

Miami-Dade Transit Bus Service Evaluation Study

October 2011

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Introduction

In December of 2009, Miami-Dade Transit (MDT) implemented a variety of changes to its bus service, which included adjustments in headways, stops, route coverage, and other general service characteristics. Several routes were combined to reduce overlapping services, frequencies of low-ridership routes were reduced, frequencies of high-ridership routes were increased, and routes were modified to take advantage of the grid street layout. The three major objectives for this study were to analyze the impacts of the December 2009 service changes; develop an on-going monitoring pro-

gram; and develop standards for the installation, relocation, and elimination of bus stops.

The study process was coordinated with the Miami-Dade Metropolitan Planning Organization (MPO) and a Study Advisory Committee, which included MDT and the Florida Department of Transportation (FDOT) to provide insight and recommendations to the study effort. Data was collected and analyzed for each route in the MDT system.

MDT boasts an extensive Metrobus system providing services from Miami Beach to West Miami-Dade and from the Middle Keys into Broward

County. Metrobus feeds into three fixed guideway systems: Tri-Rail, Metrorail, and Metromover. Metrobus also connects with the Special Transportation Service, which serves patrons with disabilities. All buses in the Metrobus fleet are wheelchair accessible. Metrobus Service is provided 365 days a year. Select routes operate 24 hours per day, while other routes operate late hours to provide night service. The Metrobus system service area spans approximately 306 square miles in Miami-Dade, Broward, and Monroe Counties.

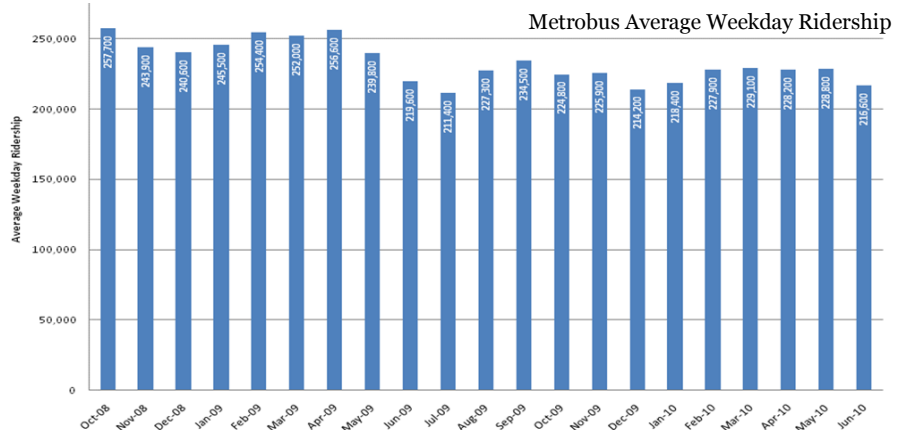
Data Collection

A comprehensive data collection effort was undertaken, to include MDT Monthly Ridership Reports, MDT Route Productivity Reports, MDT Omnibus Reports and automated passenger count (APC) data. The purpose of this information was to establish a baseline for data analysis. Between October 2008 and June 2010, ridership fluctuated by almost 20 percent. These variations may be due in part to service

changes, gasoline price effects, economic downturn and loss of jobs, as well as normal seasonal variations such as school and university sessions and tourist travel.

MDT Monthly Ridership Reports provide ridership data

by service type for the entire MDT system. MDT Route Productivity Reports provide cost and revenue related data, and Omnibus reports provide data by route: Route Trip Miles; Route Scheduled Speed; Route Running Time;



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Performance Measures

Following consideration of available data, MDT performance objectives, and a review of nearly thirty possible measures, a set of

eleven performance measures were selected for system wide comparison and route analysis, as summarized below.



