

Metropolitan Transit Authority of Harris County

Fiscal Years 2012-2015
Performance Audit

Task 2: Performance Indicators

January 2017



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Section 1. Introduction

1.1 Transit Performance Audit Background

Section 451.454 of the Texas Transportation Code mandates quadrennial performance audits of Texas transit agencies for municipalities with a population of more than 1.9 million. The purpose of the performance audit is to provide evaluative information necessary for state and local officials to perform oversight functions and to provide useful information to the transit agency for improving efficiency and effectiveness of its operations.

The Metropolitan Transit Authority of Harris County (METRO) meets this requirement and therefore retained Milligan & Company, LLC to perform the audit. Milligan & Company, LLC, in association with Contract Service Innovations, LLC, worked closely with METRO's staff to conduct the Fiscal Years (FY) 2012 to 2015 performance audit. This audit included FY 2012 data, which was previously reviewed as part of the FY 2009 – FY 2012 quadrennial audit. Some of the performance statistics reported in FY 2012 have been adjusted for this report.

The performance audit assessed METRO's:

- Compliance with applicable state law from Chapter 451 of the Texas Transportation Code (Task 1).
- Collection and compilation of base statistics and measurement of specified state-mandated performance indicators (Task 2).
- Performance in one of three areas (i.e. administration and management, transit operations, or system maintenance). Each functional area must be addressed once every three audit cycles (Task 3). The focus of the functional review for this audit is on transit operations.

This report presents the performance indicator data definitions and trends between October 1, 2011 and September 30, 2015 (FY 2012, FY 2013, FY 2014, and FY 2015). The results of the legislative compliance and the functional review of METRO transit operations are the subjects of separate audit reports.

- Legislative Compliance review (final report dated January 2017)
- Transit Operations (final report dated January 2017)

SECTION 1. INTRODUCTION

The nine performance indicators required to be analyzed under the Texas Transportation Code are as follows:

- Operating cost per passenger
- Operating cost per revenue hour
- Operating cost per revenue mile
- Sales and use tax receipts per passenger
- Fare recovery ratio
- Average vehicle occupancy
- On-time performance
- Accidents per 100,000 total miles
- Miles between mechanical road calls

The data verification process included review of the data reporting methods to ensure conformity with the state-mandated definitions for the statistics used to calculate performance measures. Performance indicator trends have been reviewed and discussed with staff.

Interviews were conducted with over 80 METRO staff for this performance audit. Key personnel who are knowledgeable of data sources, data collection, data reporting and performance trends include:

- Executive Vice President of Operations, Public Safety, and Customer Service
- Deputy Chief Executive Officer
- Executive Vice President of Planning, Engineering, and Construction
- Vice President and Chief Financial Officer
- Vice President of Human Resources
- Director of Budget
- Senior Director of Contracted Paratransit and Vanpool
- Director of Safety
- Executive Vice President of Administration
- Director of Labor Relations
- Chief Safety Officer
- Director of Drug and Alcohol Program
- Director of Service Planning and Evaluation
- Lead Management Analyst Revenue/Fare Policy
- Chief Operating Officer

SECTION 1. INTRODUCTION

Documents reviewed to compile the performance indicator results include:

- METRO National Transit Database (NTD) Reports, FY 2012 – FY 2015
- METRO Monthly Year End Board Reports (include revenue, expense, ridership, and other performance indicators), FY 2012 – FY 2015
- Oracle Financial Data, FY 2012 – FY 2015
- Data collection and reporting documents provided by METRO staff

1.2 METRO Transit Service Overview

METRO provides transit service in a 1,303-square mile area that includes the City of Houston, 14 other municipalities, and portions of adjacent counties. The population of the service area is approximately 4,365,000. METRO has nine members on its Board of Directors and over 3,730 salaried and hourly employees.

METRO provides bus, light rail, paratransit, and vanpool services. METRO's bus services carry over 86 million passenger trips annually throughout greater Houston with a fleet of over 1,230 vehicles. METRO has 75 local and 32 commuter bus routes, 20 transit centers, and 29 park-and-ride lots with more than 33,000 parking spaces.

METRO also runs some special event services. Bus services are both directly operated and partially operated under contract. METRO has five operating facilities for its directly operated services (Fallbrook, Polk, West, Hiram Clarke, and Kashmere). Contracted services, provided by First Transit, Inc., operate from METRO's Northwest bus operating facility.

