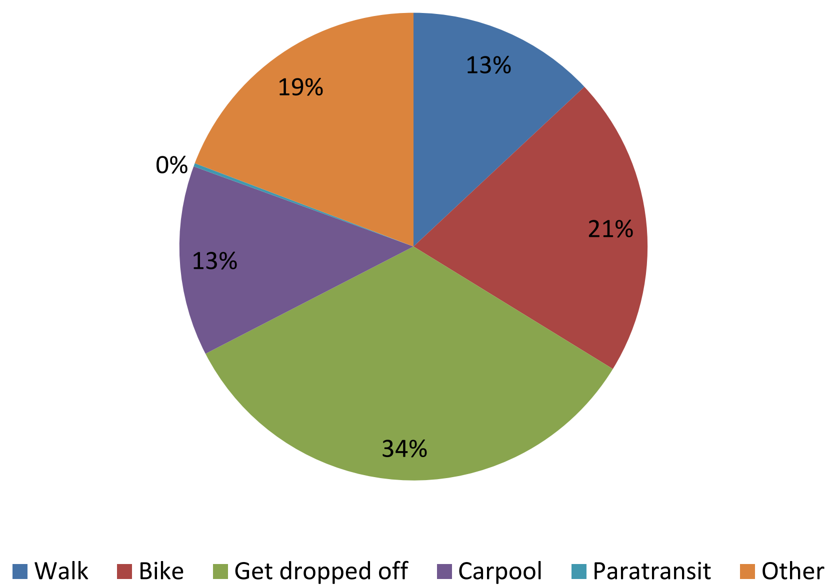

Figure 2-7 - Preferred Alternative Commute Mode

If the respondent never selected transit in the Stated Preference section or carpool as a mode of transportation in the last six months, they were asked what would encourage them to use these modes; the results are summarized in Tables 2-11 and 2-12. Respondents could select all measures that would apply.

Table 2-11 Measures to Encourage RTS Bus Use

Measure	Percent
Nothing would encourage me to take an RTS bus	52.5%
Guaranteed Ride Home	22.2%
More frequent bus service	21.2%
Real time information about next arrival/departure	21.0%
Adding route/stop near my home/work	18.9%
More/better information about bus options	17.0%
Adding a park and ride lot near my home	14.7%
Other: Security on buses and at stops Loss of employer parking subsidy Cleaner buses	12.3%
Extending service later in the evening	10.5%
Beginning service earlier in the morning	6.1%

Table 2-12 Measures to Encourage Carpool Use

Measure	Percent
Nothing would encourage me to carpool	58.7%
Guaranteed Ride Home	28.8%
More/better information about finding carpoolers	19.6%
Having a reserved parking space	14.9%
Ability to use company car or car-share vehicle during the day	12.3%
More/better information about savings	10.4%
Having a closer parking space to my office	7.7%
Other:	0.0%

More than 50% of the respondents indicated that nothing would encourage them to use an RTS bus or carpool. The most effective measures to encourage RTS bus use include a Guaranteed Ride Home, more frequent service and real-time information. A Guaranteed Ride Home and more/better information about finding carpoolers would encourage carpool use.

Respondents were also asked how they viewed a series of statements to determine their willingness to shift to an alternative mode. The results are summarized in Table 2-13.

More than 50% of respondents indicated that they somewhat or strongly agree with the statement: "I am satisfied with my current parking options in downtown Rochester." When someone is satisfied with their current commute, it is very difficult to change their travel behavior. This is supported by the responses indicating that the majority of downtown employees currently do not make an effort to use alternative modes of transportation and are not willing to do so in the future. Approximately 25% of respondents indicated that they would be willing to make an effort to use an RTS bus or carpool more frequently. A slightly higher share (32%) indicated that they would be willing to park further away and take a free shuttle to work.

Table 2-13 – Respondent View of Commute

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree	Not Applicable
I am satisfied with my current parking options in downtown Rochester	14.1%	14.1%	12.0%	21.7%	35.8%	2.3%
I currently make an effort to take public transit to work	68.9%	8.9%	5.1%	3.7%	5.6%	7.8%
I currently make an effort to carpool to work	61.6%	12.9%	6.9%	4.3%	5.6%	8.7%
I currently make an effort to bike or walk to work	67.3%	6.8%	4.5%	3.5%	4.3%	13.6%
I would be willing to park further away and take a free shuttle to my office	34.2%	14.9%	14.3%	23.4%	8.6%	4.7%
I would be willing to take public transit to work more frequently	40.8%	15.9%	14.1%	16.2%	8.3%	4.7%
I would be willing to carpool to work more frequently	36.2%	14.7%	16.6%	19.8%	6.2%	6.5%
I would be willing to bike or walk to work more frequently	60.6%	7.3%	5.9%	8.2%	6.0%	12.1%

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2.2.7 Comments

At the end of the survey, respondents were given the opportunity to provide additional comments or suggestions. A copy of all comments is provided in **Appendix B-6**. The following is a summary of the most frequent comments:

Shuttle

1. Non-bus Options – trolley, light rail, heavy rail, monorail
2. Free service
3. Inconvenience of having to carry items (laptops, briefcases, etc.)
4. Frequency – short headways, approximately 5 minutes
5. Hours of operation – all day, not limited to peak commuting periods
6. Connection to Main Street bus transfers
7. Connection to parking and major destinations (High Falls, East End)

Parking

8. Cost
    a. High cost
    b. Comparison to suburbs
    c. Desire for free parking
    d. Need for employer reimbursement
9. Availability
    a. On-street, including 2- and 10-hour meters
    b. Re-open Midtown Garage
    c. Handicapped accessible spaces
    d. Reserved spaces and monthly passes
    e. Requiring parking for new construction
    f. Replace surface lots with garages
10. Safety
    a. Lighting
    b. Hours of operation
    c. Vandalism
    d. Litter evidence of activity (liquor bottles, broken glass, etc.)
11. Condition of lots and garages
    a. Potholes
    b. Litter
    c. Maintenance of lights and elevators; snow removal from roof
12. Enforcement of on-street meters – needs to be more forgiving
13. Payment options (EZ-Pass Plus in garages/lots and use of credit or debit cards at meters and in garages/lots)

Transit – RTS

15. Need for greater frequency, throughout day
16. More park-n-ride service
17. Safety
18. Bus stops
19. Student use
20. Passenger behavior – fighting, language
21. Confusing route structure and schedules/website
22. Condition of buses
23. Need for shelters at stops
24. eligibility of schedule/need for real-time arrival information
25. Hub and spoke system is not serving area well
26. Cost – bus fare is higher than subsidized parking and shared carpool fees
27. Need for central transfer station

Bicycle/Pedestrian

28. Safety
    a. Especially early morning and after dark
    b. More police presence
    c. More Red Shirts coverage
    d. Panhandling
    e. Large groups of students/Liberty Pole area
29. More paths
30. Separation of bicycles and motor vehicles – bike lanes
31. Benefits of skyway or underground walkway
32. Need for more bicycle parking, including lockers
33. Streetscape improvements
34. Sidewalk snow removal
35. Employer provided shower/locker facilities
36. Make bike rentals/community bikes available
37. Driver education and enforcement is needed (yield to pedestrians/share the road)

Reasons for driving alone

38. Need vehicle for work purposes during day
39. Daycare/Errands
40. Time sensitivity

<u>Other</u>

42. Traffic patterns
    a. One-way streets
    b. Turn restrictions on Main St.
43. Transit options, including fixed guideway (subway, commuter or light rail) that serves downtown and extends to suburbs
44. Access and egress issues in various parking garages
45. Confusion/concerns regarding commuting options questions
46. Broad Street – transit or road preferred over "flooding/re-watering" Broad Street
47. Need for more amenities downtown (dining, shopping, daycare, etc.) to reduce need for car to run errands during the day
48. Need for carpool incentives, i.e. reduced parking fees

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3.0 BEST PRACTICES

To inform the feasibility study, a review of best practices of urban transit circulator systems was conducted. Information on each system was compiled through interviews with operators and web research. Through coordination with the Project Advisory Committee (PAC), the following systems were identified as suitable for comparison to Rochester:

- Raleigh, NC – R Line Circulator
- Orlando, FL – Lymmo
- Little Rock, AR – River Trail
- Charlotte, NC – Gold Rush Trolley
- Chattanooga, TN – Downtown Electric Shuttle
- Grand Rapids, MI – DASH
- Des Moines, IA – D Line Shuttle
- Buffalo, NY Metro Rail
- West Palm Beach, FL – Downtown Trolley Services

3.1 Summary of Key Lessons

The key components of each system are summarized in Table 3-1. A detailed description of each system is provided in **Appendix C.**

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Table 3-1 – Best Practices Summary

	City	Raleigh, NC	Orlando, FL	Little Rock, AR	Charlotte, NC	Chattanooga, TN	Grand Rapids, MI	Des Moines, IA	Buffalo, NY	West Palm Beach, FL
Ref.	**System**	**R Line Circulator**	**Lymmo**	**River Rail**	**Gold Rush Trolley**	**Downtown Electric**	**DASH**	**D Line Shuttle**	**Metro Rail**	**Downtown Trolley**
1	System Type	A 3 mile loop that takes one bus 10 minutes	A 1.5 mile one way loop system	Two 1 mile loops connected by a .3 mile bridge with a .3 spur	Two linear 1.5 mile long routes	A 1.5 mile loop system	Three loops, at 1 mile, 2 miles and 3 miles each system	A 4 mile loop system	A 6.4-mile linear rail line	A 2 mile loop system with about 20 stops
2	Hours of Operation	Mon-Wed 7 am-11 pm\Thurs-Sat 7 am-2:15 am\Sun 1 pm-8 pm	M-F 6am to 10 pm\SAT 6am to midnight\SUN 10 to 10	M-Sat 8:20 to 10:00\Thur – Sat till midnight\11-6 Sun	M-F 6:30am-7:00pm	M-F 6:30am-11:15pm\Sat9:30am-11:15pm\Sun9:30am-8:40pm	M-F 6:30am-6:45pm\Sat 6:30am-10pm	M-F 7am – 6pm	M-F 5am to midnight\SAT 7am to midnight\SUN 10am to 6:30pm	Sunday-Wednesday 11am-9pm\Thurs- Sat: 11am-11pm
3	Monthly Ridership	8,512	100,000	10,250	30,000	8,335	50,000	19,000	504,000	45,000
4	Monthly Cost	$6,875	unknown - embedded in the budget	$68,333	$83,333	$125,000	$83,333	$12,500	$2,083,333	$47,302
5	Estimate of cost per rider	$1	unknown	$7	$3	$15	$2	$1	$4	$1
6	Cost per Service Hour	80	81.19	unknown	68	50	50	unknown	60	70
7	Fare	free	free	1	free	free	free	free	free	free
8	Frequency of Service in	10	10	20	8	6	5	10	10	10
9	Operator	City Transit	Regional Authority	Regional Authority	Regional Authority	Regional Authority	City Parking	Regional Authority	Regional Authority	Private Contractor
10	User Profile - d=transit dependent, t=tourist,	d-t-e	d-t-e-c	t-85%	t-e	d-t-e-c	e	t-e	unknown	d-t-e-c
11	Type of Vehicle (bus, rail,	bus hybrid	bus biodiesel	trolley electric	bus trolley	bus electric	bus diesel	bus trolley	light rail	bus trolley
12	Integrated with Parking	yes	yes	no	yes	yes	yes	no	no	yes
13	Integrated with Bus	no	yes	no	unknown	no	no	no	no	no
14	Downtown Merchants	yes	yes	yes	yes	yes	yes	yes	yes	yes
15	Funding Sources	FTA and City	City thru parking fees	FTA and City	Downtown Association	City plus parking fees	City Parking	FTA for first year, unknown thereafter	FTA, State, sales tax, real estate tax	Tax District
16	Advertising Revenue	some	no	yes	no	no	no	yes	yes	yes
17	Major Impacts of Service	supports parking, downtown merchants and convention center	mitigated the need for more downtown parking	connects two downtowns across a river and supports downtown merchants and tourism	provides easy mobility in a dense downtown area, supports special events and tourism	catalyst for revitalizing the downtown area	eliminated the need to build downtown parking decks	catalyst for redevelopment	originally built in 1978 to replace all the buses in the downtown	supports downtown merchants, employees, and reduced the need for more parking, also keeps customers in the down town
18	Why was the service Implemented	Downtown Alliance of business pushed for it at the same time the convention center was constructed	The city wanted to mitigate the need to build more parking downtown	For Economic Development for both Cities. Connects one historic downtown with the downtown entertainment district of another	They have 55,000 daily workers in a 20 by 20 square block area with two professional sports teams	To facilitate tourism and to enhance air quality by using electric vehicles	It used to be just a lunch time circulator then it expanded to connect to parking for employees	Downtown Community Alliance requested it from the city	The light rail line was built to replace all of the bus lines downtown and to create a more pedestrian mall type urban environment	To connect a master planned,dense urban development with the historic downtow core

