Feasibility Report on Streetcar Transit Service as a Downtown Circulator for the Savannah Historic District and Other Locations

Final Report

Presented by

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In association with Stone Consulting and Design, Inc.

December 5, 2003

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Executive Summary

The proposed Streetcar[1] Circulator Project includes construction of a vintage streetcar system by the Chatham Area Transit Authority to serve as a downtown circulator for the City of Savannah, Georgia. The streetcar system will aid visitor mobility within the downtown and riverfront areas, reduce congestion in the Historic District, attract further economic development within Savannah, and enhance Savannah's visibility as a tourist destination. The mobility system complements the Martin Luther King, Jr. Boulevard Renaissance project by providing a reliable and dependable way for visitors and residents to reach downtown venues.

Downtown Circulator

A reliable circulator for the downtown and riverfront areas of Savannah will ensure dependable movement of visitors with less reliance upon automobiles. With visitor parking at the Visitor Information Center on the west side and at the planned parking garage on the east side, the streetcar would move people through many of the most popular destinations in downtown Savannah and take them to River Street and back with ease.

Development

The links between transportation and development are historic and modern. Particularly near a fixed-rail system, developers are assured of the arrival of people for employment, for housing and for entertainment purposes. The addition of this historic streetcar system will enhance the current renaissance of Savannah's west side in the areas along and surrounding Martin Luther King, Jr. Boulevard, bringing visitors to the Roundhouse Railroad Museum, the Ralph Mark Gilbert Civil Rights Museum, and to shops and offices along the way. Broughton Street will attract additional shops and restaurants and expand further development into unused areas near the East Side. River Street will continue to flourish as the single most sought-after attraction for visitors.

The vintage streetcar will interface with all other modes of public mobility in Savannah. This includes Chatham Area Transit Authority's fixed-route bus system and downtown Shuttle, the Savannah Belles Ferry service to Hutchinson Island for Convention and Trade Center and Westin Hotel patrons, and a potential high speed ferry system that will connect to Beaufort, Hilton Head Island, Daufuskie Island and Bluffton in South Carolina. The streetcar will be a crucial link in a system of seamless mobility choices for visitors and residents alike.

[1] Electric rail vehicles may be called Streetcars or Trolley cars. There are many variations of trolleys operating in Savannah. To distinguish between rubber-tired trolleys and the proposed electric rail system, we will refer to the proposed system using the term 'Streetcar' throughout this document. See Appendix III.

Historic Significance

From 1869 through 1946 Savannah's chief public transportation mode was streetcar. In her engaging history of the streetcars of Savannah, Mary Beth D'Alonzo notes that the major impetus for the network of tracks and streetcars that sprang up chiefly during the late 1800's was its ability to enhance land development. "Those individuals who owned much of the land surrounding Savannah had a vested interest in exposing to the public the attractions of their lands in the hope of improving their own businesses. Often it was these people who were instrumental in establishing the various systems of transportation. To increase patronage of the street car lines, many types of activities were planned and amenities were built."[2]

Currently, there are many U. S. cities where streetcar renewal or new construction provides links to areas of interest within the city. Memphis, Tennessee, New Orleans, Louisiana, Kenosha, Wisconsin and Dallas, Texas have all built or expanded historic streetcar lines and been running them for several years. Charlotte, North Carolina and Little Rock, Arkansas are in the process of implementing a streetcar system.

These systems use the historic overhead wire method of delivering power to the streetcars. In this era of burying wires, the streetcar wire system will be kept as unobtrusive as possible by using lamp poles to support suspension arms and by using a single electric vehicle wire instead of an overhead catenary system.

There are still a number of cars that were used during the time of streetcar travel. These cars may be purchased and refurbished for use on the current systems. The City of Savannah and the Coastal Georgia Heritage Society own one car that will be used for this system, and the proposal includes purchase of four more like it. These vehicles were well built and have many years of useful life in them. The car that Savannah has can be modified to provide modern amenities that visitors currently desire; it is also adaptable for accessibility for all passengers with little change to the vehicle's appearance.

Proposed Routes

This report presents several different route alternatives for the Board's consideration. The primary differences on routes are the 'return path' northbound to Broughton and how far south the MLK route is extended. Each of these track and route options varies the mileage of track slightly and therefore the construction cost.

The streetcar track will complete a route from River Street up Martin Luther King, Jr. Boulevard, with a circuit through City Market. Returning to MLK Boulevard it will stop at the Visitor Information Center and continue south on Martin Luther King, Jr. Boulevard to Gaston Street where it will turn toward Forsyth Park, passing an area that has several bed and breakfasts. At the southern end of the route it will return by one of two optional routes, described below. With alternating cars, it will complete a shorter loop between River and Broughton Streets to carry passengers to restaurants and shops.

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[2] D'Alonzo, Mary Beth (1999) *Images of America: Streetcars of Chatham County,* Arcadia Publishing, Charleston, South Carolina, Introduction.

City Market Options

In our Ridership Survey (see page 11) visitors and residents selected City Market as the most popular destination by trolley. Both options deviate from Martin Luther King, Jr. Boulevard to stop in the City Market area. Our proposed route brings the streetcar from Martin Luther King, Jr. Boulevard left onto Congress Street to travel into City Market and turn right on Jefferson Street. It follows Jefferson to Broughton Street to return to Martin Luther King, Jr. Boulevard as in option one above. . At the corner of Broughton Street and Jefferson, the streetcar would turn right and return to Martin Luther King Jr. Boulevard, where it would turn left, continue to the Visitor Information Center and go south to Gaston Street, stopping at the Ralph Mark Gilbert Civil Rights Museum.

Southern End Options

At the southern end of the route, one option is to turn left at Gaston Street and turn left onto Whitaker Street to head north on the return leg. The traffic on Whitaker Street will have to become two-way or be routed in the opposite direction since the streetcar will be traveling northbound; currently traffic flows southbound. The streetcar would continue on Whitaker to Broughton Street where it would turn right and proceed to Randolph Street. There it would turn right and go to the proposed City Parking lot at Tybee Depot where it would turn around and proceed down the existing railroad track to complete the circuit to River Street.

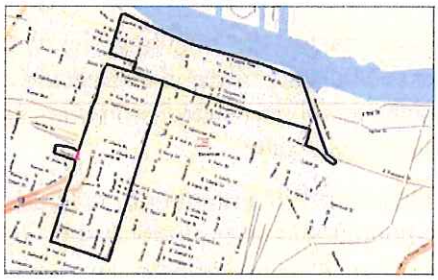


Figure 1. Whitaker Street Route

A second option for the southern end is to continue out Martin Luther King, Jr. Boulevard to Gaston Street, touching Forsyth Park, where the City of Savannah is contemplating a Visitor Information Center that will encourage more visitors to the Forsyth Park area. At Forsyth Park the trolley would turn north on Whitaker as described above or proceed to Drayton Street where it continues to Broughton Street. At Broughton Street its route would be identical to that described for option 1 above.

Figure 2. Drayton Street Route

Short Loop Circuit

Once through City Market, the streetcar would complete a shorter route using alternating cars by turning left onto Broughton from Jefferson Street and continuing on Broughton Street to Randolph, to the proposed City Parking lot at Tybee Depot to turn around and proceed to River Street. In the evening, with the Visitor Information Center closed and trolley tours on an evening schedule, the streetcar may run this loop more frequently to take passengers on a short trip between River Street and Broughton through City Market. This has the added advantage of potentially increasing service levels with no additional equipment needed.

Figure 3. Short Loop Circuit

On the total of all routes would be between 20 and 25 stops. During peak periods of travel there would be a ten-minute wait between streetcars on the short loop and 20 minutes between cars on the longer loop. The long circuit itself would take 25 minutes to complete. During peak street vehicle traffic periods the route could take as long as 40 minutes to traverse and will require four cars to maintain a 20-minute headway. This variation between normal and peak street traffic periods assumes that streetcars will run with traffic (such as on Martin Luther King, Jr. Boulevard) and not pre-empt traffic signals to expedite schedules.

A second option for the daytime route is to run a five-minute headway on River Street while maintaining a 10-minute headway on the remaining portion of the routes. This would require seven operating streetcars to maintain this schedule but would assure that all of Broughton Street receives regular streetcar service.

The proposed routes provide connectivity to all of the areas that should be connected in an historic streetcar route. In some segments it traces the routes of the historic streetcars of Savannah. As an economic development tool it includes several areas that will benefit from its presence. On the West End they include River Street to Martin Luther King, Jr. Boulevard. On the south end, areas that will benefit from the streetcar presence include the Visitor Information Center, Battlefield Park, the Roundhouse Railroad Museum, the Ralph Mark Gilbert Civil Rights Museum and Forsyth Park. It will pull the areas north and south of the I-16 overpass together. The longer option going to Gaston Street will provide connectivity with 15 inns and bed and breakfasts that are within one block of Whitaker Street from Gaston Street to West Broughton Street. Also on the south end, the connection to Forsyth Park will benefit that entire neighborhood. Using Drayton Street would encourage redevelopment of the area from Gaston to Oglethorpe Streets.

By designing the route in this way, we anticipate major economic development benefits as well as establishment of a new transportation corridor that will encourage movement along its entire length. Businesses along Broughton Street will greatly benefit from the presence of the streetcar line and additional development will occur at the east end of Broughton from Houston Street to Randolph. We would also expect to see development along both Randolph and President Streets. The

streetcar's presence on either Drayton or Whitaker Streets will encourage additional development and improvements to properties along the route.

We recommend that the streetcar be set up with an all-day pass that would encourage streetcar riders to get off the cars at numerous stops, shop and enjoy the attractions and then re-board the car to continue on to additional areas. The fixed guideway (tracks) and single direction of travel reassure tourists and newcomers to the area that they will be able to return to the place they started from without fear of boarding the wrong vehicle.

Economic Impact of the Project

Each new project brings economic benefits to the area served. Below is an input-output analysis, a key component of most regional economic modeling of the employment and income impacts of investment in the transportation infrastructure. Input-output analysis quantifies the many economic effects that result from a change in the final demand for a specific product or service. For example, a person being paid to work on a transportation project will spend some of those wages to buy goods and services. The money he or she spends shows up as sales and wages to other parties, who spend the money elsewhere, and so on. This chain of effects, known as the "multiplier," captures the distributive effects of transportation capital spending and operating benefits across a broad range of industries. Typically, the initial, direct benefits and costs of the project as determined during engineering and/or feasibility analysis define the input-output multipliers. (Appendix IV contains information about economic modeling.)

When calculating levels of ridership, income and expense scenarios, and capital budget spending options, it is important to focus on and understand the relationships between a common set of circumstances that seems reasonable in this situation. We develop an understanding for what we feel the *most likely* results are.

For the purposes of this report, several basic assumptions from other sections of the report carry directly into this section:

1. Construction Budget Options: The calculations are based on our recommended option with two routes, using Drayton Street as the northbound return, 3.85 miles of new track

2. Operating Budget Options: The calculations are based on our recommended option of an 18 hour operating day

3. Utility (Ridership) Level: Estimated at 240,000 level; ridership level (other than pro-forma impact) does not impact as deeply as project budget spending

Economic Impact - Construction Phase (Capital Costs)

The first table takes the new construction projects as identified under the "Engineering" sections and develops the secondary and multiplier effects of new construction jobs as an output of the project:

SAVANNAH STREETCAR ECONOMIC IMPACT –

CONSTRUCTION PHASE

Recommended Construction Option - 3.85 miles new track, 10min. River / 20 min. MLK headways

Category of Expenditure	Direct Impact	Output Multiplier	Impact on Total Output
Demolition	$406,780	2.2773	$926,360
Construction	$15,644,764	2.4250	$37,938,552
Equipment Costs	$3,950,000	2.0744	$8,193,880
Design/Const. Mgt./etc.	$6,040,466	2.1944	$13,255,198
Total	$26,042,010		$60,313,990

Total Regional Business Output. (Operational Costs)

The second RIMSII basic input is fairly straightforward. The project will be spending for employment, materials and supplies, and services locally and regionally. Some of this activity creates immediate activity beyond itself, and has a higher multiplier. The basic input for this calculation is the Pro-Forma Income and Expense Statement developed at the 240,000-ridership level.[3]

[3] Some items need to be qualified. For instance, payroll overhead (taxes and benefits) has no multiplier on local economic activity as the funds leave the region. Other activities, such as repairs, would not necessarily be thought of as being local, but are. Although skilled tradesmen may be necessary to perform such services, the duration of such projects typically keeps them in the area for an extended period.

OPERATING BUDGET – 12 hr. operating day – Recommended Option
10 minute headways on River St./Broughton, 20 min on MLK/Gaston

Category of Expenditure	Direct Impact	Output Multiplier a	Impact on Total Output b
Wages	$667,872	1.3250	$884,930
Payroll O'head	$176,184	0	0
Professional Services	$8,000	2.1944	$17,555
Electric	$83,368	1.5518	$129,370
Utilities (G&W)	$2,920	1.5518	$4,531
Tele/Comm Equip	$2,000	1.7510	$3,502
Building/Grounds Maintenance	$19,100	2.1927	$41,881
Insurance	$40,000	2.7259	$109,036
Gen. Office Supplies/Computer Software	$4,300	2.2284	$9,582
Shop Supplies	$21,700	2.0744	$45,014
Adv/Promo	$70,000	2.1944	$153,608
Depreciation	$125,000	0	0
Outside Material/Labor	$12,000	2.1927	$26,312
Absorbed Admin Overhead	$66,787	1.3250	$88,493
TOTALS	**$1,299,231**		**$1,513,814**

a/ *Each entry represents the total dollar change in output from all industries for each dollar of output delivered to final demand.*

b/ *Excludes expenditures for depreciation ($125,000) and payroll taxes/overhead.*

OPERATING BUDGET – 18 hr operating day – Recommended Option
10 minute headways on River St./Broughton, 20 min on MLK/Gaston

Category of Expenditure	Direct Impact	Output Multiplier a	Impact on Total Output b
Wages	$936,512	1.3250	$1,240,878
Payroll O'head	$246,264	0	0
Professional Services	$8,000	2.1944	$17,555
Electric	$123,252	1.5518	$191,263
Utilities (G&W)	$3,360	1.5518	$5,214
Tele/Comm Equip	$2,500	1.7510	$4,378
Building/Grounds Maintenance	$19,100	2.1927	$41,881
Insurance	$40,000	2.7259	$109,036
Gen. Office Supplies/Computer Software	$4,600	2.2284	$10,251
Shop Supplies	$29,200	2.0744	$60,573
Adv/Promo	$70,000	2.1944	$153,608
Depreciation	$125,000	0	0
Outside Material/Labor	$15,000	2.1927	$32,891
Absorbed Admin Overhead	$93,651	1.3250	$124,088
TOTALS	**$1,716,439**		**$1,991,616**

a/ *Each entry represents the total dollar change in output from all industries for each dollar of output delivered to final demand.*

b/ *Excludes expenditures for depreciation ($125,000) and payroll taxes/overhead.*

TOTAL ECONOMIC IMPACT – SUMMARY

Recommended Construction & Operation Options @ 12 hr/day

	$ Impact On Total Output	Incremental Job Creation [A, B]
Operating Budget	$1,513,814	
Wages And Payroll	$667,872	
Property Taxes	--	
Payroll Taxes And Overhead	$176,184	
Total Economic Impact – Railroad Operation (Table A1)	$2,357,870	70.02
Total Area Economic Impact – Construction Phase (Table B)	$60,313,990	2,219.55
Total Job Creation		**2,289.55**

a/ Equivalent full-year jobs.

b/ Projection of jobs created are based on the RIMS II models for the State of Georgia. The actual number of jobs created may be higher, but the numbers shown here are equivalent of full-time employment. Job creation for the light-railroad operation does not necessarily mean employment with the railroad, but rather employment with those firms servicing and selling goods and services to the railroad operation. The same holds true for job creation projections in other categories as listed.

Regional Input-Output Modeling System (RIMS II)

Recommended Construction & Operation Options @18 hr. day

	$ Impact On Total Output	Incremental Job Creation [A, B]
Operating Budget	$1,991,616	
Wages And Payroll	$936,512	
Property Taxes	--	
Payroll Taxes And Overhead	$246,264	
Total Economic Impact – Railroad Operation (Table A2)	$3,174,392	94.27
Total Area Economic Impact – Construction Phase (Table B)	$60,313,990	2,219.55
Total Job Creation		**2,313.82**

a/ Equivalent full-year jobs.

b/ Projection of jobs created are based on the RIMS II models for the State of Georgia. The actual number of jobs created may be higher, but the numbers shown here are equivalent of full-time employment. Job creation for the light-railroad operation does not necessarily mean employment with the railroad, but rather employment with those firms servicing and selling goods and services to the railroad operation. The same holds true for job creation projections in other categories as listed.

Funding the Project

In this analysis, we assumed that the Federal Funding of a streetcar system would cover no more than 50% of the capital costs and contribute nothing to the operational costs. We further assume that the State of Georgia would fund 10% of the capital costs, leaving the local capital share at 40% and 100% of operating costs.

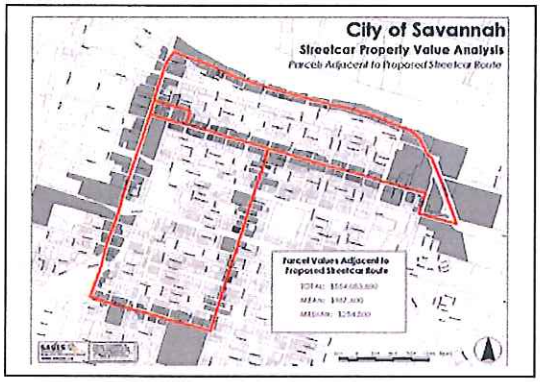
When determining financing alternatives for the construction and operation of a streetcar system it is critical to look at the direct and indirect beneficiaries of the infrastructure investment and related service. In addition to the riders on the streetcar system, there are four key constituencies that will benefit from the proposed streetcar system.

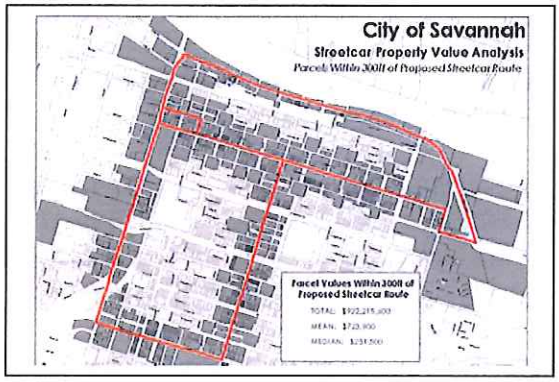
The first beneficiary is the City of Savannah. The proposed routes are contained within the city limits and are designed to move visitors and residents efficiently into and through the downtown area mitigating the effect of vehicular traffic along prime destination routes. The streetcar design also facilitates greater circulation of tourists to more venues in the downtown area, also helping reduce visitor congestion. Another potential advantage to the city is forestalling or eliminating other capital expenditures. For example, the streetcar system may very well lesson the redevelopment costs for returning the existing city market parking to its original purpose as a historic square by eliminating the $17 Million to build underground parking.