METRO Rail, METRO's light rail service, began operations in January 2004 and carried over 15 million passenger trips in FY 2015. The Red Line was extended 12.8 miles in 2013. The line begins at the Northline Transit Center, serving Houston Community College Northeast and Northline Commons Mall, and continues south through Houston's Central Business District, Midtown, the Museum District, Rice University, the Texas Medical Center and the NRG Complex to the Fannin South Park and Ride. There are 24 Stations along the route.

METRO opened two additional light rail lines in FY 2015, the Purple (Southeast) and Green (East End) Lines. Destinations served by these two lines include Texas Southern University, the University of Houston, BBVA Stadium and the Theater District. The new lines add 8.9 miles of service, increasing METRO's total miles to approximately 22.

METRO Lift, METRO's paratransit service, provides pre-scheduled, curb-to-curb shared-ride transportation for persons with disabilities. METRO Lift serves about 1.9 million passenger trips in FY 2015, augmented by additional taxi service.

1.3 Organization of the Report

The remaining sections of this report provide the results of the performance indicator review:

- **Section 2: Compliance with State-Required Data Items** – includes the verification of METRO's compliance with state-mandated data collection and reporting definitions for 11 data items.
- **Section 3: State-Required Performance Indicators** – provides an assessment of METRO's performance over the audit period as measured by nine state-mandated performance indicators.
- **Section 4: Findings and Recommendations** – identifies opportunities to improve compliance with state requirements with respect to reporting performance indicators and improving performance trends.
- **Appendix A** – provides the annual data used in calculating the performance indicators as well as the annual performance measures.
- **Appendix B** – provides the performance indicators by mode, including two additional service effectiveness indicators (passengers per revenue hour and passengers per revenue mile) that are frequently reported as a basis for evaluating performance in the transit industry.

Section 2. Compliance with State-Required Data Items

The data items used to calculate the required performance indicators include the following:

- Operating cost
- Passenger fare revenue
- Sales and use tax receipts
- Passenger trips
- Revenue vehicle hours
- Revenue vehicle miles
- Total vehicle miles
- Passenger miles
- On-time performance
- Accidents
- Mechanical road calls

Data was provided by and discussed with METRO staff. METRO complies with state reporting requirements for the data items used in the state-required performance measures.

The definitions and methodologies used by METRO for each data item are described on the following pages.

2.1 Operating Cost

Definition

Operating cost includes an authority's cost of providing public transit service, including the cost of purchased transit service not performed by an authority, but excluding depreciation, amortization and capitalized charges, charter bus operations cost, and costs associated with coordination of carpool and vanpool activities.

Methodology

METRO maintains a computerized chart of accounts suitable to capture expenses and revenues by object class, including wages and salaries, fringe benefits, temporary help and other services, materials and supplies, fuel and utilities, and miscellaneous. Direct expenses are entered into appropriate expense accounts for each Responsibility Center (RC). Labor and parts that are attributed to capital expenses are allocated to capital costs and are not included in operating costs.

Most RCs are specific to a particular mode (bus, light rail, paratransit). For RCs that cover multiple modes, such as administrative labor, costs are allocated between METRO's service modes based on service quantities that include ridership, vehicle hours, and vehicle miles.

Assessment

METRO is in full compliance with data collection and reporting of operating cost as defined by the State of Texas.

2.2 Passenger Fare Revenue

Definition

Passenger fare revenue is defined as revenues provided by passengers of revenue vehicles of an authority or the sponsors of those passengers, and includes revenue received from cash fares and METRO Q® fare cards. Passenger fare revenues exclude charter revenues and non-fare revenue such as advertising income, interest income and other non-fare operating sources.

Methodology

METRO collects, counts and reports fare revenue on a daily basis. On buses, fareboxes collect cash revenue. For METRORail, cash revenue is collected from ticket vending machines (TVMs) located in rail stations. Paratransit fares are accounted by the contractor and submitted to METRO on a monthly basis.

METRO Q® stored value fare can be purchased and reloaded at fare card retailers, METRO Ride Store, or METRO’s website. METRO Q® fare cards can also be reloaded at rail TVMs, credit vending machines (CVMs) at park-and-ride lots, and at on-board METRO Q® fare card reloader machines on buses. Revenue from each of these sources is tracked and recorded separately.

