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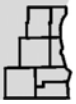

MEMORANDUM

REVIEW AND EVALUATION OF CITY OF MILWAUKEE STREETCAR PROJECT ESTIMATES

City of Milwaukee Common Council Resolution 110372 required the Comptroller's Office to independently validate the costs and financing associated with phase 1 of the Milwaukee Streetcar project. This requirement includes providing independent validation of the capital cost estimates, annual operations and maintenance cost estimates, ridership projections and financial plan prepared for the project. At the request of the City Comptroller, the Southeastern Wisconsin Regional Planning Commission staff has prepared this review and evaluation of the capital cost estimates, annual operations and maintenance cost estimates, vehicle requirements, private vendor availability, ridership projections, and annual revenue estimates for the Milwaukee Streetcar project. Other requirements of Resolution 110372, including the capital financial plan for the project, the ability of the City's parking fund to sustain the needed operating revenue, and changes in City-wide debt service due to the project, will be evaluated directly by the Comptroller's Office.

For the purposes of this memorandum, the Milwaukee Streetcar project is defined as Phase 1 of the Locally Preferred Alternative adopted by the Downtown Connector Steering Committee on May 6th, 2010, and approved by the Federal Transit Administration (FTA) through the issuance of a Finding of No Significant Impact on January 25th, 2012, with a minor route refinement approved by the FTA in January 2014. This phase of the project is a 2.1 route-mile[1] modern streetcar line between the planned Operations and Maintenance Facility location on N. 4th St. underneath IH 794 and Burns Commons just east of the intersection of N. Farwell Ave. and E. Ogden Ave. The project includes three vehicles operating during peak periods to achieve 10 minute headways. One spare vehicle is included in the capital cost estimate for this project.

CAPITAL COST ESTIMATE REVIEW

Commission staff were provided with the *City of Milwaukee, MKE Streetcar – Phase 1: 60% Estimate,* dated September 25, 2014, in order to review and analyze the validity of the overall capital cost estimate for the Milwaukee Streetcar project. The review and analysis conducted by Commission staff included a comparison of the capital costs estimates for the Milwaukee Streetcar to other recently completed and under construction streetcar projects in the United States. It also included a comparison of unit cost estimates for the Milwaukee Streetcar to two Midwestern streetcar projects currently under construction, the Cincinnati Streetcar and the Kansas City Downtown Streetcar, and a review of the methods proposed to mitigate possible cost overruns on the Milwaukee Streetcar project.

Overall Cost Evaluation

Table 1 compares the capital costs experienced or projected for selected streetcar projects under construction or completed within the past year in the United States. The per track-mile[1] cost projected for the Milwaukee Streetcar is lower than some other systems currently under construction or recently completed in the United

[1] 'Route-mile' refers to the length of a one-way trip for a streetcar vehicle, from terminus to terminus. 'Track-mile' refers to the length of physical track in the roadway, rather than a trip distance.

States. However, the Milwaukee Streetcar project is lean compared to many of the projects listed in Table 1, as it does not include rebuilding the entire width of the roadway that the streetcar travels along, has the simplest maintenance facility of any of the projects, and the least amount of street beautification included in the project costs. The other six streetcar projects include the complete reconstruction of the roadways that their projects travel along for much or all of the length of the project.

Table 1

CAPITAL COSTS FOR UNDER CONSTRUCTION OR RECENTLY COMPLETED STREETCAR PROJECTS

Project	Total Actual or Projected Capital Cost (millions)[a]	Total Track Length (mi)	Number of Platforms	Cost per Track-Mile (millions)
Atlanta Streetcar	$98.9	2.7	12	$36.6
Cincinnati Streetcar	$148.1	3.6	18	$41.1
M-1 Rail Line (Detroit)	$137.0	6.6	20	$20.8
Kansas City Downtown Streetcar	$102.5	4.0	16	$25.6
First Hill Streetcar (Seattle)	$134.0	4.9	15	$27.3
Tucson Sunlink	$196.8	7.8	24	$25.2
Milwaukee Streetcar	*$98.8*	*3.8*	*18*	*$26.0*

[a]Each streetcar project has differing circumstances regarding the amount of private and public utility costs included in its project costs, and this information should be considered when comparing these costs.