For these reasons alone, it is recommended that the Chatham Area Transit Authority develop a partnership with the City of Savannah to share the local match costs for construction and operation of the Streetcar System.

Second beneficiaries are the developers of properties and property owners along the routes. When fixed rails are constructed the value of properties along the route increase as development, redevelopment and renewal activities increase. A method of capturing the increase in value is Tax Increment Financing (TIF). This approach produces no new taxes. The increases in taxes over a specified base are simply directed to the purposes of a district that is formed for the TIF. These revenues could then be used for construction and/or operation of the streetcar system. TIF districts encompass the area where development and properties have the greatest geographic opportunity to benefit from its presence.

The City of Savannah through SAGIS provided a survey of adjoining properties and properties within 300 feet of the streetcar route. The following maps show these properties and the related total of assessed valuations.





Below is a table showing the revenue that could be generated from just the commercial properties along the route. The growth rates are reasonable, given the historical growth over the past three years on the Broughton Street corridor. The revenues generated show that by year four there would be funds to cover the capital and operational costs. By year six all negative cash flow would be covered and the bond, based on revenue generation could be retired by year eight and at the same time still cover operational costs.

Commercial Property in a Streetcar TIF District

Year	Growth	Value over Base	TIF Income	Streetcar Costs		Net
Base	$580,995,828			Capitalization	Operational	
1	104%	$23,239,833	$569,074	$834,523	$1,544,876	($1,810,325)
2	105%	$53,451,616	$1,308,870	$834,523	$1,622,120	($1,147,773)
3	106%	$91,518,463	$2,241,013	$834,523	$1,719,447	($312,957)
4	107%	$138,594,463	$3,393,763	$834,523	$1,839,808	$719,431
5	108%	$196,161,686	$4,803,411	$834,523	$1,986,993	$1,981,895
6	108%	$258,334,288	$6,325,832	$834,523	$2,145,952	$3,345,356
7	109%	$333,873,998	$8,175,573	$834,523	$2,339,088	$5,001,962
8	109%	$416,212,282	$10,191,790	$834,523	$2,549,606	$6,807,661
9	109%	$505,961,012	$12,389,467	$834,523	$2,779,071	$8,775,874
10	109%	$603,787,128	$14,784,935	$834,523	$3,029,187	$10,921,226
				$8,345,229		$34,282,350

TIF Assumptions

Commercial Property % of Total Assessed Value	63%
City and County Millage Rate	24.487
Operational Costs equal increase w/ growth	
40% Capital Costs Bonded @ 5% for 20 years	

Another method to accomplish the same end is the establishment of a Business Improvement District or other Special Taxing District to assess fees commensurate with the commercial value added by the investment in and operation of a streetcar system. For example, a value benefit fee of .25% of assessed commercial valuation could be charged to those properties immediately adjacent to the streetcar based on the increase in economic activity generated by the improved mobility of visitors and residents along the route. If that value-benefit fee were imposed on the mean property values adjacent to the route it would mean that if patrons or clients spent $20 per transaction, the commercial enterprise would have to have only ninety (90) additional transactions a year to cover the value-benefit fee.

The one challenge that a special district must address is the value provided property tax-exempt properties that also benefit from the service provided. A case in point is the Savannah College of Art and Design (SCAD). This service will provide students with significantly improved access and should reduce the amount of expenditure SCAD now encounters with providing ground transportation services. There are mechanisms to capture these benefits and they should not be overlooked.

The third beneficiary consists of visitors to the area whose visit will be enhanced by the experience of riding the streetcars and the ease of getting to desired destinations without having to contend with traffic and limited parking. Special district taxes on visitor amenities such as hotels can also be used to fund streetcar construction and operation to the degree that they do not overlap other benefit-value fees.

The final beneficiary is the general community, all of whom to one degree or another rely on downtown Savannah to prosper while maintaining its unique character. To the degree that the streetcar system reduces other infrastructure costs to the community, enhances the overall mobility flow and increases economic activity, there is justification for a portion of the capital and operating costs of the project being shared by the entire community. The accompanying economic impact analysis of the construction and operation of the streetcar system provides an indicator of what may be an equitable share to be financed community or county-wide. With a multiplier effect of over $45 Million dollars from construction and an annual multiplier impact of nearly $800,000, if only 5% of these benefits were invested over a ten-year period, the value would be between $2.5 and $3 Million.

In summary, there are more than adequate benefits to be accrued from the investment in a streetcar system for Savannah to justify the expenditure. Further, the value derived from the service can be calculated to create an equitable financing package to construct and operate the system.

Additional Options. Other historic streetcar authorities developed creative financial approaches to implement and operate their systems. The recently completed streetcar system in Tampa, Florida used a variety of funding tools for both construction and operation. While their methods are controversial, the result is a system that is built and operating.

Tampa's original $31.5 million construction budget for a 1.5 mile system consisted of 50% TEA-21 federal funding, with the city and state making substantial contributions. Beyond that, Tampa raised private funds through a virtual auction of naming rights. The system is named for the utility company (TECO) at a sponsorship cost of $1,000,000. Individual car naming rights were sold for

$250,000 each. Station rights were sold for $50,000 and up. These private funds were put into an endowment to create operating funds, now in excess of $5 million. Operating expenses of $1.3 million/year are met by a sales tax in the served district, income from the endowment fund, and farebox recovery. The TECO system has also aggressively licensed logo-based naming rights, pursued on-board advertising, and produced clothing and other souvenirs.

Tampa's experience illustrates that, unlike a bus line, a streetcar system captures the public imagination and participation that can be captured for construction and operating funds. The use of an endowment of private money for annual operating funds is a new concept, and appears to be successful, if somewhat limited by current investment market financial returns. But, if typical FTA-style construction and operating funds fail to materialize, these alternatives now have a demonstrated precedent.

Similarly, the system in Kenosha, Wisconsin was built virtually unnoticed by the Federal Transit Administration (FTA) because the $4 million total construction costs were well under FTA's major investment thresholds, and were funded by discretionary funding inside the Kenosha Transit Authority budget. Additional monies came through Federal clean-air mitigation funding because the system has all-electric vehicles. The Kenosha streetcar system was constructed simultaneously with major downtown street improvements, minimizing the impacts on pavement and utilities. Operating costs consist of one operator cycling the car in a continuous loop, electricity, and car maintenance, a relatively low-budget operation within the existing transit system. Because the system uses older PCC-style equipment, the system uses redundancy to ensure reliability; they have up to four operable cars and a spare for what is primarily a one-car service.

Cost of the Proposed Savannah System

The cost of constructing the proposed Savannah routes, the longest of which is 4.5 miles long, range from approximately $17.9 million to $29.7 million. Currently 1.15 miles of existing track will need to be repaired, and there will be 3.35 miles of new track to be laid to complete the entire route. The total cost per mile for the streetcar system ranges from $4,982,000 to $5,700,000. This includes: purchase and rebuild costs for 4 to 9 vintage streetcars ($6,300,000); construction of a car barn ($5,0000,000); track installation ($5,810,000); overhead electrification ($4,000,000); and 2 large and 22 small stations ($1,300,000). We are following with great interest the bill in the House of Representatives (H. R. 1315) "to establish a pilot grant program to provide assistance for the capital and startup costs of streetcar development and revitalization." A detailed capital budget is located in Appendix I at the end of this study.

For an 18 hour day of operation on the initial route, which would run from River Street to the Visitors Center, using 8 drivers and 2 part-time drivers, with 1 part time mechanic and 1 part time mechanic's assistant total estimate yearly operating costs would be $1.7 million or an average cost per car mile of $10.25, and an average cost per vehicle hour of $66.13. A detailed operating budget is located in Appendix I at the end of this study as well as a Pro Forma analysis of operating revenue and expenses and a schedule of route times and vehicle requirements.

Project Approach

Team, Inc. began this project in response to a request to analyze the potential utilization of streetcar service serving River Street and the Visitor Information Center. There existed some work done by the City of Savannah and the Coastal Heritage Society regarding the development of streetcar service for this proposed route; the two entities had also purchased a vintage streetcar for such a service. We started the feasibility study with the idea that it might not be a wise investment for such a short distance, and that we needed to see whether this would be an effective and efficient way to move people between the two venues.

In addition to examining the engineering feasibility of the project we conducted a market research survey (see below and Appendix II). We also consulted with many people in Chatham County and Savannah to determine the level of acceptance among the public and to seek feedback regarding use and destination that could guide the design of the routes. In the process of interviewing and meeting with representatives of organizations and the public, the single trek from River Street to the Visitor Information Center quickly expanded in response to the feedback in terms of desired mobility within the downtown area into the circulator system that we are proposing. A list of people with whom we met is included in Appendix V along with the sign-in sheets from information feedback meetings we conducted in November 2002, October and November 2003.

One of the more important first decisions on a project such as the Savannah Streetcar proposal is whether the end result is primarily focused toward transit or tourism entertainment. Few communities can lay almost equal claim to both sides, but Savannah deserves and demands a balance of these influences. Although these views are both complementary and conflicting, the positive convergence of transit and tourism streetcar systems is that both need to be cost-effective. They also require that clean equipment be operated on a convenient schedule. Routing options can complement both uses.

How, and why, transit riders and visitors get from point "A" to point "B" may be vastly different. Transit users want the most direct and timely route. They expect to get to their destination in a rapid manner, and tend to become irritated if they perceive that driving or even walking is much faster. Transit users may also become discouraged if they see their end destination and have to take side trips before getting there. Therefore most transit routes travel round-trip either on the same street or on adjacent one-way street. Fixed transit routes usually serve a corridor and/or an end destination.

The opposite is true for tourists, who may actually prefer an indirect ride to see a variety of points of interest. The tourist, unlike the transit user, is generally unsure about various locations in relation to one another, and/or how physically far apart locations may be. In contrast to transit's 'up-and-back' approach on the same street, tour routes are generally in a loop. Routes with a loop arrangement provide exposure to a larger area without costing significantly more money to construct than multiple tracks on one street. There is also a certain sense of security in a fixed-rail system where visitors know that they can't take the wrong vehicle or be on the wrong route – the car will eventually bring them back to where they began.

These primary differences in basic route design require compromise in the project because in Savannah you cannot cater fully to resident riders and tourists in perfect harmony. It is easier to compromise a routing toward a transit focus and meet tourism goals, than it is to have a winding route and keep the transit user on board. Having the streetcar operator describe the access to a site "only a short block away" easily compensates for the lean toward transit riders. Prominent signage can direct tourists back to the streetcar, tell them when to expect it, and remind them how much fun it will be. Boarding locations for the streetcar can reflect the images or theme of the attraction off-route. Brochures for both the attraction and the streetcar must clearly show the relationship between the streetcar stop and the location of the attraction.

Ridership

Comparable streetcar operations can be found in locales that are similar to Savannah, with an equal emphasis on local transit and tourism attractions. While composites of estimated ridership can be developed using several methodologies, it is perhaps most reliable to base estimates on recognized SMSAs (standard metropolitan statistical areas) with known visitation profiles that have historic streetcar systems already in place. For comparison purposes to other systems, Savannah shows a city population of 131,000 and a tourism person trip count of 5.73 million (***Savannah Domestic Tourism Report***, D.K. Shifflet Associates, 2000).

Seattle's Waterfront Trolley, featuring a similar tourism-to-transit connectivity approach, reported to the Federal Transit Authority annual ridership (trip count method) of 450,000.[4] This is in a metropolitan area of 563,000[5], with a vibrant tourism economy estimated at over 27 million out-of-state visits[6]. The streetcar system is 2.1 route-miles long, and is operated with a fleet of five ex-Melbourne streetcars. Schedules are every 20 minutes between 6:30 AM and 10:30 PM, with slightly longer hours on weekends[7]. The route is anchored between the Seattle waterfront and the transit center, with numerous attractions en route. The system is owned and operated by King County Transit. Standard ride fare is $1.50 per trip.

Memphis' Main Street Trolley was built through a pedestrian-only section of downtown with 2.5 route miles between a waterfront stadium and the Main Street district. The streetcar runs parallel to the Mississippi River in a loop configuration. An additional 2-mile parallel track was laid on the riverfront district to augment the original Main Street trackage. Main Street Trolley operates with a fleet of 14 Gomaco-rebuilt cars (a mix of Melbourne and heritage rebuilds) on headways as short as five minutes. Standard fare is sixty cents per trip, and ridership has grown steadily from 535,000 in 1995 to 941,000 in 2000, leveling off in the 800,000 range for the last two years.[8] This is in a metropolitan area population of 646,000. Memphis Area Transit Agency (MATA) operates the streetcar system.

San Francisco's F Line is perhaps the largest and longest historic streetcar route operated by a non-profit organization (Market Street Railway) in conjunction with MUNI, its municipal transit

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[4] American City Business Journals, Puget Sound Business Journal, 2001.
[5] US Census 2000 data
[6] Dean Runyon Associates, 1999, City of Seattle.
[7] Seattle King County transit website: http://transit.metrokc.gov/tops/bus/waterfront_streetcar.html
[8] www.downtownmemphis.com

authority with six route miles and over thirty cars, primarily ex-PCC cars from other transit agencies that sold them at scrap prices. Now carrying as many as 20,000 riders per day at a $1.00 trip fare, estimated ridership is as much as 7.3 million per year. The F line is primarily an urban transit through line that has historic equipment.

Tampa, Florida began a new system in October 2002 using eight Gomaco-built replica cars (all-newly fabricated bodies on used Milan-car parts). The system is 2.4 miles long and is called TECO – named for the corporate power company sponsor, The Electric COmpany. The system is designed to connect tourism visitation areas with parking and hotels in a remarkably similar system concept to Savannah. Ridership projections began at 264,000 and have been revised upward as high as 600,000 in the few months since the project was opened. Current operational statistics disclosed by TECO indicate the average daily boarding is 1200 riders per day (April 2003) with an estimated annual projection of 438,000. This is a metropolitan area with a population of 303,000 and 15.5 million county tourism visitations (strongly influenced by the cruise boat terminals). The TECO system operates the streetcars on 15-20 minute headways; the basic fare is $ 1.25, they offer several discounts (one as low as sixty cents), and operating hours are between 11AM and 8PM.

Ridership Estimate

Savannah's population is 43% of Tampa's and the projected tourism/transit market is 50% of Tampa's. Distinct differences are present between markets, as Tampa has a high cruise-boat element, but Savannah will have a direct connection with the river ferries that Tampa cannot emulate. The estimate of initial ridership for the Savannah Streetcar would be a performance projection demand of 660 per day or 240,000 trips per year. This also appears realistic when doing similar comparisons with the Seattle, Memphis and San Francisco systems. All these systems are running at significantly higher ridership levels than Savannah, based from larger metro population and estimated regional tourism market. Savannah's recent experience with the river ferry shuttle, producing 117,762 riders between May and August 2003, would indicate a strong potential carryover of any connected service that would add to the projected base ridership market.

A capacity-based system analysis for a Melbourne-type car assumes 43 seats and a maximum of 40 standees. Given a 'real' capacity of roughly 50 seats per closed-type car, a realistic maximum system capacity can be projected to be no more than the following:

Operating hours projected – a 'most likely' 11AM – 10PM core schedule with 10-minute headways equates to six cars per hour:

11 operational hrs * 6 cars/hr. * 50 seats/car = 3300 seats/day

3300 seats/day * 360 days/yr. = 1,188,000 maximum capacity seats.

240,000/1.188 million = 20.3% of maximum capacity.

Reducing frequency on non-peak vehicle traffic hours to no more than 20-minute headways decreases the capacity to meet actual demand and will remove empty seats from the system as necessary. This calculation assists in developing estimates of system capacity constraints. The

results demonstrate that the basic system as designed still has the capability of meeting a significant additional ridership with no additional fixed cost in either route or equipment.

Development of the Routing

The original focus for an historic streetcar routing was simply to serve the existing track on River Street. There is not much of a routing decision here. The only decision is to decide what end points make sense for both service and connectivity.

The next focus was to connect the Visitor Information Center on Martin Luther King, Jr. Boulevard to River Street. As the streets connect on paper, it looks simple, but the steep grade and narrow corner where the two streets connect create concerns – particularly running downhill. To remove this impediment on a single-track bi-directional routing the alternatives are to shift the River Street trackage in this area so that a direct connection will be less severe, or look at other options. The logical option is to continue further west on River Street to Fahm Street, go south on Fahm Street and loop back to the corner of East Bay and Martin Luther King, Jr. Boulevard.

This option could theoretically open up another area of River Street to development in the long term. In the immediate future, though, it adds three blocks of trackage, and increases construction costs and total trip time. The additional time and distance must be weighed with its potential tourism or transit value. We recommend that the streetcar go one way westbound on River Street to minimize the risk of accidents due to congestion and confusion. If vehicle traffic continues to be eastbound instead of westbound on River St., additional traffic protection may be necessary in areas of tight clearance and reduced visibility. Such traffic protection can be automatically triggered by oncoming streetcars similar to a conventional railroad crossing circuit.

The position of the Visitor Information Center on the west side of Martin Luther King, Jr. Boulevard also strongly suggests a westbound River Street, southbound MLK direction, as curbside loading is only possible if a streetcar is running in that direction.

From an overall design standpoint, these two major issues strongly combined to develop and recommend a loop concept – preserving the one-way nature of River Street, allowing the intersection of Martin Luther King, Jr. Boulevard and River Street to be used, and including the Visitor Information Center as a key destination. All other routing concepts flowed from this original decision.

Ridership Survey

A key part of determining the feasibility of a streetcar project is its ability to attract and retain riders. Whether the farebox meets operating costs directly or the streetcar is subsidized as a free service, the public's perception that the service is useful and beneficial is crucial. Because of that, one of the most important issues when determining feasibility is exploring and defining the market. An empty and unused streetcar service will not survive for long.

Most other issues can be solved with time or money if there is sufficient, sustainable usage by the public. But if funding is to be found, the system must meet a need, serve a market, and develop public support.

To determine streetcar project success we asked potential customers the following:

- Where did you come from?
- Are you a resident or a visitor?
- Are you familiar with streetcar services?
- Would you be interested in historic streetcar and ferry services, and if so, when, and for how much?

Asking these questions in the planning phases helps to fit the service to the market well in advance of the start of construction.

The purpose of the ridership survey is to use statistical sampling and analysis to determine the interests and needs of potential historic streetcar riders. Personal experience, no matter how valuable, is no substitute for the idiosyncrasies of each project and its potential customers.