Performance Measures	System	Corridor	Route	Segment	Stop
Passengers per Trip			X		
Passengers per Vehicle Mile	X	X	X	X	
Passenger per Revenue Hour	X	X	X	X	
Passenger Movement (ONs/OFFs)					X
Passenger Movement by Time of Day					X
Farebox Recovery Ratio	X	X	X	X	
Direct Operating Cost (DOC)/Revenue Mile	X	X	X	X	
DOC Per Passenger	X	X	X	X	
DOC Per Trip			X		
Bus Route Spacing - Guideline		X			
Stop Spacing - Guideline					X

MDT Bus Service Evaluation Performance Measures

Bus Stop Analysis

A system wide analysis of all stops was based on the stop activity at each location, represented by the sum of daily boardings and alightings. Due to the high directional peaking of many routes, it is common to have a high number of boardings on one side of a road and a high number of alightings on the opposite side of the road. Selection of bus stop locations is an important element of bus service planning, as it involves a trade-off between accessibility, which would be aided by frequent bus stops, and speed, which would be aided by infrequent bus stops. Current MDT policy calls for local bus route stop spacing of 3 to 5 stops per mile for low density residential to high density, respectively.

The table at right illustrates the cumulative distribution

of bus stops as a function of stop activity. As indicated, 1,212 stops (15 percent of all stops in the MDT system) have five or fewer boardings or alightings per weekday and 30 percent of stops have ten or fewer.

At the other end of the spectrum, a small percentage of all stops contribute to a high percentage of daily activity. Bus stop facility and amenity improvements are recommended at stops with the highest amount of activity. MDT will consider the following:

- Elimination or consolidation of low use stops with fewer than five boardings and alightings on a weekday unless there are special considerations such as elderly housing, rehabilitation centers, or other unique existing conditions that would warrant main-

taining a low use stop;

- Elimination or consolidation of stops to meet spacing requirements of the *MDT Service Standards*, summarized on Page 3;
- Use of *MDT Service*

Standards for new bus stop amenities throughout the entire system, summarized and illustrated at on Page 3; and

- Construction of bicycle lockers at all transit hubs.

Total Activity	Number of Stops	Cumulative # of Stops	Cumulative % of Stops
0	30	30	0.4%
1	160	190	2.4%
2	206	396	5.0%
3	287	683	8.5%
4	278	961	12.0%
5	251	1,212	15.2%
6	270	1,482	18.5%
7	236	1,718	21.5%
8	214	1,932	24.2%
9	242	2,174	27.2%
10	224	2,398	30.0%