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The following are key lessons from operator interviews:

Origins

- The systems surveyed all had economic development origins as most had downtown merchants requesting some kind of service.
- Parking in the downtowns was a factor but not the only factor, more of a secondary consideration.
- Some of the systems had "political champions" that pushed for the systems' implementation at either the local and/or state and federal levels of government (Chattanooga had a very aggressive county attorney take the lead in 1992).

Operation

- Most of the systems contracted for the service from their respective regional transit authorities. Two of the systems did not, one system was run by the city's transit system (Raleigh) and the other system was run by the city's parking department (Grand Rapids pays for their service out of parking deck revenues). One was contracted by the Downtown Development Authority (West Palm Beach).
- Most of the advertising was by word of mouth and the internet. Some sold advertising space to downtown merchants to pay for "downtown bus route/attractions" brochures (Raleigh and Chattanooga).
- Some of the systems sent their drivers to "ambassador" training to provide tours of historical places and to make recommendations on restaurants and other entertainment venues (Little Rock and Chattanooga).
- Cold weather systems had additional expenses for providing salting and snow removal at the bus shelters and other major stops. Other miscellaneous expenses included having heated garages (Grand Rapids and Des Moines).

Service Characteristics

- The frequency of vehicles in the most heavily used systems ranged from 10 minutes to less than 5 minutes.
- The more frequent the service, the less need there is for putting the "real time" vehicle locations on the internet. The threshold seems to be 10 minutes or more, then put the bus locations on the internet.
- The service span (start and finish by day of the week) was dictated by the entertainment districts served. Those with mostly downtown employee riders (Grand Rapids) did not have evening hours except for weekends.
- Most of the systems did not connect to a bus transfer center (exception - Orlando).
- Most of the systems had distinctive looking buses that ranged from trolley type to BRT or wrapped buses.
- The vehicles ranged in size and type from heavy-duty urban transit vehicles to electric buses to trolleys on catenaries.
- The ADA provisions ranged from lifts to ramps. Ramps are preferred because they are much, much quicker to assist boarding and alighting.
- All the downtown systems were fare free, except for Little Rock, which was across-town, cross-river system.

- All of the systems surpassed their projected ridership from the feasibility studies. Of course, the more venues and "destinations" (e.g., parking garages, museums, entertainment, sports arenas, college campuses, employment, shopping) downtown, the higher the ridership.

Funding/Revenue
For those that were FTA funding recipients, the optimal vehicle was a BRT type of hybrid bus. Because it's easier to get capital funds from the FTA than operating funds, the hybrids operating mostly on electric in the slow speed downtowns reduced fuel costs (Raleigh).

- Advertising was not a major source of revenue, but those that did get some significant revenue have hired an accounts manager (Des Moines has an advertising manager).

Most important attributes:
- free
- frequent
- dependable service
- dedicated funding

Other Recommended Systems:
- Santa Barbara
- Kenosha, WI
- Miami Metro
- Jacksonville People Mover
- Portland
- San Francisco

4.0 CIRCULATOR FEASIBILITY

4.1 Service Goals

As detailed above, a review of several cities with downtown circulators was performed. In total, nine systems with a mix of trolley, streetcars, light rail, transit buses and trolley buses were interviewed and their answers, together with their thoughts and experiences from other systems, were coalesced and presented to the Project Advisory Committee (PAC). Based on these findings, the PAC laid out a series of objectives for the Center City Circulator. These goals are highlighted below as well as any relevant points relating to the recommendation.

4.1.1 Markets

AM/PM Peak Service

At a minimum, the circulator service should provide short travel times (time to travel entire route) and short headways (time between buses) during the morning (6:30-9:30 AM) and afternoon (3:30-6:30 PM) peak periods. These characteristics are intended to provide commuters with convenient service between perimeter parking facilities and downtown workplaces. Providing perimeter parking would alleviate some of the parking constraints currently found in the core of downtown, which are expected to worsen as the number of spaces is reduced due to development/redevelopment.

Four potential perimeter parking locations have been identified in and around the study area, as shown on Figures 3-7. The location to the west of the study area on West Main Street is roughly 1.2 acres and could accommodate approximately 130 surface parking spaces. The location to the west of the study area on Industrial Street is roughly 1.9 acres and could accommodate over 200 spaces. The location to the north on Andrews Street is roughly 1.7 acres and could accommodate approximately 180 spaces. Finally, the location to the east on Charlotte Street is roughly 1.9 acres and could accommodate over 200 spaces. Portions of these parking lots would require minimal resurfacing, while others would require full construction. The average cost per parking space would likely be less than $4,000. By comparison, structured parking more centrally located in Downtown could have costs in excess of $20,000 per parking space (Victoria Transport Policy Institute, 2009). Additional existing lots with excess capacity have also been highlighted.

Daytime Service

As a secondary feature, the service should function as a downtown circulator during the day time (9:30 AM – 3:30 PM) that would serve both employees and visitors to downtown with circulation to and from all major destinations within the study area. Some of the key destinations include major office/employment centers, hotels, retail/restaurants, the convention center, and transportation hubs.

Evening Service

As a tertiary feature, the circulator could also provide an evening/late night service (6:30 PM – 2:30 AM) among entertainment venues, such as restaurants, bars, and theaters. Additional or modified routes should be considered for special events at Frontier Field, Blue Cross Arena, Rochester Riverside Convention Center, and other major venues. Evening service could be expanded to incorporate the University of Rochester (U of R), the Rochester Institute of Technology (RIT), and other area colleges and universities.

4.1.2 Fare

At a minimum, AM/PM peak hour and daytime circulator service should be fare-free. A fare could be charged during evening service hours to offset some of the costs, though this would require some investment in infrastructure for collection of fares. Onboard fare collection would also increase the delay at stops, increasing overall run-times and headways. Ridership would be reduced when charging a fare, even if the fare is modest. The charging of a fare would also discourage the use of the vehicles for shelter and other unintended uses, though most systems address this through acceptable use policies and driver training.

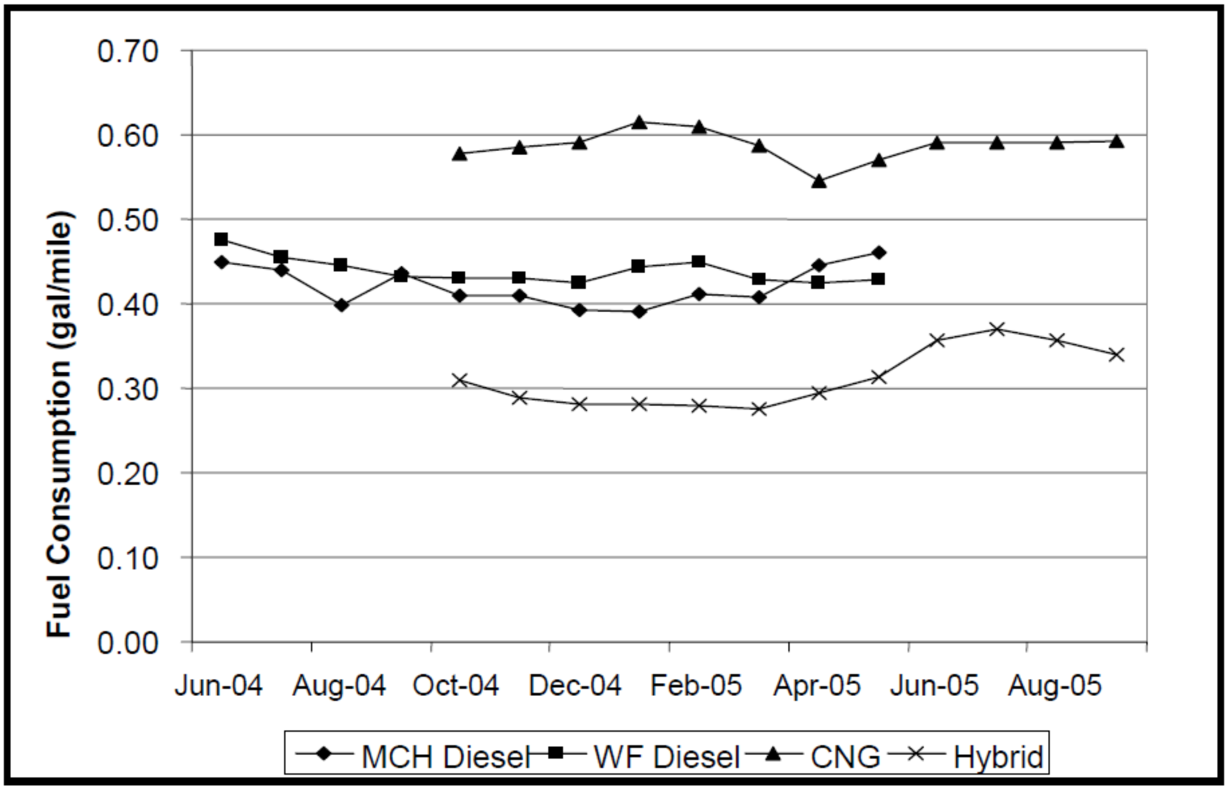
4.1.3 Vehicle

The vehicle should be a low floor, full-sized bus, roughly thirty to forty feet in length, consistent with the current RTS fleet since they are considered a potential operator.

