



RIVERVIEW CORRIDOR

Project Report: Operations and Maintenance Cost Estimating Methodology

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1.0 INTRODUCTION

The Riverview Corridor is a transportation corridor extending approximately 12 miles from downtown Saint Paul to the Minneapolis-St. Paul (MSP) International Airport and the Mall of America. The Riverview Corridor is defined by the Mississippi River on the south, Interstate 35E (I-35E) and Ford Parkway on the north, Lowertown and Union Depot on the east, and MSP Airport and Mall of America on the west.

This report documents the proposed methodology to determine annual costs related to operations and maintenance (O&M) for each transportation alternative for detailed analysis as part of the Riverview Corridor Pre-Project Development Study ('Study'). Further, this methodology is consistent with the Rush Line Corridor Pre-Project Development Study, also undertaken by the Ramsey County Regional Railroad Authority.

1.1 Detailed Alternatives

Following the Initial Screening of Alternatives, the Study will examine a relatively small set of options characterized by factors such as alignment, transit mode, transit operating characteristics, and stop/station locations:

- Alignment options
 - Trunk of the Riverview Corridor – W. 7th Street, the Canadian Pacific Railway tracks between the Union Depot and the Ford Site
 - Sub-areas – Downtown Saint Paul, the Ford Site, Mississippi River Crossing, and Airport/South Loop in Bloomington.
- Transit mode
 - Bus – Local Bus, Arterial Bus Rapid Transit, Dedicated BRT
 - Rail – Modern Streetcar, Light Rail Transit (LRT), Diesel Multiple Unit (DMU)
- Transit operating characteristics
 - Mixed traffic – In street, existing freight railroad
 - Dedicated – At-grade, aerial structure, tunnel
 - 'Hybrid' – Combination of mixed traffic and dedicated

Many of these modal options will have similar operating characteristics but varied cost components, which will be covered in more detail in the following sections. As the PPD process continues, some modes will be limited to certain alignments and some may drop out entirely.

2.0 O&M COST MODEL OVERVIEW¹

2.1 Basis

The following overview of O&M costing is provided as described in the *Southwest LRT Operating and Maintenance Cost Methodology and Results Report* (subsequently referred to as “Southwest LRT O&M Report”) from September 2014.

The Federal Transit Administration (FTA) requires cost models for transit O&M estimation to be resource driven. In these types of models, certain costs borne by the transit agency are related to certain types of resources or “supply variables.” For instance, salaries paid to bus operators are directly proportional to annual revenue hours: with more bus service provided, more bus operators must be paid to operate that service. An O&M cost allocation model is created by associating supply variables, such as revenue hours, revenue miles, or peak vehicles, to cost items, such as operator or mechanic labor, administrators, fuel, marketing, utilities, and many other costs. Unit costs are then created by disaggregating an existing annual budget and assigning costs to supply variables and dividing by the annual quantity of each of those variables. These resulting building blocks can then be used to determine the incremental costs of additional service or total costs needed to provide new transit service. For instance, to supply one unit of revenue hours it will cost X amount of dollars for bus operator expenses.

Supply variables are also cost drivers and are assigned to specific cost items. Most items are driven by a single cost driver but some cost items are driven by multiple drivers. Presented in **Table 2-1** are representative examples of cost items driven by certain cost drivers. The following table summarizes representative cost drivers and cost items used in this report.

Table 2-1: Representative Cost Drivers and Cost Items

COST DRIVER	COST ITEM
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

Supply variables for bus operations will include:

Revenue Hours – *service costs are driven by the amount of local bus service provided by the transit agency*

¹ This methodology is consistent with the Rush Line Corridor Pre-Project Development Study, also undertaken by the Ramsey County Regional Railroad Authority.