MDT Metrobus Stops with Lowest Activity

Miami-Dade Transit Bus Service Evaluation

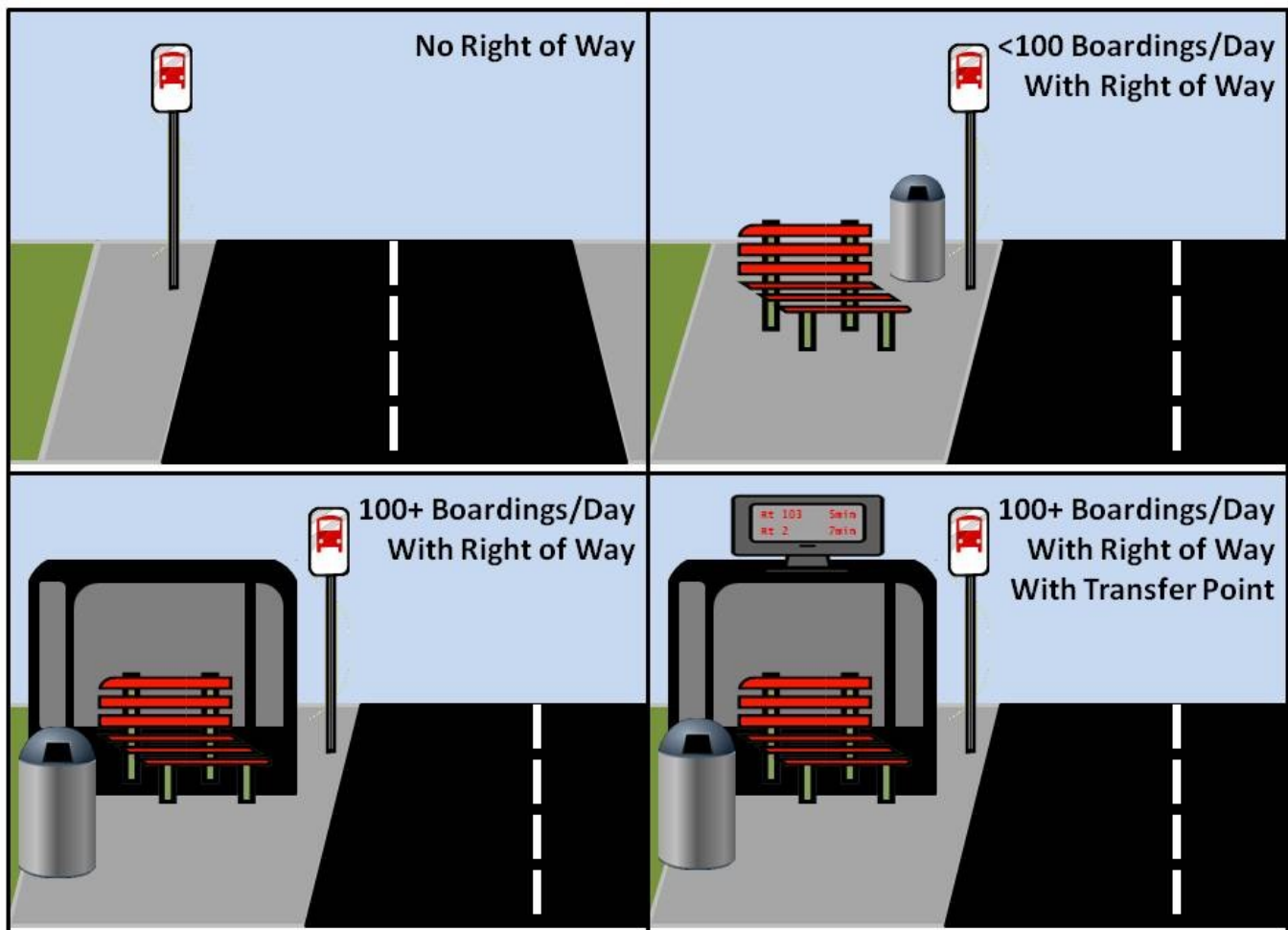
Summary of Current MDT Bus Stop Standards

Density	Stops per Mile
High Density, CBD, Shopping Centers, Special Needs	5
Medium Density, Fully Developed Residential Area	4
Low Density, Residential	3
Rural	2

**Miami-Dade Transit Service Standards, MDT Adopted 11/4/09*

Amenity	Minimum Requirement
Future Real Time Information	More than 100 boardings per day and major transfer points
Bench	All stops with sufficient right-of-way
Shelter	All stops with greater than 100 boardings per day with sufficient right-of-way
Litter Bins	All MDT bus stops with benches or bus shelters