As a distinguishing feature, and to support the City's sustainability objectives, the preferred vehicle technology is a hybrid diesel/electric bus. Hybrid diesel/electric bus technology typically offers an increased fuel economy of 10-50 percent over traditional diesel buses. At low speeds, consistent with downtown circulator routes, the increased fuel economy is typically on the higher end of that range. A study of New York City Transit buses conducted from 2004-2006 showed their hybrid buses having a 37% higher fuel economy, on average, than conventional diesel buses running similar routes. In the summer, the fuel economy benefit dropped to 12% during one month, due primarily to running air-conditioning.

Compressed natural gas (CNG) buses are a lower-emissions alternative to conventional diesel buses. However, at low speeds they offer significantly lower fuel economy than conventional diesel buses. City/County green fueling stations, currently under development, are likely to provide CNG facilities, however these are not convenient to RTS' East Main Street campus. Fuel consumption from the New York City Transit study is given in Figure 2 for the three technologies. The figure includes data from two diesel depots, Monta Clara Hale (MCH) and West Farms (WF). Each serves a set of routes with different operating characteristics, with West Farms having lower overall average speeds, which is reflected in the small difference in average fuel usage.

Figure 4-1 Fuel Consumption by Bus Technology



Source: (Barnitt & Chandler, 2006)

4.1.4 Image

The circulator service should have a unique look that is different from typical buses and distinguishes itself from RTS service in terms of branding and vehicle appearance, based on concerns from the Downtown Workforce Transportation Survey regarding safety and reliability of existing RTS bus service. A unique, modern style can invoke curiosity and attract riders to the service. Stops should also be easily identified through branding.

4.1.5 Long-term Flexibility

While the cost and timing of the project make fixed-guideway service (such as a street car or light rail) impractical in the near term, it is important that the Center City Circulator service lay the groundwork for a potential future system. For each of the routes, the report provides comment and insight on the potential suitability for a fixed-guideway system. As background to this discussion, additional detail on the relative merits of bus and fixed-guideway systems is discussed below.

In addition to the possible future conversion of the system to street car or light rail, the project could also be seen as a pilot project for the creation of future high-frequency service to planned transit nodes outside the downtown as well as to high-demand areas, such as service between UR, or RIT and the downtown.

4.2 Discussion of Vehicle Technology

The capital costs for a bus system are much lower than those of a fixed-guideway system. Circulator buses typically run on existing roads which in most cases requires no new investment. The vehicles cost $400,000 to $500,000 on average for hybrid diesel buses, and stops would require minimal costs for signage and amenities such as benches or shelters, particularly if the stops are co-located with RTS stops. The lead time for a bus purchase is typically about one year. Depending upon the operator, there may be a need to acquire or expand a maintenance facility to support the buses associated with the new service, though the current RTS expansion at the East Main Street facility would likely have sufficient room to accommodate circulator vehicles.

The costs for fixed-guideway systems, such as a streetcar, are substantially higher. In their recent feasibility studies for streetcars, Seattle and Minneapolis estimated the infrastructure costs to be $20-$30 million per mile of track. This includes tracks, overhead catenary wires, signals, electric substations, utility relocation work, platforms, and soft costs. In addition, vehicles are $2.5-$3 million each. Moreover, a maintenance facility would need to be constructed, preferably very close to the service area to avoid high capital costs associated with a distant location. Colorado Springs performed a streetcar feasibility study in 2010 which estimated that the maintenance facility would need to be 2 to 5 acres in size. A Seattle feasibility study, completed in 2004, estimated the costs of a maintenance facility to be $2.6 million. For full-sized fixed-guideway projects, the project cycle is typically a decade or longer.

There are several advantages of streetcars including:

- **Ability to catalyze development.** Many streetcar systems see significant investment and development around their lines which is often credited to the system. Portland, Oregon estimated about $3 billion in investment around its streetcar lines. It is difficult to parse out how much of this investment is directly attributable to the streetcar system, however there does seem to be at least some stimulation of development. Also, several studies have shown an increase in property values in the vicinity of rail stations.

- **Ability to attract more riders and more varied riders.** Streetcars usually attract 15-50 percent more riders than bus systems. Streetcars may attract more “choice” riders and a greater diversity of trip purposes, whether for work, tourism, or discretionary purposes, as there is often a general preference for rail and an inherent perception of rail as a cleaner, safer, and/or more efficient technology. Indeed, there were several comments in the Downtown Workforce Transportation Survey expressing the desire for non-bus circulator options. Further, streetcars may attract new riders who otherwise would not take public transportation.

However, there are several disadvantages to streetcars as well:

- **Visual impacts.** Streetcars must have catenary (overhead) wire systems to operate which may be considered unsightly to some (though there are examples of good aesthetic design). There must also be frequent poles to support the wires. Stations may require more elaborate design and/or infrastructure, such as platforms and shelters. (There are options for in-ground power provision, but these are typically avoided in northern climates as they can be clogged with snow and ice.)

- **Cost.** As previously discussed, the initial capital costs are significantly higher than bus systems. This is also true of operating costs. Operating costs for streetcars are generally 35-50 percent higher than bus operating costs, running from $130 to $200 per vehicle revenue hour, though the cost per passenger may be lower due to increased capacity and ridership.

- **Flexibility.** As downtowns grow and evolve, there is frequent redevelopment that occurs. A streetcar system cannot be shifted to adapt to changing downtown land uses and densities as easily or inexpensively as a bus system.

- **Maintenance Facilities.** Maintenance facilities for streetcars must be constructed adjacent to the service area because of the significant capital costs that would be required to reach a distant maintenance facility. Although it is important for all systems to minimize deadhead time to and from maintenance/storage facilities, this is much less problematic for buses.

- **Pedestrian and Bicycle Impacts.** Streetcars are often credited with improving pedestrian areas and encouraging walking, but there can be conflicts, particularly with bicycles crossing the tracks. It is important for bicyclists to cross tracks at close to a 90-degree angle to minimize the risk of a crash from getting a wheel caught in the track bed.

4.3 Service Alternatives

The service alternatives were developed based on the desire to provide circulator access to parking facilities, major employment destinations, and retail/entertainment destinations. For this analysis, circulator routes were assumed to run all day, not just during peak commuting hours. Routes would operate in the directions indicated on the accompanying figure. Evening service headways of up to twenty minutes were utilized as well. Once a final option is recommended, a cost sensitivity analysis should be performed to show the effects of reducing/eliminating mid-day service for the circulator route(s) and/or running multiple evening circulators to reduce headways. The cost assumptions are based on RGRTA's all-inclusive average hourly cost of RTS service of $119 per hour. Additional details on the assumptions used to develop costs for the circulator options are given in **Appendix D.** Capital costs associated with the purchase of the vehicles and any supporting infrastructure, such as a maintenance facility, are discussed in the following section and are not included in the costs presented below. The five circulator alternatives are given in decreasing order of capital and operating costs.

4.3.1 Circulator Option 1

Circulator Option 1 has the greatest coverage, but requires three routes and five buses. Route 1a (shown in blue) is primarily a parking circulator, connecting conceptual perimeter parking locations with recognized parking "hotspots" in the core of downtown (i.e., Four Corners and Midtown). The more linear nature of Route 1a also makes it an attractive candidate for future conversion to a fixed-guideway system if ridership demand is commensurate. Routes 1b and 1c serve, respectively, as west and east circulator routes, connecting Frontier Field, Amtrak and Greyhound Stations, and several parking locations with most employment, retail, and entertainment destinations within the study area. Route 1c would continue in the evenings using two buses and a potential route deviation as shown on Figure 4-2. While the nighttime headway of 18 minutes for route 1c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 9 minutes. For visitors or anyone unfamiliar with this circulator option, the complexity of this system could make it difficult to use. The annual operating cost is roughly $2.3 million.

Table 4-1 Circulator Option 1 Costing

	1a West (Day)	**1a East (Day)**	**1b (Day)**	**1c (Day)**	**1c (Night)**
Number of Buses	1	1	1	2	1
Headway (minutes)	8	8	15	10	18
Revenue Miles (per day)	120	120	120	240	80
Revenue Hours (per day)	12	12	12	24	8
Cost (per day)	$1,428	$1,428	$1,428	$2,856	$952
Total Cost (per day)	$8,092				
Total Annual Cost	$2,296,700				