Assessment

METRO is in full compliance with data collection and reporting of passenger fare revenue as defined by the State of Texas.

2.3 Sales and Use Tax Receipts

Definition

Sales and use tax receipts of an authority.

Methodology

Harris County, the City of Houston, and 14 cities that comprise the METRO service area collect a one-cent sales tax that is used to fund public transportation and associated improvements. The sales tax applies to certain consumer items and is collected by the state and allocated to METRO on a monthly basis.

SECTION 2. COMPLIANCE WITH STATE-REQUIRED DATA

Assessment

METRO is in full compliance with sales and use tax receipts as defined by the State of Texas.

2.4 Passenger Trips

Definition

Passenger trips are the total of all passenger boardings, including transfers between buses, but excluding charter passengers and carpool and vanpool passengers, whose trips are only coordinated by an authority.

Methodology

Since FY 2007, 100 percent of METRO's fixed-route bus fleet has been equipped with automatic passenger counters (APCs). The Federal Transit Administration (FTA) approved the use of APCs for preparing METRO's ridership data, starting in FY 2008. METRO samples trips based on a minimum of 23 days of each month. A methodology is used to fill in data gaps (such as when operators do not log in correctly) and to extrapolate data to the full month.

APCs tend to undercount ridership. METRO uses a process to reconcile for APC undercounting, as determined in cooperation with the APC manufacturer. A series of point checks are conducted at major locations on an annual basis to verify boardings and alightings on individual buses.

For other METRO services, the methodology to collect ridership data is as follows:

- Light Rail: APCs count passengers as they board and alight from each car using a 100 percent count. On an annual basis METRO performs manual counts of sample trips in order to calibrate the automated system. METRO then compares the manual counts to the same trip counts done by the APCs.
- Paratransit: Passenger trips are derived from a 100 percent count, which is obtained from the scheduling system and adjusted for cancellations and no-shows.

Assessment

METRO is in full compliance with data collection and reporting of passenger trips as defined by the State of Texas.

2.5 Revenue Vehicle Hours and Miles

Definition

The total scheduled hours and miles that a revenue vehicle accumulates while in revenue service. A revenue vehicle is one that carries paying passengers in scheduled service and is operated by an authority or as a purchased service. Revenue service means the time that a revenue vehicle is in operation to carry passengers other than charter passengers.

SECTION 2. COMPLIANCE WITH STATE-REQUIRED DATA

Methodology

METRO uses different methodologies to collect revenue hours and miles for each mode:

- Bus: Revenue vehicle hours and miles are derived from METRO's scheduling system, Trapeze. Dispatchers record adjustments for missed service or detours on a daily basis. Quality Assurance (QA) staff verifies data on a monthly basis.
- Light Rail: Revenue vehicle hours and miles are based on scheduled daily revenue trips, also provided by Trapeze. Adjustments are made for variations to the schedule.
- Paratransit: Drivers track the time that passengers are on a vehicle and this is reported as revenue vehicle hours. Revenue vehicle miles are recorded from odometers and adjusted to exclude deadhead.

Assessment

METRO is in full compliance with data collection and reporting of revenue vehicle hours and miles as defined by the State of Texas.

2.6 Total Vehicle Miles

Definition

Total vehicle miles are the annual total number of miles for all service directly operated by an authority, including charter service and non-revenue service.

Methodology

METRO uses different methodologies to collect total miles for each mode:

- Bus: Total vehicle miles are taken from hubometer readings made by cleaners which are entered into the SAP software. This number is compared with a figure calculated by taking the daily fuel load and multiplying it by the average miles per gallon for that vehicle.
- Light Rail: Total vehicle miles are recorded manually for each vehicle.
- Paratransit: Total vehicle miles are tracked by the contractor based on odometer readings and reported to METRO on a monthly basis.

Assessment

METRO is in full compliance with data collection and reporting of total vehicle miles as defined by the State of Texas.

2.7 Passenger Miles

Definition

Passenger miles are derived by multiplying annual unlinked passenger trips by the average distance ridden by passengers during the same time period.