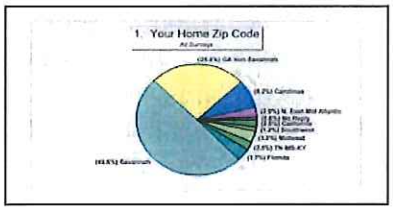
The survey is a relatively free-standing description of the prospective rider. Feasibility in this case is best defined as the ability to meet riders' expressed expectations and interest because to ignore it is to condemn virtually any proposed project to failure, or at least to a very difficult start. This survey can be redone or expanded at any point using the same mechanism.

Stone Consulting has performed similar surveys on numerous existing and proposed tourist railroad and streetcar projects since 1993[9]. Most of these surveys ask identical or relatively similar questions, which allow us to compare this project to other existing and proposed streetcar lines across the United States. Certain responses, like zip code, vary with each one, but others, such as the ideal service/price combinations, seem to ring true on a nationwide basis. This allows us to provide further commentary and comparison on how Savannah compares as a market and as a project to the rest of the trolley universe in a very detailed manner.

Question development and wording was proposed by Stone Consulting and Design, reviewed and subsequently edited by personnel at CAT and Team, Inc. A detailed description of the survey methodology and statistical validity is contained in Appendix II at the back of this report.

Survey Responses[10]

1. Enter your home zip code, first five digits only:



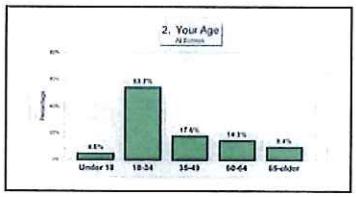
We wanted to obtain a relatively equal split of surveys obtained between residents and visitors, because a truly useful system will have equal utility to both groups. Zip code analysis results came back with almost an

[9] See Appendix II for a list of similar survey projects.

[10] Please note that the term "Trolley" was used in the survey rather than Streetcar. Where the wording is in the original survey we have kept it. Please see Appendix III for a description of the origins of the terms Trolley and Streetcar.

equal split (49.6% vs. 51.4%) of surveys split between resident and non-resident. Of the 51.4% of non-resident zips, half of those were non-Savannah, Georgia zips, and roughly 25% were from nationwide responses varying from the northeast to California. No state of sub-group within that 25% had sufficient surveys to determine any specific statistical analysis of the results.

2. *Your Age*?

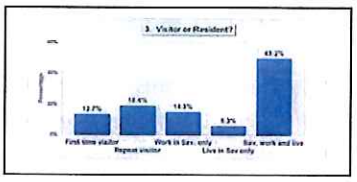


The 18-34 age group dominated the responses with 53.7% of the total. As previously mentioned, we were concerned about potential response skew due to the age group, plus the obvious potential for college students to simply be surveying other college students on the AASU campus. A review of survey locations did not indicate this was a concern; only 7% were actually taken on-campus. Repeated analysis of this group compared to other groups, and to the totals by survey location, relieved this initial concern about potential age and/or location bias.

This survey is not similar to age responses by other surveys done in Savannah for the entire Savannah visitation profile. The Savannah Convention and Visitors Bureau Conversion Study for 2000 indicated a 13% breakout for the 18-34 age group, but that was measured through an Internet survey with a 30% response rate consisting of 646 voluntary completions. Meanwhile, the D. K. Shifflet & Associates 2000 study titled ***Savannah Domestic Travel Report*** received 33.4% of its visitors from the 18-34 age group, a significant number, but not over 50%.

The resulting survey dataset was accepted as valid with the understood conclusion that the River Street survey district (with almost 85% of the surveys) tends to be a rather 'young' market as compared to Savannah in general, due to the attractions, retail/service outlets, and the pedestrian walkway. Therefore, the service responses to this market for a proposed streetcar system are just as valid to this age group, though improved transportation to this area may effectively shift access to older age groups over time. If anything, this finding suggests there may be difficulty for older age groups of pedestrian to access River Street particularly after private trolley bus services cease at 5PM.

3. *Visitor or Resident? (Please Select the answer that best describes you and mark the corresponding letter in the box at the right)*

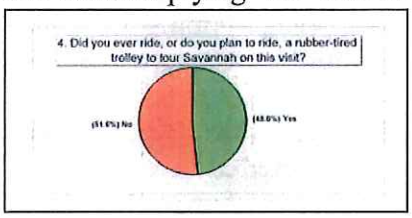


Almost 50% of the responses were from individuals that both lived and worked in Savannah. Residents of Savannah that didn't work there comprised 5.3% of the respondents; 14% worked in Savannah but didn't live there, and 31% were visitors. Only 12.7% were from first-time visitors that would not necessarily be familiar with some of the more detailed questions on the survey about locations, street names, etc.

This relatively high percentage of Savannah residents is important to remember when evaluating responses on the following service and location questions. The responses did not come strictly from tourists and non-residents who were not familiar with the city, transportation issues, or Savannah itself. The survey was deliberately designed to be inclusive, rather then exclusive, to Savannah residents, as long as they could be differentiated.

4. Did you ever ride, or do you plan to ride, a rubber-tired trolley to tour Savannah on this visit?

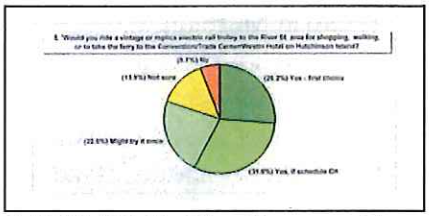
Taken overall, the responses were almost split evenly with 51.6% replying "No" and 48% replying "Yes."



Within subgroup analysis, the responses were quite different. The *non-* 18-to-34 age group was much more likely to ride the rubber-tired trolley, a 56% response. Fifty-eight percent of the 18-34 year olds were *not* planning to ride. Resident vs. non-resident responses weren't much different from the 50/50 total survey split, most likely due to the inclusion of the free CAT Shuttle available to residents familiar with local transportation. The responses would include this service as well as the rubber-tired tour trolleys.

5. Would you ride a vintage or replica electric rail trolley to the River Street area for shopping, walking, or to take the ferry to the Convention/Trade Center/Westin Hotel on Hutchinson Island?

Our previous streetcar interest surveys have concluded that visitors and residents are more interested in real electric trolleys than rubber-tired imitations, and only by directly contrasting the two responses can this be compared.

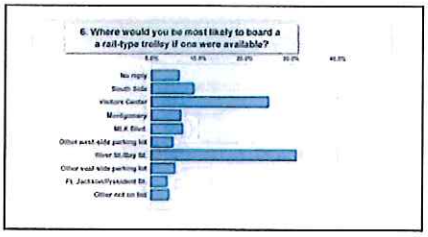


When offered the electric trolley, the same respondents replied 26% "Yes, first choice", 31.6% "Yes, if schedule convenient", 23% "Might try it once", 14% "I'm not sure", and 5.7% "No". The direct positive responses were nearly 10 percentage points higher than the rubber-tired responses above.

Within sub-groups, breakouts of residency and age didn't change responses by more than 5%. Non 18-34's and resident vs. non-resident all were quite similar in the response totals. This is a relatively positive response and typical of other historic streetcar surveys we have conducted.

6. Where would you be most likely to board a rail-type trolley if one were available?

While there are certainly many constraints on feasible places to board, we still wanted to evaluate where the most popular and necessary places might be to load.



Given the options of Visitors Center, Montgomery Street, Martin Luther King Boulevard, other west side parking, River Street district/Bay Street, east side parking; Ft. Jackson – President Street, and other – the most dominant responses were "River Street/Bay Street" at 31.1%, and "Visitor Information Center" at 25%. No other single response received more than 10%, and the lowest response of 3.3% was from Ft. Jackson/President Street.

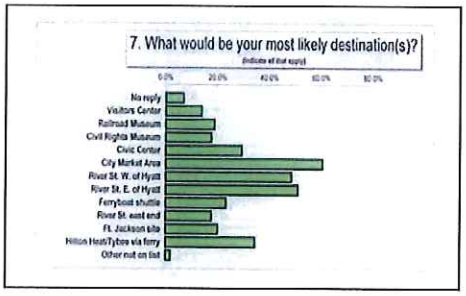
The non 18-34 group was much more likely to board from the Visitor Information Center (37%), and the 18-34's preferred River Street (40.5%). Residency also made a predictable split with the Savannah residents preferring River Street (34.7%) and non-residents preferring the Visitor Information Center (32.5%).

Since the surveys were predominantly conducted on River Street, this is only surprising in that the Visitor Information Center remained as high as it did when the surveys were not taken there, and that it remained the highest percentage single point other than River Street for Savannah residents. (17.4%)

7. What would be your most likely destination(s)? (Multiple responses allowed)

Given the choices of the following:

- ⊗ Visitors Center
- ⊗ Railroad Museum
- ⊗ Civil Rights Museum
- ⊗ City Market Area
- ⊗ River Street – west of Hyatt
- ⊗ River Street – east of Hyatt
- ⊗ Ferryboat shuttle to Convention Center
- ⊗ East end River Street
- ⊗ Ft. Jackson historic site
- ⊗ Hilton Head area or Tybee island (via Ferry)
- ⊗ Other not on list

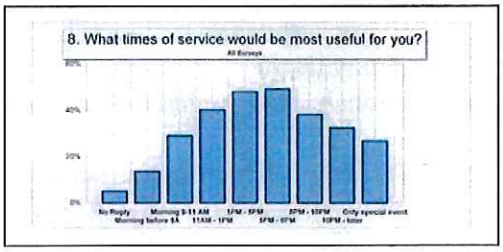


Prior to this question, we had imagined that Visitors Information Center and River Street would likely be the largest responses. But, the City Market area actually came in as the single largest response at 60.7%. Not only was it the largest total response, but it held this position among all four subgroups of age and residency.

This significantly changed our impressions of the likely market and where it wants to go, and in turn, affected our recommendations on physical trackage and routes. This is possibly the single most significant finding of the actual ridership survey.

River Street destinations were the second largest response(s), with near 50%, and the third-largest response came from "Hilton Head area or Tybee Island" via ferry. Other destinations were fairly well evenly distributed at under 10% each.

8. What times of service would be the most useful to you? (Multiple responses allowed)



While the individual survey responses are shown on the graphs, the overall time by service trend analysis departed dramatically from all existing transportation services and options.

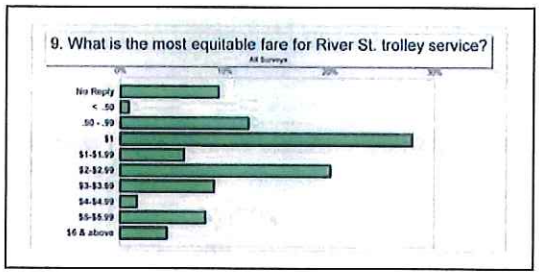
The responses developed a near-perfect bell-curve of percentages, with 30% or less wanting service before 11AM. The significant demand volume existed between 11AM-1PM (40%), 1PM to 5PM (48%), and an even more significant 49% between 5PM and 8PM. Later times, such 8PM to 10PM, received 38%, and 32% wanted even later than 10PM.

Like the City Market response, this question resulted in a significant change and recommendation in the proposed operation. Unlike the rubber-tired guided-tour trolleys, which make their last loop to River Street typically at 4:30PM, and the CAT Shuttle, which doesn't directly serve River Street, the streetcar has the potential to serve River Street in an afternoon-evening heavy schedule that neither service can now provide.

It is particularly significant in this response that peak demand is actually after 5PM, indicating that the surveyed group had the most interest in using the streetcar to go to River Street and the City Market area after work hours, or as part of an entertainment evening. As such, the service could be complementary to existing River Street tour operations, rather than in perceived direct competition.

9. What is the most equitable fare for River Street trolley service?

This was a deliberately open-ended question, with no price ranges suggested at all. Any response was considered valid up to $99.99, down to zero.



The issue with this question is not just the basic transportation service, but also an element of entertainment. As historic streetcars certainly contain both, and often contain at least some elements of historic context that encourages (if not demands) a contribution, the fare structure is completely unlike conventional bus transit. We wanted to know what the perceived value would be to the rider.

While the typical CAT bus transit fare is currently $ .75 cash fare per ride, and the CAT Shuttle currently is free, the responses from this question resulted in much higher potential fares. Only 13% of those responding replied that the most equitable fare is under $1.00. The majority response of 27.9% was for $1.00, and a significant 20% of responses were in the $2 - $2.99 range. A remarkable 12.7% even felt that the fare should be $5.00 or above.

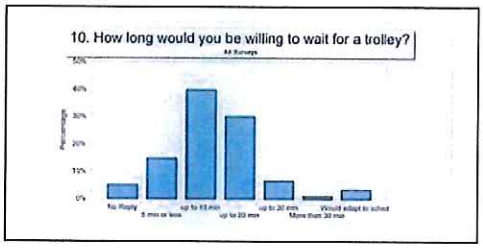
These responses are not at all uncommon on historic streetcar systems. Even municipal systems such as in Seattle or Memphis, the historic streetcar fare is significantly higher than bus fare.

Transit systems that have adopted historic streetcars almost universally charge a higher differential fare than for the bus. As part of their standard fare system, Seattle charges a 'one zone fare' for the electric trolley, even though the bus service in the same downtown zone is free. The trolley effectively commands a $1.25-$1.50 per-ride fare. Memphis (MATA) has a standard per-ride fare of $.60 (or a day pass for $2.50) compared to a lowest bus-zone fare of $ .30. New Orleans has a complete philosophical split, where the Charles Street historic trolley line is the same as standard bus fare ($1.25) but the newer Riverfront line is charged a higher $1.50 fare for historic streetcar on the added route.

While there may be some political reasons for equalizing streetcar and bus fare, the market will willingly accept a proportionately higher amount, even if the routes are nearly identical.

10. How long would you be willing to wait for a trolley?

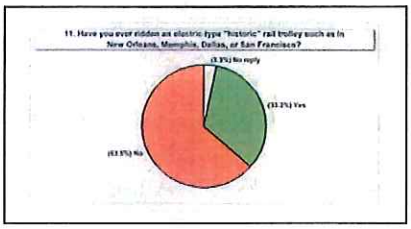
The responses on this question ring true to historic streetcar projects nationwide and even transit system studies on regular headways. Historic streetcars will gain some patience with the wait time involved as compared to a bus, but not much.



Of the respondents, 15% would only be willing to wait 5 minutes, 40% would wait up to 10 minutes,

and nearly 30% would wait up to 20 minutes. An understandable minority of 10.7% would actually wait longer than 20 minutes. This is quite consistent with other trolley studies we have performed. The wait-time willingness for streetcars governs the number of cars in service at a given time, and in this case, the operating plan should attempt to function for no longer than 10-minute intervals between cars. This is the assumption we used for developing proposed equipment needs.

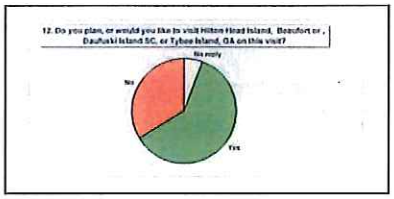
11. Have you ever ridden an electric-type "historic" trolley such as in New Orleans, Memphis, Dallas, or San Francisco?



As a question to validate the study, we wanted to establish what level of experience the survey respondents had with actual electric trolleys, and not just the rubber-tired ones. Not surprisingly, 63.5% had no experience. If anything, this response validates the survey as not being exclusive to those that have a predisposed favorable impression of a streetcar simply based upon other systems. Surveys were not deliberately aimed at those in favor of, or familiar with, other electric streetcar systems in the U.S.

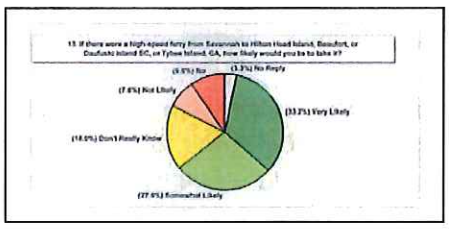
Surprisingly, the breakouts by residence and age groups resulted in almost no change at all – less than 2% difference in any sub-group analysis on the previous historic streetcar experience.

12. Do you plan, or would you like to visit Hilton Head Island, Beaufort or Daufuski Island SC, or Tybee Island on this visit?



As part of the high-speed ferry portion of the study, we asked this question to the same survey group – predominantly on River Street. Sixty percent of the replies were "yes," indicating the same group that was responding to the trolley survey was also intending to visit the outlying water-destination islands. Only 33.6% replied no, and the percentages were relatively consistent across all age and residency breakouts.

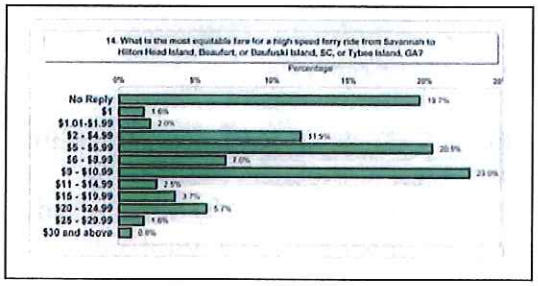
13. If there were a high-speed ferry from Savannah to Hilton Head Island, Beaufort, or Daufuski Island, SC or Tybee Island, GA, how likely would you be to take it?



The high-speed ferry question has not been previously asked of any group, and in this case, the responses were relatively favorable. Thirty-three percent were very likely, 27.9% were somewhat likely, and only 17.6% replied "Not likely" or "No". The responses from this question were actually slightly more favorable than the streetcar and indicate a very favorable market.

14. What is the most equitable fare for a high-speed ferry ride from Savannah to Hilton Head Island, Beaufort, or Daufuski Island, SC, or Tybee Island, GA?

Like the streetcar fare, this question is essentially a matter of perceived value. The responses in this situation, however, were all over the map.



There were two distinct 'bulges' in survey responses, with the expected minorities at the ends. Only 3.6% felt that it should be under $2.00, and another 11.9% felt it should be under $5.

Twenty-one percent replied in the $5-5.99 range, with a peculiar 7% response gap all the way between $6 and $9. Another major group of 23% replied they felt a fair price is between $9 and $10.99. The balance of 14.3% respondents replied they were willing to pay above $10.99. In that group, six responses (2.4%) actually replied above $25.

There is obviously little fixed preconception about what this service should cost. Fare development may be problematic when groups are equally split between a $5 ticket and a $10 ticket. Interestingly enough, Savannah residents consistently registered higher on the fares than any other sub-group, with nearly 30% in the $9-10.99 fare response group.

Survey Recommendations

The most significant outcome from the ridership survey is that it reinforces some assumptions – particularly that the core route is a Visitor Information Center to River Street routing. Other destinations are significant, but those are the two key points for both residents and visitors.

What wasn't anticipated was the strong response regarding City Market and the need to directly serve this area instead of simply passing by the area a block away. This response, plus the feedback on the focus groups, modified our proposed route map.