Unit Cost Evaluation

A detailed comparison of the unit costs of individual items on two streetcar projects currently under construction to those projected for the Milwaukee Streetcar was also conducted. Utilizing construction bids from the Cincinnati Streetcar and the Kansas City Downtown Streetcar, Commission staff compared the unit cost estimates from the *City of Milwaukee, MKE Streetcar – Phase 1: 60% Estimate* to the unit costs received from construction firms bidding for work on the Cincinnati Streetcar and the Kansas City Downtown Streetcar. Nearly all City of Milwaukee Streetcar project unit cost estimates were within 10 percent of comparable items in the construction bids for the Cincinnati Streetcar and the Kansas City Downtown Streetcar.

The only unit cost of any significance to the overall cost of the project that was not within 10 percent was the estimated cost of the substations for the traction power supply system. The Milwaukee Streetcar unit cost was on average 30 percent less than the unit cost for substations in the bids received by Cincinnati and Kansas City. However, the potential impact of this lower unit cost is minimal, as there are only three substations in the Milwaukee Streetcar project and their estimated unit cost is $864,000. In addition, City staff were able to provide information verifying that Seattle received three bids with an average substation cost of $630,000, indicating that the estimated unit cost of the substations included in the Milwaukee Streetcar capital cost estimate are not unreasonable.

Vehicle Cost Estimate Evaluation

The most expensive single item of any streetcar system are the streetcar vehicles, and particular attention was given to comparing the estimated cost of the four vehicles for the Milwaukee Streetcar project to streetcar vehicle purchases made over the past four years in the United States. Table 2 shows that comparison, and indicates that the cost estimate for streetcar vehicles for the Milwaukee Streetcar project is similar to actual bids received by other streetcar projects across the country.

Table 2

COSTS FOR STREETCAR VEHICLES PURCHASED SINCE 2010

Project	Total Cost of Winning Bid (millions)	Number of Vehicles	Cost per Vehicle (millions)	Manufacturer
Atlanta Streetcar	$17.2	4	$4.3	Siemens
Cincinnati Streetcar	$22.0	5	$4.4	C.A.F.
DC Streetcar	$8.7	2	$4.4	United Streetcar
Kansas City Downtown Streetcar	$22.0	5	$4.4	C.A.F.
First Hill Streetcar (Seattle)	$26.0	7	$3.7	Inekon
Tucson Sunlink	$26.0	7	$3.7	United Streetcar
Milwaukee Streetcar	*$17.6*	*4*	*$4.4*	*Not Applicable*

Evaluation of Cost Overrun Mitigation Measures

In order to mitigate the possibility of a cost overrun, the City's engineering consultant and owner's representative both developed independent cost estimates, and arrived at similar totals for the overall capital cost of the project. In addition, a number of elements of the capital cost estimate, including the track elements, stations, maintenance facility and yard, sitework along the project right-of-way, and systems including the overhead catenary system, the signals system, and the communications system, have a contingency of between 5 and 10 percent included in their cost estimates, plus an additional 10 percent contingency that is not allocated to any particular cost element. This level of contingency is considered sufficient by industry standards.

ANNUAL OPERATIONS AND MAINTENANCE COST ESTIMATE REVIEW

The validation of the annual operations and maintenance cost estimates for the Milwaukee Streetcar was conducted by comparing these cost estimates to the operating and maintenance costs of the three similar modern streetcar systems in the United States. Specifically, the operating and maintenance cost estimates for the Milwaukee Streetcar as documented in the *Milwaukee Streetcar Study: Operations Planning, Operations and Maintenance Cost Estimating Memorandum*, dated March 7, 2011, were compared to the costs experienced by the three modern streetcar systems in the United States that have been operating for more than one year (the Portland Streetcar in Portland, Oregon; the South Lake Union Streetcar in Seattle, Washington; and the Tacoma Link in Tacoma, Washington).