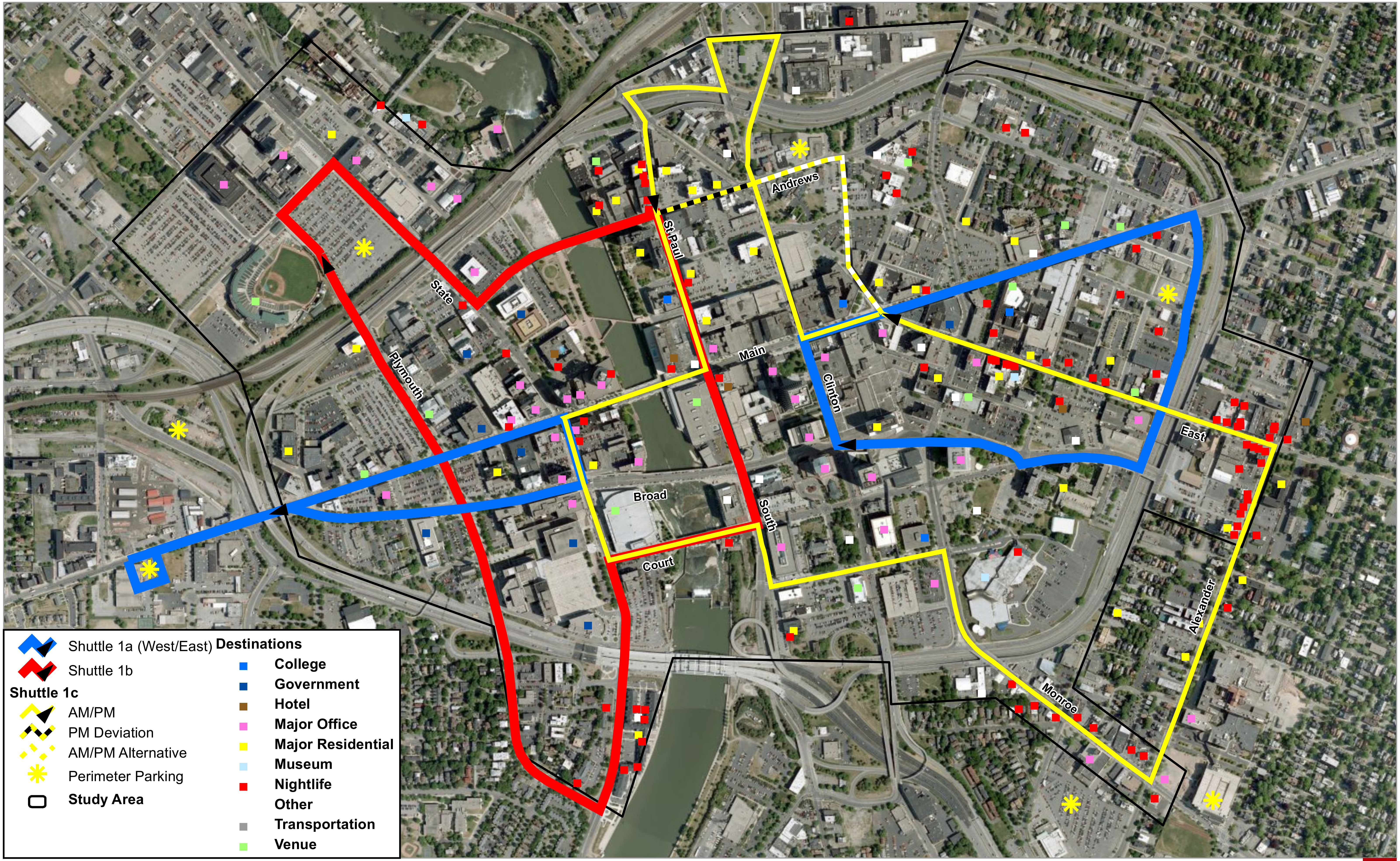


Figure 4-2 Circulator Option 1

ROCHESTER DOWNTOWN CIRCULATOR

March 2011

MARTIN ALEXIOU BRYSON

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4.3.2 Circulator Option 2

Circulator Option 2 has a very similar coverage area to Circulator Option 1, but has only two routes and four buses, no longer utilizing a dedicated east/west parking circulator route. Circulator Option 2 has the benefit of providing all-day service to perimeter parking lots, where other circulator options might restrict service to remote parking to peak commuting hours only to reduce operating costs. However, with no east-west route, certain trips within Downtown could be prohibitively difficult. Route 2a (shown in green) acts as a western circulator route, serving perimeter parking, Frontier Field, Corn Hill, Four Corners, St. Paul Quarter, the Cascade District, High Falls, and the Convention Center district. Route 2a (shown in blue) acts as an eastern circulator route, serving perimeter parking, the Amtrak and Greyhound Stations, the Convention Center district, Main/Clinton, East End, Monroe/Alexander, Manhattan Square, Washington Square, St. Paul Quarter, St. Joseph's Park, and Grove Place. Route 2c would run in the evenings using one bus with 17 minute headways. While the nighttime headway of 17 minutes for route 2c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 8 minutes. The annual operating cost is roughly $1.9 million. This system is shown on Figure 4-3.

Table 4-2 Circulator Option 2 Costing

	2a (Day)	2b (Day)	2c (Night)
Number of Buses	2	2	1
Headway (minutes)	10	11	17
Revenue Miles (per day)	240	400	80
Revenue Hours (per day)	24	40	8
Cost (per day)	$2,856	$2,856	$952
Total Cost (per day)	$6,664		
Total Annual Cost	$1,939,700		

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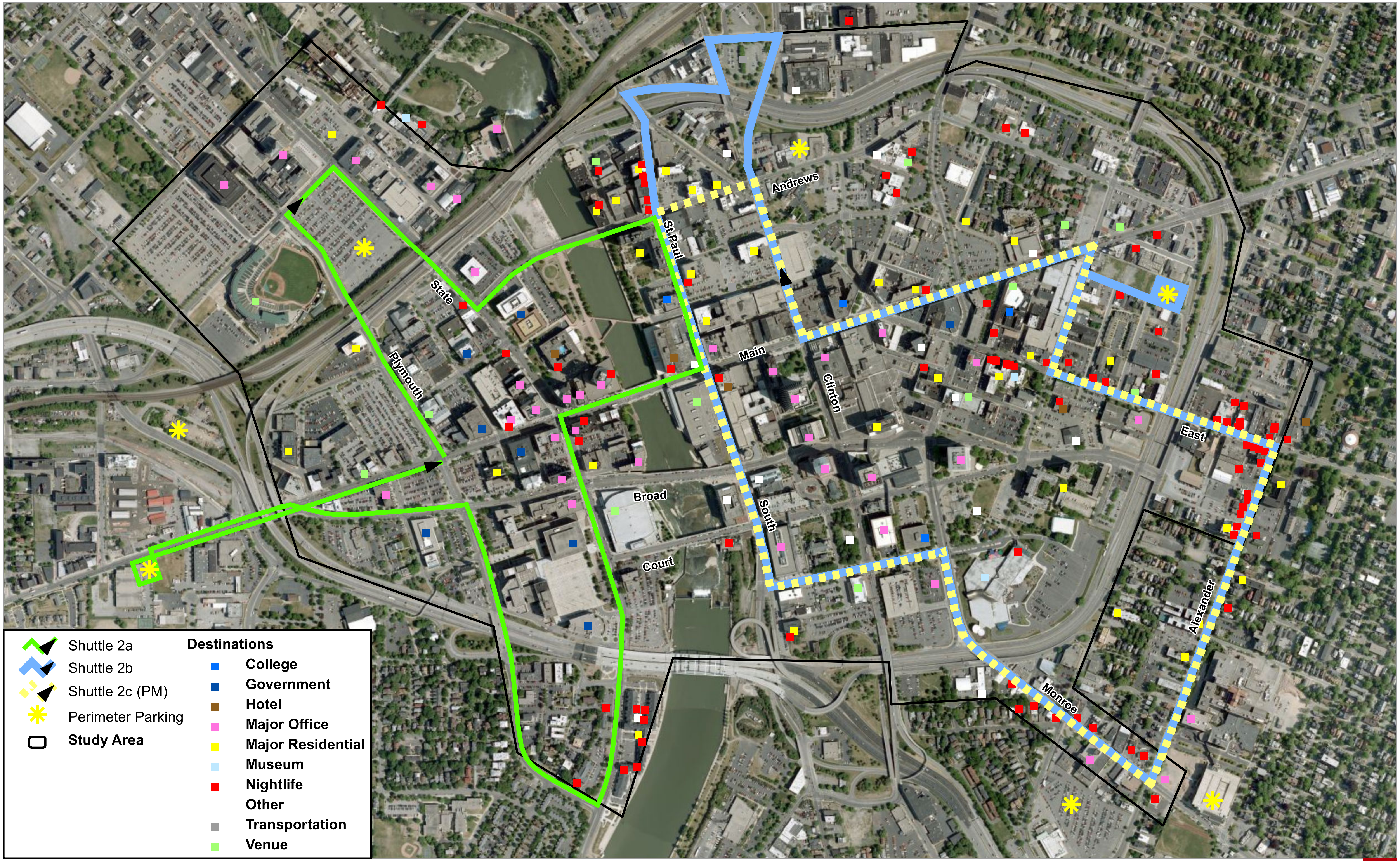

Figure 4-3 Circulator Option 2

ROCHESTER DOWNTOWN CIRCULATOR

March 2011

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4.3.3 Circulator Option 3

Circulator Option 3 is comprised of two A.M. routes and one P.M route, utilizing four buses total. The two A.M. routes roughly form an X pattern, with an east/west and a northwest/southeast route. While the coverage area is not as good as Circulator Option 2, Circulator Option 3 is easier for the user to comprehend and the more linear nature allows for denser coverage, which provides the users with more options for boarding/alighting. Route 3c would run in the evenings using one bus with 17 minute headways. While the nighttime headway of 17 minutes for route 3c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 8 minutes. Circulator Option 3 provides simple and convenient access to most key destinations in Downtown. However, for those unfamiliar with the system, there could be some confusion, particularly with the nighttime route change. The annual operating cost is roughly $1.9 million. This system is shown on Figure 4-4.

Table 4-3 Circulator Option 3 Costing

	3a (Day)	**3b (Day)**	**3c (Night)**
Number of Buses	2	2	1
Headway (minutes)	10	12	17
Revenue Miles (per day)	240	400	80
Revenue Hours (per day)	24	40	8
Cost (per day)	$2,856	$2,856	$952
Total Cost (per day)	$6,664		
Total Annual Cost	$1,939,700		

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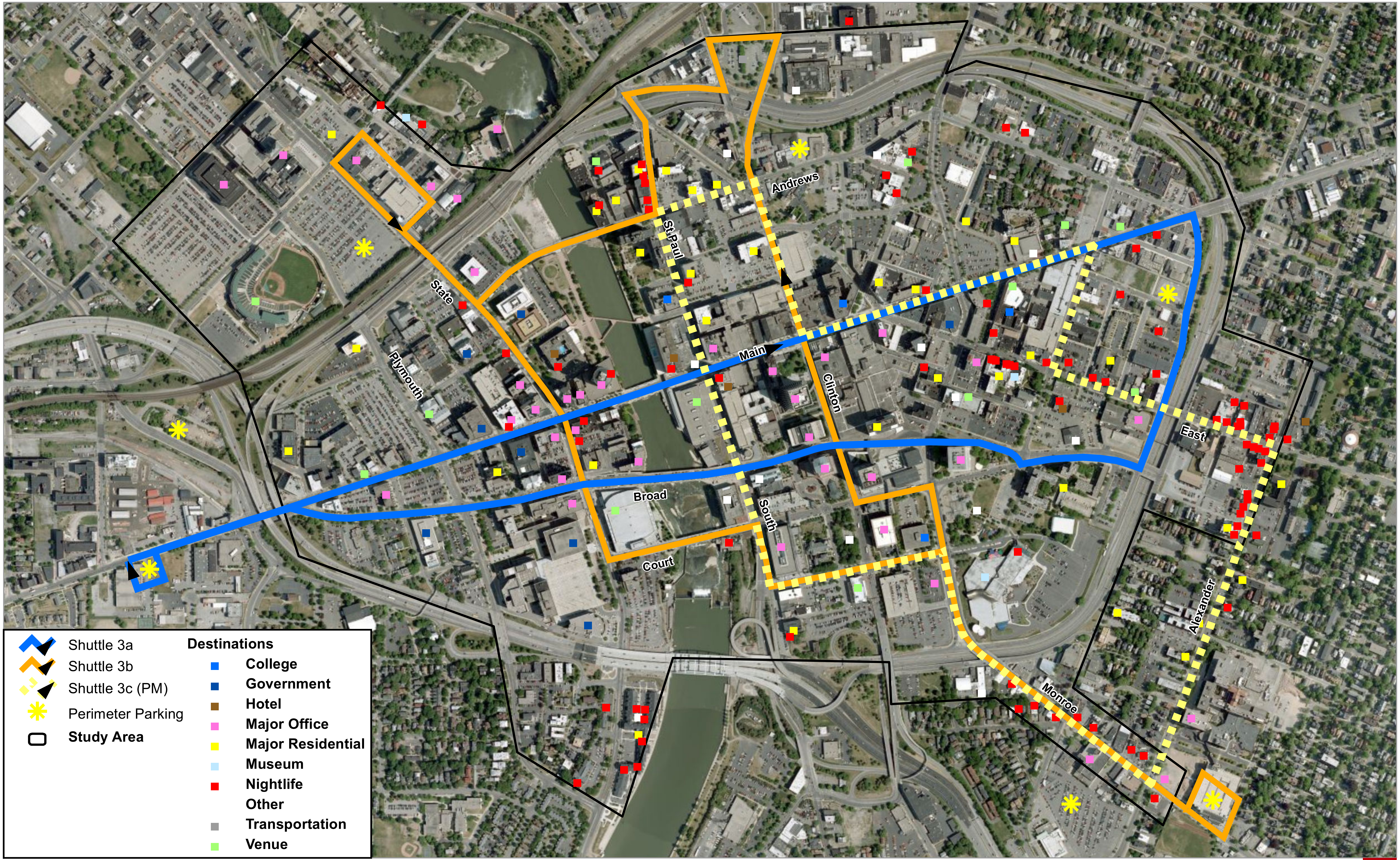

Figure 4-4 Circulator Option 3

ROCHESTER DOWNTOWN CIRCULATOR

MARTIN ALEXIOU BRYSON

March 2011

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4.3.4 Circulator Option 4

Circulator Option 4 is comprised of two small circulator routes with short enough run times to require only one bus each, translating to significant capital and operations cost savings. This option would utilize several RTS routes (namely 2, 4, and 8) that run along the Main Street east-west spine of downtown to serve destinations in and around the Cascade District and perimeter parking to the west. These three RTS routes could be made fare-free on Main Street from Canal Street on the west to Pitkin Street on the east. The routes could include additional signage/branding to designate them as part of the circulator system. The RTS route timing would need to be adjusted to minimize "bunching" and standardize headways within the fare-free zone. The use of RTS buses as parking circulators could be less convenient for commuters, but would likely have minimal effects on non-commuters that are well-served by routes 4a and 4b. Only route 4b would continue to run in the evenings, using one bus with 13 minute headways. The annual operating cost is roughly $1.2 million, which does not include any operating costs associated with RTS buses, establishing a fare-free zone, or signage/branding for RTS buses. This system is shown on Figure 4-5.