While some degree of competition was assumed between rubber-tired tour trolleys and the streetcar for the key Visitor Information Center to River Street core line, the new discovery was that the time of peak streetcar demand was actually after the rubber-tired tour trolleys stop running from the Visitor Information Center. The potential certainly exists for the streetcars to focus on the afternoon-evening entertainment and transportation market, while the tour trolleys continue to be a late-morning/early afternoon venue from that location. Rubber-tired tour trolleys return all passengers back to the Visitor Information Center promptly by 5:00 PM. Streetcar service to return visitors and residents back into the River Street district could have definite positive economic impacts to restaurants, hotels, and entertainment venues that would enhance the entire Savannah experience.

Fares for the streetcar can certainly be higher than the existing bus fare, and have no expectation of being free to the boarding passenger as the CAT Shuttle is currently. While there is no expectation that the streetcar can cover operating costs directly from the farebox, it can generate a significant amount of revenue on its own and not be bound by existing bus fare structures.

The enthusiasm and interest for the streetcar is only matched by the high-speed ferry concept. There appears to be a definite synergy and relationship for visitors and residents toward both transportation options, and station/departure linkages should be developed to provide a combined transportation option in a unified manner.

Savannah Route Selection and Routing

The original route concept for the streetcar was driven by four key factors.

- ***Inclusion of the River Street trackage***: The existing track down the center of River Street, owned by Norfolk Southern, was to be a key line segment of the historic streetcar concept.

- ***Martin Luther King Blvd. Routing***: Unless found to be completely infeasible, one or more tracks should be routed via MLK, as a possible future link to light rail systems to the southern area of the city.

- ***Visitor and Community inclusion***: The system was to reach as many destinations as could be rationally included, serving both the residents at large and Savannah visitor.

- ***Minimizing Historic District impacts***: Wherever possible, streetcar routes and designs were to be away from primary historic residential areas and those areas of sensitive scenic beauty. While the Savannah trolleys of the early 1900's ran directly through the town squares in many areas, this was not considered to be feasible today.

With those broad goals in mind, the process of examining and evaluating potential historic streetcar routes began in earnest. Aerial photos, scaled with accurate City of Savannah topographic and street drawings, were obtained and used to develop scale drawings. Potential routes were examined on foot, videotaped, and photographed. Concepts were evaluated, and what appeared to be a relatively straightforward process of linking two basic destination areas became much more involved.

Early on in the route selection, several key issues developed that strongly influenced our evaluation process. Given these discovered constraints, the end alternatives and route recommendations developed in a logical manner.

Considering the cost of track and overhead construction, we naturally sought to minimize total track footage as much as possible. Track that didn't directly serve the goals and destinations of the project was removed, and duplicate tracks were relocated to serve a wider area. Additional trackage beyond our concepts can certainly be added to serve additional neighborhoods or destinations, but at a price. The second major reason for containing overall project size is to effectively reduce operational costs while keeping service intervals between the 10-20 minute mark. The ridership survey reinforced a design goal of no more than 20 minutes between cars. Reducing total route mileage, along with the resulting number of cars required to provide service effectively reduces operating costs while meeting the goals of the market.

River Street Traffic Flow and Clearances

During our very first visit to River Street, vehicular traffic was still allowed to travel both east and west. Access via the ramps off of Bay Street, and the end connections at President and Martin Luther King, Jr. Boulevard contributed the connecting traffic. While River Street was not a high-volume connector, it had its own unique issues.

Prior to noon, the street was heavily used for deliveries. Despite city ordinances and enforcement attempts, the street was partially blocked with parked trucks. While vehicular traffic could alternate and dodge around these parked trucks, they were parked squarely on the existing railroad tracks. Several places along River Street were configured in such a way that any stopped vehicle attempting a delivery would effectively block the trolley.

Subsequently, River Street was changed to one-way eastbound, with the continuing restrictions on deliveries after noon. Potential interference from delivery trucks continues, as there is inadequate space between the side of the track and the curb to allow a delivery truck to park and still allow the trolley to pass in some areas.

The existing River Street trackage, while reconstructed in a high-quality and enduring fashion by Norfolk Southern, owes its street alignment to freight service, not trolley service. Original mapping of the area indicated that the peculiar and irregular alignment of the remaining main track down River Street is a leftover of the multiple tracks, sidings, and switches that once existed along its length. As unused spurs, multiple tracks, and sidings were removed over the years, the remaining main track meanders from side to side instead of an exact street centerline typical to a trolley, or traveling in a directional lane.

We studied the operating legacy of the "River Street Rambler" freight switcher service that ceased operation in 1999. Until that time, Norfolk Southern ran a 'daily' switching freight train down River Street to connect the port with the Kimera Pigments chemical plant on the east side of Savannah. The freight switcher engine was specially painted, and even equipped with on-board loudspeakers playing Dixieland music to announce its presence and serve as both a vehicle and pedestrian warning. After the commercial redevelopment of River Street (post 1977) the freight railroad had increased difficulty navigating River Street on a daily basis, requiring the eventual assistance of the Savannah Parking Services to walk ahead of the train and notify visitors to move

their vehicles from streetside parking.[11] While this was apparently done in a satisfactory manner for the once-daily trip, the impact on a scheduled trolley service being blocked by parked vehicles would be more problematic. Currently there is no parking on River Street itself other than loading and unloading delivery trucks. For safety we recommend that all streetcar stops on River Street be on the riverside (north) and that appropriate signage indicate that traffic yields to the streetcar.

Because of that track alignment, the narrow street width, and the potential vehicle parking conflict, River Street is difficult to navigate. If a trolley were to regularly operate both east and west on River Street, the safest and most likely alternative would be to entirely ban vehicular traffic from the street except for cross-street access to parking lots, and for limited-time commercial deliveries. While this may be the easiest way to implement the trolley, we sought a system design that would not demand that vehicles be completely banned in order for the trolley system to function.

The existing rough cobblestone street design has had an unintended result – vehicles deliberately try to drive on the railroad rails to reduce vibration. Evening traffic, particularly the number of 'cruisers' on River Street, attempted to drive directly on the railheads wherever possible. This doesn't do any damage to the steel rails, but could be an issue if the vehicles and trolleys were operating in opposite directions, particularly at night. A head-on collision between an inattentive driver and a trolley is a very real potential. A direction of flow that keeps vehicles and the trolley moving in the same direction would be much safer for both. One-way eastbound vehicular traffic can be only accommodated with particular attention to the MLK/River Street intersection and the narrowest choke points of track position and street width at the West End of River Street. There is currently a stop sign for traffic entering River Street from Martin Luther King, Jr. Boulevard. Additional signage indicating that traffic yields to the oncoming streetcar would enhance the safety of all vehicles.

Tour busses restrict their parking to the westernmost ends of the street nearest the power plant, and rubber-tired trolleys restrict their movements to a relatively short length of the street between access ramps. Our own impression was that the 'historic' trolley busses experienced severe vibration and window rattling on the cobblestones, and that the resulting noise was high and ride quality was marginal. The trolley busses are restricted as much by this factor as by any deliberate route design. River Street, along with the cobblestone access ramps, is hard on these vehicles in general. The CAT Shuttle does not access River Street

River Street/MLK Grades

The intersection of Martin Luther King, Jr. Boulevard and River Street is a relatively steep and difficult connection for vehicles, and particularly challenging for historic trolleys. Historically, the Savannah electric trolleys actually did come down this hill apparently to access the power plant – delivering loaded freight cars down the slope. They did not, however, attempt to tie into the existing River Street freight trackage, as this new system would do. The final sharp curve to access the power plant was off the slope of the street intersection.

[11] Savannah Morning News, Mar. 28, 1999 "River St. Rambler Makes One Last Run"

Study of topographic maps indicated that the actual grade at the foot of Martin Luther King, Jr. Boulevard is 8%. This, by itself, is not a project-ending restriction for trolleys, but is still a steep grade by any definition. Electric trolleys regularly climbed grades this steep, and continue in service on such steep grades in cities such as Pittsburgh. Six hundred volt DC motors have heavy low-speed torque capabilities, and the duration of the climb is relatively short – preventing severe motor overheating. Power requirements to make this hill with a fully loaded car, however, will likely become the most demanding on the entire system. The system will have strategically located rectifiers. The rectifier is a heavy-duty transformer type installation that converts commercial high-voltage AC (alternating current) power into the 600-volt DC (direct current) supplied to the overhead wire to move the trolley. Location of this grade beside the power plant, the most likely place for a rectifier, is a happy coincidence and would minimize the amount of high-current feed cable to supply the overhead wire.

Power requirements to make this hill also affect the feasibility of self-propelled cars and/or diesel generator trailers – both of which increase car weight to provide adequate power, and keep increasing size and weight until total demand balances.

While climbing the grade is a concern, descending it is potentially the biggest hazard. A car that can't climb the hill may simply stop, but a car that cannot safely descend the track onto River Street not only has the potential of derailing on the curve but coming down the hill into vehicular or pedestrian traffic. A surprise loss of braking while descending the hill and curving into oncoming traffic would be catastrophic. Newer-style cars such as the PCC cars employed additional track brakes in Pittsburgh to provide supplemental braking, and all trolley cars have redundant hand brakes in addition to air brakes. Further compounding this situation is the presence of several trees on the west side of MLK overhanging the track, and wet leaves on the steel rails have been the enemy of trolley systems since their inception.

The foot of Martin Luther King, Jr. Boulevard at River Street is relatively wide, allowing a wide swing from the existing track up to the far northwest side of the street, where street parking currently exists, back to the southbound travel lane centerline. The inside of the curve consists of a stone/concrete retaining wall for a hotel complex. A swimming pool is located just inside this wall, at a higher elevation. A USGS benchmark exists on the steps, as well. All of these issues combine to effectively limit any potential to cut to the inside of the curve to reduce the grade by any significant amount. Excavation to widen this curve must be minimized to avoid disturbing the retaining wall for the swimming pool.

Compounding the entire situation is the curve <u>on</u> the hill. As the curve on the hill cannot be either perfectly flat, or properly super-elevated (banked on the outside rail), climbing speeds will be limited to 5 mph and any descents equally limited. This combination of curve and grade on Martin Luther King, Jr. Boulevard is possibly the single most difficult design feature of the proposed system.

There are alternatives to this hill and curve, and those are discussed under route alternatives. Even if a longer and less-steep ascent of the hill is preferred, the end result is still a single-track system running westbound against traffic on River Street With that configuration the short, steep climb <u>up</u> the foot of MLK remains a safety and engineering concern.

Impact on the System Design

The combination of the existing River Street track location, River Street traffic direction, and the MLK/River Street intersection combine to effectively determine a westbound-only movement on River Street. While it may be possible to do a bi-directional system generally connecting River Street with the Visitor Information Center on a single track, the resulting negative impacts on parking, traffic, and commercial activity would likely generate negative reaction from the very area that could potential benefit the most from the trolley service.

Martin Luther King, Jr. Boulevard

Martin Luther King, Jr. Boulevard, known historically as West Broad Street, has a long history of electric trolleys. This street was historically a 'main line' for the system headed south. Today, MLK is a high-traffic thoroughfare on the west side of town, and has a full 65-foot width including parking, travel lanes, and center turning lanes at intersections.

Locating a trolley track on Martin Luther King, Jr. Boulevard is not simply a matter of drawing a conceptual line in the street. Most street intersections, and nearly all of the connecting lanes, do not have an open center boulevard area sufficiently wide to allow trolley operation without narrowing all travel lanes, or shifting all lanes to eliminate one entire parking lane and make the center lane a 'trolley only' route. The center lane is heavily used for left turn stacking at intersections.

A center median track would be the easiest to construct, but would have the highest impacts on street design, traffic flow, and parking. Boarding a trolley on MLK would be much more dangerous if the rider were expected to walk across two traffic lanes and attempt to board from the center. Moving the trolley from a center street alignment across a traffic lane to access the curbside is equally dangerous for vehicles.

Therefore, the best/safest alignment for track(s) on Martin Luther King, Jr. Boulevard is to travel in the existing right-hand traffic lane wherever possible, moving over to the curbside only in such limited areas as the Visitors Center. Moving with traffic, in the existing travel lane, will increase rider safety, decrease the potential of a head-on collision in the center lane, and allow some degree of 'stop on demand' service to unload and load passengers without risking their safety.

The disadvantage to this approach is that running a trolley in two directions (as a simple single-track, out and back system to River Street) then requires at least two tracks on Martin Luther King, Jr. Boulevard and increased project costs. Conceptually, this would mean one track in the southbound lane and one in the northbound lane, at least to the intersection of Bay Street and MLK Boulevard. This approach effectively solves much of the traffic safety issues of a center track, but equally effectively doubles the cost of construction and implementation on Martin Luther King, Jr. Boulevard.

We looked at several potential routes using this approach. Most, if not all, involved running along Martin Luther King, Jr. Boulevard past the Visitor Information Center, turning on Alice, and returning back in the northbound lane of Martin Luther King, Jr. Boulevard toward River Street. All met the basic operating criteria of the system, if not all the destination goals. It is important to

mention that running two tracks (north and south) on Martin Luther King, Jr. Boulevard *is considered feasible*. It does not, however, maximize the impact and ridership possible on the system.

Once the underlying concept of running with traffic on Martin Luther King, Jr. Boulevard is accepted using two tracks, the question becomes one of maximizing the utility of the system. Is it better to have two tracks both running on Martin Luther King, Jr. Boulevard, or separate the other return track by one or more blocks to serve more of the community? This conceptual design issue became one of the key decision and recommendation points of this study.

Directional Running on Martin Luther King, Jr. Boulevard

While we examined the potential of either northbound or southbound running on MLK, the physical position of the Visitor Information Center realistically only favors access from the west side; i.e. southbound running. Northbound-running would be possible, but not recommended, by attempting to 'cross over' from the east (northbound) lane to some kind of a protected, off-street boarding area, and the return back into to the northbound lane; or, to simply board from the other side of the street. In the end, we cannot recommend either of these alternatives. The multiple cross-lane movement is potentially too difficult and risky for the high traffic volumes, and expecting pedestrians to cross Martin Luther King, Jr. Boulevard to board a trolley to River Street puts it completely out of normal traffic flows, almost out of visual sight, and across a busy and intimidating street for pedestrians. Southbound running on MLK Boulevard is the best alternative.

Accessing the Visitor Information Center

Existing trolley tour busses and the CAT Shuttle enter the Visitor Information Center through a 'back door' route rather than through the Martin Luther King, Jr. Boulevard access. They park and load in the Visitor Information Center parking lot, and depart out on Martin Luther King, Jr. Boulevard on their dedicated tour routes.

We sought to duplicate this routing for the electric trolley if at all possible. The trolley service should be considered as being an adjunct and alternative, and a Savannah visitor would be the most comfortable and familiar with the service if it were offered in the same general area as existing tour and trolley busses. We considered a variety of entrances and exits to the Visitor Information Center all with the goal of directly interfacing the vehicle to the same general loading area as the busses.

Physical constraints to achieve this goal were numerous:

- The existing entrance to the Visitor Information Center is through a narrow, two-lane brick portal that is directly against the sidewalk, and already has limited visibility. A trolley track properly located in the street lane cannot easily turn into this entrance without car body overhang that would collide with vehicular traffic. The only 'feasible' alternative would be to modify/remove the entrance and exit area to remove the brick drive portal, widen the entrance, and/or make an exclusive trolley entrance.

- We also looked at a complete 'back door' entrance approach, including routing the trolley further west away from Martin Luther King, Jr. Boulevard by one or more blocks. This routing effectively met the goal of interfacing the trolley into the Visitor Information Center, but at the expense of losing a major portion of MLK routing, visibility, and complicating the River Street to MLK connection. Rerouting the intersection and the routing west of River Street was also considered. Routing the trolley through this alignment was primarily through a high-density residential area with potential conflicts with young children and other pedestrians. This did not meet two of the basic goals of the route.

- Exiting the Visitor Information Center gracefully became equally difficult. One initial concept was to reconstruct the Louisville Road railroad overpass, using the existing bridge abutments. The streetcar would enter the Visitor Information Center site via Martin Luther King, Jr. Boulevard, exiting the Visitor Information Center to the rear. The vehicle would then make a sharp, reverse curve, cross over Louisville Road on a railroad-style reconstructed overpass, cross Battleground Park and through the Railroad Museum, and return to Martin Luther King, Jr. Boulevard, continuing south. While this routing had some advantages – specifically directly connecting the Visitor Information Center to the Railroad Museum (increasing its visibility), its roundabout routing created traffic, design and entrance problems that left the trolley at the back edge of the Visitor Information Center property for boarding. It resulted in an expensive steel bridge overpass, created potential use conflicts with the Battlefield Park site, and required a difficult and tight exit through the Railroad Museum property.

One key restriction to the existing loading area at the Visitor Information Center is the vertical distance between the street level/sidewalk and the current bus loading area. The ideal boarding location would be at or near the current private trolley bus stop, but exiting this location to return to Martin Luther King, Jr. Boulevard would not be feasible due to the elevation changes, brick walls, and necessary curve radius to continue south on MLK.

In the end, a rather simple approach of staying on Martin Luther King, Jr. Boulevard achieved the goals of the project with minimal additional expense. Continuing the track in the southbound traffic lane of MLK directly in front of the Visitor Information Center allows the track to swing over to the sidewalk for loading out of the major traffic lane. Positioning the trolley directly in front of the Visitor Information Center for regular loading keeps visibility of the electric trolley to a maximum, without creating an additional safety hazard, and does not directly conflict with the boarding area of the existing tour trolley busses.

Accessing the Roundhouse Railroad Museum

The Roundhouse Railroad Museum site has a natural link to the project from a rail preservation standpoint. It also has some potential to be used as a car restoration/car barn site. While there is no overwhelming reason the museum track must be tied into the trolley system, the ability to physically move electric trolley equipment between the two areas would have some mutual benefit.

The high differences in visitation level between the Roundhouse Railroad Museum and the Visitor Information Center result from a number of factors – mostly because the Roundhouse Railroad Museum is nearly invisible to someone in the Visitor Information Center parking lot. Any trolley route that accesses Martin Luther King, Jr. Boulevard will improve this, and directly serving the Roundhouse Railroad Museum during business hours would dramatically improve visitation.

We have shown a 'loop' to the Roundhouse Railroad Museum in our conceptual plans, but this loop is only of value to the system when the museum is actually open. In the evenings and after-hours, the additional track loop only serves to slow the system down. A direct line down Martin Luther King, Jr. Boulevard is shown as the primary, and faster, routing.

The conceptual loop does not appear to conflict with Battlefield Park plans, and moves with traffic in the right-hand lane, through the museum-access streets. Linkage with rail museum trackage could even be made on the northeast corner of the streetcar track, beside the Roundhouse, and connecting with the turntable lead. This would only be useful for streetcars, and possibly the small steam tank locomotive that is equally capable of negotiating sharp curves.