**Miami-Dade Transit Service Standards, MDT Adopted 11/4/09*



Route Recommendation Summary

Individual Route Analysis

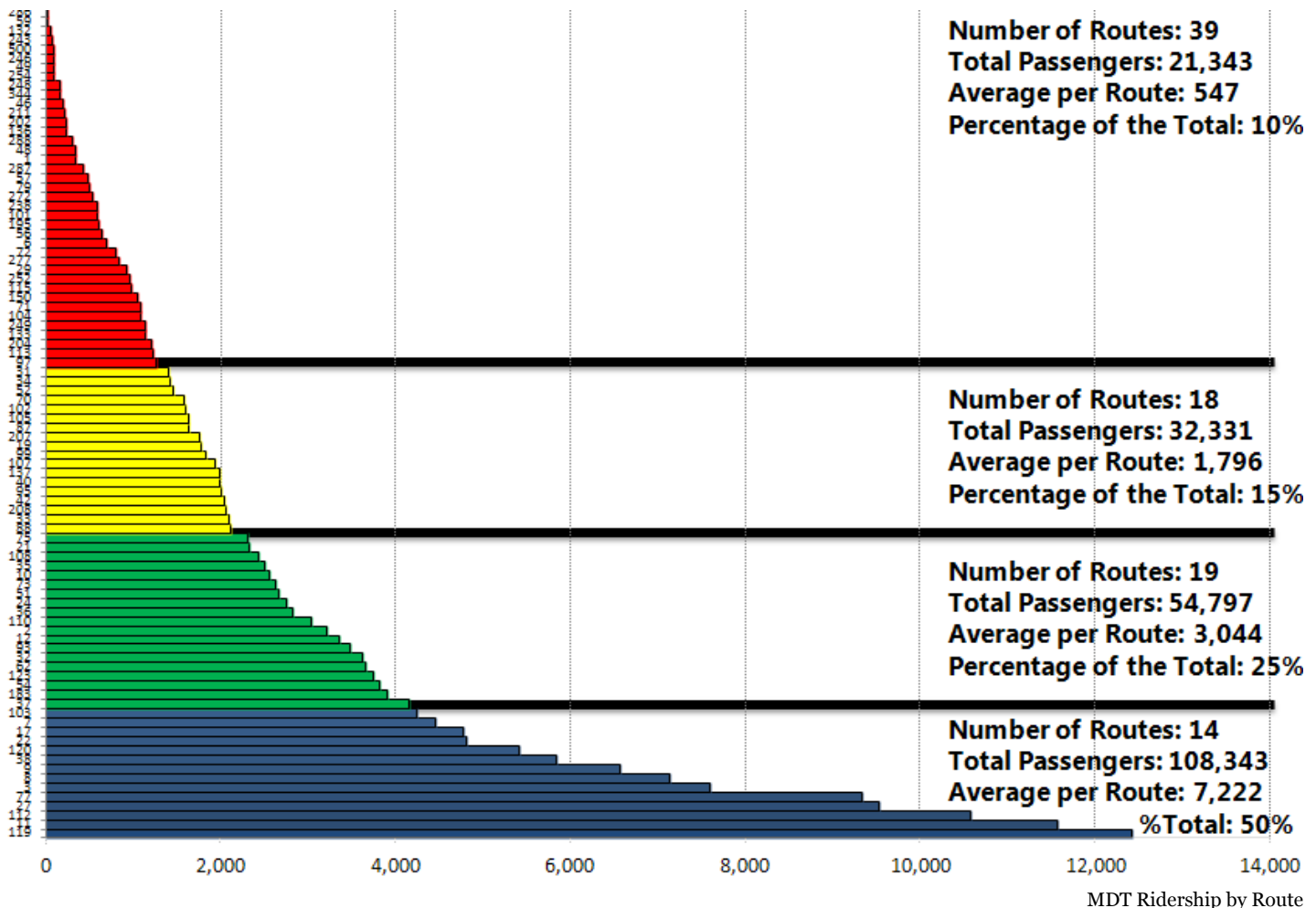
Individual route analyses were primarily based on quantifiable performance measures developed from boarding and alighting count data. Stop level data was used to identify directionality and activity distributions for various time periods of a typical week-day. Demographic characteristics of neighborhoods and mobility needs were also considered. In some instances, combinations of routes serving a specific corridor were considered collectively. Such analyses allowed identification of cumulative capacity of transit services and corresponding transit demand. Recommendations for individual routes fall into five main

categories: alignment adjustments, operational adjustments, partial route consolidation, entire route consolidation, and route elimination. The table on Page 5 provides a summary of individual route recommendations by adjustment category.

Alignment adjustment recommendations generally involve splitting a route, route deviation, or deletion of a part of a route. Operational adjustment recommendations involve increases or decreases in headway in different time periods of the day. Partial route consolidation involves combining services along similar roadways, and in

many cases the creation of a feeder route that connects to a trunk system. Consolidating entire routes involves the combining of routes along similar roadways in order to merge services to increase efficiency. Route elimination entails the complete elimination of an entire route. Each route was ranked by daily boardings and service miles. As seen in the following figure, the top 15 routes carry 50% of daily boardings and the bottom 39 routes carry 10% of daily boardings.