Table 4-4 Circulator Option 4 Costing

	4a (Day)	**4b (Day/Night)**
Number of Buses	1	1
Headway (minutes)	15	13
Revenue Miles (per day)	120	200
Revenue Hours (per day)	12	20
Cost (per day)	$1,428	$2,380
Total Cost (per day)	$3,808	
Total Annual Cost	$1,225,700	

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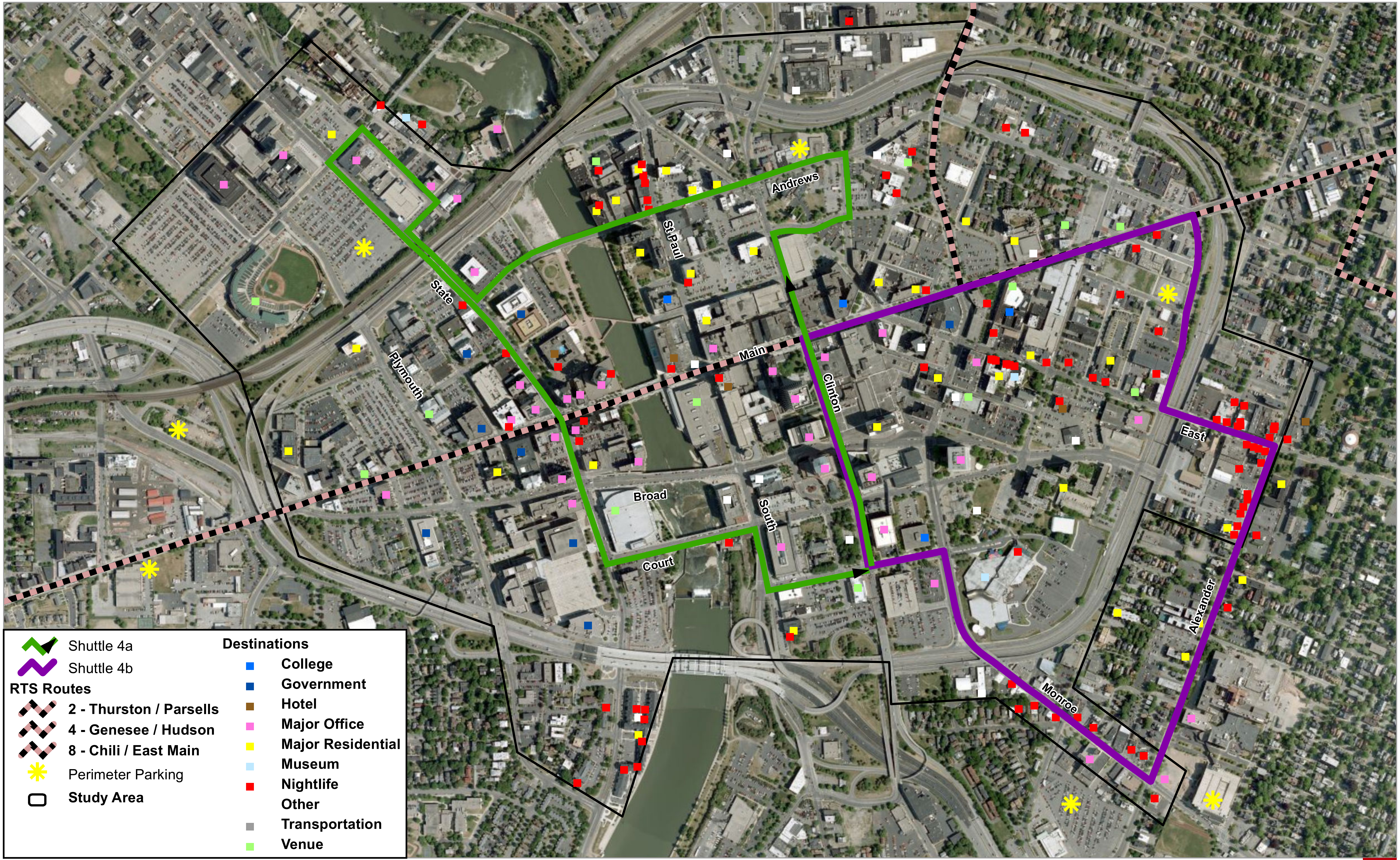

Figure 4-5 Circulator Option 4

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4.3.5 Circulator Option 5

Circulator Option 5 is comprised of a small route with a short enough run time to require only one bus, requiring the lowest capital and operations costs of any circulator option. This option would rely heavily on multiple RTS routes, as shown on Figure 7. RTS routes could include additional signage/branding to designate them as part of the circulator system. RTS routes serving the same destinations could be given the same route color so users aren't required to look for multiple route numbers. Variable headways on the RTS routes could be a detractor for commuters. Thus, the RTS route timing should be adjusted to minimize "bunching" and standardize headways within the fare-free zone. Some conceptual perimeter parking locations, such as the eastern lot on Charlotte Street, would not be directly served, as they are in other options. Overall, the use of RTS buses as parking circulators would be less convenient for commuters, but would likely have lesser negative effects on non-commuters that would primarily use Circulator Option 5. The annual operating cost is roughly $0.7 million, which does not include any operating costs associated with RTS buses, establishing a fare-free zone, or signage/branding for RTS buses. This estimate also does not account for the potential need to increase capacity on existing RTS routes within the free-fare zone. This system is shown on Figure 4-6.

Table 4.5 Circulator Option 5 Costing

	5 (Day/Night)
Number of Buses	1
Headway (minutes)	14
Revenue Miles (per day)	200
Revenue Hours (per day)	20
Cost (per day)	$2,380
Total Cost (per day)	$2,380
Total Annual Cost	$731,850

4.3.6 Summary of Service Alternatives

Each of the alternatives was evaluated with respect to the service goals laid out by the PAC. This includes route frequency, cost, service coverage and ease of use. The key districts and destinations are based on the districts identified by the RDDC, as well as additional key parking and transportation facilities. The service alternatives are summarized below in Table 4-6.

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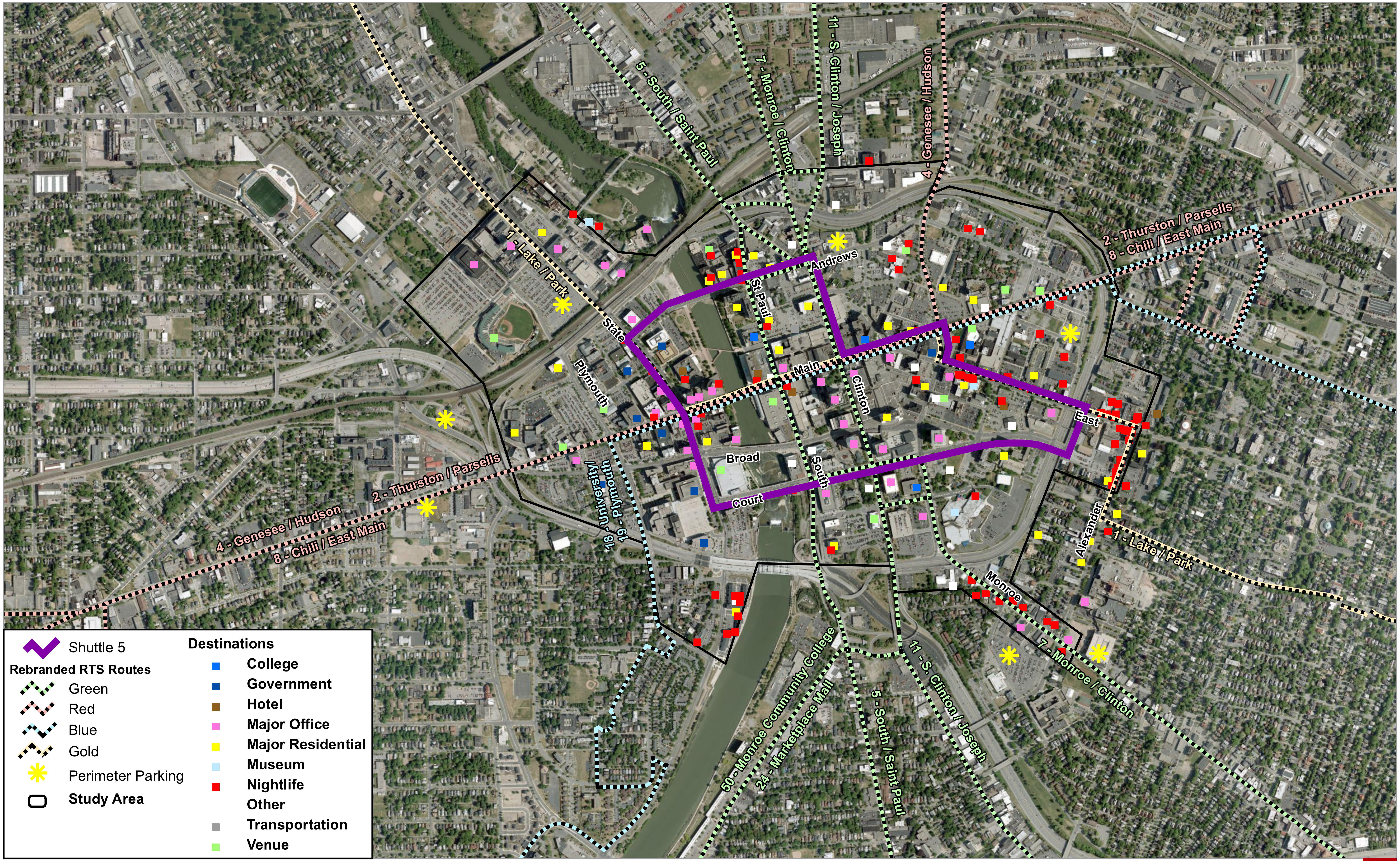