Revenue Miles – *maintenance costs for the fleet are driven by the total number of miles operated*

Peak Buses – *administrative costs of the agency are driven by the size of the agency as represented by the total number of buses in operation during the period of maximum service*

Maintenance Garages – *maintenance and engineering costs for maintaining infrastructure are driven by the total number of fixed route bus maintenance and storage facilities operated by the transit agency*

Operating Divisions – *bus administration costs are driven by the number of bus operating divisions*

Transit Centers – *bus marketing, service planning, and street operations costs are driven by the number of transit centers*

Supply variables for rail operations will include:

Train Revenue Hours – *service costs are driven by the actual amount of rail service hours operated by the transit agency*

Passenger Car Revenue Miles – *maintenance costs for the fleet of rail vehicles are driven by the total number of miles operated*

Peak Passenger Cars – *administrative costs of the transit agency are driven by the size of the agency as represented by the total number of rail passenger cars in operation during the period of maximum service*

Directional Track Miles – *maintenance costs associated with the rail guideway are driven by the number of guideway miles maintained by the transit agency in each direction of travel*

Train Yards – *maintenance and engineering costs of maintaining the transit agency's train yards are driven by the total number of yards operated by the transit agency*

Rail Stations – *policing, staffing, and maintenance costs for rail stations are driven by the total number of stations*

2.1 Overview of O&M Cost Approach

For local bus and LRT modes, the O&M cost methodologies will be based on analysis conducted for the *Southwest LRT O&M Report* from September 2014. The local bus mode will only apply to the No Build Alternative for this project.

Alignments utilizing BRT, modern streetcar, and hybrid rail technologies will be based on the *Metro Transit O&M Cost Methodology for Robert Street, Nicollet Avenue and Midtown Corridor Projects* report (referred to as "*Joint Corridors O&M Report*") from October, 2013. O&M costs particular to specific BRT stations will be updated based on information generated from Metro Red Line analysis conducted this year.

For modern streetcar and hybrid rail options, unit cost drivers that are common with LRT will come from established LRT costs (per the *Southwest LRT O&M Report*). However, cost distinctions related specifically to streetcar O&M will use the method established in the *Joint Corridors O&M Report* and subsequent work developed for the Nicollet Avenue corridor.

Alignments proposing use of DMU technology will have their costs estimated using, as a starting point, the Denton County Transportation Authority A-Train, which employs Stadler GTW 2/6 DMU vehicles to operate service on a 29-mile corridor. Costs will be customized to account for regional differences in wage rates, climate differences and fare enforcement. In addition, DMU operations in other cities will be reviewed in order to provide a contextual range of O&M costs related to DMU service.

3.0 O&M COST ESTIMATION OVERVIEW: BUS OPTIONS

The following overview provides cost estimation methodologies for local bus and BRT services. The BRT cost methodology overview incorporates all forms of BRT currently under consideration: Arterial BRT service, Dedicated Guideway BRT, and Hybrid Bus. Local bus service is discussed in the context of the No Build Alternative; local bus service is not a transit mode under consideration for this project.

3.1 Local Bus Service

As noted previously, the cost estimation methodology to obtain O&M costs for local bus service will come from methodologies formerly established within the *Southwest LRT O&M Report* from September 2014. That report documents supply unit costs calculated for local bus, based on Metro Transit Bus calendar year (CY) 2013 expenses, inflated to CY 2014 dollars by applying a 3.15% inflation rate. Local bus service cost estimation will apply to a No Build Alternative for this project.

Table 3-1 summarizes the supply unit costs calculated for Metro Transit Bus in 2014 dollars (as previously documented in the *Southwest LRT O&M Report*) and in 2016 dollars. To escalate costs from CY 2014 to 2016 dollars, the same inflation rate of 3.15% used in the *Southwest LRT O&M Report* from 2013 to 2014 is assumed for escalating from 2014 to 2016.

Unit costs are based on the vehicles currently in use within the Metro Transit fleet, which is composed of 77% standard and 18.5% articulated buses (the remainder are over-the-road coaches), based on National Transit Database information.

Table 3-1: Local Bus Unit Costs and Supply Variables (CY 2014 & 2015 \$)

UNIT COSTS (2014 \$)	UNIT COSTS (2016 \$)	COST DRIVERS
\$3.19	\$3.39	Annual revenue bus-miles
\$50.70	\$53.94	Annual revenue bus-hours
\$42,968.8	\$45,718.47	Maximum number of buses operated in service
\$1,962,208.57	\$2,087,774.71	Number of maintenance garages
\$7,985,884.45	\$8,496,919.16	Number of operating divisions
\$721,903.38	\$768,099.60	Number of transit centers

Source: *Southwest LRT O&M Report* (2014 dollars); 2015 dollars assume 3.15% annual inflation rate.