Methodology

METRO reports passenger mile information through procedures specified by NTD requirements:

- **Bus:** Trips are sampled on a random basis. For the sampled trips, ride checkers determine average passenger trip lengths. The average trip length is multiplied by the number of passenger boardings for each service category to calculate passenger miles. These calculations meet FTA requirements for sampling accuracy.
- **Light Rail:** Passengers are counted using APCs and passenger miles are calculated by multiplying the number of passengers by the average trip length, which is determined by ride checkers who ride the line from end to end. Passenger miles are regularly compared to historical data.
- **Paratransit:** Passenger miles are calculated by multiplying the actual number of passengers (100 percent count) by the average trip length, which is determined from the scheduling database.

Assessment

METRO is in full compliance with data collection and reporting of passenger miles as defined by the State of Texas.

2.8 On-Time Performance

Definition

On-time performance means the percentage of revenue vehicle trips that depart from selected locations at a time not earlier than the published departure times and not later than five minutes after the published departure time.

Methodology

For fixed-route bus service, METRO calculates on-time performance using the Integrated Vehicle Operations Management System (IVOMS). IVOMS measures on-time performance at designated time points listed in the bus schedules based on Automatic Vehicle Location (AVL) software. IVOMS data provide the time that every bus passes a designated time point, calculating data to the second, and generating hundreds of thousands of data points per month.

SECTION 2. COMPLIANCE WITH STATE-REQUIRED DATA

A local bus is considered on-time if it does not leave early and leaves within a five-minute window after the scheduled departure time. A commuter bus is considered on-time if it does not depart early (except in the morning when a bus can leave from a park-and-ride lot when full) and is within a five-minute window after the scheduled departure time, during peak service.

For other METRO services, on-time performance is calculated as follows:

- Light Rail: Scheduled departure times are not published for the light rail system. METRO calculates on-time performance based on actual versus scheduled departure times from either end of the line.
- Paratransit: Internally, on-time performance is reported monthly according to METRO's definition, but is not required according to the state definition since there are no published departure times.

Assessment

METRO is in full compliance with data collection and reporting of on-time performance as defined by the State of Texas.

2.9 Accidents

Definition

Accidents include: (1) All collisions that involve an authority's revenue vehicle, other than a lawfully parked revenue vehicle, and that results in property damage, injury, or death; and (2) incidents that result in the injury or death of a person on board or boarding or alighting from an authority's revenue vehicle. The state definition requires agencies to report accidents for directly operated vehicles only.

Methodology

Initial accident data and information are based on reports filed by operators of revenue vehicles and supervisors.

These reports are supplemented by reports received from witnesses and claimants. Accidents are divided into collision and non-collision categories with details by accident location, types of collision accidents, and results in terms of personal injuries/deaths and property damage. Final report information is based on the investigations and assessments of METRO's claims representatives and safety personnel.

METRO maintains records on accidents for directly operated services according to the state definition (including all accidents, regardless of the amount of damage) as well as the Texas Department of Transportation safety oversight definition (specific defined thresholds pertaining to fatalities, injuries, property damage, evacuations, mainline derailments, vehicle collisions, and at-grade crossing collisions).

SECTION 2. COMPLIANCE WITH STATE-REQUIRED DATA

Assessment

METRO is in full compliance with data collection and reporting of accidents as defined by the State of Texas.

2.10 Mechanical Road Calls

Definition

Mechanical road calls are defined as an interruption in revenue service caused by equipment failure of a revenue vehicle that requires assistance from someone other than the vehicle operator before the vehicle can be operated normally. The state definition requires agencies to report road calls for directly operated vehicles only.

Methodology

For bus services, when an operator reports a vehicle problem, dispatch goes through a step-by-step process to diagnose the nature of the problem. If the operator is unable to resolve the issue, a repair truck is sent out. The dispatcher captures the information in the SAP software, including time of failure, location, and lost time incurred. When the bus goes back to the garage, the maintenance foreman prints out this information and provides it to the mechanic. The mechanic makes repairs and documents the repair work. This information is faxed back to the QA Department each morning to code road calls by type and by vehicle.

METRO's road call information is comprehensive and categorized by type, including road calls for mechanical problems, fleet defects, and warranty issues. The categorization of road calls assists METRO management. For example, the data is used to compare performance across individual garages using road calls for mechanical problems, but excluding road calls such as fleet defects that are not necessarily under the control of a garage and do not provide a good basis for comparing garage performance.