The City of Milwaukee Streetcar operating and maintenance cost estimates were developed for the year 2010, based on year 2008 operations and costs of other streetcar systems which were then inflated to the year 2010 with the Bureau of Labor Statistics' Consumer Price Index. The total operating and maintenance cost (including labor, materials, power, and administrative costs) of the Milwaukee Streetcar was projected to be $139.42 per revenue vehicle hour in 2010 dollars[2] or $2.4 million per year to operate the planned 17,214 annual revenue vehicle hours of service. In order to evaluate the validity of the cost estimation model used to develop the estimated annual operating costs for the Milwaukee Streetcar project, Commission staff compared the estimated cost per revenue vehicle hour for the Milwaukee Streetcar to the costs per revenue vehicle hour experienced by the three existing modern streetcar systems in the United States. It should be noted that the methodology used to develop the total annual operating cost, including modeling the labor, materials, and power required to operate the system, and developing administrative cost assumptions is consistent with industry standards.

[2] This estimate does not include the current approach to require the O&M contractor to provide OMF equipment and tools. While this approach would be expected to increase annual O&M costs, the cost per revenue vehicle hour would not be expected to significantly increase when the cost is distributed across total revenue hours.

The projected operating and maintenance cost per revenue vehicle hour for the Milwaukee Streetcar was compared to the per revenue vehicle hour operating and maintenance costs for the three streetcar systems mentioned previously. To account for regional differences in labor and materials costs, the cost of providing local bus service per revenue vehicle hour by each streetcar operator was compared to the cost per revenue vehicle hour reported by the Milwaukee County Transit System, and this factor was applied to localize the operating and maintenance cost of each streetcar project to the Milwaukee area[3]. Finally, the Consumer Price Index was used to convert these costs to year 2010 dollars to make them comparable to the estimate in the Milwaukee Streetcar operations and maintenance cost memorandum. Table 3 shows the results of this analysis. The estimated Milwaukee Streetcar operating and maintenance costs are higher than the Portland Streetcar, comparable to the costs of the South Lake Union (Seattle) Streetcar, but are significantly lower than the Tacoma Link per hour costs.

Table 3

OPERATIONS AND MAINTENANCE COSTS FOR MODERN STREETCAR SYSTEMS

Streetcar System	Year 2012 Annual Revenue Vehicle Hours	Year 2012 Total Operating Cost	Year 2012 Cost per Revenue Vehicle Hour	Year 2012 'Localized' Cost per Revenue Vehicle Hour	**'Localized' Cost per Revenue Vehicle Hour in Year 2010 dollars**
Portland Streetcar	54,000	$8,798,828	$162.94	$124.45	**$118.23**
South Lake Union Streetcar (Seattle)	11,736	$2,794,211	$238.09	$166.10	**$157.80**
Tacoma Link	9,822	$4,169,997	$424.56	$247.46	**$235.09**

It should be noted that the Tacoma Link appears to have high administrative costs relative to the other two systems. Administrative costs for the Milwaukee Streetcar are estimated to represent an additional 18 percent on top of all other operations and maintenance costs. This compares well with the Milwaukee County Transit System administrative cost factor of 14 percent. Each of the three comparable systems has a higher administrative cost percentage, varying from 24 percent for the South Lake Union Streetcar to 47 percent for the Tacoma Link.

Evaluation of Service Plan and Number of Vehicles

Another element of the validation was to review the service plan and assess the consistency of the plan with the number of streetcars to be acquired. Table 1 of the *Milwaukee Streetcar Study: Operations Planning, Operations and Maintenance Cost Estimating Memorandum*, dated March 7, 2011, specifies that the proposed peak vehicle headways are 10 minutes for the initial streetcar system. Round trip travel time for the route is estimated to be approximately 30 minutes; therefore, three vehicles would be required to be in service during peak periods to provide the proposed service frequency. In addition, spare vehicles need to be provided in a transit fleet in case of breakdowns or service irregularities. The fourth vehicle included in the *City of Milwaukee MKE Streetcar – Phase 1: 60 % Estimate* should satisfy this need, and the service would be able to be provided as proposed with the planned fleet of four modern streetcars.

