

Appendix C

Operating Cost Methodology Memorandum

**O & M Cost Methodology for:
Robert Street, Nicollet Avenue and Midtown Corridor Projects
(Final Proposed Methodology)**

This paper presents a brief summary of the transit O & M cost methodology proposed for use in all three corridor transit projects. Final proposed O & M cost methodology is presented in this paper, resulting from a series of meetings with each project's consultant staff. O & M cost methodologies are presented for the following modes:

- Metro Transit Bus
- BRT (both arterial and highway)
- Metro Transit LRT
- Rail

The methodology presented in this paper is to be used as a guide in the development of O & M costs for each project. It is recognized that adjustments to unit costs may be appropriate to account for alternative nuances.

Metro Transit Bus O & M Cost Methodology

It is agreed that all three projects will utilize unit costs developed from a detailed O & M cost model recently prepared for the Robert Street Transitway Alternatives Study. That cost model uses FY 2011 Metro Transit cost data, with adjustments to account for differences for articulated bus operations and maintenance. The Robert Street cost model follows cost assumptions used in the recently completed Bottineau Corridor DEIS. Resulting unit costs, in FY 2012 dollars, are as follows:

\$3.05	x 40' bus annual revenue bus-miles
\$3.55	x articulated bus annual revenue bus-miles
\$63.02	x annual revenue bus-hours
\$38,729.59	x maximum number of buses operated in service
\$1,636,509	x number of maintenance garages
\$1,323,806	x number of operating divisions
\$649,129	x number of transit centers

The above-noted cost drivers are assigned to each specific cost item in the Metro Transit expense report, with some items driven by more than one driver. Listed below are representative examples of expense items driven by the above-noted cost drivers.

- Annual revenue bus-miles – bus mechanic wages, fuel, bus parts
- Annual revenue bus-hours – operator wages, bus operations administration
- Peak buses – customer relations, marketing, service development
- Maintenance garages – systems facilities, garage building maintenance
- Operating divisions – bus transportation administration
- Transit centers – street supervisors, transit information center

As noted above, this methodology has been updated to account for differences in articulated bus operations. Specifically, the following line item costs under Bus Maintenance have been adjusted with different rates for standard vs. articulated buses.

Garage Maintenance Divisions

- Mechanics Regular Pay
- Mechanics Overtime
- Fringe Benefits for those Mechanics
- Fuel & Lubricants
- Bus Parts & Tires

Heavy Maintenance Functions

- Mechanics Regular Pay
- Mechanics Overtime
- Fringe Benefits for those Mechanics
- Bus Parts & Tires

Revenue bus-miles associated with articulated buses are estimated to have a unit cost that is 20% higher than standard bus-miles for these specific line items.

BRT O & M Cost Methodology

It is agreed that arterial BRT O & M costs will be estimated with the Metro Transit Bus O & M unit costs presented above, but with the following additional line item costs, many of which were developed for use in the *Arterial Transitways Corridor Study (ACTS)*:

Fare Collection

- TVM's - \$10,000 per TVM
- GoTo Validators - \$150 per GoTo Validator
- Fareboxes - \$2,000 in savings per fleet bus for ACTS buses using TVM's and GoTo Validators

Enhanced Station Maintenance

- \$3,500 per directional stop for snow removal
- \$80,000 per FTE for salary & Benefits, with 1 FTE per 40 directional stops, or \$2,000 per directional stop

Police/Fare Enforcement

- 0.2201 police officer hour for every revenue bus-hour, 1800 hour police hours per FTE, \$100,000 wages & fringe benefits per FTE. This calculates to \$12.23 per BRT revenue bus-hour (i.e., $0.2201 / 1800 * \$100,000 = \12.23). This additional cost is primarily related to additional fare enforcement that will be required for BRT.