For light rail service, the rail operator reports any vehicle problem to the Operations Control Center (OCC) to diagnose the nature of the problem. If the operator is unable to continue running the vehicle in revenue service, then the vehicle is taken out of service, appropriate personnel are sent out to remedy the situation, and the OCC initiates a work request for repair work. The rail vehicle maintenance superintendent reviews the work requests and determines which of the service interruptions qualify as mechanical road calls.

Assessment

METRO is in full compliance with data collection and reporting of mechanical road calls as defined by the State of Texas.

Section 3. State-Required Performance Indicators

System wide and modal performance indicators have been validated as a basis for determining performance trends. Section 451.454 of the Texas Transportation Code requires that the performance audit include an examination of the following nine indicators over the audit period:

- **Operating Cost per Passenger**, a measure of cost effectiveness
- **Operating Cost per Revenue Hour**, a measure of cost efficiency
- **Operating Cost per Revenue Mile**, a measure of cost efficiency
- **Sales and Use Tax Receipts per Passenger**, an indicator of regional subsidization
- **Fare Recovery Ratio**, a measure of the share of operating costs paid by riders
- **Average Vehicle Occupancy**, a measure of service productivity
- **On-Time Performance**, a measure of service quality
- **Accidents per 100,000 Total Miles**, an indicator of system safety
- **Miles between Mechanical Road Calls**, a measure of service quality

Performance indicators were calculated based on verified data and in compliance with state definitions. The raw performance statistics used to calculate the performance indicators are provided in the appendices to this report.

Performance indicators have been calculated for METRO services system-wide as well as separately for bus, light rail, and paratransit services. System-wide and modal performance trends are reviewed to assess the effectiveness and efficiency of transit operations.

The performance trends cover the period from FY 2012 through FY 2015. The growth rates shown correspond to METRO's October 1 to September 30 fiscal year. Graphs on the following pages show system-wide performance trends for each performance indicator. The mode-specific performance trends discussed in this section are provided in the appendices of this report.

SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

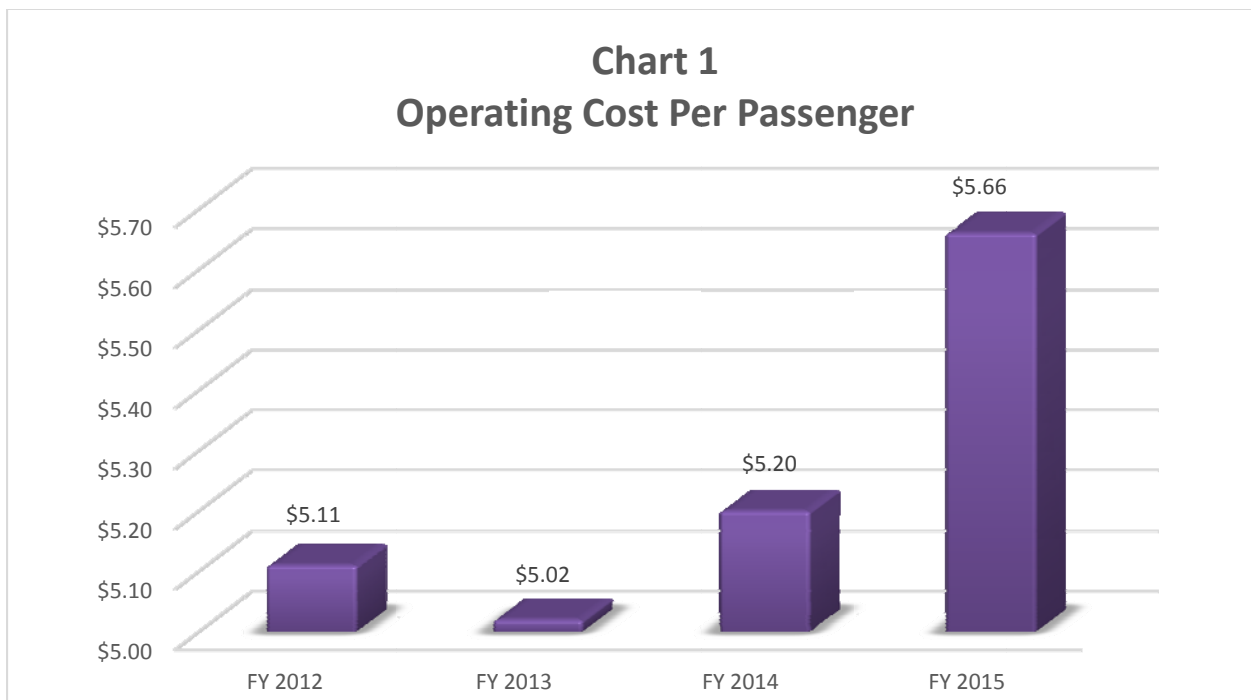
3.1 Operating Cost per Passenger

Operating cost per passenger measures cost effectiveness of service. During the audit period, system-wide operating cost per passenger grew from \$5.11 in FY 2012 to \$5.66 in FY 2015, an increase of 10.7 percent as illustrated in *Chart 1* below.

- Bus: operating cost per passenger grew by \$.47, an increase of 9.3 percent.
- Light Rail: operating cost per passenger grew by \$1.79, an increase of almost 116.6 percent. The increase was due to major increases in rail service. In FY 2013, the Red Line extension was completed and in FY 2015 the Green and Purple Lines opened for public use.
- Paratransit: operating cost per passenger grew by \$6.24, an increase of 26.5 percent. Paratransit service is the highest cost service that is provided by METRO and grows exponentially.

The change in operating cost per passenger was a result of these factors:

- Operating Cost: System-wide operating costs increased by \$73.9 million or 17.8 percent. A significant portion of the operating cost increase was due to the expansion of the Red Line and the addition of the Green and Purple Lines.
- Passenger trips: System-wide passenger trips increased by \$5.0 million trips or 6.4 percent. Rail and paratransit trips has the greatest impact on this increase, growing significantly during the audit period by 3.9 million trips or 35.1 percent and 229,709 trips or 13.7 percent, respectively.



SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

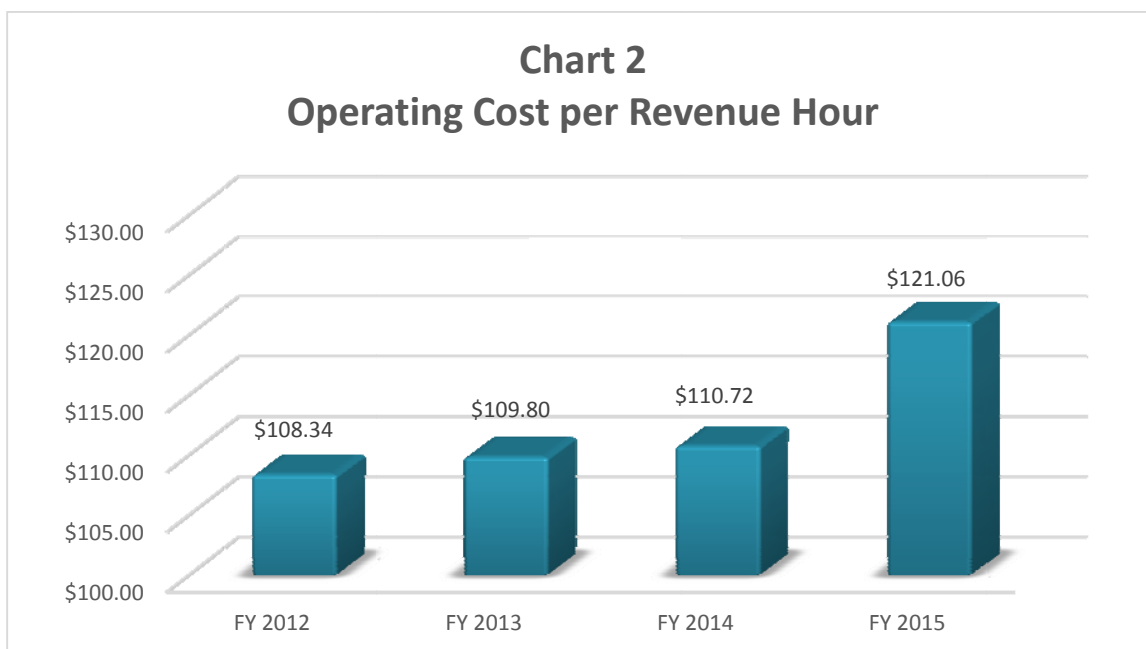
3.2 Operating Cost per Revenue Hour

Operating cost per revenue hour measures cost efficiency. System-wide operating cost per revenue hour grew from \$108.34 in FY 2012 to \$121.06 in FY 2015, an increase of 11.7 percent as illustrated in *Chart 2* below.

