



UNIVERSITY DRIVE MOBILITY IMPROVEMENTS PLANNING STUDY

FINAL OPERATING AND MAINTENANCE (O&M) METHODOLOGY

9.17.14

Prepared for:



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1.0 OVERVIEW

The O&M Methodology Report presents the methodology for developing operating and maintenance (O&M) cost estimates for the recommended Tier 2 Transit Alternatives for the University Drive Mobility Improvement Study. University Drive is an approximately 27-mile, 6-lane corridor that runs from south of the Miami-Dade/Broward County line at NW 215th Street to Westview Drive in northern Broward County. Annual O&M costs will be estimated to determine an annual budget to administer, operate and maintain Enhanced Bus and/or BRT services on this corridor. Included in the report is a general description of the O&M cost estimation methodology, model structure and inputs that will be employed.

1.1 Description of Alternatives

An operating and maintenance (O&M) cost model will be developed to estimate the annual operating and maintenance costs for the identified Tier 2 Transit Alternatives. Each of the transit alternatives consists of a northbound/southbound alignment that will operate in either mixed traffic and/or BAT Lane on University Drive. A brief description of the transit strategies and operating schedule for each alternative is featured (below).

Silver (No Build)

- CAD-AVL system on all BCT buses
- EasyCard in all BCT buses
- Bus Islands at Oakland Park Boulevard WB
- Split Route 2 at Cleary Boulevard
- Passenger real-time arrival information
- Install bus shelters and improve bus stops

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - SILVER			
Weekday Peak	8.5	5:30 a.m. - 9:30 a.m., 3:30 p.m. - 8:00 p.m.	20 mins.
Weekday Off-Peak	10.5	9:30 a.m. - 3:30 p.m., 8:00 p.m. - 12:00 p.m.	30 mins.
Saturday	17.0	5:30 a.m. - 12:30 a.m.	30 mins.
Sunday	13.0	8:00 a.m. - 9:00 p.m.	60 mins.

ROUTE 102 - SILVER			
Weekday	8.5	5:30 a.m. - 9:30 a.m., 3:30 p.m. - 8:00 p.m.	25 mins.

Green (Future Baseline Transit)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 35 bus shelters at identified locations along the corridor
- Add 16 benches at identified locations along the corridor
- Add 4 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile ticketing
- Split Route 2 at West Regional Bus Terminal
- Increase frequencies of Route 2 & Route 102 (see operating schedule below)

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - GREEN			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Saturday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Sunday	13.0	8:00 a.m. - 9:00 p.m.	30 mins.

ROUTE 102 - GREEN			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	30 mins.
Saturday	14.5	5:30 a.m. - 8:00 p.m.	30 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	30 mins.

Blue Alternative (Enhanced Bus Operating in Mixed Traffic)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 35 bus shelters at identified locations along the corridor
- Add 16 benches at identified locations along the corridor
- Add 4 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile Ticketing
- Split Route 2 at Cleary Boulevard
- Relocate bus stops at intersections with queue jumps
- Add Bus Islands
- Enhanced Bus Stations
- Add queue jumps
- Increase frequencies of Route 2 & Route 102 (see operating schedule below)

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - BLUE			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	20 mins.
Saturday	19.0	5:30 a.m. - 12:30 a.m.	20 mins.
Sunday	13.0	8:00 a.m. - 9:00 p.m.	20 mins.

ROUTE 102 - BLUE			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	30 mins.
Saturday	14.5	5:30 a.m. - 8:00 p.m.	30 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	30 mins.

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Red Alternative (Enhanced Bus Operating in Outside Curb Lane as BAT Lane)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 35 bus shelters at identified locations along the corridor
- Add 16 benches at identified locations along the corridor
- Add 4 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile Ticketing
- Split Route 2 at Cleary Boulevard
- BAT Lanes in existing curb lanes (from Oakland Park Boulevard to Griffin Road)
- Add Bus Islands
- Relocate bus stops at intersections with queue jumps
- Enhanced Bus Stations
- Add queue jumps
- Increase frequencies of Route 2 & Route 102 (see operating schedule below)

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - RED			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Saturday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Sunday	13.0	8:00 a.m. - 9:00 p.m.	30 mins.

ROUTE 102 - RED			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	20 mins.
Saturday	14.5	5:30 a.m. - 8:00 p.m.	20 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	20 mins.

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Indigo Alternative (Bus Rapid Transit (BRT) Operating in Mixed Traffic)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 40 bus shelters at identified locations along the corridor
- Add 17 benches at identified locations along the corridor
- Add 5 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile Ticketing
- New Bus Fleet (with level boarding and on-board bike racks)
- Full scale branding
- Off-board fare payment
- Split Route 2 at West Regional Bus Terminal
- BRT Bus Stations
- Add Bus Islands
- Add queue jumps

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - INDIGO			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Saturday	15.0	6:00 a.m. - 9:00 p.m.	30 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	30 mins.

ROUTE 102 - INDIGO			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	15 mins.
Saturday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.