Availability of Private Vendors

As part of this review of the operations and maintenance plans, an evaluation was conducted of the availability of private firms that the City could contract with to operate the service and maintain the vehicles and infrastructure. Four of the five currently operating modern streetcar systems in the United States use the local transit agency as their operators, even when they are owned by the local municipality. In addition, there are a number of modern streetcar systems under construction in the nation, and some system owners have selected private firms to operate and maintain their systems through a request for proposals solicitation process.

[3] Local bus costs per revenue vehicle hour in 2012 were: $108.40 for Milwaukee, $141.93 for Portland, $155.38 for Seattle, and $185.98 for Tacoma.

RATP Dev McDonald Transit (RDMT) has been selected to operate the DC Streetcar and currently operates the Tucson Sun Link, and is part of the RATP Group, operators of the Paris Metro system and numerous bus lines and tramways in the world. RATP Group is a large company, earning $7.1 billion in revenue in 2011. Herzog Transit Services, Inc. (HTSI) has been selected to operate the KC Downtown Streetcar, and currently operates a number of commuter rail systems in the United States. Other known, but unsuccessful, bidders to operate and maintain other modern streetcar systems include:

- First Transit – Part of the United Kingdom's FirstGroup plc, First Transit operates numerous fixed-route bus and paratransit services in the United States. First Transit is the operator for the Memphis Area Transit Authority, including the MATA Trolley heritage streetcar system. FirstGroup plc is also the owner of Greyhound, and operates a number of rail lines in the United Kingdom and Ireland. It earned $10.5 billion in revenue in 2012.

- Veolia Transportation – Part of France's Transdev, Veolia Transportation operates a number of fixed-route bus services, commuter rail lines, and light rail lines in the United States, as well as light rail systems across the world. Veolia Transportation is the operator of the New Orleans Regional Transit Authority, including New Orleans' historic streetcar lines. Transdev operates a number of bus and rail services throughout the world, and earned $10.5 billion in revenue in 2012.

- Keolis America Transit – Part of France's Keolis company, Keolis America Transit operates fixed-route bus and paratransit services in the United States, as well as the Virginia Rail Express commuter rail service in the Washington, D.C. region and the Massachusetts Bay Commuter Rail service in the Boston, Massachusetts region. Keolis is majority owned by SNCF, the French national train operator, and operates tramway lines and bus routes in numerous countries. Keolis earned $6.3 billion in revenue in 2012.

Table 4 lists the operators of existing modern streetcar systems either under construction or in operation in the United States, as well as the operators of a selected group of Historic and Heritage Streetcar Systems.

Table 4

OWNERS AND OPERATORS OF SELECT STREETCAR SYSTEMS IN THE UNITED STATES

Streetcar System	Location	Owner	Operator
Modern Streetcar Systems			
Atlanta Streetcar	Atlanta, Georgia	City of Atlanta	Metropolitan Atlanta RTA[b]
Cincinnati Streetcar	Cincinnati, Ohio	City of Cincinnati	Southwest Ohio RTA[b]
Oak Cliff Streetcar	Dallas, Texas	Dallas Area Rapid Transit	Dallas Area Rapid Transit[b]
DC Streetcar	Washington, D.C.	District of Columbia	RDMT
KC Downtown Streetcar	Kansas City, Missouri	Kansas City Streetcar Auth.	HTSI
M1 Rail	Detroit, Michigan	M-1 Rail	To Be Announced[a]
Portland Streetcar	Portland, Oregon	Portland Streetcar, Inc.	TriMet[b]
S Line	Salt Lake City, Utah	Utah Transit Authority	Utah Transit Authority[b]
South Lake Union Line	Seattle, Washington	City of Seattle	King County Metro[b]
Sun Link	Tucson, Arizona	City of Tucson	RDMT
Tacoma Link	Tacoma, Washington	Sound Transit	Sound Transit[b]
Historic/Heritage Streetcar Systems			
Charlotte Trolley	Charlotte, North Carolina	Charlotte Area Transit	Charlotte Area Transit[b]
MATA Trolley	Memphis, Tennessee	Memphis Area Transit	First Transit
New Orleans Streetcars	New Orleans, Louisiana	New Orleans RTA	Veolia Transportation
River Rail Streetcar	Little Rock, Arkansas	Central Arkansas Transit	Central Arkansas Transit[b]
TECO Line Streetcar System	Tampa, Florida	City of Tampa	Hillsborough Area Transit[b]