Figure 4-6 Circulator Option 5

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Route	Route 1a West (AM) [3]	Route 1a East (AM)	Route 1b (AM)	Route 1c (AM)	Route 1c (PM) [4]	Route 2a (AM)	Route 2b (AM)	Route 2c (PM)	Route 3a (AM)	Route 3b (AM)	Route 3c (PM)	Route 4a (AM)	Route 4b (AM/PM)	RTS Routes (2,4, 8)	Route 5 (AM/PM)	RTS Routes (Multiple)
Time Estimate (Minutes)	8	8	15	21	18	20	22	17	19	22	17	15	13		14	
Number of Buses [1]	1	1	1	2	1	2	2	1	2	2	1	1	1		1	
Buses Required	5					4			4			2			1	
Headway (Minutes)	8	8	15	10	18	10	11	17	10	11	17	15	13		14	
Annual Cost [2]	$2,296,700					$1,939,700			$1,939,700			$1,225,700			$731,850	
Key Districts/Destinations Served																
Perimeter Parking (West Main)	Green					Green			Green					Green		Green
Perimeter Parking (Charlotte St)		Green					Green		Green				Green			
Cascade	Green		Green			Green			Green					Green		Green
Amtrak/Greyhound				Green			Green			Green						Green
Mortimer Street Future Hub			Green	Green	Green	Green	Green	Green		Green	Green	Green			Green	Green
Kodak/High Falls			Green			Green				Green		Green				Green
Four Corners Intersection	Green			Green	Green	Green			Green	Green		Green		Green	Green	Green
Convention			Green	Green	Green	Green	Green	Green	Green	Green	Green			Green		Green
Main/Clinton		Green		Green	Green		Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Corn Hill			Green			Green										Green
Manhattan Square		Green		Green	Green		Green	Green	Green	Green	Green		Green		Green	Green
St. Paul Quarter			Green	Green	Green	Green	Green	Green		Green	Green	Green			Green	Green
St. Joseph's Park				Green	Green		Green	Green		Green	Green	Green			Green	Green
East End		Green		Green	Green		Green	Green	Green		Green		Green		Green	Green
Alexander Park				Green	Green		Green	Green		Green	Green		Green			Green
Grove Place		Green					Green	Green	Green		Green		Green	Green	Green	Green
Washington Square			Green	Green	Green		Green	Green	Green	Green	Green	Green	Green		Green	Green
% of Key Districts/Destinations Served	100%					100%			94%			88%			94%	
Simplicity and Ease of Use (Commuter)	Green	Green	Green	Green	Green	Yellow			Green	Green	Green	Yellow			Red	
Simplicity and Ease of Use (Visitors)	Red	Red	Red	Red	Red	Yellow			Yellow	Yellow	Yellow	Yellow			Green	
Pros/Cons:	While most expensive in terms of capital and operations costs, shuttle option 1 offers the best coverage area and service to all key destinations. For commuters, perimeter and interior parking is well connected to employment destinations. However, for visitors to downtown, deciding which of the shuttles to take and where to board could be difficult.					Shuttle option 2 is less expensive than shuttle option 1, but no longer has a route serving the east-west spine of downtown. Visitors to downtown should be able to familiarize themselves with the two routes fairly quickly.			Shuttle option 3 has the same cost as shuttle option 2. It offers a fairly straightforward east/west and north/south route structure that serves all destinations, with the exception of Corn Hill. The PM route change could be confusing to visitors of downtown.			Shuttle option 4 requires only two buses, which significantly reduces capital and operations costs from shuttle options 1, 2, and 3. The coverage area and destinations served are somewhat sacrificed, but the route run-times are relatively short. Commuters using perimeter parking to the west of downtown would have to rely on RTS routes as shuttles into the downtown core. The RTS routes 2, 4, and 8 could be branded as circulator routes in addition to RTS routes and could be fare-free within downtown. While the headways are fairly frequent, they are somewhat sporadic which could be a detractor for commuters looking for consistent headways.			Shuttle option 5 relies heavily on existing RTS routes to cover much of the downtown perimeter For visitors to downtown, the route 5 circulator would suffice as a circulator in and of itself and is very straightforward. For commuters looking to access parking facilities or destinations on the perimeter of downtown, the reliance on RTS routes could be a challenge. Sporadic headways on the RTS routes could be a detractor for commuters and the issue of fare and branding could be overly complicated.	

Notes:

1 Recommended number to achieve 10-15 minute headways during the day and less than 20 minutes at night

2 Assumes 6:30 AM to 2:30 AM service. Based on NTD, RTS service costs $119 per hour to operate.

3 6:30 AM to 6:30 PM

4 6:30 PM to 2:30 AM

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4.4 Service Operator

The circulator service could be directly operated by RTS/RGRTA or contracted to a private transportation provider. RTS operation would benefit from shared resources, such as facilities, maintenance tasks (e.g. clearing of snow), and personnel. RTS operation could also provide more flexibility in terms of number of buses and total capacity for special events or periodic fluctuations in demand. Purchased operation would provide the benefit of fixed, predictable costs and less financial risk. Most private-operator contracts include service standards and other provisions to guarantee high levels of service and customer satisfaction in a way not possible with public operators – though there is typically a price premium associated. For example, the R-Line in downtown Raleigh, NC operates under the local transportation authority, Capital Area Transit, which has an operating contract with a private operator. At an estimated $80 per service hour, the R-Line is more costly to operate than most of the peer systems reviewed, though the cost per rider is the lowest.

If a private operator is selected to operate the service, assuming the federal dollars are available, it would likely be much more cost-effective to have the RGRTA own (and likely maintain) the buses. While the City and other quasi-governmental agencies can theoretically receive federal funding to support transit vehicle purchases, as the RGRTA is the designated provider for the area, funneling funds to another entity would be very complicated. RGRTA will consider these alternatives and their effect fleet size and personnel prior to making a final decision.

4.5 Assessment of Operations

4.5.1 Schedule

The service hours for a circulator system should be tailored to suit the desired goals of the system. The highest level of ridership can typically be expected during the morning and afternoon commuting hours, mid-day during lunch hours, evenings during dinner hours, and the late evening on weekends during “nightlife” hours.

Based on the City of Rochester’s desire to provide circulator access to parking facilities, major employment destinations, and retail/entertainment destinations, service should commence no later than 7 A.M. and run until at least 10 P.M. Peer systems with the goal of serving more than commuters all run until at least 10 P.M, with the exception of West Palm Beach which runs from 11 A.M. until 9 P.M. and is designed to serve from “lunch until dinner.” Initial service hours should be as extensive as is financially feasible in order to best promote awareness and use of the new service. Once the service has been in operation for some time, service hours could be expanded or reduced based upon user surveys and ridership data.

4.5.2 System Costs

Capital Costs

Depending on the technology used, each bus could cost up to $500,000. Depending upon the alternative selected, this would translate into initial vehicle costs of up to $2.5 million, excluding any spare vehicles. Normally, at least one extra vehicle would be required as a spare. Up to 80 percent of the cost of rolling stock can be acquired from the Federal Transit Administration under Section 5307 or 5309 grant funds. The most likely source of 5309 funds are bus grants, though these allocations have historically been made entirely by earmark. Other Section 5309 funds could be attained competitively (as part of the New Starts process), however the service standards for such systems include additional infrastructure investments – such as substantial stations and signal priority – that extend beyond the initial vision for the circulator. If federal funds are available, the state will typically contribute ten percent of the project cost, leaving the remaining ten percent to be covered by a mix of funds from local government, private entities, and non-profit agencies. Depending upon the number of additional vehicles and their maintenance requirements, the project may incur additional capital costs for any additional maintenance and storage facility requirements. These infrastructure upgrades are typically eligible for 80 percent federal funding, as well, under 5307 and 5309 grants.

If a private operator is selected to run and maintain the system, it is also possible that it would be responsible for procuring vehicles and a maintenance facility. These costs are then typically rolled into the charge per service hour and diminish for longer contract terms (as the contractor is able to amortize the cost over a longer period, up to the useful life of the vehicle).

Operating and Maintenance Costs

The use of hybrid electric bus technology can significantly reduce fuel costs, particularly at low speeds, consistent with downtown circulator routes (*see* ***Vehicle***). Many cities have found hybrid buses to be more reliable and have lower maintenance requirements than conventional diesel buses, though initial maintenance costs associated with training and inefficiency from the “learning curve” may be much higher.

Based on data from RGRTA, RTS service costs $119 per hour to operate and maintain. As such, operations and maintenance costs estimates for the analysis included in this report assumed an operating cost of $119 per hour, though actual costs could be lower given potential administrative efficiencies, state operating support and fuel savings if hybrid vehicles are used. The cost per service hour for the peer systems studied ranged from $50 to $80. However, the typical range is from $65 to $90. The estimates of operating costs for each circulator option are based on moderate ridership demand. A typical 40-foot transit bus can transport about 65 passengers at full load; at seven trips per hour, one circulator bus could transport approximately 455 passengers per hour. If high demand for perimeter parking circulators is experienced, then there would be additional costs necessary to cover the additional runs needed to achieve higher frequencies. These additional trips would also likely require additional vehicles unless the operator had spares regularly available for use on the service.

Service operated by the RGRTA could also be eligible for state operating assistance (STOA). Current rates are $0.405 per passenger and $0.69 per vehicle mile. A local match equal to the amount of state assistance is required. In the case of fare-free service, in order to collect the per-passenger assistance, an additional local match would be necessary in the amount of at least 30 cents per rider. Private operators may be eligible for STOA.

Marketing and Branding Costs

There will be one-time costs associated with the development of a logo and marketing campaign. Assuming the initial vehicles are new, the vehicle branding and styling will be included as part of the vehicle charges.

Initial marketing costs will vary with the extent of the campaign. The RDDC and local agencies should pursue in-kind donations to support these initial efforts and minimize ongoing marketing costs. If RTS is selected to operate the service, much of the oversight and development of these continuing campaigns could likely be rolled into ongoing operations. Unless the City or RDDC chooses to take on sole marketing and branding responsibility, this cost would typically be rolled into the operating agreement (with RGRTA or a private operator).

In conjunction with downtown circulator service, it is not uncommon for cities or business districts to introduce “ambassadors” or other public awareness and assistance campaigns. These range from special websites and call-in numbers to the creation of a small staff who patrol the district or are stationed at key locations, providing assistance and reinforcing the “brand” of the district. In some cases, this can extend to assisting with daytime maintenance of circulators or otherwise aiding in efforts to improve perceived security on the vehicles and at the circulator stops. Such efforts are typically organized and operated largely independently of transit operations. In Downtown Rochester, the circulator “ambassador” service could be an extension of the existing Downtown Special Services’ “Red Shirts” program.

4.5.3 Funding Strategy

Operating costs for the circulator service could be funded through a number of sources, but it is important to have a reliable and dedicated source of funding to ensure continuity and reliability of service. A tiered parking fee structure could be implemented, with the highest parking fees in the areas with the highest demand and nominal or no parking fees for perimeter parking. The additional “incremental” parking fees could be used to finance some of the circulator operating costs without displacing existing parking funds, while encouraging more commuters to take advantage of the circulators. The City of Rochester, the Rochester Downtown Development Corporation (RDDC), or other local government and non-profit agencies could assist in funding the service. Advertising can provide some revenue, but would most likely be a minor contribution to overall operating costs.