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Magenta Alternative (Bus Rapid Transit (BRT) Operating in Outside Curb Lane as BAT Lane (From Westview Drive to Griffin Road)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 35 bus shelters at identified locations along the corridor
- Add 16 benches at identified locations along the corridor
- Add 4 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile Ticketing
- New Bus Fleet (with level boarding and on-board bike racks)
- Full scale branding
- Off-board fare payment
- Split Route 2 at West Regional Bus Terminal
- BRT Bus Stations
- Add Bus Islands
- Add queue jumps
- Increase frequencies of Route 2 & Route 102 (see operating schedule below)

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - MAGENTA			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Saturday	15.0	6:00 a.m. - 9:00 p.m.	30 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	30 mins.

ROUTE 102 - MAGENTA			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	15 mins.
Saturday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.

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Violet Alternative (Bus Rapid Transit (BRT) Operating in Outside Curb Lane as BAT Lane (From Westview Drive to Griffin Road)

- Move bus stops closer to intersections at multiple locations along the corridor
- Add 35 bus shelters at identified locations along the corridor
- Add 16 benches at identified locations along the corridor
- Add 4 pads at identified locations along the corridor
- Corridor-wide transit signal priority
- Mobile Ticketing
- New Bus Fleet (with level boarding and on-board bike racks)
- Full scale branding
- Off-board fare payment
- Split Route 2 at West Regional Bus Terminal
- BRT Bus Stations
- Add Bus Islands
- New lane as BAT Lane from Westview Drive to Griffin Road
- Add queue jumps
- Increase frequencies of Route 2 & Route 102 (see operating schedule below)

OPERATING PERIOD	HOURS	PERIOD	FREQUENCIES
ROUTE 2 - VIOLET			
Weekday	19.0	5:30 a.m. - 12:30 a.m.	30 mins.
Saturday	15.0	6:00 a.m. - 9:00 p.m.	30 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	30 mins.

ROUTE 102 - VIOLET			
Weekday	16.5	5:30 a.m. - 10:00 p.m.	15 mins.
Saturday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.
Sunday	14.0	7:00 a.m. - 9:00 p.m.	15 mins.

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2.0 O&M MODEL DEVELOPMENT APPROACH

The following sections describe the development of the O&M cost model structure and required inputs for Enhanced Bus and/or BRT operations. The O&M model excludes all other expenses associated with capital project development, such as design engineering, construction management, testing and inspection, and depreciation.

3.0 ENHANCED BUS AND/OR BRT O&M MODEL

The O&M model and cost estimation methods are consistent with the Federal Transit Administration (FTA) guidelines by developing fully allocated cost models utilizing multiple supply variables. O&M model was developed for Enhanced Bus and/or BRT alternatives. The Enhanced Bus and/or BRT O&M unit costs and cost estimates were prepared utilizing Broward County Transit's (BCT) FY 2012 National Transit Database (NTD) operating and financial data for fixed route bus service.

3.1 Structure and inputs

BCT expenses are generally categorized by operating function (i.e. vehicle operation, vehicle maintenance, non-vehicle maintenance and general administration) and broken out by the following expense categories reported:

- Operator Salaries & Wages
- Other Salaries & Wages
- Fringe Benefits
- Services
- Fuel & Lubricants
- Tires & Tubes
- Other Materials & Supplies
- Utilities
- Casualty & Liability

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- Taxes
- Expense Transfers

Operating expenses, by operating function and expense category, were then allocated to one of the following driving supply variables:

- **Stations**: Total number of stations along the alignment. This is based on reported station maintenance costs per station location for cleaning and maintenance of BRT and Enhanced Bus stations. The station maintenance costs per station are estimated to be approximately \$9,787.00 for BRT and Enhanced Bus stations along the University Drive corridor. The source of the station maintenance costs per station is from EmX (Eugene, OR) and LYMMO (Orlando, FL) BRT and Enhanced Bus services.
- **Garages**: Total number of maintenance storage facilities including bus garages.

BCT's currently has two bus maintenance facilities. The first facility is located at 3201 West Copans Road, Pompano Beach, FL and can accommodate storage for about 180 buses. The second location is at 5440 Ravenswood Road, Fort Lauderdale, FL. The Ravenswood Maintenance Facility is being upgraded and expanded with an anticipated completion of FY 2015. The Ravenswood Maintenance Facility currently has bus storage for 117 vehicles with several pull-through maintenance bays to accommodate new bus vehicles. The expansion will increase storage for additional 35 buses and may provide the necessary space required for the additional bus vehicles. However, a fractional Bus Garage was calculated for each of the alternatives depending on whether the expansion can accommodate the additional Enhanced Bus and/or BRT vehicles.

- **Annual Revenue Bus -Hours**: Total hours of revenue service operated by all Enhanced Bus and/or BRT in one year.
- **Annual Revenue Bus -Miles**: Total miles of revenue service operated by all Enhanced Bus and/or BRT in one year.
- **Peak Vehicles**: The maximum number of Enhanced Bus and/or BRT vehicles required for scheduled peak service.

Unit costs will be calculated based on total expenses and units of service supplied for each variable reported. Operating expenses assigned to each variable will be summed and divided by units of service to derive unit costs. The following equation summarizes the fully-allocated cost model used to estimate annual O&M costs for Enhanced Bus and/or BRT operations.