[a]*This streetcar system is intending to use a private operator, but is still in the solicitation process.*
[b]*This operator is a local, publicly-owned transit agency.*

RIDERSHIP PROJECTIONS REVIEW

The review of the ridership projections included a review of the travel demand model that produced the ridership projection, and comparison of the projections to the ridership experienced on other modern streetcar systems in the United States. The travel demand model utilized in the preparation of the Milwaukee Streetcar ridership forecasts is a four-step model. The four-step model divides the forecast of travel into four steps: 1) the decision to make a trip (trip generation); 2) the destination of the trip (trip distribution); 3) the method or mode of travel used (mode choice), and; 4) the route utilized to get to the destination (assignment). This structure of the travel demand model utilized in the Milwaukee Streetcar Project is consistent with current and accepted travel demand modeling practice.

In the Milwaukee Streetcar travel demand model, three different types of trips are quantified within the study area based on the existing mode of travel: pedestrian trips, automobile trips, and transit trips. These three different types of trips were identified, as they would be expected to have different potential to shift to the Milwaukee Streetcar, with pedestrian trips viewed as the largest potential source of ridership for the Milwaukee Streetcar. The division into, and separate treatment of these three types of trips is a reasonable approach.
The step of Trip Generation involved the application of trip generation rates to existing and projected land uses, as well as use of Milwaukee County Transit System Automatic Passenger Count information.

- Pedestrian trips were estimated based on the pedestrian trip generation rates in the Federal Highway Administration Pedestrian Planning Procedures Manual. Overall, the estimated number of pedestrian trips for the year 2015 and 2030 appear reasonable when compared to estimates of travel from the Commission's 2011 household travel inventory.
- Transit travel was estimated based on the Milwaukee County Transit System (MCTS) Automatic Passenger Counter (APC) data. A transit trip table was synthesized based on the MCTS APC data and estimates of trips produced and attracted within the study area. Synthesizing trip tables controlled to

actual count information is an accepted technique to model travel when more detailed survey data is not available.

- Automobile travel with both trip ends within the study area was estimated utilizing the Institute of Transportation Engineers (ITE) trip generation manual. Automobile trip generation within the study area was estimated by subtracting 90 percent of the study area cordon line counts from the trips estimated using the ITE trip rates. It was assumed that 10 percent of the cordon line counts were through trips.

Trip Distribution was performed on the pedestrian trips and automobile trips using a gravity model. Pedestrian trip distribution was validated against survey data collected for the Milwaukee Streetcar project in August 2010. The use of a gravity model is consistent with current modeling practice. Trip distribution was not performed on the pool of transit trips as the synthesis of the trip table also performed the trip distribution step.

Mode Choice was applied differently for each of the three pools of trips (pedestrian, auto, and transit). With regard to the pedestrian and auto trips the mode choice models were based on mode choice models from the Green Bay, Wisconsin area, which were then calibrated to provide ridership estimates comparable to similar streetcar systems. The mode choice model applied to the transit trips relied on national parameters as documented in National Cooperative Highway Research Program Report 365, "Travel Estimation Techniques for Urban Planning." The transferring of model parameters and structures for other areas with requisite calibration is a common and accepted practice when limited local information is available. All three mode choice models used a binomial (two choice) logit model. The use of a logit model is consistent with national practice. Overall, the mode choice model resulted in very modest estimates of shifts in travel to the Milwaukee Streetcar, specifically the shift of only 0.6 percent of pedestrian and automobile trips to the Milwaukee streetcar and 3 percent of transit trips.
Trip Assignment was performed utilizing Citilabs Cube and TPPlus software. This software is one of the most widely utilized travel demand modeling software in the United States.