Accessing City Market

The ridership surveys and the visitor focus groups clearly indicated that one of the top potential stops for an historic trolley would be the City Market area. This requires a detour from the Martin Luther King, Jr. Boulevard section, but in turn, creates other route opportunities.

Finding a route in to, and out of, City Market without creating undue disruption is not an easy task. Historically, an east-west streetcar on West St. Julian, dodging around Franklin Square served the area. Repeating this route through or around the square today was not considered viable. A southbound route via Jefferson, working with traffic, was considered to be the best overall alternative to directly access the area without undue disruption. The question then became how to get to Jefferson Street from the hill climb up Martin Luther King, Jr. Boulevard (MLK) from River Street. There are three options:

- MLK to Jefferson Street via East Bay Street: This route has the advantage of directly serving three of the hotels on the west end of West Bay Street, and increasing the visibility of the project to those hotels. A theoretical routing would be in the right-most traffic lane, headed east, for two blocks, and turning south on Jefferson. This route has the distinct disadvantage of being located in the highest-traffic street in the entire city, even for a very short distance. Under the best of circumstances, the assumption would be that the trolley would not stop on West Bay until after a turn was made onto Jefferson, due to traffic concerns. The corner of West Bay and Jefferson Street is a very tight design curve.

- MLK to Jefferson via West Bay Lane (back alley): Mapping showed a low-volume alley between Bryan Street and West Bay Street that might have been a viable potential route. It is located to the back of one hotel, and borders on a parking lot at Jefferson. This alley is currently one-way westbound, which is the wrong direction. After inspecting the alley and determining that even with a traffic flow change it would not be a desirable site to run the streetcar, it was discarded as an option.

- MLK to Jefferson Street via West Bryan Street: Though this street has the width and position to be viable, it is currently one-way westbound. Use of this street by the trolley would require either a separate, and protected, travel lane for the trolley headed east or reversal of the vehicle traffic flow westbound.

- MLK to Jefferson Street via West Congress Street: West Congress Street is further up Martin Luther King, Jr. Boulevard for the turn into the City Market area. It is also in the heart of the City Market attraction area. Running the trolley down West Congress avoids the crowded area on Jefferson where tour trolleys load and unload passengers during daylight hours. This route appears to have the best combination of traffic protection systems and flow to access the City Market area.

Back to Martin Luther King, Jr. Boulevard

Returning the trolley to Martin Luther King, Jr. Boulevard from City Market requires turning onto West Broughton Street for two blocks, and swinging back out onto MLK to continue south. Track alignment on this segment would be the right-hand (westbound) travel lane.

Creating a direct link directly up MLK that does not include the City Market area is a viable design alternative, particularly if the route is matured toward transit functions. The overwhelming response and interest shown for the City Market stop resulted in this plan despite the additional trackwork and design issues encountered.

Jefferson Street became the most desirable southbound route when combined with the alternatives of northbound routes. By linking these two routes in the middle via a connection at the intersection of Jefferson and Broughton, it is now possible to run a shorter, quicker 'north end only' circulator around the system.

I-16 Overpass

Vertical clearances under the I-16 overpass were checked and will require no special provisions for overhead wire clearances.

Ralph Mark Gilbert Civil Rights Museum/Alice Street

Ridership surveys confirmed the interest in stopping at the Ralph Mark Gilbert Civil Rights Museum at the corner of Alice Street and Martin Luther King, Jr. Boulevard. The stop would be on the south side of Alice Street, directly across from the museum, in the right-hand traffic lane, and out of the high-volume MLK flows. Alice Street appeared to be a particularly viable cross street headed east when checked on a map. After inspecting Alice in the field, it was determined that it was not a viable streetcar route due to its winding nature as it progressed east.

The next street south is Gaston Street. It is one short block from the Civil Rights Museum and is the street that acts as the north entrance to Forsyth Park. After a thorough inspection of Gaston Street, it was determined that it would be the best route to either Whitaker or Drayton Streets.

Which Way North?

- Several streets have at least the potential to be the return route north for streetcars.

- Montgomery Street was an early choice, due to the one-way running headed north. This route is wide, serves the Civic Center front, and has excellent service potential to the Civic Center. Disadvantages include the high traffic volumes coming off of I-16, and the relatively short distance between MLK and Montgomery; i.e., the return route does not serve many alternative neighborhoods or destinations better than MLK.

- Jefferson Street is a little-used, bi-directional street that is bisected by the Civic Center parking lot. Because it is both bi-directional and low-traffic, it has excellent potential to be used as a streetcar route. It does not bisect or interfere with any historic squares. While the street has limited commercial exposure, it serves the back door of the Civic Center, and the large parking lot. The only impediments to serving the Civic Center are concrete posts set in the ground to prevent through vehicle traffic. The trolley, however, could be allowed to cross into this area.

- Barnard was the historic north-south route, where the electric streetcar cut through the center of no fewer than four squares (Chatham, Pulaski, Orleans and Telfair) and skirted the previous square at the City Market parking ramp. This was not considered to be a viable route today.

- Whitaker Street is a wide, two-lane street, but runs southbound. Its use would be predicated on the assumption that it could be either given a dedicated northbound lane for the streetcar, or entirely reversed in direction. It does have the advantage that it is strategically much closer to Forsyth Park, which surfaced as a desirable destination in the focus groups.

- Similar to Barnard, Bull Street has five historic squares on it, necessitating either cutting through the center or negotiating them via roundabout "S" curves. Trolleys did not run here before, and this was not considered viable.

- Drayton Street has the advantages of expanding the streetcar system far enough east to fully include the Forsyth Park area, and would not require the directional rerouting that Whitaker would, as it now flows northbound. Drayton has adequately wide streetside space to develop high-level boarding platforms, and has some property that is available for redevelopment. There are no conflicts with historic squares. A Drayton Street route can also take advantage of a stop at Forsyth Park and the city's proposed Visitor Information Center for that area.

Routing via Jefferson Street was initially considered to be the most viable alternative that would have the fewest traffic impacts, reach the Civic Center and the parking area behind it, and connect with the southbound leg from the City Market connection to allow long or short-loop running. The revision of the system goals to include the Broughton district return loop now favors a Drayton Street northbound return as having the lowest traffic impacts combined with the least engineering conflicts, while including a larger area of the city in the project.

Eastbound on Broughton

Broughton Street had the most visible and signature piece of electric railroad track in Savannah. Track ran the full length of the street between Habersham and Martin Luther King, Jr. Boulevard (formerly West Broad Street) and served as the major destination on the historic street railroad. The original retail downtown area owed much of its success to the trolley services down the center of the street.

The original track orientation was a bi-directional, centerline track, with one traffic lane and one parallel-parking lane to either side. While this was a tight fit into a nominal 44-foot street width, it was regularly done for many years up until 1946. The current practice of two 10-foot parking lanes with two 12-foot travel lanes makes this much more difficult to do today.

Like other streets in Savannah, we recommend moving the trolley track to the eastbound travel lane; roughly six feet south from its original center location. There are understood concerns about the potential for subterranean basements, etc., along the edge of Broughton Street, but the position of the track in the center of the existing, eastbound main traffic lane should completely avoid that possibility. Trolleys are lighter than a typical semi-truck, and spread their weight over four axles and eight wheels. Total surface loading of a trolley is lighter than that of a loaded truck[12].

Broughton has the exciting ability to show the Savannah visitor something they don't see much of on a typical trolley tour – the vibrant and historic retail downtown shopping district that has maintained its presence over time. Routing the track via this street will add an entirely new dimension to the project that was not originally envisioned – the ability to serve Broughton Street and the downtown shopping district, provide direct connections to the City Market, and to the outlying parking districts. While there may be additional engineering, streetscape, and traffic issues to contend with, the routing via Broughton Street adds much more to the project, and vice versa, than attempting to avoid it or devise a safe reverse running scheme strictly on River Street

Operating the top half of the route loop on the short circulator scheme creates a two-mile route down River Street, to the City Market, across on Broughton, to the Tybee depot parking and back again – a very viable circulator system primarily devoted to commercial activity with short intervals between cars. The combination of the River Street plus Broughton Street effectively pulls both together to develop an afternoon – evening attraction that will meet the needs of the visitor and the resident, in addition to providing day long service on its full north-south route.

[12] For example, the newly built steel-bodied Tampa trolleys from Gomaco have a 46,000 lb. empty weight and a capacity of 44 seated and 44 standees for a maximum capacity load estimate of 17,600 lb. The total 63,600 pounds spread over eight wheels results in 7950 lb. per wheel – still less than the AASHTO "H" truck loading that is 8,000 lb/wheel.

Tybee Depot Parking

We developed one of the key destination points of the project based upon the City of Savannah's potential acquisition of the Tybee Depot land parcel from Norfolk Southern Railroad. The Tybee Depot property was the original site of a short, steam-operated railroad out to the island, with a small passenger station on the actual site. Since then, the actual station building was relocated to Ft. Jackson and now serves as its visitor center.

The parcel of land that the original railroad station sat on is still owned by Norfolk Southern Railroad, and negotiations are currently underway to purchase the property for the City of Savannah. The property will be vacant, developable, and is imagined to be one of the few available parcels to serve as visitor parking for the trolley. It also is one of the most likely sites to develop an equipment storage car barn. Its current industrial-area location will allow construction of a parking lot and a new utilitarian maintenance facility. In other historic trolley projects such as Kenosha, WI, the car maintenance barn has become a showcase with glass windows, recognizing the fact that the public has an interest in the cars, how they are maintained, and what they all look like. It has the potential to be a new attraction in the City, and will attract attention even if not mentioned at all.

The track moves off of the public street and onto this parcel as soon it crosses Randolph Street. This will prevent a stopped trolley from being involved in the stacked eastbound traffic at the intersection of President Street with General McIntosh Blvd and allow the trolleys to wait in the immediate parking area, rather than on the curbside or on the street itself.

Back to River Street

The total circle route is completed by a reverse curve back onto the original Norfolk Southern trackage on River Street to continue its westbound route. The existing President Street crossing is used, which has complete railroad-style grade crossing protection. River Street is an important intermodal connection for the Savannah Belles Ferry to Hutchinson Island and as a critical connection for the proposed high-speed ferry to Tybee Island and South Carolina destinations. As part of the planning the system will tie into the property beyond the Savannah Marriott Hotel that is the most likely location for the development that will accompany that ferry service.

Other Design and Route Issues

Location of the Car Barn

Previous feasibility studies recommended the use of the vacant fire station at the north end of Martin Luther King, Jr. Boulevard as a potential three-stall car barn. Stone Consulting does not concur with this recommendation. The building is situated on the 8% grade of upper Martin Luther King, Jr. Boulevard, leaving the two northern most bays hanging with a sharp drop-off into the street. While this was marginally acceptable for fire trucks, it is nearly impossible to negotiate with

streetcars. Only the southernmost of the three bays shows any real potential to even be efficiently accessed. Adding switches at the top of the hill to access the building would also add hazards and track irregularities that would compromise the ability of streetcars to climb the hill without slipping slightly.

Vertical clearances on the building are also too low to efficiently serve as a maintenance facility. Overall, the building is only minimally effective, and the site itself is in the wrong location. Our recommendation would be to construct a new operating and storage barn on the Tybee Depot site or a site at Fahm and Oglethorpe that is currently a vacant lot located within one block of the route.

Overhead Wire versus Generator Cars

Charlotte, North Carolina, the Willamette Trolley in Portland, Oregon, and the Astoria Riverfront Trolley in Astoria, Oregon have all developed successful low-volume historic trolley projects by towing along a generator trailer. A generator trailer typically consists of a diesel-fueled commercial-style DC generator on a separate trailer to provide the electric supply to the streetcar. The streetcar is modified to the extent that the power is taken from a cable connecting the generator trailer to the main controller, instead of from the trolley pole on the roof that contacts the overhead wire.

These cars have been a success where the initial cost of overhead wire on a longer system is prohibitive, and the number of cars is one or two. This is particularly the case on the Willamette Trolley, where the seven-mile route is strictly a tourist ride. In Astoria, and in Charlotte, the generator is viewed as an interim step until wire can be erected. In both those operations, the routes are almost completely flat and relatively short.

The biggest objection to the generator cars is the noise and odors of a diesel generator. While the car itself may be authentic, it is hard to ignore the sound of a very diesel-sounding generator operating constantly. The normally quiet electric trolley sounds more like a small bulldozer. In order to reduce noise, Charlotte has extended the exhaust stack on their generator to full height, reducing the noise somewhat but creating a very ungainly looking vehicle as a result. Each operating car must have its own generator, and on a moderate length system that envisions multiple cars as the Savannah Streetcar project does would result in a significant investment.

Generator trailers are not only noisy, and have exhaust, but they are also heavy. The generator trailer must be big enough to generate enough power to propel the car at full load, and that will vary from car to car. The larger the generating capacity, the larger the generator, and the larger the generator, the heavier it is. As the generator trailer is not self-propelled, but relies on the trolley to pull it, this adds additional load and additional weight. This becomes a real concern on the 8% grade up MLK on this project. As a result of this, we do not recommend the use of generator trailers for this project, primarily due to the grade/load issue, and the potential number of generator trailers required.

Figure 4. Generator Car, Charlotte, NC

Savannah's Tree Canopy

One of the most appealing aspects of Savannah is the backdrop of mature oak trees and Spanish moss along many streets. The streetcar project seeks to preserve this natural attraction in a similar fashion to the New Orleans Streetcars that traverse a similar oak and moss lined boulevard. During design and construction there must be continual coordination with the City of Savannah's Department of Parks and Trees to ensure that both the tree canopy and tree roots are unharmed by construction and operation of the system. The canopy along the proposed routes is high enough to adequately accommodate the streetcar wires. The proposed route along Gaston Street has low hanging canopy mostly confined to the north side of the street. The streetcar would run in the southern lane where the palmetto trees are tall enough to accommodate the wires without trimming.

Additional Routing Options

The Martin Luther King, Jr. Boulevard/River Street grade was repeatedly analyzed for an alternative. Prior to the development of the westbound-only concept on River Street, descending the grade was enough of an issue to examine every possible alternative to this hill.

Equipment Selection and Operation

The resurgence of heritage streetcars in the United States has created a surprising collection of restored, rebuilt, and reproduction (i.e., new) cars. None of these cars are considered light rail transit though many of them can accomplish essentially the same task. Prices are often the biggest difference, with the typical modern light rail vehicle often marketed for $ 1.2 - $3 million per car, and the typical streetcar at $ 650,000 -$1.2 million – generally half the cost. In some cases, serviceable streetcars can be developed for much less on an individual car basis using recently retired transit-type streetcars.

Restored Historic Streetcars

Restored historic streetcars are defined as original vehicles that maintain their original materials, appearance, and technology for current day services. Components and materials more closely resemble an authentic museum vehicle in transit duty, even though the materials may have been renewed. Classic examples of restored historic cars in daily service include the original New Orleans St. Charles line, which operates with the same historic car fleet that it had in the 1950's.

Savannah currently has one semi-restored ex-Melbourne, Australia car in storage at the Railroad Museum. While this is not an authentic Savannah streetcar, and isn't precisely similar to those that operated in Savannah, it is a legitimate original heritage wood car. These "Melbourne" streetcars feature bi-directional operation with two operator control stands, seating for approximately 40, and another 30 or so standees. The wide center doors are the passenger entrance. The very narrow end doors in the photos are for the operator cab, and not the passengers. Doors from the center section access the two semi-enclosed seating areas, and the windows do open. The car Savannah owns does not have air conditioning. This car has had extensive car body restoration and electrical work already applied and is in near-operational condition. The car is missing some small parts, additional interior finish work, and a trolley pole. (*Photo of Melbourne streetcar in Memphis Tennessee.)*

Figure 5. Melbourne Car, Memphis, TN

Melbourne cars have become favorites of heritage trolley systems across the United States, and form the backbone of systems in both Seattle (five cars) and Memphis (seven cars). They have held up well in day-to-day service by transit authorities, and the trucks and running gear have been adapted to other U.S. car body styles, such as the Lowell reproduction trolleys.

Melbourne cars had been difficult to obtain because the Australian government put a stop to their export when it became apparent that the majority of their remaining historic cars were being exported to the U.S. Melbourne cars are once again available, as the Australian government has resumed allowing their export. Parts are exported through Bendigo Tramways, Ltd.,[13] including trucks, motors, and seats. With access to cars and parts now available the Melbourne car is a viable option for the Savannah system and is maintainable through regular daily service.

The other available streetcar at the railroad museum is a self-propelled gasoline-powered replica vehicle built over a Fairmont motorcar frame. This type of self-propelled vehicle was used to transport workmen along the track until the advent of hi-rail pickup trucks, which are standard pickup trucks equipped with retractable flanged guide wheels for traveling the rail tracks. They made most rail-only inspection vehicles, such as Fairmont motorcars, limited and obsolete. While it has some external physical resemblance to a streetcar, it is neither particularly accurate nor suitable for historic electric rail trolley purposes.

[13] http://www.swanhillsc.vic.edu.au/home/trams/index.htm

While much newer-appearing, the streamlined PCC (Presidential Conference Car) trolley is equally accurate and appropriate for authentic car restoration and service. The late 1930's technology still holds up relatively well in regular service, and such cars have become the vehicles of choice by historic trolley systems in Kenosha, Wisconsin and Pikes Peak, Colorado. The disposition of relatively large fleets of these cars by Philadelphia and Toronto – some as late as the 1990's – made their immediate transition to historic trolley fleets relatively rapid. The biggest criticism of these cars is their overall appearance – more closely resembling an art-deco streamlined steel bus than a 'classic' wood trolley – and the standard design that generally limits them to one-directional running, as only a handful were ever built with double-ended controls. PCC cars are now much more closely guarded by the few remaining transit agencies that have not disposed of them, finally recognizing their historic nature. They are a relatively generic vehicle; most trolley museums across the United States have at least one or two in their collections. Components and parts for many can still be purchased from overseas suppliers.

Figure 6. PCC Car, Kenosha, WI

Most trolley museums in the U.S. have a substantial collection of equipment, including many un-restored cars and derelict car bodies on their property. When enough duplicates of a particular car type exist, some trolley museums have bravely begun a limited program of de-accession to historic trolley projects, sometimes developing hybrid ownership and restoration programs that blend museum ownership with regular transit operation. Such a program is underway between the Seashore Trolley Museum, and the Lowell National Historic Park, where Seashore is looking to establish a satellite location in Lowell, to furnish additional historic vehicles to the existing system. Beyond even that concept, Seashore has indicated past willingness to sell several duplicate vehicles in their extensive vehicle collection, if they are to actually be restored and used by legitimate projects. These cars are not available in any volume, and a major car fleet cannot be developed reliably by this method. Authentic historic cars may be procured on a limited basis with this approach, given the understanding that a museum may wish to both limit heavy use, and consider the equipment as leased on the basis of repairs performed.