3.2 Bus Rapid Transit Service

Three BRT variations are to be considered for operation along the Riverview Corridor. These include Arterial BRT, Dedicated Guideway BRT, and Hybrid Bus. The differences between these BRT modes is the amount of infrastructure assumed for stations and dedicated lanes. The BRT unit costs shown in this section may not be used in the O&M cost estimate of each alternative.

O&M costs for BRT services all use identical base unit costs as identified for local bus service, as shown in **Table 3-2**. To escalate costs from 2014 to 2016 dollars, the same inflation rate of 3.15%

used in the *Southwest LRT O&M Report* from 2013 to 2014 will also be used for 2014 to 2015. More details on how these unit costs were calculated are available within the *Southwest LRT O&M Report*.

Table 3-2: BRT Unit Costs and Supply Variables (CY 2014 & 2016 \$)

UNIT COSTS (2014 \$)	UNIT COSTS (2016 \$)	COST DRIVERS
\$3.19	\$3.39	Annual revenue bus-miles
\$50.70	\$53.94	Annual revenue bus-hours
\$42,968.80	\$45,718	Maximum number of buses operated in service
\$1,962,208.57	\$2,087,775	Number of maintenance garages
\$7,985,884.45	\$8,496,919	Number of operating divisions
\$721,903.38	\$768,100	Number of transit centers

Source: *Southwest LRT O&M Report (2014 dollars); 2016 dollars assume 3.15% annual inflation rate.*

BRT is considered a premium transit service and has distinct costs separate from standard local bus service. Additional BRT-related costs will be applied based on methodologies outlined in the *Joint Corridors O&M Report* from October 2013 (which shared many of the same BRT cost items developed for the *Arterial Transitway Corridors Study*). Separate line item costs in addition to the unit costs presented above are due to additional O&M costs associated with amenities that enhance the quality of transit service provided to passengers.

Not all BRT alternatives will include each of the elements listed below. The following line item costs will only be applied if the specific element is included in the project definition. For those additional BRT costs established in the *Joint Corridors O&M Report*, costs have been inflated from 2012 dollars to 2016 dollars based on a 3.15% annual inflation rate.

Police/Fare Enforcement

- \$13.85² per BRT revenue bus-hour primarily related to additional fare enforcement that will be required for BRT

Fare Collection

- Standard Ticket Vending Machines (TVM) – \$10,320 per TVM³
- “Light” Ticket Vending Machines (TVM) – \$6,190 per TVM³
- GoTo Validators – \$170 per GoTo Validator⁴
- Fareboxes – \$2,260⁵ in savings per fleet bus for buses using TVMs and GoTo Validators

² 2012 cost: \$12.23.

³ Updated cost provided by Revenue Operations, Metro Transit, June 2015.

⁴ 2012 cost: \$150.

⁵ 2012 cost: \$2,000.

Enhanced Station Maintenance

- \$3,960⁶ per directional stop for snow removal
- \$90,600 per full-time employee (FTE) for salary & benefits, with 1 FTE per 40 directional stops, or \$2,260 per directional stop⁷

Intelligent Transportation System (ITS) Equipment Maintenance

- \$2,940⁸ for equipment at each directional stop for ITS applications (e.g. real-time bus arrival information)
- \$3,170⁹ per intersection with traffic signal priority (TSP) maintenance

Parking Lot Maintenance¹⁰

- An additional unit cost of \$70 per surface parking space and \$140 per structured parking space will be used for BRT station park and ride lot facilities¹¹

Elevator/Escalator Maintenance¹⁰

- An additional \$22,640¹² per station will be used for any stations requiring vertical circulation elements such as escalators or elevators

Exclusive BRT Lane Miles¹³

- BRT alternatives may also include new roadway lane miles that are for exclusive use by BRT vehicles, which will have an added cost for roadway maintenance (periodic repaving, snow plowing, etc.) estimated at a rate of \$11,950 per lane-mile, or \$23,900 per route-mile.¹⁴

Some station-related cost items such as Parking Lot Maintenance and Elevator/Escalator Maintenance may be updated based on current analysis being conducted for the Minnesota Valley Transit Authority (MVTA) detailing Cedar Avenue Red Line Corridor expenses.