Grants may be obtained from the Federal Transit Administration (FTA), particularly to cover capital costs associated with the system. The Rochester area has too large a population to make it eligible for FTA operating grants, though assistance from the state is possible. Federal money from the Congestion Mitigation and Air Quality (CMAQ) Improvement Program is distributed at the state level, and may be available for the circulator if potential emissions reductions attributable to the system are demonstrated. While the proposed system might be eligible for funding under one of the competitive Section 5309 federal grants, such as the recent Urban Circulator Systems or "State of Good Repair" programs, much of this money is allocated via Congressional earmark so successful lobbying may prove critical to ensuring federal monies. Additional stimulus-type legislation could create additional competitive funding opportunities; however there are no indications that such legislation is forthcoming. Section 5307 funds received by the RGRTA could be used for the project's capital costs as well. In all cases, the federal support will be no more than 80 percent of the project cost with remaining funds coming from local and/or state sources.

If the evening service is expanded to serve special events and area colleges, these private entities could contribute a share of the operating subsidy. If extra vehicles were required – and these costs were not rolled into the operating cost – they might also be expected to defray part of this cost.

4.5.4 Maintenance and Storage

If the circulator bus system operated under the RGRTA, the circulator buses could utilize RGRTA maintenance and storage facilities. RGRTA is in the midst of a major facilities expansion at its East Main Street campus, which should accommodate fleet expansion, if necessary.

4.5.5 Long-Term Expansion

While the proposed circulator system would primarily serve persons working in or visiting Downtown Rochester who have first driven there, the long term aspiration is to provide a more extensive system that would connect directly to residential neighborhoods or other key demand generators. There are two aspects of such a system which have been discussed by the PAC. First, there is interest in the possibility of a fixed-guideway system. This is generally envisioned as a downtown streetcar or light rail line that would stretch beyond the Inner Loop, with potential future connections to suburban locations. Rather than circulate through the downtown, it would likely bisect it linearly along Main Street, State Street or Clinton Avenue. This service would likely be commuter and fare-driven though there are many examples of fare-free zones in city centers. If the system does not extend beyond the CBD, though, it is unlikely it will be fare-free as the costs will be substantial enough that some cost recovery will be necessary.

Route 3a provides coverage similar to what an east-west oriented line traveling down Main Street would provide. Route 3b provides coverage similar to what a north-south oriented line would provide if it were to leave north along State Street, cross the river and continue south along Clinton Avenue or Monroe Avenue. Route 1b provides coverage similar to that of a line that followed State Street without crossing the river. Option 4 provides a system that would most likely represent the future circulator system were the RTS routes along Main Street upgraded to a fixed-guideway system.

The second aspect of system expansion revolves around better capturing the evening and weekend demand. Such service would likely be express to high demand generators such as the University of Rochester and RIT, but could also include service to park and ride lots or suburban activity centers. The service would be similarly branded as the downtown circulator service using similar vehicles. Routes serving universities would likely need to be funded primarily by the institutions. Routes to other areas could charge a fare, but it would need to be low enough to be competitive with evening parking rates Downtown. As economic development tools, such routes would likely, at least initially, need support from the RDDC, the City or other entities. It would also be critical to ensure that the service not dilute the brand that has been established for the Downtown circulator, particularly if it has different operating characteristics. It would also be important to ensure that the bus and the patrons remained orderly and safe, not acting as a “bar bus”.

4.6 Assessment of Benefits to Parking System

Based on the stated preference data from the Workforce Transportation Survey, elasticities of demand for garage/parking lot price, circulator price, circulator travel time, and circulator frequency were calculated for the following four options: drive and park at current location, drive and park at a peripheral lot and take a circulator bus, take an RTS bus, or use alternative modes (e.g. walk, bike, get dropped off).

The study determined that circulator demand is most affected by the price of the circulator (including circulator parking and fare), with an elasticity of -60 percent (i.e., a 100 percent increase in parking/fare results in a 60 percent decrease in circulator ridership). The second biggest effect on circulator demand is the price of current parking, with an elasticity of 30 percent. As such, the price to park in garages/lots with limited capacity could be increased to incentivize use of peripheral circulator parking. In this way, a tiered parking rate structure could be developed based on known demand and capacity of parking lots and garages from the Comprehensive Downtown Parking Study (2008) by Walker Parking Consultants. The third greatest effect on circulator demand is circulator travel time, with an elasticity of -20 percent. Thus, parking circulator routes should be as short and direct as possible, while still adequately serving primary destinations.

The data from the survey was used to create a parking mode-choice model as part of the first phase of the project. The model was calibrated to the results of the 2000 Census Transportation Planning Package (CTPP) for the City of Rochester. CTPP provides information on worker-flows between home and work. Additionally, the results of this survey were weighted by parking location obtained from the Comprehensive Downtown Parking Study. The model inputs include CBD parking fee, circulator lot parking cost (including circulator fare if applicable), circulator time (average time from circulator lot to employer), additional circulator in-vehicle travel time (IVTT) (average additional travel time to access perimeter circulator lot), RTS in-vehicle travel time (average additional travel time incurred taking RTS versus driving and parking in CBD), and circulator frequency (circulator trips per hour).

As part of this study, the model was used to conduct a sensitivity analysis for public parking demand and associated annual revenue. The variables for additional circulator in-vehicle travel time (IVTT), RTS IVTT, and circulator frequency were held constant at four, ten, and ten minutes, respectively. Parking demand and total annual revenue estimates from public parking fees for each scenario are given in Table 7. The table is meant to show general shifts in annual public parking revenue with the introduction of a parking circulator service in Downtown Rochester, as CBD public parking cost, circulator parking cost, and circulator time are varied.

To establish the baseline conditions, the 2000 CTPP was used to determine the number of commuters to the Rochester CBD (approximately 19,200); this is the same dataset that was used to calibrate the parking mode-choice model. As a baseline for the peak public (versus private) parking occupancy, the number of drive alone commuters (15,400) was multiplied by the proportion of peak occupied public parking spaces as reported in the Comprehensive Downtown Parking Study (67.6 percent). The average existing CBD peak public parking usage was thus calculated to be approximately 10,400, which is consistent with the peak parking inventory determined as part of the Comprehensive Downtown Parking Study. Annual parking revenue was estimated using an average daily parking cost of $4.73 (from the Comprehensive Downtown Parking Study) and 240 annual business days. Additionally, as the model predicts a different mode split by season, the annual total reflects this seasonal variation by calculating the mode split for each of the four seasons and assuming that each represents one quarter of the total annual revenue. It should be noted that as the mode split shifts with each scenario, the total number of parkers may go up or down. Also, while the City has increased parking rates since the survey was conducted, the analysis is based on previous pricing for consistency with the survey. However, for comparison purposes, the sensitivity analysis shown here adequately demonstrates the effects of the various demand elasticities.

As the table shows, low parking fees in the CBD and at remote parking will likely result in a net decrease in parking revenues. A noticeable increase in the CBD parking fees, coupled with a modest fee for remote parking could result in a positive revenue stream that could be used to cover some costs associated with circulator operations. For example, increasing CBD parking by $2.00 to $6.73 and charging $2.00 for perimeter circulator parking with a direct circulator that takes only 7 minutes to transport passengers would increase annual revenue from public parking fees over $800,000 compared to the baseline scenario with no circulator. On the other hand, a nominal perimeter parking fee of $0.50 per day, with all other factors unchanged, would incentivize use of the parking circulator while decreasing revenue from perimeter parking: annual public parking revenue would decrease $1.3 million compared to the baseline scenario. Thus, changing the cost of perimeter circulator parking by $1.50 per day, while holding every other factor constant, could affect annual revenue from public parking by more than $2.1 million.

It is important to note that while the model was carefully constructed to be as accurate as possible given the available data, it is based on stated preference data from survey respondents. There is always a difference between stated and revealed preference, and individuals are often more optimistic about behavior change than revealed by their actual behavior. Additionally, the majority of survey respondents indicated that they are satisfied with the current parking options in Downtown meaning that it will likely take price signals in addition to the introduction of a circulator service to shift parking habits. It will also likely take some time for employees to shift parking habits, and as such smaller numbers are likely at the outset of the circulator service. Additionally, this analysis assumes that all other factors are equal. There is currently increasing demand for parking downtown, with many core lots and garages full or nearly so. While this could lead to the ability to support higher prices over time there are also pressures to offer reduced rate parking in order to attract or retain businesses.

Table 4-7 Parking Circulator Sensitivity Analysis

	Average Daily Parking Fee (CBD)	Circulator Parking Fee	Circulator Time	Circulator Parking	CBD Public Parking	Total Annual Parking Revenue	Change from Baseline
Baseline (Current)	$4.73	N/A	N/A	N/A	10,399	$ 11,804,746	$ 0
No Parking Increase	$4.73	$0.50	7 Minutes	4,263	7,299	$ 8,278,243	$(3,526,503)
	$4.73	$0.50	15 Minutes	3,908	7,519	$ 8,361,753	$(3,442,993)
	$4.73	$2.00	7 Minutes	3,741	7,621	$ 9,970,265	$(1,834,482)
	$4.73	$2.00	15 Minutes	3,418	7,823	$ 10,042,886	$(1,761,861)
$2.00 Parking Increase	$6.73	$0.50	7 Minutes	4,682	6,750	$ 10,505,043	$(1,299,703)
	$6.73	$0.50	15 Minutes	4,309	6,982	$ 10,836,814	$(967,933)
	$6.73	$1.50	7 Minutes	4,310	6,979	$ 11,980,996	$ 176,249
	$6.73	$2.00	7 Minutes	4,132	7,090	$ 12,646,804	$ 842,057
	$6.73	$2.00	15 Minutes	3,788	7,306	$ 12,829,445	$ 1,024,698
$4.00 Parking Increase	$8.73	$0.50	7 Minutes	5,119	6,187	$ 12,319,380	$ 514,633
	$8.73	$0.50	15 Minutes	4,730	6,426	$ 12,769,230	$ 964,484
	$8.73	$2.00	7 Minutes	4,545	6,538	$ 14,784,822	$ 2,980,075
	$8.73	$2.00	15 Minutes	4,183	6,764	$ 15,080,279	$ 3,275,533

4.7 Conclusions and Next Steps

This study examined several alternatives for developing a commuter and visitor circulator system in Downtown Rochester. While all five options are viable, overall, Circulator Options 2 and 3 generally provide the best balance of serving commuters and visitors. Based on technical merit alone Option 2 generally provides the best balance of serving commuters and visitors in both day and nighttime, particularly given its ability to easily convert from daytime to nighttime operations with minimal change in route structure. Option 3 provides superior service to commuters at the expense of some ease of use for visitors. If the ability to serve visitors is deemed financially impossible in the short-term, Route 3a provides the best commuter service while still maintaining some usefulness for daytime circulation within the CBD.