ITS Equipment Maintenance

- \$2,600 per directional stop for ITS applications (e.g., real time bus arrival information)
- \$2,800 per intersection with TSP maintenance

Parking Lot Maintenance

- An additional unit cost of \$60 per surface parking space and \$120 per structured parking space will be used for BRT stations park and ride lot facilities (based on discussions with Metro Transit's Manager of Facilities Maintenance).

Elevator/Escalator Maintenance

- An additional \$20,000 per station will be used for any stations requiring vertical circulation elements (escalators/elevators). This is also based on discussions with Metro Transit's Manager of Facilities Maintenance.

Exclusive BRT Lane Miles

- BRT alternatives may also include *new* roadway lane miles that are for exclusive use by BRT vehicles. These new lane miles will have an added cost for roadway maintenance (periodic repaving, snow plowing, etc.). A rate of \$10,557 per lane mile, or \$21,114 per route-mile will be used, based on information provided by Minnesota DOT for a 2012 Wisconsin Transportation Finance and Policy Commission State Highway Maintenance Policy Issue Paper.

Not all BRT alternatives will include each of the above-noted elements. For example, arterial BRT alternatives are unlikely to include exclusive BRT lane miles. The above-noted unit cost should only be applied if the specific element is included in the project definition.

Metro Transit LRT O & M Cost Methodology

It has been agreed that all three projects will utilize unit costs developed from a detailed O & M cost model recently prepared for the Robert Street Transitway Alternatives Study. That cost model uses FY 2011 Metro Transit cost data that has been inflated to FY 2012 dollars, with enhancements made to account for differences between station type (walk-up vs. with p&r/bus facilities). Supply variables are assigned to specific line item costs. These costs are then rolled up to arrive at total unit costs. Proposed unit costs for use in the three corridor studies are as follows:

\$171.02	x annual revenue train-hours
\$1.98	x annual revenue car-miles
\$57,387	x maximum number of rail cars operated in service
\$97,325	x LRT stations with p&r lots
\$74,303	x walk-up LRT stations
\$190,277	x directional track miles
\$3,215,959	x number of rail maintenance yards

The above-noted cost drivers are assigned to each specific cost item in the Metro Transit expense report, with some items driven by more than one driver. Listed below are representative examples of expense items driven by the above-noted cost drivers.

- Annual revenue train-hours – operator wages, rail operations administration
- Annual revenue car-miles – rail mechanic wages, propulsion power
- Peak rail cars – marketing, service development, executive expenses, propulsion power
- Stations with and without p&r lots – police/security, station maintenance
- Directional track-miles – systems maintenance costs, police/security
- Rail maintenance yards – yard maintenance

Streetcar O & M Cost Methodology

It is agreed that Streetcar O & M costs will be estimated with Metro Transit LRT unit costs, but with several adjustments, as noted below:

- *Station Maintenance Costs* – Streetcar station costs will utilize the same methodology identified for Arterial BRT. Costs will be built-up by including costs for TVM maintenance, station/stop maintenance and ITS station-related application maintenance.
- *Track and Right-of-Way Maintenance Costs* – The LRT unit cost used for directional track miles will be factored by 50% to reflect anticipated lower maintenance costs associated with embedded rail, and lower costs associated with train control systems (due to in-street running).
- *TSP maintenance* – The Arterial BRT unit cost will be used for TSP maintenance (i.e., \$2,800 per intersection with TSP).
- *Yard Maintenance Costs* – The Robert Street LRT cost model assigns \$3.2 million as yard-related costs. Most of the costs driven by yards are labor costs under AGM Rail Operations, Rail Transportation Administrative, Rail Operators, Stores and Rail Facility Maintenance. The largest non-labor cost driven by yards is utilities. It is anticipated that a streetcar maintenance facility will be much smaller in size than the current Metro Transit LRT rail maintenance facility. The streetcar facility likely will have different and fewer functions than the LRT facility. For example, it was noted that Portland Streetcar vehicles are trucked to the Portland LRT facility for heavy maintenance (e.g., wheel trueing). Thus, yard-related costs are likely to be lower for streetcar. It was agreed to assume that streetcar yard-related costs would be 1/3 of the cost of LRT yard-related costs.
- *Police/Security* – It was agreed that streetcar police/security-related costs will likely fall between the level assumed for BRT and the level presently provided on Metro Transit LRT. Police/security costs in the LRT cost model are driven by train-hours, directional route-miles, stations and yards. Adjustments being made to the directional track-miles and stations unit costs are already factoring down LRT police/security-related unit costs for streetcar use. Police-related costs driven by revenue train-hours were also factored by 66% to arrive at police/security costs that are similar to BRT.
- *Bus Operations Direct Charged* – No adjustments are to be made to these line item costs in the LRT cost model.