Table 3-3 provides the unit costs for local bus and BRT modes side-by-side, in 2016 dollars.

⁶ 2012 cost: \$3,500.

⁷ 2012 costs: \$80,000 and \$2,000, respectively.

⁸ 2012 costs: \$2,600.

⁹ 2012 costs: \$2,800, respectively.

¹⁰ Based on previous discussions with Metro Transit's Manager of Facilities Maintenance.

¹¹ 2012 costs: \$60 and \$120, respectively.

¹² 2012 costs: \$20,000.

¹³ Based on information provided by Minnesota DOT for a 2012 Wisconsin Transportation Finance and Policy Commission State Highway Maintenance Policy Issue Paper.

¹⁴ 2012 costs: \$10,557 and \$21,114, respectively. Based on the identical 2012 cost per mile as the Gateway/Gold Line but with a slightly different inflation factor. The proposed Riverview cost per mile is based on an annual inflation rate of 3.15%.

Table 3-3: Proposed Unit Costs for Bus Modes (2016 \$)

COST CATEGORY	SERVICE SUPPLY VARIABLE	LOCAL BUS	BRT
Bus Service			
Vehicle Operations	Revenue Bus-Hours	\$3.39	\$3.39
Vehicle Maintenance	Revenue Bus-Miles	\$53.94	\$53.94
General Administration	Peak Buses	\$45,718	\$45,718
Maintenance Garages	# of maintenance garages	\$2,087,775	\$2,087,775
Operating Divisions	# of operating divisions	\$8,496,919	\$8,496,919
Transit Centers	# of transit centers	\$768,100	\$768,100
Additional BRT Features			
BRT Police/Fare Enforcement	Revenue Bus-Hours	n/a	\$13.85
TVM Maintenance	# of TVMs (Standard)	n/a	\$10,315
TVM Maintenance	# of TVMs (Light)	n/a	\$6,190
On-board fare collection	# of Go-To Validators	n/a	\$170
Cash collection savings	# Fleet Buses without Fareboxes	n/a	(\$2,260)
Station Maintenance	# of Station Platforms	n/a	\$2,260
Snow Removal	# of Station Platforms	n/a	\$3,960
ITS Features	# of Station Platforms	n/a	\$2,940
TSP Maintenance	# of Intersections with TSP	n/a	\$3,170
Vertical Circulation	# of Station Platforms	n/a	\$22,640
Surface Parking	# of Spaces	n/a	\$70
Structured Parking	# of Spaces	n/a	\$140
Guideway Maintenance	# of BRT Lane-Miles	n/a	\$11,950

Source: Southwest LRT O&M Report (bus service costs) and Joint Corridors O&M Report (additional BRT features), escalated to 2016 dollars assuming 3.15% annual inflation rate; TVM costs updated by Metro Transit in 2015 and escalated to 2016 for the Riverview Study.

4.0 O&M COST ESTIMATION OVERVIEW: RAIL OPTIONS

Four potential rail transit modes are under consideration for operation within the Riverview Corridor. These include LRT, modern streetcar, DMU, and Hybrid Rail.

4.1 LRT Service

As noted previously, the cost estimation methodology for estimating O&M costs for LRT service will come from methodologies formerly established within the *Southwest LRT O&M Report* from September 2014. The report documents supply unit costs calculated for LRT, based on Metro Transit CY 2013 expenses, inflated to Year 2014 dollars by applying 3.15% inflation rate.

Table 4-1 summarizes the supply unit costs calculated for Metro Transit LRT in 2014 dollars (as documented in the *Southwest LRT O&M Report*) and in 2016 dollars. To escalate costs from calendar year 2014 to 2016 dollars, the same inflation rate of 3.15% used in the *Southwest LRT O&M Report* from 2013 to 2014 is also used.