"The top 15 routes carry 50% of daily boardings, and the bottom 39 routes carry 10% of daily boardings."



Miami-Dade Transit Bus Service Evaluation

Summary of Route Recommendations

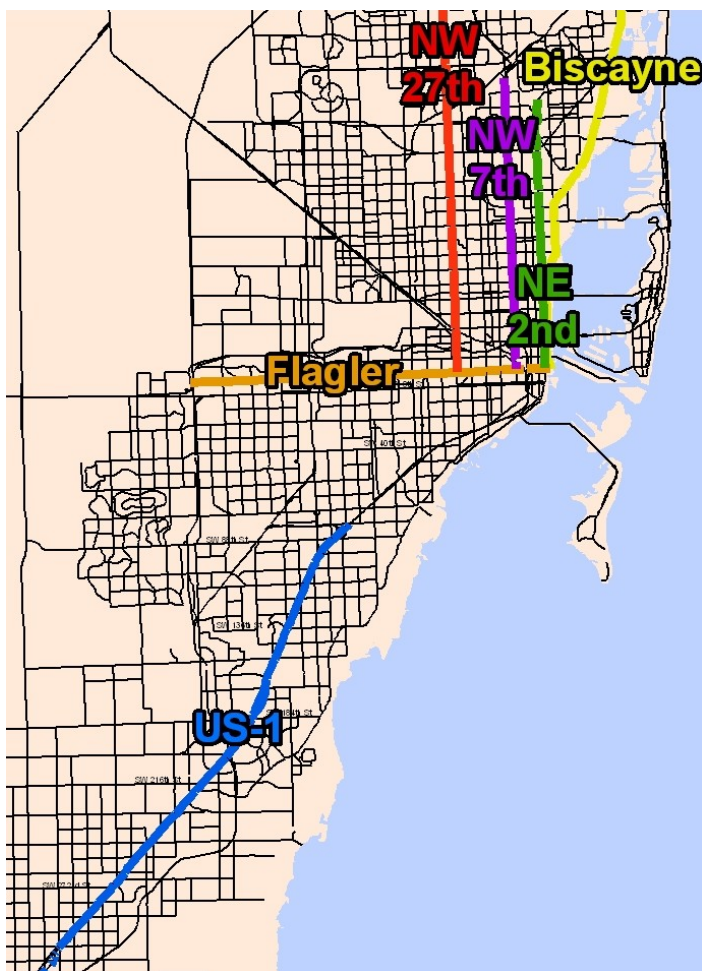
Alignment Adjustments	Operational Adjustments	Partial Route Consolidation	Entire Route Consolidation	Route Elimination	Further Evaluation	
3	2	12	35/52	248	1	115
6	22	21	36/132	286	3	135
17	38	35	37/136	344	6	137
22	19	56	49/183	46*	9	202
27	123	57	287/70	48*	11	211
29	248	62	3/62/93 (LT)	136*	36	246
31	252	104	9/10 (LT)	238*	54	252
35		110	11/51 (LT)	243*	59	254
40		204	27/97 (LT)		71	272
42			46*		75	500
51			48*		95	
56			136*		108	
57			238*		115	
62			243*		135	
70					137	
88					202	
					211	

(LT) = Long Term

* Routes recommended for either complete consolidation or elimination



MDT Bus Stop



Corridor Analysis

For the corridor level review, performance measures were used to examine groups of routes within a corridor to identify any route overlap or any areas of potential ridership where service is not currently provided. Overall recommendations for corridor level improvements include the following:

- South Miami-Dade Busway Corridor:** Development of a trunk-and-feeder service by truncating Routes 52, 252, and 287 before entering the Busway, and improvement of headways on Routes 34 and 38 to accommodate the riders from these feeder routes;
- Biscayne Corridor:** Implementation of BRT service and consolidation of Route 62 with Routes 3 and 93 ;
- Flagler Corridor:** Implementation of BRT service along Flagler Street, which would include the combination of Routes 11 and 51;
- NE 2nd Avenue Corridor:** Implementation of BRT service on NE 2nd Avenue, which would include the combination of Routes 9 and 10;
- State Road 7 Corridor:** Continuation of existing service along State Road 7; and
- North Corridor:** Partition of Route 27 at the Brownsville Metrorail Center into two separate routes and continuation of the Route 97 limited stop service. Long term plans for this corridor involve the construction of a Metrorail extension to the north portion of the County.

System Wide Analysis & Recommendations

MDT adjusts its Metrobus services every six months, creating a new, revised lineup. In order to evaluate the impact of service changes executed in December 2009, data was collected for the June 2009 and December 2009 lineups.

To evaluate the service adjustments implemented in December 2009, data collected in March 2010 was used to compare with data from the prior six-month service period that started in June 2009. The performance measures used to analyze the changes in service were passengers per revenue mile (Pass/RM), passengers per revenue hour (Pass/RH), fare recovery, and

direct operating cost per revenue mile (DOC/RM), and direct operating cost per passenger (DOC/Pass). A summary of the comparison is provided in the table above.

Overall recommendations for system wide improvement include the following:

- Initiation of trunk-and-feeder systems along major corridors to maximize available resources;
- Adoption of enhanced technologies, including a real-time bus tracking program;
- Coordination with local jitney services to provide connections to

Lineup	Pass/ RM	Pass/ RH	Fare Rec.	DOC/ RM	DOC/ Pass
June 2009	2.5	35	0.30	\$8.10	\$3.30
December 2009	2.4	34	0.33	\$8.36	\$3.40
% Difference	-4.00%	-2.86%	10.00%	3.21%	3.03%

System Wide Comparison Between Service Change Implementation

communities out of the MDT system's reach; and

- Development of a "Vision" or "Master Plan" will identify the necessary steps to reach the outlined goals by providing both a consistent and continuous approach to corridor and route prioritization, implementation of BRT/EBS, route improvements, and operational changes.

It is possible for MDT to utilize hierarchy in the existing grid system to develop a trunk-and-feeder system in which several terminals are established along a critical corridor on which one route with frequent headways, the trunk service, operates. Each terminal serviced on the corridor by the trunk line connects with several feeder services that reach destinations off of the main line. An illustration of a trunk-and-feeder system is provided below.

Use of Technology, Jitneys, Private Sector

Miami-Dade Transit has recently adopted several new technologies that can improve quality of service and efficiency of the system. Three major technologies are described below:

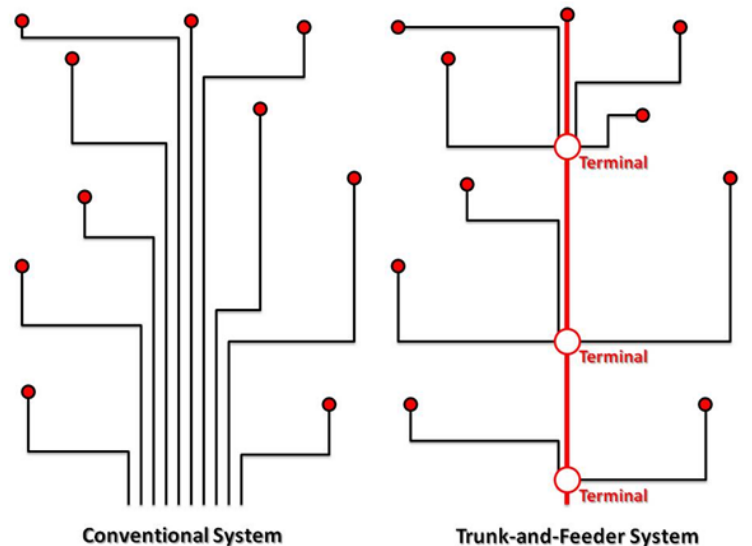
- **Real-time Bus Tracking Program:** This "Bus Tracker" is currently in the pilot stage. It has been implemented for Route 288, which operates along Kendall Drive. The program allows real-time tracking of buses on the MDT website.
- **Easy Card:** Users tap the card to the farebox to pay the fare. This technology minimizes fare losses, reduces boarding time, and provides accurate data

for planning analyses.