Overall, the structure of the model is consistent with current modeling practice, and the projected shifts in travel to the Milwaukee Streetcar are modest. Table 5 compares the year 2015 ridership estimates for the Milwaukee Streetcar to 2012 ridership statistics from the National Transit Database for the modern streetcar systems currently in operation in the U.S. As shown in the table, the ridership forecast for the Milwaukee Streetcar is based on a $1.00 fare and 10 minute peak and 15 minute off-peak headways. The forecast Milwaukee Streetcar ridership is comparable to the other modern streetcar systems, and may even be considered conservative.

Table 5

COMPARISON OF YEAR 2015 MILWAUKEE STREETCAR RIDERSHIP FORECASTS TO YEAR 2012 EXISTING OPERATIONAL EXPERIENCE OF PEER STREETCARS WITHIN THE NATION

System	One-Way Route Length (miles)	Peak/Off-Peak Headway (minutes)	Service Hours	Adult Fare (2012)	Average Weekday Ridership (2012)	Revenue Vehicle Hours
Portland Streetcar	7.2	14/20	5 a.m. – Midnight	$1.00	10,814	36,739
South Lake Union Streetcar (Seattle)	2.6	15/15	5 a.m. – 10 p.m.	$2.50	2,561	11,736
Tacoma Link	1.6	12/24	5 a.m. – 10 p.m.	Free	3,474	9,822
Tucson Sunlink[a]	3.9	10/20	7 a.m. – 10 p.m.	$1.50	~ 5,000	N/A
Milwaukee Streetcar	*2.1*	*10/15*	*5 a.m. – Midnight*	*$1.00*	*1,840*	*17,214*

[a]*Tucson Sunlink opened in August 2014, and the ridership listed here is an estimate based on 2014 data.*

ANNUAL REVENUES REVIEW

The projected annual farebox revenues of $588,800 for the Milwaukee Streetcar is consistent with the projected 1,840 riders per weekday and the fare of $1. Based on the annual revenues received by the Milwaukee County Transit System for advertising on its vehicles and bus stops, and advertising and sponsorships revenue received by the Portland Streetcar, the projected annual advertisements and sponsorships revenue for the Milwaukee Streetcar of approximately $250,000 is reasonable. The Milwaukee County Transit System received $725,000 in 2013 for advertising on its vehicles and stops. In addition to advertising revenue, the Portland Streetcar receives $30,000 annually for each of its vehicle sponsorships, $6,000 annually for each stop sponsorship, and additional smaller amounts for sponsoring artwork and recycling facilities at each stop.

SUMMARY OF REVIEW

The findings of the review of the City of Milwaukee Streetcar are as follows:

- Unit capital costs for the Milwaukee Streetcar are similar to those of streetcars under construction in Cincinnati, Ohio and Kansas City, Missouri.

- Capital costs per track-mile are lower than some other streetcar projects under construction or recently completed in the United States. However, the Milwaukee Streetcar is not proposing the complete reconstruction of the streets along its route, which other streetcar projects include.

- Milwaukee Streetcar estimated vehicle purchase costs are equal or greater than actual bids received by other streetcar projects.

- Milwaukee Streetcar annual operations and maintenance cost estimates when adjusted based on relative existing local bus operating costs are comparable to Seattle streetcar operating and maintenance costs.

- The number of streetcar vehicles proposed to be purchased is consistent with the proposed schedule of service.

- Private vendors would be available to operate the Milwaukee Streetcar.

- Ridership projections are based on accepted travel demand modelling practice and projected ridership is comparable to other streetcar projects.

- Projected annual farebox revenue is consistent with proposed fares and projected ridership, and advertising/sponsorship revenue is consistent with Portland streetcar and Milwaukee County Transit System revenues.

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