Once unit costs adjustments are established for streetcar, it will be necessary to test results with a project's streetcar operating plan. Cost performance metrics (e.g., cost per train-hour) should be compared to LRT and bus cost performance metrics for Metro Transit, and compared to other transit systems to verify the reasonableness of results.

Summary of Unit Costs

The following tables present resulting unit costs that are proposed for use in all three Metro Transit corridor studies.

**Table 1:
Proposed Unit Costs for Bus Modes (2012\$)**

Service Supply Variable	Metro Transit Reg. Bus	BRT (Hwy & Art.)
<u>Regular Bus Service</u>		
Annual Rev. Bus-Miles		
Standard	\$3.05	\$3.05
Articulated	\$3.55	\$3.55
Annual Rev. Bus-Hours	\$63.02	\$63.02
Peak Buses	\$38,730	\$38,730
Maint. Garages	\$1,636,509	\$1,636,509
Operating Divisions	\$1,323,806	\$1,323,806
Transit Centers	\$649,129	\$649,129
<u>Add'l. BRT Features</u>		
BRT Police/Fare Enforc't/Rev. Bus-Hr.	n/a	\$12.23
BRT Stations		
<u>Fare Collection</u>		
# of TVM's	n/a	\$10,000
# of Go-To Validators	n/a	\$150
# Fleet Buses w/o Fareboxes	n/a	-\$2,000
<u>Station Maintenance</u>		
Maintenance/Dir. Stop	n/a	\$2,000
Snow Removal/Dir. Stop	n/a	\$3,500
ITS Features/Dir. Stop		\$2,600
Vertical Circulation/Dir. Stop		\$20,000
<u>Additional P&R Lot Maint.</u>		
Surface Parking (per Space)	n/a	\$60.00
Structured Parking (per Space)		\$120.00
TSP Maint./Intersection		\$2,800
Exclusive BRT <u>Lane</u> -Miles	n/a	\$10,557

**Table 2
Proposed Unit Costs for Rail Modes (2012\$)**

Service Supply Variable	LRT	Streetcar
Annual Rev. Train-Hours	\$171.02	\$164.72
Annual Rev. Car-Miles	\$1.98	\$2.00
Peak Cars	\$57,387	\$57,387
Directional Track-Miles	\$190,277	\$95,139
LRT Stations		
Walk-up Stations	\$74,303	n/a
Stations w/ P&R Lots	\$97,325	n/a
Streetcar Stations		
<u>Fare Collection</u>		
# of TVM's	n/a	\$10,000
# of Go-To Validators	n/a	\$150
# Fleet Buses w/o Fareboxes	n/a	-\$2,000
<u>Station Maintenance</u>		
Maintenance/Dir. Stop	n/a	\$2,000
Snow Removal/Dir. Stop	n/a	\$3,500
ITS Features/Dir. Stop	n/a	\$2,600
Vertical Circulation/Dir. Stop		\$20,000
<u>Additional P&R Lot Maint.</u>		
Surface Parking (per Space)		\$60.00
Structured Parking (per Space)		\$120.00
TSP Maint./Intersection	n/a	\$2,800
Yard & Shop	\$3,215,959	\$1,071,986