Rebuilt Historic Cars

Rebuilt historic cars comprise cars in which there are substantial changes applied to the original vehicle, including modifications for ADA accessibility, air conditioning, changes in electrical controls, materials, and seating. They may be an authentic trolley, but have been extensively modified to operate in the real world of daily transit services. Gomaco Trolley, of Ida Grove Iowa, has an extensive history of developing rebuilt, new, and hybrid vehicles of different types. Their work varies from pure restoration, to developing virtually new trolleys with rebuilt electrical gear and air conditioning (Tampa). Overall, their work is custom, based on the project, and incorporates a high degree of workmanship with a high degree of practicality. Gomaco cars are in everyday service in Memphis, Tennessee, Lowell, Massachusetts, Tampa Florida, Portland Oregon, and will be used in Little Rock, Arkansas.

Figure 7. Gomaco Car, Lowell, MA

For the purposes of this project, the desirability of a car that has the historic appeal of an early-twentieth century streetcar is appropriate. Savannah's climate and history also favors the use of at least one open car, similar to those currently operated at Lowell, Massachusetts and built by Gomaco. If Savannah wants a diverse fleet, there is the possibility of adding Milan cars, a museum car, and one open car. Memphis runs no fewer than three different car type is daily service. (*Lowell, MA photo from Gomaco Trolley)*

These cars are not the low cost or high volume option. Gomaco currently has a number of "Milan" cars on hand, which are steel, single-ended cars that closely resemble an American streetcar. Depending on the options, and ADA considerations such as on-board ramps, etc, the total car price could vary between $500,000 and $800,000 per car. From a practical viewpoint, these are the new generic historic trolleys for Heritage systems such as Savannah. (*photo from Gomaco Trolley)*

Figure 8. Gomaco "Milan" Cars

"New" Cars

New Orleans has taken the unprecedented step of constructing all-new historic trolley cars for their routes, using their existing 1920's streetcars as patterns. The primary deviation from the historic design is the inclusion of fully-ADA accessible on-board lift ramps, heavy-duty air-conditioning, and more sophisticated control electronics. While these cars have been considered to be very appropriate and attractive, the finished price has been reported to be closer to $1.5 million per car. The finished product is virtually indistinguishable from the original New Orleans cars operated since the 1920's. These cars are actually being built in New Orleans, by New Orleans personnel on a fully-paid basis.

Accessibility Considerations

Historic trolleys are by nature an unfriendly vehicle for full accessibility. The combination of steps, higher floors, and narrow aisles and doors create several obstacles to easy boarding and loading. Though it may be theoretically "legal" to grandfather historic trolleys into public service as being exempt historic vehicles, most public historic trolley systems have found a way to realistically accommodate all passengers. This has been accomplished with a wide variety of approaches and there is no single answer to solving the access problem. It should be noted, however, that 'new' cars, even if emulating old cars, are required to have access.

On the 'low end', the least expensive and least complicated solution has been done by the National Park Service in Lowell, MA. Portable aluminum ramps are carried on-board the cars at all times, and passengers gain easy access up the ramp to the conventional floor height. This is helped by the fact that Lowell has two-person crews to assist in the process (motorman and flagman), and that the system is on a rather loose schedule at a tourism circulator. The two open bench-type cars have a tiltable front bench directly behind the operator to allow extra parking space for a wheelchair. The closed trolley has an open area beside the operator that can hold a single wheelchair. While this system appears almost too simple to be true, it is an excellent solution for Lowell, as boarding areas are fluid, high platforms were impractical, and on-board lifts were not feasible for the bench-type reproduction cars. Lowell is considered to be fully ADA accessible, but does warn about "one accessible secure space per vehicle" and recommends reservations.

Figure 9. Boarding Ramp, Seattle, WA

Melbourne-type cars that are used by Seattle and Memphis and recommended for Savannah have adequate room for full accessibility if passengers can be lifted up to the car. This has taken two approaches – high-level boarding areas with portable short bridge ramps (Seattle), or hi-tech hydraulic platforms that lift passengers from street level to car floor level (Memphis). In Seattle's case, the covered pavilions include a concrete ramp/waiting platform to rapidly load all passengers at the floor level of the car. In Memphis, a complicated, expensive and sometimes balky hydraulic lift at each station stop lifts a small platform level with, and partially inside, the car itself.

Seattle's solution has no moving parts to cause difficulty at the expense of much more expensive boarding areas that are closer to a station than a stop.

In the mid-price range, PCC-type car operators have favored on-board lifts. Kenosha, WI, mounted existing, conventional wheelchair lifts that were the same Stewart and Stevenson model as used on their transit busses. The rear entrance is essentially used as the passenger lift area. While this approach was both economical and practical, the time delay for deploying, loading, and stowing the lift has impacted schedules up to 10 minutes per boarding.

Figure 11. Wheelchair Lift, Kenosha, WI

Figure 10. Accessible Ramp Lift, Memphis, TN

Similar to Kenosha, New Orleans opted for on-board lift devices. In this case, the lifts were custom-built to fit the newly-designed cars that imitate the originals in appearance. Original New Orleans cars were nominated for National Historic Register status, exempting them from ADA accessibility issues. Old and new cars are often mixed on the same routes.

Tampa's TECO system includes high-level 'island' platforms with bridge platforms to accomplish access to two spaces per vehicle.

Nearly all historic trolley systems operating today are fully accessible. The final choice of vehicle and the track location in relation to the street typically dictate the approach. In a system as we propose for Savannah with a small number of streetcars, and a relatively large number of potential stops at curbside all along the route, the design configuration clearly favors an on-board lift sharing design components with bus lifts, such as Kenosha. Higher-level platforms with aluminum bridge plates can still be used at major stops such as the Visitor's Information Center, the Hyatt, etc. to speed the boarding process.

Cost Savings Issues

The proposed track design has one important consideration – the ability to *not* necessarily require a double-ended car. All cars can operate in a continuous loop, not requiring either reverse loops or changing ends. As the Gomaco Milan cars are single ended, and have not been determined as feasible to convert to double-ended, this is a very important issue in route design. Double-ended cars are much more useful, but difficult to obtain. Since the Gomaco Milan cars (and various conversions) are single-ended, and all but a handful of PCC-type cars were built as single-ended, a track design that allows this will create a significant savings in car cost – as much as $50,000-$100,000 per car. It is important to note that the only 'fleet' configuration currently offered by Gomaco as a stock car is the Milan-type rebuild, or using a Milan car as the starting point.

Fleet Size Projections

Maintaining a 10- to15-minute headway (waiting time between cars) on the conceptual dual-loop route will require no fewer than four cars. In the evenings, when the primary route is shortened to the upper River Street – Broughton Street loop, this can allow 4 cars to intensify the service levels to 5-10 minute intervals, which is ideal for both market and timing requirements. When the operation is in a continuous loop similar to Memphis, there is little confusion as to where the cars come from and where they are going. This leads to a sense of security on the part of the visitor and resident that they really cannot get lost in the system. (For a schedule of route times and vehicles please see Appendix I.)

A fifth car will be necessary for standby, maintenance, and reserve requirements. There is at least the potential that the streetcars could be equipped as 'multiple unit' cars, allowing the control of coupled trolleys by a single operator (forming a two-car train) to allow increased capacity on the same schedule. While this is an uncommon option today, it was frequently used in the past to allow for sports specials, and was a near-standard feature of light-rail interurban systems.

Increasing service levels to 5-minute headways on River Street directly increases both capital cost and operational cost, as the projected fleet size increases from five to seven or more cars. As this is a desirable alternative, we have included cost and budget projections to this option. This does not impact route design or initial track construction cost.

Many historic trolley systems have equipment fleets that would appear to be an eclectic mix of unrelated cars, when, in reality, they share many parts and components. Lowell's reproduction cars, while dramatically different in appearance between closed trolleys and open bench cars, are all built from the same Melbourne-car components, and share all major electrical, mechanical, and braking components. Kenosha and San Francisco are proud of the varied appearance of their cars, celebrating different paint schemes and appearances from across the United States. "Under the hood", however, cars are virtually identical, featuring all-Toronto rebuilt cars, Chicago Transit wheels, brakes, and trucks, and transit-style wheelchair lifts. Reproduction trolleys have the potential to represent vastly different eras, yet share key mechanical components to minimize maintenance inventories and headaches. Gomaco's current supply of Milan-style electrical

equipment and mechanical components will undoubtedly be used in a variety of vehicles other than the TECO Tampa trolleys.

Car fleets for Savannah would probably be a fleet of Melbourne cars now that they are available, but the fleet might also be comprised of the existing Melbourne car, one Gomaco open Lowell-type car, and three Milan or Milan-derivative cars.

Implementation

In part due to the pilot project started by the City of Savannah and the Coastal Georgia Society, there are already some significant strides toward establishing an historic streetcar service. When compared to other proposed locations for such systems, a number of key elements can be effectively counted off that are already present, and are absolutely critical for success:

- A key attraction destination corridor that is long enough, interesting enough, and vibrant enough to create lineal demand for streetcar services – River Street.
- An existing, high-quality, recently-rebuilt standard-gauge track down the corridor that will not require extensive reconstruction for streetcar use, and can be used virtually 'as is' for much of its length.
- A transit system and management team that already utilizes a Shuttle service in the downtown area to service residents and tourists alike, using attractive, quasi-historic appearing vehicles.
- A local railroad museum that has one near-serviceable streetcar, some demonstrated experience in equipment restoration, and an appreciation for the historic implications necessary for such a project.
- An actual *need* for service to a busy area needing transportation alternatives, rather than attempting to redevelop a 'dead' area through introduction of something different and new.

These are significant developments that most projects never attain, and only seek to develop. In that light, Savannah has progressed well beyond initial project concept. The potential for the use of the existing tracks on River Street leads to easy visualization of a larger system.

The remaining challenges require a different approach than most proposed projects. In a blighted area, nearly any attempt to do virtually anything is greeted with at least initial approval. There is not a sense of urgency to attack a specific problem. The real problems that do exist include pedestrian and vehicle access, parking, through vehicle movement, and limits of capacity are very real, nevertheless. No one in Savannah wants to 'ruin' the streetscape or the community in an effort to improve things – there is simply too much at stake. Our own enthusiasm for historic streetcars was maintained only within the bounds of creating minimal impacts on what is a beautiful and distinctive community.

The numerous physical constraints on the system create the most boundaries, from the narrow nature of River Street, traffic flow, high traffic densities on connected streets, and historic squares that may have been bisected by trolleys in the past, which would be completely unacceptable today. These physical constraints dictated the final route design more so than in any other project we have studied. The recommended alternatives for the final route design go beyond the initial design concept and incorporate corridors not originally envisioned as part of this project. While by no means fixed, the decision to recommend a general single-direction loop was not made lightly.

Implementation of this project will therefore not initially center as much on the physical issues as much as a community participation in this expanded loop concept and route. While there have been ongoing conceptual meetings among stakeholders and focus groups, the community at large may be unaware that a proposed historic streetcar project incorporates anything beyond River Street and possibly Martin Luther King, Jr. Boulevard. This is now a substantially different project than either we began with. The ability of a community to completely lack participation and misinterpret communication culminated by complete project rejection is not to be underestimated.

For example, San Antonio, TX, expanded a small (1 mile) proposed historic streetcar concept into the backbone of a city-wide light rail transit system prior to any demonstration of successful services. While the initial short historic streetcar nearly met projected operating costs directly through the farebox (and had extensive private participation in planned construction), the overall city light-rail plan within which it was embedded was met with widespread suspicion and hostility. When funding for the larger system through a local sales tax went to a referendum voters turned it down. Furthermore, lawsuits were initiated by citizens against the VIA transit authority for promoting the light-rail alternative using public funds for advertising. The end result was that a key missed communication – the differentiation between a short 1-mile historic streetcar and a conventional light rail system – led to complete project stoppage before it was ever begun. No distinction was ever made between the small, historic system, and the light-rail proposal, ultimately resulting in the failure of both.

Timetable for Implementation

Should the Chatham Area Transit Board decide to implement the Savannah Streetcar System they will issue a request for design and implementation proposals. Once there is a contract for services work will proceed on several levels.

> CAT will begin to seek funding for construction of the system from the federal government and the State of Georgia and determine its sources of local funding match monies for construction and operation.
>
> There will be an environmental impact study made of the entire proposed route. This study could take from nine to eighteen months to complete.
>
> Designers will proceed with initial design concepts. Once the environmental impact study is completed satisfactorily construction of the route will begin. The construction phase is estimated to last six to nine months.

When the level of community participation is adequately met, and the project adequately explained, the sequence of events that lead to actual construction will begin to fall into place.

Issues

Savannah has several key issues that will need to be grasped and accepted by the community to allow this project to move forward, and this report will focus and highlight those issues. During the feasibility study we interviewed key stakeholders in the area including trolley tour operators, neighborhood associations, and development and business associations. We held a total of six meetings to gather input from groups that would be most impacted by the streetcar system and the public. (Appendix V contains sign in sheets from information and feedback meetings held in September and October, 2003.) Below is a discussion some of the issues that surfaced in those meetings.

Overhead wire. Noise, exhaust, and physical grade constraints on MLK/River Street resulting from a generator car are balanced against the efforts of the community to remove overhead wires on River Street, Broughton Street, and other areas. The design calls for a single-track system in a single traffic lane that will minimize pole mass and the visual impact of the overhead wires. While not invisible, we designed the system so that the majority of citizens will not find the additional overhead wire offensive to the streetscape and results in an authentic, quiet, and environmentally friendly project. A genuine concern is that the wires will harm the tree canopy that forms an essential part of the natural surroundings in Savannah. We are working with the Department of Parks and Trees for the city to ensure that there is no damage to the trees. We expect that there will be no significant impact on tree branches or roots as construction proceeds.

Traffic impacts. While all in-lane streetcar systems impact traffic, this system is designed to mitigate the impact as much as possible. The streetcar will run on River Street either with a reversed traffic flow, or on the opposite side with additional traffic protection, and will schedule to coordinate with delivery truck regulations for River Street businesses. Streetcars will generally move with traffic, in the traffic lane, and not occupy a central median or attempt to run against vehicular traffic. While a Whittaker-northbound option would require a reversal of Whittaker Street from one-way flow southbound to two-way or one-way flow northbound, a Drayton route would not require any directional changes.

Residents of Gaston Street voiced concern about the streetcar running along Gaston from Martin Luther King, Jr. Boulevard to Drayton Street. The CAT Shuttle currently completes a portion of that route traveling along Gaston Street from Whittaker Street past Drayton Street. Noise and traffic would not increase appreciably by replacing the Shuttle with a streetcar. The streetcar would generate less noise because it is powered by electricity. After considering several optional streets Gaston Street remains our recommendation.

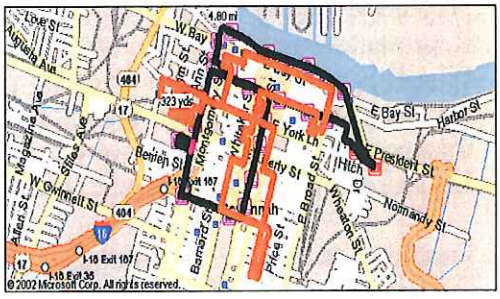


Figure 12. Proposed Route & Shuttle Route

It's not just for tourists. Inclusion of the return path via Whittaker or Drayton Streets, serving Broughton Street and including the City Market, makes the system far more useful to Savannah residents that need circulator transportation. The Drayton Street route is nearly half way into the residential area providing easy walking access for many residents. Unlike the original design concept, this loop combines parking with destination corridors for employment and shopping that are primarily aimed at residents. The connection on the East Side with a proposed parking facility at Tybee Depot provides commuter options for residents east and southeast of the central downtown area. Because of that, the system is far more transit-oriented, and justifies more community participation and interest.

Its not "light rail". The high historic cost of new municipal light-rail type systems, including initial construction costs, automatic signaling, and hi-tech streamlined vehicles, is not to be confused with an historic streetcar system, which blends with traffic at vehicle speeds and integrates with existing streetscapes. While the proposed system is by no means self-funding, construction and operations costs are far less than typical metro light-rail systems.

Real World Experience Does Exist. Savannah is not alone in this project concept, and most if not all concerns can be addressed by closely examining other relatively nearby operating historic streetcar systems in New Orleans, Louisiana, Memphis, Tennessee and Little Rock, Arkansas, which is currently under construction. Citizen groups should be encouraged to visit those systems, comment on what they see, and draw their own conclusions. Only by combining the elements that make the most sense for Savannah can this project succeed, and while consultants may be familiar with the projects and the results, individual citizens and residents will make the ultimate decisions for their own communities.

Taxes are Burdensome. At the public information meetings several individuals raised concerns about taxing citizens to pay for the system. We have made several suggestions that would shift the tax burden to those who benefit the most. However, there is no getting around the fact that CAT will have to find a revenue source to pay its share of construction and operating costs.

Currently under the Transportation Equity Act – 21 (TEA-21) a streetcar project may come under the New Starts category of Federal Transit Administration (FTA) grants. Currently New Start projects are only approved at a 60% funding level. FTA Administrator Jennifer Dorn states in her Annual Report on New Starts 2003 that "the Administration is seeking legislation that would limit the Federal New Starts share to no more than 50 percent beginning in FY 2004[14]." The New Start projects are mainly "light rail" that is not a streetcar. There is current legislation in the House of Representatives (H.R. 1013, known as the Community Streetcar Development and Revitalization Pilot Program) proposing a five year pilot program specifically for streetcar projects. The proposed legislation would limit the amount of grant funds to a project in any one year at $ 15M. Federal transportation legislation is currently in the process of reauthorization. We expect that the proposed legislation may be incorporated into the new Act.

Funding alternatives will continue to be a moving and ongoing target, resulting from ongoing state, federal, and local budget decisions. When the community accepts the rationale for the proposed route, design alternatives can further hone the final budget number. Similarly, as routing

[14] Annual Report on New Starts 2003, Jennifer Dorn, Administrator, U.S. Department of Transportation Federal Transit Administration, C-02-03, February 3, 2003.

alternatives are accepted by the community, and budget numbers refined, there will be a determination whether or not the system may be done as a phased approach, or a single project. A phased approach has the potential of tapping FTA discretionary funding, which does not necessarily require a full FTA Major Investment Study. Typically, an FTA major investment study includes a full transit-style trip generation study (which is frequently inadequate for high percentages of tourists) and often a full Environmental Impact Analysis – two expensive and time-consuming study steps. Therefore, keeping project size within bounds of discretionary funding has specific advantages. This current level of discretionary funding is generally considered to be the 'under $10 million' range. However, FTA guidelines as of December 2002 indicate that the current benchmark for "Full Funding Grant Agreements" and "Major Capital Investment" is at the $25 million level for Federal participation (given a maximum of 80% of project cost)[15]. Therefore, tapping FTA discretionary funding (and discretionary funding even within the transit agency itself) was the key effort in developing the Kenosha system at the $3-4 million level, as a primarily transit-oriented function, without an MIS study. Our preferred-option recommended capital estimate of $26 million is more than what is considered to be historic discretionary funding levels.