Table 4-1: LRT Unit Costs and Supply Variables (CY 2014 & 2015 \$)

UNIT COSTS (2014 \$)	UNIT COSTS (2016 \$)	COST DRIVERS
\$1.90	\$2.02	Annual passenger car revenue miles
\$184.70	\$196.52	Annual train revenue hours
\$45,753.70	\$48,682	Passenger cars in maximum service
\$86,057.93	\$91,565	Number of LRT stations
\$208,617.07	\$221,967	Number of directional track miles
\$3,432,027.43	\$3,651,651	Number of train yards

Source: *Southwest LRT O&M Report* (2014 dollars); 2015 dollars assume 3.15% annual inflation rate.

4.2 Modern Streetcar Service

As previously noted, the cost estimation methodology for estimating modern streetcar O&M costs follows the procedures outlined in the *Joint Corridors O&M Report* from October 2013.

Because modern streetcar operations share similarities with LRT service, unit costs will mirror established LRT costs, as shown in Table 4-1. However, a number of adjustments will be made in order to distinguish from LRT costs. Modern streetcar-related adjustments include:

Enhanced Station Maintenance

- Modern streetcar station costs will utilize the same methodology identified for BRT.
- Costs will be built up by including costs for ticket vending machine 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).

Traffic Signal Priority (TSP) maintenance

- BRT unit costs will be used for TSP maintenance (i.e., \$3,170 in 2016 dollars per intersection with TSP).

Yard Maintenance Costs

- It is anticipated the maintenance facility costs will be based on the Nicollet-Central operations and maintenance facility (OMF) costs outlined in the *Supplemental OMF Site Screening Tech Memo* document from December 2014. The OMF was configured for the capacity required for the full-build fleet and the largest streetcar size: modern, 100% low-floor streetcar vehicles 79 feet in length.
- The OMF matched other Metro Transit facility amenities in terms of work environment conditions and amenities, as well as basic amenities such as break rooms.
- The streetcar maintenance facility would handle operations, storage and maintenance of vehicles in enclosed and heated areas and it is anticipated would handle the majority of daily and recurring operations and maintenance tasks on-site. However, there is potential for a connection to the nearby Green Line maintenance facility for certain maintenance tasks resulting in possible cost savings.
- As alternatives and alignments are more fully defined, requirements of this facility will be better known and refined for the O&M cost estimate.

Police/Security

- 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 are also factored by 66% to arrive at police/security costs that are similar to BRT.

4.3 Hybrid Rail Service

Hybrid Rail is a combination of both LRT and streetcar modes and the unit costs presented in the previous chapters apply to the hybrid rail mode. Hybrid rail would operate partly in exclusive guideway and partly in mixed traffic on streets, depending on the selected alignment. Trains operated in this manner would be similar to streetcar trains, and unit costs reflect this fact in terms of station maintenance.

Table 4-2 presents a summary of unit costs of LRT, modern streetcar, and hybrid rail. LRT unit costs are taken from the *Southwest LRT O&M Report* and inflated to 2016 dollars using a 3.15% escalation rate, consistent with the 3.15% used in the *Southwest LRT O&M Report* to escalate from 2013 to 2014 dollars. Streetcar and hybrid rail costs use various methods of factoring LRT unit costs (annual revenue train-hours, directional track-miles, and yard and shop) or adopting costs associated with BRT (fare collection, station maintenance, additional park and ride lot maintenance, TSP maintenance) as described above, based on discussion from the *Joint Corridors O&M Report*. BRT-related components use unit costs established in the *Joint Corridors O&M Report*, escalated from 2012 to 2016 dollars using a 3.15% annual escalation rate.