In general, the community response to the concept of a circulator service was well received. There appeared to be a slight preference towards Option 3 because it offers an east-west connection and reflects an often discussed alignment of a potential fixed guideway system. However, the lack of connection to Corn Hill was noted as a disadvantage of Option 3.

While many in the community were highly positive about the concept of opening up remote parking for use by visitors and employees downtown, there were many questions about the location and size of this parking. While such details are beyond the scope of this study, it will be an important early step to identify the size and funding sources for such facilities. Also, it will be important to understand how this demand may be affected if one or more new garages were to be constructed within the CBD.

Circulator operating costs would likely be close to $2 million per year, though this may go down depending on the operator and whether the system qualifies for state subsidies. While the startup costs will vary with vehicle selection, branding campaign and maintenance requirements, initial costs, separate to the operating costs, in the range of $2-$3 million seem likely. Additionally, unless center-city parking rates are raised, the introduction of the circulator could result in a sizable decrease in parking revenue.

The following steps are recommended to progress the circulator service:

1. Select preferred alternative (Option 2 or 3)
2. Identify and progress development of new parking facilities
3. Establish metrics that would define a successful system
4. Estimate ridership of preferred system
5. Refine costs of RGRTA or private operation
6. Prepare funding plan
7. Select an operator

Reference: Barnitt, R., & Chandler, K. (2006). *New York City Transit (NYCT) Hybrid (125 Order) and CNG Transit Buses: Final evaluation results.* Golden, CO: National Renewable Energy Laboratory.

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5.0 TRANSPORTATION DEMAND MANAGEMENT (TDM)

Transportation Demand Management (TDM) is a collection of strategies to reduce vehicle trips and encourage alternative modes. Effective TDM can save both employers and employees money while reducing parking demand.

The results of the Workforce Transportation Survey indicated that approximately 25% of downtown commuters would be willing to take public transit or carpool more frequently. An additional 14% indicated they would be willing to bike or walk more frequently. According to survey respondents, the most effective measures to encourage transit use and carpools include:

Top measures to promote transit:

- Guaranteed Ride Home
- More frequent service
- Real time arrival and departure information

Top measures to promote carpools:

- Guaranteed Ride Home
- More/better information on finding carpools

One of the critical components to a successful TDM program is marketing and promotion. Promotion of alternative modes of transportation will be supported by the web-based Regional Commuter Choice Program, being administered by the Genesee Transportation Council. This program, which should be operational this spring, will provide a ride-matching system along with functionality that enables individuals and organizations to estimate air pollution reductions and cost savings. It will also integrate bicycle routing and transit trip planning. This program addresses one of the top measures needed to promote carpool use.

The following is a list of recommended TDM measures for the City of Rochester. Some measures can be addressed by the City and others need to be implemented at the employer level. Implementation is addressed in Section 5.08.

5.1 Financial Incentives

Transportation Allowance – The results of the Workforce Transportation Survey indicate that 34% of employers currently subsidize parking but only 10% offer benefits for alternative travel modes. The intent of a transportation allowance is to provide employees with the same dollar amount currently used to subsidize parking and allow the employee to choose the transportation mode they will apply it to. This amount can be applied tax-free to transit or it can be added to an employee's taxable income if they choose to walk or bicycle to work, often referred to as "parking cash-out."

Pre-tax Allocation of Transportation Expenses – In 2011, employers can offer employees up to $230/month in pretax benefits for qualified transportation expenses including transit and vanpool expenses. Since 2009, there has also been the opportunity to get a $20/month bike benefit. Pretax allocation of transportation expenses is also convenient to the employees since it is automatically deducted from their paycheck.

5.2 Transit Incentives

Transit Subsidy – In addition to the pretax benefit, employers could offer an additional subsidy towards a monthly bus pass to promote transit use.
On-site bus pass sales/distribution – Employers should consider on-site bus pass sales or distribution to encourage transit use by making the purchase of bus passes convenient and accessible to all employees. As an alternative, employers could make a web-enabled computer available to all employees who wish to take advantage of bus pass purchase through the RGRTA e-store.
Modifications to Routes and Stops – Businesses should work with RTS to consider potential modifications to existing routes and stops to better serve the needs of employees and customers.
Provisions to Accommodate Bikes – All RTS buses can accommodate bicycles. Most buses are equipped with bicycle racks on the front of the bus. Currently, RTS buses can accommodate two bikes per bus, however, using a different type of rack, the buses could accommodate a third bike on each bus.

5.3 Carpool Incentives

Matching Services – To ensure a successful ride-share program, there is need to match potential riders. The Regional Commuter Choice Program will provide an on-line ride-matching system. It will provide functionality to allow employers or other groups to set up ‘portals’ so that individuals can match within their chosen subgroup only.
Preferred Parking – Providing convenient, reserved parking for car-pool vehicles provides an added incentive to use this mode of travel. Employers that provide their own private parking supply should provide a designated number of spaces for car-pool vehicles. Some spaces may also be reserved within public facilities although the vehicles would need to be registered to ensure compliance.
Reduced Rates – Car-pool vehicles should be offered reduced parking fees in both public and private facilities to encourage use.
Vanpools – Vanpools offer a higher capacity alternative to carpools and are particularly well-suited for longer distance travel. These programs are typically administered by the local transit agency or a TMA. They typically provide the vehicle, help organize the vanpool and will often provide startup subsidies, such as paying for empty seats, while the vanpool is getting started.

5.4 Bike/Walk Incentives

Bicycle Master Plan – The City should continue to implement the Bicycle Master Plan recommendations for improved infrastructure to enhance and promote bicycling in Rochester.
Bicycle Storage – Just like vehicle parking spaces, bicycle parking and storage at the destination is critical to encourage the use of bicycles. Businesses should work with their landlords to ensure that bicycle storage is provided at the building. If the installation of bike racks or lockers is not feasible, they should work with the landlord to ensure that bicycles are allowed in the building, elevators and suites so that riders may store bikes within their office.
Rewards Program – As an incentive to encourage bicycling and walking, employers should offer cash rewards or gift certificates to employees who log a designated number of miles. This

program also benefits employers who reap the rewards of having healthier employees with fewer sick days.

5.5 Back-up Programs

Guaranteed Ride Home – This program ensures that an employee who regularly uses alternative modes of transportation will have a safe and convenient ride home in the case of an emergency. Respondents to the Workforce Transportation Survey identified this as the top measure that is needed to encourage them to use transit or carpool more frequently. The RTS Employer Support Program provides this service for participating employees. Employers should consider expanding this program for all alternative modes of travel.
Occasional Parking Permits – This program provides employees who regularly use alternative transportation with a limited number of daily parking passes or the equivalent reimbursement. This allows an employee to occasionally drive when they have appointments or schedule changes that would preclude them from using their regular car-pool or bus schedule.

5.6 Car Sharing Programs

Car sharing programs provide members with on-demand access to a diverse fleet of vehicles conveniently located throughout a metropolitan area. To use the service, members reserve a vehicle online, use a smartcard to open the doors, take their trip, and then return the car at the end of the reservation. A simple hourly or daily fee covers gas, insurance, maintenance, parking and 24-7 emergency service. Zipcar, one of 30 car sharing companies in the U.S., is currently operating this service at the University of Rochester and has two vehicles located on the Eastman Campus in Downtown Rochester. This service is open to community members. The City should work with Zipcar to increase the number of vehicles located downtown. By offering subsidized memberships, employers can support employees' decisions to live car-free or own fewer cars. Employers may also have a corporate membership to provide employees with access to a vehicle during work hours for business-related trips, thus eliminating the need for access to a personal vehicle.

5.7 Flexible Work Arrangements

Many companies are offering flexible work arrangements to assist in the recruitment and retention of employees. However, these arrangements also reduce traffic congestion and parking demand. Telecommuting, flexible or staggered work hours, and compressed work weeks all contribute to reduced parking demand.

5.8 Implementation

TDM programs can be implemented in a few different ways. The most successful programs are typically those provided collaboratively or by large employers: not only are there efficiencies of scale, but successful TDM is about having a wide range of options so that everyone has access to the programs that best suit their needs, something that's hard to accomplish when done piecemeal. At a minimum, the City should encourage all businesses to participate in voluntary TDM programs and promote available resources such as the Regional Commuter Choice Program and services through RGRTA/RTS. The City should also consider the establishment of a Transportation Management Association (TMA) for downtown or the requirement of TDM programs as part of large project review.

1. Voluntary TDM Program - Some enlightened companies who wish to provide choices for their employees or who are committed to a sustainable environment, may voluntarily commit to the implementation of TDM programs. Information regarding TDM Programs and their benefits should be provided to all major employers with a request that they consider implementation of some of the strategies in an effort to support a sustainable transportation system downtown and provide options for their employees. As TDM is often substantially cheaper than the lease of a parking space in an urban environment, these programs can lead to substantial savings for employers who provide parking and an increase in take-home pay for employees who must pay for their own parking.

   The University of Rochester, the largest employer in the region, voluntarily promotes Green Commuting Options in support of the University's commitment to embrace sustainability programs and policies. To encourage transit use, the University provides its own shuttle service to supplement the RTS bus routes. It also offers on-site bus pass sales and pretax savings for annual bus passes. To encourage bicycling, bike racks are provided throughout the River and Medical Center campuses and in the garage. To encourage carpooling, the University offers access to a web-based matching service. It also offers discounted parking with reductions of 50% for 2-person carpools, 75% for 3-person carpools and a free parking permit for 4-person carpools. For employees who take advantage of alternative commuting options, the University offers an Occasional Parking Permit Program which provides two free parking passes per month. Finally, the University has partnered with Zipcar to provide cars on its three campuses and memberships to campus affiliates at discounted rates.

2. Requirement for TDM Program as part of Site Plan Review – To provide consistency and equitability throughout downtown, it may be necessary to require the implementation of TDM Programs. The development and approval of a TDM Program could become a part of the project review and approval process. The City would need to establish a policy regarding what size employers or what size project would require a TDM program. Subsequent monitoring of the program is also required to ensure compliance with the original agreement.

3. TDM Programs Managed through a Transportation Management Association (TMA) – TMAs are non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, medical center or industrial park. They are generally public-private partnerships, consisting primarily of area businesses with local government support. TMAs provide an institutional framework for TDM Programs and services and usually more cost effective than programs managed by individual businesses. TMAs allow small employers to provide services comparable to those offered by large companies. TMAs can provide a variety of services that encourage more efficient use of transportation and parking resources including:
   - Commuter Financial Incentives
   - Flextime/Telecommute Support
   - Guaranteed Ride Home Services
   - Parking Management and Brokerage (shared parking arrangements)
   - Pedestrian and Bicycle Planning
   - Rideshare Matching and Vanpool Coordination
   - Shared Parking Coordination

- Shuttle Services
- Special Event Transport Management
- Marketing and Promotion

Regional or local governments, chambers of commerce or management of a major facility (such as a mall or hospital) can help create a TMA and provide seed funding. Developers or facility managers may be required to establish a TMA to mitigate local congestion and parking problems. TMAs are typically funded through dues paid by member businesses and government grants. Services typically provided through a TMA could also be offered by established organizations like the Rochester Downtown Development Corporation (RDDC) or the Rochester Business Alliance (RBA) as a service to their members.