Congressional participation in discretionary funding, including that of the FTA, continues. A key function of such discretionary funding has been demonstration funding for smaller projects where a full Major Investment Study could result in more effort in study, consulting and engineering than actual project cost. The controls typically enforced comprise overall project size in conjunction with local congressional support for a specific project. Ongoing and substantial support from Savannah's Federal representative and senators will be necessary in order for this approach to succeed.

Summary

Too many proposed historic streetcar projects initiate a system in an attempt to develop something they hope will happen. For example, Main Street Trolley in Memphis was a last-ditch attempt to revitalize a faded retail downtown into a vibrant district, after the first pedestrian mall concept failed. While the historic streetcar is by no means a failure in Memphis, the actual impact of the trolley was not as originally envisioned. While it did not impact retail businesses as much as imagined, it did succeed in creating new development. There are many reasons for this, but the initial plan was for the streetcar project to rescue the district as a downtown retail center.

Savannah in general and River Street in particular represents an entirely different situation. Savannah has, by all definitions, essentially already succeeded in redeveloping a post-industrial district into a vibrant attraction. Preserving the area by keeping the rough cobblestone streets and the river-bluff topography makes street transportation and access naturally difficult. Improving transportation for all using a surface historic streetcar as a circulator and tourist attraction seems completely obvious and deceptively easy, yet becomes progressively more complex as the problem is explored in-depth.

[15] http://www.fta.dot.gov/library/policy/5200.1/intro.html

Selection of the preferred route alternatives was heavily market and survey driven, with the addition of the City Market to the route mid-way through design. Physical and traffic constraints on River Street dictate either a near-complete shutdown of the street to allow safe bi-directional movement of a streetcar, or design the system to flow with traffic in a one-way scenario. A steep hill at the intersection of Martin Luther King, Jr. and River Street further influences the system design toward a single-track loop-type design rather than a single-tracked, bi-directional track design between the Visitor Information Center and River Street.

While other destination attractions certainly exist (in particular, Ft. Jackson), they did not result in the level of enthusiasm necessary to justify the construction and operating expenses of such an expanded system. A basic standard-gauge system has the potential to be expanded as community concepts and needs change, as has been demonstrated in Memphis, San Francisco, and New Orleans.

Once this design concept was selected, completing the loop presented the most alternatives, and in some respects, the most exciting, new and potentially beneficial ones. Completing the loop via Whitaker or Drayton Streets allows inclusion of Forsyth Park. Heading east on Broughton Street allows an entirely new function for the streetcar, to regularly cycle River Street visitors through the downtown retail area. Prior to this study, a generally accepted single-track routing between River Street and the Visitor Information Center created a nearly tourist-only, limited-use system. Expanding the system into a one-way loop integrates the streetcar into vehicle traffic flow, improves the usefulness of the entire system into the Broughton retail district, and allows a constant, predictable flow of streetcars through the system to prevent destination confusion and irregular performance.

Finally, the concept of the figure-eight loop allows operating flexibility by allowing two separate routes to operate simultaneously. Riders who wish to get from River Street to Broughton or vice versa, can board a car that is making the short loop and get to their destination quickly. Riders who wish to park at the Visitor Information Center and ride to River or Broughton Streets can take the longer route car. Riders from River, Broughton or Tybee Depot parking can catch a ride to Forsyth Park for one of the many functions that go on at that location.

While equipment may be the most interesting part of the system, and develop the most heated debate, it is an equally moving target. Selection of the final vehicles will be governed by system need plus provider availability of key components. Savannah is encouraged to take advantage of existing, proven, and operating reproduction car designs wherever possible, and to not attempt to design a new 'Savannah only' car design that has not undergone real-world operations over some period of time. This could be a general fleet of Melbourne-cars, Melbourne component-cars, Milan cars, or Milan-component cars such as Tampa. At the current time, a Tampa-style car, featuring historic appearance, steel construction, air conditioning, and Milan-type components, would appear to be a very viable alternative for a homogenous fleet.

Savannah has the real potential to develop an historic streetcar system that is not only novel and an attraction, but serves a vital mobility function for tourist and resident alike. It fills a market niche unique to Savannah that cannot easily be met by bus-type vehicles in current service. It exceeds most transit and streetcar systems in the degree of farebox recovery toward its own operation, and is a project that falls under the general guidelines of an FTA discretionary funding and SAFETEA

intermodal efforts. We enthusiastically recommend that Chatham Area Transit Authority pursue this goal, and engage the community in defining the project and developing the interest necessary to move the project forward.

Appendix I. Capital and Operating Budgets

Savannah Streetcar Project Capital Costs

Description	10 Min. HDWY Short Route	10 Min. HDW Long Route	Recommended Alternative 10 & 20 Min. Headways	5 & 10 Min. Headways
Remove Existing Roadbed				
Saw Cut Existing Pavement	$44,280	$94,440	$107,640	$107,640
Embedded Trk excavation (10' wide x 26" deep)	$106,605	$227,355	$259,140	$259,140
Demolition of existing track structure				
Demolition on Fahm and River Street to make connections	$40,000	$40,000	$40,000	$40,000
Prepare Subbase				
Embedded Track	$19,680	$41,974	$47,840	$47,840
Geotextile				
Embedded Trk. - under subbase	$17,220	$36,727	$41,860	$41,860
Crushed Concrete Base				
Embedded Track (10' wide x 10" deep)	$40,995	$87,450	$99,660	$99,660
Rail - 115# RE -				
New 115# RE RAIL - blank or drilled ends - embedded	$237,300	$506,800	$577,500	$577,500
Guard Rail				
Strap Guard - From Pittsburgh	$84,000	$180,000	$180,000	$180,000
Rail - End Welding - labor/materials/equip.				
Flash Butt Welding - embedded	$177,120	$377,760	$430,560	$430,560
Steel Ties 10mm				
Ties - IG grade ties, 6' spacing on tangent, 3' on curves	$37,710	$37,710	$37,710	$37,710
Cost of ties includes fixation system.				
#4 Tongue and Mate Switch				
Standard AREA Plan 980-60 Single Tongue & Mate	$450,000	$585,000	$675,000	$675,000
Timber for turnout	$35,000	$45,500	$52,500	$52,500
Cast in Place Concrete/Sealant				
Embedded Track to 2" below tie (10' wide x 16" deep)	$1,093,250	$2,331,750	$2,657,750	$2,657,750
Labor / Equipment - Installation				
Embedded Track	$247,968	$528,864	$602,784	$602,784
Overhead Electrification	$1,194,240	$1,996,800	$2,208,000	$2,208,000
Trolley Wire Poles				
Bracket Poles	$417,200	$700,000	$772,800	$772,800
Span Poles	$460,800	$460,800	$460,800	$460,800
Bonding existing Rail Joints	$10,000	$10,000	$10,000	$10,000
Rectifier Station (Converts AC to 60v DC current)	$360,000	$540,000	$540,000	$540,000
Stations				
Large	$200,000	$200,000	$200,000	$200,000
Small	$950,000	$1,050,000	$1,100,000	$1,100,000
Car Barn	$5,000,000	$5,000,000	$5,000,000	$5,000,000
Cars				
Purchase and rebuild vintage cars	$2,100,000	$3,500,000	$3,500,000	$6,300,000
Rebuild existing Savannah car	$400,000	$400,000	$400,000	$400,000
Bucket truck	$50,000	$50,000	$50,000	$50,000
Sub Total	**$13,773,368**	$19,028,930	**$20,051,544**	**$22,851,544**
Construction Cost Per Mile	**$4,871,609**	*$4,025,351*	**$3,835,948**	**$4,371,600**
Project Contingency 20%	$2,754,674	$3,805,786	$4,010,309	$4,570,309
Design, Bidding, Construction Observation	$991,682	$1,370,083	$1,443,711	$1,645,311
Inspection	$413,201	$570,868	$601,546	$685,546
Project Total	**$17,932,925**	**$24,775,667**	**$26,107,110**	**$29,752,710**
Total Cost Per Mile	*$6,342,835*	*$5,241,007*	*$4,994,404*	*$5,691,823*

Savannah Electric Streetcar
Estimated Operating Costs
Running 10 minute headways on the River, MLK, Gaston, Drayton and Brougton

Description	Option 1 18 Hr/D	Option 2 12 Hr/D	Option 3 8 Hr/D
Wages			
Driver	$397,120	$198,560	$235,790
Part Time Driver	$102,200	$122,640	$0
Mechanic	$166,440	$110,960	$55,480
Mechanics Assistant	$105,120	$105,120	$52,560
Manager	50,000	50,000	50,000
Overtime	115,632	80,592	51,575
Overhead 30%	$246,264.00	$176,184	$118,149.00
Administrative Overhead 10%	$93,651	$66,787	$44,540
Total Personnel Services	**$1,276,427**	**$910,843**	**$608,094**
Labor Cost per Mile	$7.53	$8.06	$8.07
Labor Cost per Hour	$97	$104	$104
Professional Services	$10,000	$10,000	$10,000
Electric	$142,805	$96,403	$65,269
Natural Gas	$2,160	$1,920	$1,680
Water	$1,200	$1,000	$800
Telephone	$600	$600	$600
Communications Equip	$2,500	$2,000	$1,500
Building Maintenance	$7,500	$7,500	$7,500
Grounds Maintenance	$10,400	$10,400	$10,400
Insurance	$40,000	$40,000	$40,000
Total Contractual Services	**$217,165**	**$169,823**	**$137,749**
General Office Supplies	$1,500	$1,200	$1,000
Computer Software	$2,500	$2,500	$2,500
Shop Supplies	$6,000	$4,000	$3,000
Adv. And Promotion	$70,000	$70,000	$70,000
Depreciation (40 years)	$250,000	$250,000	$250,000
Outside Material and Labor	$15,000	$12,000	$10,000
Parts	$20,000	$15,000	$12,000
Small Tools	$1,200	$1,000	$800
Housekeeping-Janitorial Supplies	$1,200	$1,200	$1,200
Equipment Cleaning Supplies	$2,000	$1,700	$1,500
Total Non Contract Services	**$369,400**	**$358,600**	**$352,000**
TOTAL ESTIMATED YEARLY			
OPERATING COST	**$1,862,992**	**$1,439,266**	**$1,097,843**
AVE. COST PER CAR MILE	**$10.99**	**$12.74**	**$14.57**
AVE. COST PER VEH. HOUR	**$70.89**	**$82.15**	**$93.99**

Note: Option 3 requires 9 hrs per day of driver with overtime for the last hour that computes to 9.5 hrs including overtime pay.

Manager	$50,000.00 Per Year
Driver	$17.00 Per Hour
Part Time Driver	$14.00 Per Hour
Mechanic	$19.00 Per Hour
Mechanics Assistant	$18.00 Per Hour

	Hrs/Yr/Car	Car Miles	Vehicle Hours
		4 cars ave. 6.45 miles per hour	
Option 1 18 hrs. per day x 365 days per year	6,570	169,506	26,280

SHORT ROUTE

Manager	$50,000.00 PerYear
Driver	$17.00 PerHour
PartTime Driver	$14.00 PerHour
Mechanic	$19.00 PerHour
Mechanics Assistant	$18.00 PerHour

	Hrs/Yr/Car	Car Miles	Vehicle Hours
		3 cars ave. 5.2 miles per hour	
Option 1 18 hrs. perday x 365 days peryear	6,570	102,492	19,710
Option 2 12 hrs. perday x 365 days peryear	4,380	68,328	13,140
Option 3 8 hrs. perday x 365 days peryear	2,920	45,552	8,760

Daily Help Required	**Option 1**	**Option 2**	**Option 3**
Drivers	6	3	3
PartTime Drivers	3	3	3
Mechanics	3	2	1
Mechanics Helpers	2	2	1

Electric Costper kW h	$0.10
Cars Use kW h/Car Mile	4
Double for AC	8

Savannah Electric Streetcar
Estimated Operating Costs
Running 10 minute headways on River Street and part of Broughton
and 20 minute headways on MLK, Gaston, Drayton and part of Broughton
RECOMMENDED OPTION

Description	Option 1 18 Hr/D	Option 2 12 Hr/D	Option 3 8 Hr/D
Wages			
Driver	$397,120	$198,560	$235,790
Part Time Driver	$102,200	$122,640	$0
Mechanic	$166,440	$110,960	$55,480
Mechanics Assistant	$105,120	$105,120	$52,560
Manager	50,000	50,000	50,000
Overtime	115,632	80,592	51,575
Overhead 30%	$246,264.00	$176,184	$118,149.00
Administrative Overhead 10%	$93,651	$66,787	$44,540
Total Personnel Services	**$1,276,427**	**$910,843**	**$608,094**
Labor Cost per Mile	$8.80	$9.42	$9.43
Labor Cost per Hour	$97	$104	$104
Professional Services	$8,000	$8,000	$8,000
Electric	$123,252	$83,368	$56,579
Natural Gas	$2,160	$1,920	$1,680
Water	$1,200	$1,000	$800
Telephone	$600	$600	$600
Communications Equip	$2,500	$2,000	$1,500
Building Maintenance	$7,500	$7,500	$7,500
Grounds Maintenance	$10,400	$10,400	$10,400
Insurance	$40,000	$40,000	$40,000
Total Contractual Services	**$195,612**	**$154,788**	**$127,059**
General Office Supplies	$1,500	$1,200	$1,000
Computer Software	$2,500	$2,500	$2,500
Shop Supplies	$6,000	$4,000	$3,000
Adv. And Promotion	$70,000	$70,000	$70,000
Depreciation (40 years)	$250,000	$250,000	$250,000
Outside Material and Labor	$15,000	$12,000	$10,000
Parts	$20,000	$15,000	$12,000
Small Tools	$1,200	$1,000	$800
Housekeeping-Janitorial Supplies	$1,200	$1,200	$1,200
Equipment Cleaning Supplies	$2,000	$1,700	$1,500
Total Non Contract Services	**$369,400**	**$358,600**	**$352,000**
TOTAL ESTIMATED YEARLY			
OPERATING COST	**$1,841,440**	**$1,424,232**	**$1,087,153**
AVE. COST PER CAR MILE	**$12.69**	**$14.73**	**$16.86**
AVE. COST PER VEH. HOUR	**$70.07**	**$81.29**	**$93.08**

Note: Option 3 requires 9 hrs per day of driver with overtime for the last hour that computes to 9.5 hrs including overtime pay.

Manager	$50,000.00 Per Year
Driver	$17.00 Per Hour
Part Time Driver	$14.00 Per Hour
Mechanic	$19.00 Per Hour
Mechanics Assistant	$18.00 Per Hour

	Hrs/Yr/Car	Car Miles 4 cars ave. 5.52 miles per hour	Vehicle Hours
Option 1 18 hrs. per day x 365 days per year	6,570	145,066	26,280
Option 2 12 hrs. per day x 365 days per year	4,380	96,710	17,520
Option 3 8 hrs. per day x 365 days per year	2,920	64,474	11,680

Daily Help Required	**Option 1**	**Option 2**	**Option 3**
Drivers	8	4	4
Part Time Drivers	4	4	4
Mechanics	3	2	1
Mechanics Helpers	2	2	1

Electric Cost per kWh	$0.10
Cars Use kWh/Car Mile	4
Double for AC	8

Savannah Electric Streetcar
Estimated Operating Costs

Running 5 minute headways on River Street and part of Broughten and 10 minute headways on MLK, Gaston, Drayton and part of Broughten

Description	Option 1 18 Hr/D	Option 2 12 Hr/D	Option 3 8 Hr/D
Wages			
Driver	$694,960	$347,480	$412,633
Part Time Driver	$178,850	$214,620	$0
Mechanic	$166,440	$110,960	$55,480
Mechanics Assistant	$105,120	$105,120	$52,560
Manager	50,000	50,000	50,000
Overtime	171,806	116,727	78,101
Overhead 30%	$358,611.00	$248,454	$171,201.75
Administrative Overhead 10%	$136,718	$94,491	$64,877
Total Personnel Services	**$1,862,504**	**$1,287,852**	**$884,852**
Labor Cost per Mile	$7.53	$7.81	$8.05
Labor Cost per Hour	$142	$147	$152
Professional Services	$10,000	$10,000	$10,000
Electric	$205,141	$137,961	$92,974
Natural Gas	$2,160	$1,920	$1,680
Water	$1,200	$1,000	$800
Telephone	$600	$600	$600
Communications Equip	$2,500	$2,000	$1,500
Building Maintenance	$7,500	$7,500	$7,500
Grounds Maintenance	$10,400	$10,400	$10,400
Insurance	$40,000	$40,000	$40,000
Total Contractual Services	**$279,501**	**$211,381**	**$165,454**
General Office Supplies	$1,500	$1,200	$1,000
Computer Software	$2,500	$2,500	$2,500
Shop Supplies	$8,000	$6,000	$4,000
Adv. And Promotion	$70,000	$70,000	$70,000
Depreciation (40 years)	$125,000	$125,000	$125,000
Outside Material and Labor	$25,000	$20,000	$15,000
Parts	$30,000	$25,000	$20,000
Small Tools	$1,200	$1,000	$800
Housekeeping-Janitorial Supplies	$1,200	$1,200	$1,200
Equipment Cleaning Supplies	$2,500	$2,300	$2,000
Total Non Contract Services	**$266,900**	**$254,200**	**$241,500**
TOTAL ESTIMATED YEARLY			
OPERATING COST	**$2,408,905**	**$1,753,432**	**$1,291,806**
AVE. COST PER CAR MILE	**$9.74**	**$10.63**	**$11.75**
AVE. COST PER VEH. HOUR	**$52.38**	**$57.19**	**$63.20**

Note: Option 3 requires 9 hrs per day of driver with overtime for the last hour that computes to 9.5 hrs including overtime pay.