Table 4-2: Proposed Unit Costs for LRT, Modern Streetcar, and Hybrid Rail Modes (Year 2016 \$)

COST CATEGORY	SERVICE SUPPLY VARIABLE	LRT	MODERN STREETCAR	HYBRID RAIL
Vehicle Operations	Revenue Train-Hours	\$196.52	\$189.88	\$189.88
Vehicle Maintenance	Revenue Car-Miles	\$2.02	\$2.02	\$2.02
General Administration	Peak Cars	\$48,682	\$48,682	\$48,682
Track Maintenance				
Dedicated Tracks	Directional Track-Miles	\$221,970	n/a	\$221,970
Mixed Operations	Directional Track-Miles	n/a	\$110,980	\$110,980
Station Maintenance	# of Stations	\$96,565	*See below*	*See below*
Yard & Shop Maintenance	# of Maintenance Facilities	\$3,651,651	\$1,205,045	\$1,205,045
Streetcar Stations				
TVM Maintenance	# of TVMs	n/a	\$10,000	\$10,000
On-board fare collection	# of Go-To Validators	n/a	\$2,100	\$2,100
Cash collection savings	# Fleet Cars without Fareboxes	n/a	(\$2,200)	(\$2,200)
Station Maintenance	# of Stations	n/a	\$2,200	\$2,200
Snow Removal	# of Station Platforms	n/a	\$3,850	\$3,850
ITS Features	# of Station Platforms	n/a	\$2,850	\$2,850
TSP Maintenance	# of Intersections with TSP	n/a	\$3,100	\$3,100
Vertical Circulation	# of Station Platforms	n/a	\$22,000	\$22,000
Surface Parking	# of Spaces	n/a	\$70	\$70
Structured Parking	# of Spaces	n/a	\$130	\$130

Police/security costs not broken out since already reflected in unit costs. Source: Southwest LRT O&M (LRT) and Joint Corridors O&M Reports (Streetcar adjustments), escalated to 2016 dollars assuming 3.15% annual inflation rate.

Once unit cost 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.

4.4 Diesel Multiple Unit Service

Diesel multiple unit (DMU) trains, as the name implies, consist of multiple passenger car units having the ability of propelling themselves through use of an onboard diesel motor. Unlike the other modes under consideration, no existing O&M cost methodology for DMU has been established by Metro Transit.

While Minneapolis' Northstar commuter rail service was considered as the basis for establishing DMU unit costs, it has certain features that may not directly translate to a DMU service in the Riverview Corridor. Northstar operates on shared track with freight, with a joint use agreement between Metro Transit and BNSF Railway for the railroad to provide train crews and maintain track, while Metro Transit maintains the vehicles. For the Riverview study, proposed DMU alignments may not necessarily share track with freight companies and therefore may not involve the same institutional arrangements involving agreements with the railroad.

For DMU, O&M cost estimates are based on the Denton County Transportation Authority (DCTA) A-Train, which uses Stadler GTW 2/6 DMU vehicles to operate service on a 29-mile corridor linking to the Dallas metropolitan area. O&M unit costs were established using DCTA 2013 National Transit Database data. **Table 4-3** presents unit costs in 2016 dollars, using the 3.15% annual growth rate assumed for escalating unit costs for other modes. (Appendix A shows the unit cost model worksheet showing the assignment of cost drivers.) As alternatives are refined, this Study anticipates adjustments to peer data to account for factors such as climate and potential wage differences.

Table 4-3: DMU Unit Costs and Supply Variables (2016 \$)

UNIT COSTS	COST DRIVERS
\$4.50	Annual revenue car miles
\$378.00	Annual revenue train hours
\$38,858	Peak cars
\$80,085	Number of DMU stations
\$106,197	Number of route-miles
\$2,664,450	Number of DMU yards

Source: Connetics Transportation Group (DCTA expenses from 2013 National Transit Database).