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Table 1 – Enhanced Bus and/or BRT Annual O&M Cost Equation

<i>Enhanced Bus/BRT</i>										
Estimated Annual O&M Cost	=	Stations Unit Cost X Projected BRT Stations	+	Garage Unit Cost X Projected Garages	+	Bus-Hour Unit Cost X Projected Bus -Hours	+	Bus-Miles Unit Cost X Projected Bus-Miles	+	Peak Vehicles Unit Cost X Projected Peak Vehicles

Appendix A features the Enhanced Bus and/or BRT data used to develop the Cost Allocation Model used for the above bus unit costs.

4.0 O&M COST ESTIMATES

Based on the operating plans and level of service for the Enhanced Bus and BRT operations developed for the project, O&M costs were calculated by applying unit costs derived from the fully allocated model to the projected operating statistics. Costs will be estimated and summarized using 2012 dollars for the Current Year. The projected costs for Future Phases (II and III) will be estimated in the finance plan.

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Appendix A

2012 Local Bus and BRT National Transit Database (NTD) Data

Table A.1 – 2012 Broward County Transit Expense Allocation

UNIVERSITY DRIVE - Bus and BRT Cost Allocation Model

Expense Object	010 Vehicle Operations		041 Vehicle Maintenance		042 Non-Vehicle Maintenance		160 General Administration		Total Expenses
	Expense	Variable	Expense	Variable	Expense	Variable	Expense	Variable	
501.01 Operators Salaries/Wages	\$31,549,174	Bus-Hrs	\$0		\$0		\$0		\$31,549,174
501.02 Other Salaries/Wages	\$3,076,190	Bus-Hrs, Garages	\$9,869,452	Bus-Miles	\$433,857	Garages	\$5,104,166	Buses	\$18,483,665
502.00 Fringe Benefits	\$12,900,679	%Labor	\$2,971,277	Bus-Miles	\$176,409	Garages	\$1,570,920	Buses	\$17,619,285
503.00 Services	\$630,637	Buses	\$292,054	Bus-Miles	\$155,715	Garages	\$3,954,704	Buses	\$5,033,110
504.01 Fuel & Lubricants	\$14,957,409	Bus-Miles	\$275,049	Bus-Miles	\$0		\$0		\$15,232,458
504.02 Tires & Tubes	\$1,217,876	Bus-Miles	\$24,077	Bus-Miles	\$0		\$0		\$1,241,953
504.99 Other Materials & Supplies	\$19,906	Buses	\$3,447,086	Bus-Miles	\$45,095	Garages	\$59,223	Buses	\$3,571,310
505.00 Utilities	\$0		\$0		\$0		\$864,717	Garages	\$864,717
506.00 Casualty/Liability	\$0		\$0		\$0		\$3,184,524	Buses	\$3,184,524
507.00 Taxes	\$0		\$0		\$0		\$0		\$0
508.00 Purchased Transportation	\$0		\$0		\$0		\$0		\$0
509.00 Miscellaneous Expenses	\$4,377	Garages	\$41,164	Bus-Miles	\$204	Garages	\$278,769	Buses	\$324,514
510.00 Expense Transfers	\$0		\$0		\$0		\$0		\$0
Total Operating Expenses:	\$64,356,248		\$16,920,159		\$811,280		\$15,017,023		\$97,104,710

EXPENSE OBJECT	FULL ALLOCATION			
	Garages	Bus-Hrs	Bus-Miles	Peak Buses
501.01 Operators Salaries/Wages	\$0	\$31,549,174	\$0	\$0
501.02 Other Salaries/Wages	\$1,202,905	\$2,307,143	\$9,869,452	\$5,104,166
502.00 Fringe Benefits	\$176,409	\$12,900,679	\$2,971,277	\$1,570,920
503.00 Services	\$155,715	\$0	\$292,054	\$4,585,341
504.01 Fuel & Lubricants	\$0	\$0	\$15,232,458	\$0
504.02 Tires & Tubes	\$0	\$0	\$1,241,953	\$0
504.03 Other Materials & Supplies	\$45,095	\$0	\$3,447,086	\$79,129
505.00 Utilities	\$864,717	\$0	\$0	\$0
506.00 Casualty/Liability	\$0	\$0	\$0	\$3,184,524
507.00 Taxes	\$0	\$0	\$0	\$0
508.00 Purchased Transportation	\$0	\$0	\$0	\$0
509.00 Miscellaneous Expenses	\$4,581	\$0	\$41,164	\$278,769
510.00 Expense Transfers	\$0	\$0	\$0	\$0
Total Operating Expenses:	\$2,449,422	\$46,756,996	\$33,095,444	\$14,802,849
FY2012 Units of Service	2	1,001,676	13,821,812	257
Unit Cost (operating expenses only)	\$1,224,711	\$46.68	\$2.39	\$57,599

SOURCE: 2012 NTD

*A station maintenance unit cost of \$9,787.00 will be applied to enhanced bus and BRT alternatives.

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