Running 5 minute headways on River Street and part of Broughten and 10 minute headways on MLK, Gaston, Drayton and part of Broughten

Manager	$50,000.00 PerYear
Driver	$17.00 PerHour
PartTime Driver	$14.00 PerHour
Mechanic	$19.00 PerHour
Mechanics Assistant	$18.00 PerHour

	Hrs/Yr/Car	Car Miles	Vehicle Hours
		7 cars ave. 5.38 miles per hour	
Option 1 18 hrs. per day x 365 days per year	6,570	247,426	45,990
Option 2 12 hrs. per day x 365 days per year	4,380	164,951	30,660
Option 3 8 hrs. per day x 365 days per year	2,920	109,967	20,440

Daily Help Required	Option 1	Option 2	Option 3
Drivers	14	7	7
PartTime Drivers	7	7	7
Mechanics	3	2	1
Mechanics Helpers	2	2	1

Electric Cost per KW h	$0.10
Cars Use kW h/Car Mile	4
Double for AC	8

Savannah Historic Streetcar Operations
Income / Expense Models

REVENUES:	Savannah Conservative/base		Savannah Optimistic/large sys.	Da
Projected riders ONE WAY	*240000 level*		*325000 level*	
Tourism ridership / trips - std	84,000	35%	113,750	35%
Tourism ridership / trips / pkg/comp	72,000	30%	97,500	30%
Transit riders @ std trips	36,000	15%	48,750	15%
Transit riders @ discount (multitrip	48,000	20%	65,000	20%
Total Ridership ONE WAY	240,000	100%	325,000	100%
Full Ticket / ride	$1.00	65%	$1.00	65%
Effectively discounted group sales	$0.75	35%	$0.75	35%
Total ticket sales	**$219,000**		**$296,563**	
Interest				
Logo license sales (3 %) royalty	$0.00		$0.00	
Direct Concessions/Sales/Adv.	$0.00		$0.00	
Less: cost of goods sold	$0.00		$0.00	
Gross Profits - Concessions/Adv.	$0.00		$0.00	
TOTAL REVENUES:	**$219,000.00**		**$296,563.00**	

OPERATING EXPENSES	*Recommended option 10 min River/20 min VC*		*Recommended option 10 min River/20 min VC*	
	12 hr. day Budget		**18 hr day Budget**	
Activity Base: car hours estimated	96710	4 cars	145066	4 cars
Labor:				
Operator labor ($17 hr est), 4 cars m	$321,200	FT+PT	$499,320	FT+PT
Overtime	$80,592		$115,632	
Overhead / benefits	$96,360	30%	$149,796	30%
Operations Labor Total	$498,152		$764,748	
Fuel (electricity) (includes AC option)	$83,368	4 cars	$123,252	4 cars
Other Utilities	$2,920		$3,360	
Facilities Maintenance:				
Track Maintenance				
Overhead Wire Maintenance				
Car maintenance, parts	$15,000		$20,000	
Building & Grounds Maint	$17,900		$17,900	
Building & Grounds Supplies	$1,200		$1,200	
Other Operating Expenses:				
Mechanics	$216,080	FT + PT	$271,560	FT + PT
Overhead/Benefits @ 30%	$64,824		$81,468	
Supplies and Materials	$6,700		$9,200	
Contracted Services	$12,000		$15,000	
Communications Equip	$2,000		$2,500	
Equipment Rental (maint.)	$0		$0	
Depreciation allowance (maint reserve)	$250,000	@40%	$250,000	@40%
TOTAL OPERATING	$1,170,144		$1,560,188	
General Expenses				
Liability Insurance (third party)	$40,000		$40,000	
Track Lease Payments to Class 1	$0	(NS)	$0	(NS)
ADMINISTRATIVE				
Administrative Salaries	$50,000	Mgr.	$50,000	Mgr.
Admin benefits	$15,000	30%	$15,000	30%
Absorbed Admin overhead	$66,787	10% dir. lbı	$93,651	10%
Office Rental (space)	$0		$0	
Professional Services	$8,000		$8,000	
Other Administrative	$4,300	Comp, ph.	$4,600	
Marketing & Promotion	$70,000		$70,000	
TOTAL GENERAL & ADMIN EXPENS	$254,087		$281,251	
TOTAL EXPENSE	$1,424,231		$1,841,439	

OPERATING PROFIT (LOSS)	($1,205,231)		($1,544,876)	
Pct farebox recovery of operating cost (does not include conc. & adv)	15.38%		16.10%	
Operating Subsidies:				
Federal park service or other agency	$0	0%	$0	0%
FTA transit operating subsidy full %	$0	0%	$0	0%
Local & City Tax Support	$1,205,231	100%	$1,544,876	100%
State Tax Support - various	$0	0%	$0	0%
Foundation Grants - operating	$0	0%	$0	0%
Donations / Memberships	$0	0%	$0	0%
Total Operating Subsidies	$1,205,231		$1,544,876	
OPERATING RESULTS AFTER SUBSIDY	**$0**		**$0**	
Avg. cost per car mile	$14.73		$12.69	
Avg. cost per veh. hour	$81.29		$70.07	
Avg. cost per passenger	$5.93		$5.67	

Capitalized Equivalent Operating Expenses / Depreciation detail

	As Depreciation	Per Yr.	As per-item capitalized re (annual budget basis)	
Track & Structures (see capitalized budget recommended option)				
40-year property:			5.23	miles
Total Track	$5,809,944	$145,249	$27,787	per mi/y
Total Electrification	$3,451,600	$86,290	$16,508	per mi/y
Power Supply	$540,000	$13,500	$4,500	per recti
Stations	$1,300,000	$32,500	$1,121	Roofing,
Car Barn	$5,000,000	$125,000	$31,250	repairs,
	$16,101,544	$402,539		
20 year property				
Vehicles - new - 5	$3,500,000	$175,000	$35,000	per car ;
Vehicles - rebuilt - 1	$400,000	$20,000	$20,000	per car ;
5 year property				
Maintenance truck	$50,000	$10,000		
Total Capital Budget	$20,051,544			
Total Depreciation		$607,539		
Contingency - depreciation budge	2.9%	$17,461		
TOTAL		$624,999		
40% on actual local match	40.00%	**$250,000**		

Scheduling and Car Requirements

Short Route	Minutes	1st Car	2nd Car	3rd Car
Headway	10			
Required time	28			
Trips per hour per car	2			
Using 3 cars				
9:00		Tybee		
9:10		RR - Bull	Tybee	
9:20		Broug-Wit.	RR-Bull	Tybee
9:30		Tybee	Broug-Wit.	RR-Bull
9:40		RR - Bull	Tybee	Broug-Wit.
9:50		Broug-Wit.	RR-Bull	Tybee
10:00		Tybee	Broug-Wit.	RR-Bull

Long Route	Minutes	1st Car	2nd Car	3rd Car	4th Car
Headway	10				
Required Time	39				
Trips per hour per car	1.5				
Using 4 Cars					
9:00		Tybee			
9:10		RR - Bull	Tybee		
9:20		Broug-MLK	RR-Bull	Tybee	
9:30		Gaston-Forsythe PK	Broug-MLK	RR-Bull	Tybee
9:40		Tybee	Gaston-Forsythe PK	Broug-MLK	RR-Bull
9:50		RR-Bull	Tybee	Gaston-Forsythe PK	Broug-MLK
10:00		Broug-MLK	RR-Bull	Tybee	Gaston-Forsythe PK
10:10		Gaston-Forsythe PK	Broug-MLK	RR-Bull	Tybee
10:20		Tybee	Gaston-Forsythe PK	Broug-MLK	RR-Bull
10:30		RR-Bull	Tybee	Gaston-Forsythe PK	Broug-MLK
10:40		Broug-MLK	RR-Bull	Tybee	Gaston-Forsythe PK
10:50		Gaston-Forsythe PK	Broug-MLK	RR-Bull	Tybee
11:00		Tybee	Gaston-Forsythe PK	Broug-MLK	RR-Bull

Scheduling and Car Requirements

Combined Routes	Minutes	1st Car - Sht-Lng	2nd Car - Lng-Sht	3rd Car	4th Car	5th Car	6th Car	7th Car
Headway	5 or 10							
Required Time	28 & 39							
Trips per hour per car								
Headway on River Route	5.0							
Using 7 Cars								
9:00		Tybee						
9:05		RR - Habersham	Tybee					
9:10		RR - Bull	RR - Habersham	Tybee				
9:15		MLK - W. Bay	RR-Bull	RR - Habersham	Tybee			
9:20		Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee		
9:25	2.5	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybe	
9:30		Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee
9:35		Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham
9:40		RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull
9:45		RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay
9:50		Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker
9:55		Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybe	Drayton - E. York	Broughton - W Boundary
10:00		Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee
10:05		Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee
10:10	4.32	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham
10:15		RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull
10:20		RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK
10:25		MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.
10:30		Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK
10:35		Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Drayton - E. York
10:40	2.5	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee
10:45		Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham
10:50	:	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull
10:55		RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay
11:00		Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker
11:05		Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybe	Drayton - E. York	Broughton - W Boundary
11:15		Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee
11:20		Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee
11:25	4.32	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham
11:30		RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR - Bull
11:35		RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	MLK - W. Bay
11:40		MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Broughton - Witaker
11:45		Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Broughton - W Boundary
11:50		Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Tybee
11:55	2.5	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee
12:00	16.14	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham
12:05	:	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR-Bull
12:10		RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	Brougton - MLK
12:15		Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Roundhouse RR Mus.
12:20		Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Gaston-Forsythe PK
12:25		Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Drayton - E. York
12:30		Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee
12:35	4.32	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham
12:40		RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR - Bull
12:45		RR - Bull	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	MLK - W. Bay
12:50		MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Broughton - Witaker
12:55		Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee	Tybee	Broughton - W Boundary
1:00		Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham	Tybee	Tybee
1:05	2.5	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR - Bull	RR - Habersham	Tybee
1:10		Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	MLK - W. Bay	RR-Bull	RR - Habersham
1:15	:	RR - Habersham	Tybee	Tybee	Gaston-Forsythe PK	Broughton - Witaker	Brougton - MLK	RR-Bull
1:20		RR-Bull	RR - Habersham	Tybee	Drayton - E. York	Broughton - W Boundary	Roundhouse RR Mus.	Brougton - MLK

Appendix II. Survey Methodology

Methodology

The goals for the market survey are as follow:

- Survey a wide variety of individuals with an equal focus on both residents and visitors, to try to determine the best overall utility.
- Propose general route origins and destinations, and allow the respondents to pick those combinations most useful to them.
- Allow full non-interest response and negative responses to be equally valuable as survey results.
- Obtain a sufficient quantity of surveys to allow statistical comparison against previously performed visitor surveys to establish some comparison basis to larger-scale, previously-done intercept studies.[16]
- Obtain a sufficient quantity of surveys to allow sub-group analysis by zip, age, residency, selected response, and other demographic factors
- Ask detailed questions specific to the trolley project – on destinations, schedule, expectations, and price/time combinations.

Survey Locations and Dates

Between October 5, 2002 and December 3, 2002, we surveyed 244 individuals. Members of Dr. Barbara Fertig's Historic Preservation Class at Armstrong Atlantic State University in Savannah conducted the intercept research protocol. Students received training in presenting and performing an intercept survey as part of their class activity. Survey team members from Armstrong Atlantic were responsible for physical survey distribution and collection. Timing and distribution of the surveys was subject to the availability of students in the fall class period. Surveys were collected from the following locations:

AASU Campus Area	17	7.0%
Downtown Savannah	2	.8%
River Street area	207	84.8%
Visitors Center	18	7.4%
Total	244	100%

[16] Similar Ridership Surveys Performed by Stone Consulting: Virginia & Truckee Railroad – expansion of V&T to Carson City; Railroader's Memorial Museum – Altoona PA – excursion program feasibility; Lowell, MA – Expansion of Lowell Historic Park Trolley for Transit Use; Oil Creek & Titusville Railroad – visitor satisfaction survey; Shenandoah County (VA) Tourist Rail Feasibility Study; Kent, OH – Feasibility of W&LE line for Cleveland-Kent commuter service; State of West Virginia – Elkins to Bergoo tourist rail feasibility (included Cass Scenic Railroad); Humboldt Co. Tourist Rail Feasibility (Eureka, CA)

Stratification Notes

The computer software used allows a wide variety of stratification of survey results, based upon responses to single or multiple questions.

A relatively large percentage of surveys were collected from 18-34 age adults many of whom were also Savannah residents. Because of this relatively high percentage of responses from this sub-group, we felt it was important to isolate and identify these responses and analyze them separately. While surveys were collected from the "typical Savannah visitor," and other age groups, the 18-34 age plus resident sub-group initially appeared to have the potential to statistically skew the results. While this age group may have been predominant in the survey, the equally predominant survey collection point remained River Street, not the AASU campus, which only accounted for 7% of the responses. While college students on the AASU campus were obviously included in the survey, they did not dominate it unless they were also on River Street.

Within the raw data, we sub-categorized survey responses in the following manner:

- Savannah-home zip codes (nearly 50% of total)
- Non-Savannah zip codes
- 18-34 year-old age group (65% of the total survey)
- Non 18-34 year-old age group

The convergence of Savannah home zip codes with the 18-34 year-old group was 65% (79 surveys) indicating the degree of overlap.

This high percentage of sub-group responses was then contrasted directly against the 'other' responses to see if there truly was an age/residency bias in the survey results. Despite the admitted weighting of the data set, the subgroup response percentages were amazingly similar, often varying less than 5% on any question. Where the responses between this group and the 'other' groups varied significantly, it will be noted. Overall, the similarity of responses between the presumed 'resident young adult and/or college student' was actually rather surprising.

Additional stratification may be done on this survey as a result of this report, if requested. The small number of total surveys limits the potential accuracy of many smaller subsets, however.

Appendix III. Terminology

A system of electric-powered vehicles as is proposed in this document may be called either a trolley system or a streetcar system.

Webster's Collegiate Dictionary, Tenth Edition, defines "trolley" as:

> 2.a. a device that carries electric current from an overhead wire to an electrically driven vehicle
> 2.b. a streetcar powered electrically through a trolley – also called a trolley car

The term 'trolley' refers to the connecting rod that reaches from the vehicle to the electric power source. The vehicles that used a trolley for a power source were therefore called trolley cars. Within the context of early use of the vehicles, as they traversed the streets of cities, they also were referred to as streetcars.

In preparing this document, we have used the terms 'streetcar' and 'trolley' deliberately to indicate different types of vehicle. The terms in general use are relatively identical. However, the term 'trolley' is used to refer to rubber-tired vehicles as well as steel-wheel rail cars, and we wished to keep the distinction between the two.

Appendix IV. Economic Modeling

Economic Modeling

The simplest regional economic models are direct applications of input-output models, such as RIMS II ("Regional Input-Output Modeling System," 2nd edition, U.S. Department of Commerce). These applications are "static" in the sense that they provide an all-at-once view of economic effects, without a time component that is necessary for understanding when the effects will be realized. More sophisticated applications of regional economic models supplement input-output relationships with simulation techniques to forecast the year-to-year effects of projects on economic and demographic patterns. The most complex EIA models are those that integrate travel demand models, land use models, dynamic simulation economic models, and input-output models.

RIMS II Economic Analysis Methods

RIMS II is based on an accounting framework called an I-O table. For each industry, an I-O table shows the distribution of the inputs purchased and the outputs sold. A typical I-O table in RIMS II is derived mainly from two data sources: US Bureau of Economic Analysis (BEA) national I-O table, which shows the input and output structure of nearly 500 U.S. industries; and BEA's regional economic accounts, which are used to adjust the national I-O table in order to reflect a region's industrial structure and trading patterns.

Using RIMS II for impact analyses has several advantages. RIMS II multipliers can be estimated for any region composed of one or more counties and for any industry or group of industries in the national I-O table. The cost of estimating regional multipliers is relatively low because of the accessibility of the main data sources for RIMS II. According to empirical tests, the estimates based on RIMS II are similar in magnitude to the estimates based on relatively expensive surveys.

To effectively use the multipliers for impact analysis, geographically and industrially detailed information is entered for the initial direct changes in output, earnings, or employment that are associated with the project or program under study. The multipliers can then be used to estimate the total impact of the project or program on regional output, earnings, or employment.

RIMS II is widely used in both the public and private sector. In the public sector, for example, the Department of Defense uses RIMS II to estimate the regional impacts of military base closings, and State departments of transportation use RIMS II to estimate the regional impacts of airport construction and expansion. In the private sector, analysts, consultants, and economic development practitioners use RIMS II to estimate the regional impacts of a variety of projects, such as the development of theme parks and shopping malls.

Calculated at what level?

Although most studies have various levels of ridership, income and expense scenarios, and capital budget spending options, this can rapidly get out of hand when it comes to calculating economic benefits. The number of combinations begins to expand geometrically - and produce so many columns of figures that it becomes difficult to determine just what is the "answer". It is more important to develop and understand the relationships between a common set of circumstances - and develop an understanding for what we feel the *most likely* results are.

Precise results are very subjective, of course – and directly related to a host of assumptions. Even less-precise results can be of great value, however, when determining the likely employment and economic impacts at the macro employment level. It can be seen that even some relatively large adjustments in some figures at the construction and operating budget phase do not necessarily translate to a significant difference in employment levels. Therefore, the results of the economic impact analysis do not necessarily have to be completely recalculated for every adjustment in either the construction or operation phase to gain an understanding of the general bottom-line employment impacts.

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Information Meetings Sign In Sheets
October 24 2003

NAME	ORGANIZATION / ADDRESS	CONTACT INFO: PHONE / E-MAIL
Bobby Davis	Explore Savannah	zdavis.1957@aol.com 5079144
John + Pat Thorsen	116 W. Gaston	234-1775
Scott Barber	Lott-Barber Architects Vice President	912.234.5230
Mike Weiner	City	651-6600
[illegible] Horsham	401 E. Charlton Sav. 31401	234-8948
Jean [illegible]	[illegible]	
[illegible]	Lott + Barber Arch.	[illegible]@lottbarber.com 234-5230
Brian White	City of Savannah	brian.white@ci.savannah.ga.us 651-6520
Chris Gooby	City of Savannah	651-6580 Chris.Gooby@ci.savannah.ga.us
Bob Coffey	[illegible]	447-4025 [illegible].com
[illegible]	Arcanum / 432 Whitaker St.	236-6000
[illegible]	for Housing Feasibility [illegible]	[illegible] [illegible]@savannahfairhousing.org

Savannah Streetcar Project
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October 25 2003

NAME	ORGANIZATION / ADDRESS	CONTACT INFO: PHONE / E-MAIL
Carl H. Oelschig	9666 [illegible] Ave. Sav 31406	356 9680
Bruce M. Baxley	15 Barnett Dr. Sav'h 31406	352-2362
Ken Huffman	414 Inglewood Dr 31406	927-4976
Paul [illegible]	17 N. Nicholson Cir	925-6747
Eric Gilbert	24 N. Nicholson Cir	920-4015
Jim Walker	118 W. Gaston St. 31401	234-8557
Robert C. Clark	220 E. Liberty St. 31401	232-3622
Tom + Betsy Hollis	811 Whitaker St	234-4868
Patrick Shay	434 E. Oglethorpe St. 31401	232-1151
Daniel Watson	10 E. 63rd St.	354-8462 [illegible]
Carol Putnam	110 Barnard St #210 31401	231-1440
Willie Paige	1 Wilshire Blvd	

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NAME	ORGANIZATION / ADDRESS	CONTACT INFO: PHONE / E-MAIL
[illegible]	[illegible]	[illegible]