Appendix A:

Diesel Multiple Unit Operating Expenses



Table A-1: Diesel Multiple Unit (DMU) operating expenses and unit costs (CY 2015)

Expense Line Item	Regional Rail Expenses	DMU Supply Variable Unit Cost Rate						Productivity Ratio			Base Year Resource Unit Cost
		Revenue Train-Hours	Revenue Car-Miles	Yards	Route Miles	Stations	Peak Cars	Resource Variable	Resource Value	Resource/Supply	
VEHICLE OPERATIONS											
SALARIES & WAGES - OTHER	\$148,613	\$13.36						Rev Train-Hours	11,125	1.000	\$13.36
FRINGE BENEFITS	\$40,855	\$3.67						Rev Train-Hours	11,125	1.000	\$3.67
SERVICES	\$145,796						\$18,224.50	Peak Cars	8	1.000	\$18,224.50
CONTRACT OPER.-BASED SERVICES - Train Hour Driven (50%)	\$3,481,146	\$312.91						Rev Train-Hours	11,125	1.000	\$312.91
CONTRACT OPER.-BASED SERVICES - Yard Driven (25%)	\$1,740,573			\$1,740,573				Yards	1	1.000	\$1,740,573
CONTRACT OPER.-BASED SERVICES - Route-Mi Driven (25%)	\$1,740,573				\$82,884			Track Miles	21.0	1.000	\$82,884
FUEL	\$1,751,030		\$2.93					Rev Car-Miles	598,073	1.000	\$2.93
OTHER MATERIALS & SUPPLIES	\$230						\$29	Peak Cars	8	1.000	\$29
MISCELLANEOUS EXPENSES	\$3,815			\$3,815				Yards	1	1.000	\$3,815
VEHICLE MAINTENANCE											
CONTRACT OPER.-BASED SERVICES	\$216,112		\$0.36					Rev Car-Miles	598,073	1.000	\$0.36
FUEL	\$2,720		\$0.005					Rev Car-Miles	598,073	1.000	\$0.005
NON-VEHICLE MAINTENANCE											
SERVICES	\$4,407			\$4,407				Yards	1	1.000	\$4,407
CONTRACT OPER.-BASED SERVICES - Yard Driven (35%)	\$291,423			\$291,423				Yards	1	1.000	\$291,423
CONTRACT OPER.-BASED SERVICES - Route-Mi Driven (35%)	\$291,423				\$13,877			Track Miles	21.0	1.000	\$13,877
CONTRACT OPER.-BASED SERVICES - Station Driven (30%)	\$249,791					\$62,447.85		Stations	4	1.000	\$62,448
CASUALTY & LIABILITY	\$67,462		\$0.11					Rev Car-Miles	598,073	1.000	\$0.11
GENERAL ADMINISTRATION											
SALARIES & WAGES - OTHER	\$110,142						\$13,767.75	Peak Cars	8	1.000	\$13,767.75
FRINGE BENEFITS	\$27,077						\$3,384.63	Peak Cars	8	1.000	\$3,384.63
SERVICES - Yards Driven (50%)	\$42,086			\$42,086				Yards	1	1.000	\$42,086
SERVICES - Station Driven (50%)	\$42,086				\$10,521			Stations	4	1.000	\$10,521
OTHER MATERIALS & SUPPLIES	\$4,806			\$4,806				Yards	1	1.000	\$4,806
UTILITIES	\$328,731			\$328,731				Yards	1	1.000	\$328,731
CONTRACT OPER.-BASED SERVICES - Car-Mi Driven (50%)	\$161,057		\$0.27					Rev Car-Miles	598,073	1.000	\$0.27
CONTRACT OPER.-BASED SERVICES - Train-Hr Driven (50%)	\$161,057	\$14.48						Rev Train-Hours	11,125	1.000	\$14.48
MISCELLANEOUS EXPENSES	\$11,887			\$11,887				Yards	1	1.000	\$11,887
CASUALTY & LIABILITY	\$254,154		\$0.42					Rev Car-Miles	598,073	1.000	\$0.42
TOTALS	\$11,319,050	\$344.42	\$4.10	\$2,427,728	\$96,762	\$72,969	\$35,406				
Inflated to 2015 Dollars (see note 2)	1.063992	\$366.46	\$4.36	\$2,583,083	\$102,954	\$77,639	\$37,671				
2011 Resource Variable Values - A-Train		11,125	598,073	1	21.0	4	8				

Notes:

- Expenses by major category based on DCTA 2013 NTD report.
- Annual inflation of 3.15% leads to escalation factor of 1.063992 to get from 2013 dollars to 2015 dollars.