- **Automatic Passenger Count (APC):** APC technology consists of sensors placed in transit vehicles to collect boarding and alighting data by route, trip, location, and time-of-day.

The three technologies listed above have potential to offer better and more competitive transit services and also facilitate efforts to monitor and improve service.

Jitneys are currently operated in several parts of the County. Any business can start a jitney service by submitting a plan map and detailed proposed route alignment. Private jitneys sometimes compete with



Conventional Versus Trunk-and-Feeder System

MDT to provide services along high ridership corridors. It is recommended that MDT, working with the County departments, encourage the private sector to use jitneys in connecting to new areas to provide service connections with MDT routes. Overall, participation from the private sector

should be encouraged. MDT recently worked with the private sector to plan and develop park-and-ride lots. Additionally, the privatization of existing routes with low ridership is also a possibility for the future. Similar initiatives should be pursued more aggressively.

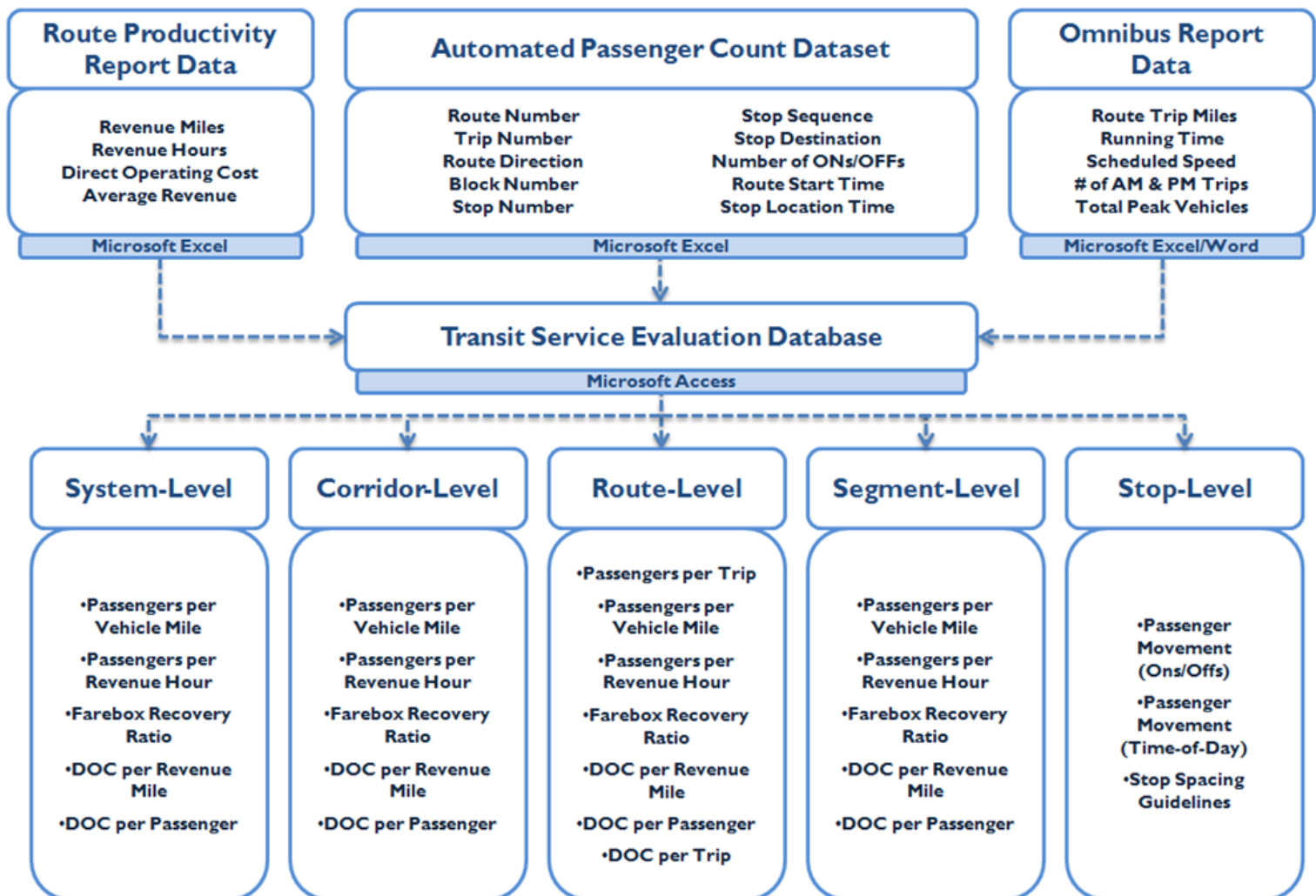
On-Going Monitoring Program

An on-going monitoring system will allow MDT to evaluate route and system performance based on the performance measures identified in this study and will streamline the process.

A depiction of the data analysis process is included in the figure below. Each of the variables that were used in the calculation of the performance measures are included in at least one of MDT's system summary reports. This performance measure methodology will easily allow MDT to determine system wide performance measures, individual route performance, and for corridor analysis. Addition-

ally, this reporting system will allow MDT to routinely monitor the performance of individual routes by analyzing the trends for each performance measure across a given timeframe of analysis.

"This performance measure methodology will easily allow MDT to determine system wide performance measures, individual route performance, and for corridor analysis."



Action Plan

The actions discussed in this report fall into three categories: (1) consideration of the stop, route, and corridor recommendations, (2) implementation of the on-going system monitoring program, and (3) development of the MDT "Vision" or "Master Plan".

The recommendations listed in the section above are based on route and system wide analyses and provide guidance on proposed actions. Additional refinement of recommended actions will need to be undertaken by MDT. Once detailed operational plans are completed, it will be possible to estimate the cost implications of the recommended actions. In addition, there may be mobility needs for special populations and other operational factors that may require modifying the systems level route suggestions of this analysis. Given the operational scope and nature of the recommendations, they could be implemented incrementally in upcoming lineup changes, following a detailed operational plan for each route modification.

The implementation of the continuous monitoring process involves the input of UTA and MDT data into the performance measure spreadsheets to maintain a record of changes during and in transition periods between lineup adjustments. Then, every six

months, prior to the next lineup change, the performance measure trends in conjunction with agency knowledge of the corridors and existing conditions will be used to evaluate and compare route and system wide changes and develop suggestions for adjustments. Performance measures taken at the corridor level will also be helpful for premium service feasibility analyses, such as BRT/EBS studies or express service considerations along major roadways in the MDT system.

Once the initial recommendations and considerations discussed in this report are addressed and the on-going monitoring program is in place, initiation of the "Vision" or "Master Plan" should commence. The purpose of the "Vision" or "Master Plan" will be to identify broad and specific goals and plan with both a short- and long-term timeframe in consideration for a more efficient system. The "Vision" or "Master Plan" will also help to focus line-up changes and service adjustments to align toward this set of goals. The "Vision" or "Master Plan" will guide the recommendations based on future service evaluations using the on-going monitoring program to ensure that changes are contributing toward the overall system vision.

The Action Plan can be summarized below:

- Review the proposed recommendations in this report;
- Prioritize recommendations to be implemented;
- Further evaluate routes and recommendations as necessary;
- Continue to monitor APC data and performance measures on a route, corridor, and system wide basis; and
- Develop a Vision for the MDT system.



**F o r m o r e i n f o r m a t i o n p l e a s e
c o n t a c t t h e M i a m i - D a d e M P O**

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