- Bus: operating cost per revenue hour grew by \$4.33, an increase of 3.4 percent.
- Light Rail: operating cost per revenue hour grew by \$117.71, an increase of 44.2 percent.
- Paratransit: operating cost per revenue hour grew by \$8.48, an increase of 19.1 percent.

The change in operating cost per revenue hour was a result of these factors:

- Operating Cost: System-wide operating costs increased by \$73.9 million or 17.8 percent. System-wide revenue service hours also increased, but at a slower rate. Between FY 2012 and FY 2015, revenue service hours grew 208,668, a 5.5 percent increase.
- Revenue Vehicle Hours: Light rail revenue hours increased significantly. The 67,118 or 102.9 percent increase in hours from FY 2012 to FY 2015 was the catalyst for the increase system-wide. Bus and paratransit revenue hours also grew, though not as impactful as light rail at 184,249 hours (7.0 percent) and 190,552 hours (20.9 percent), respectively.



SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

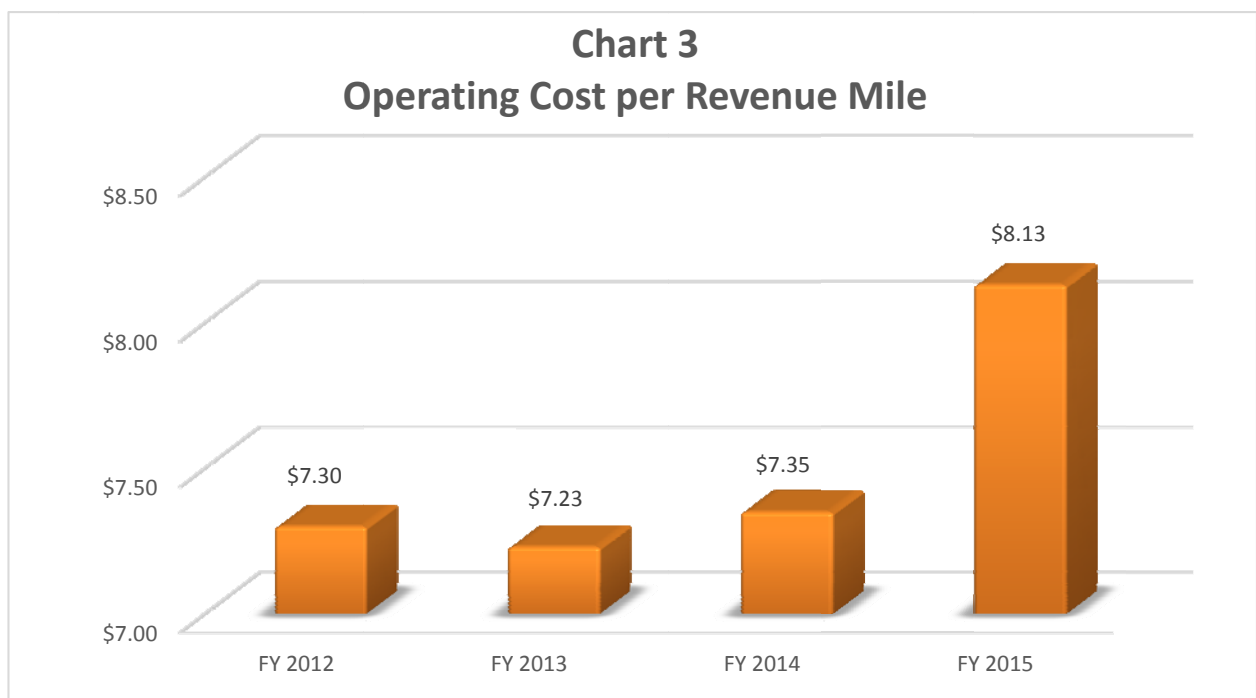
3.3 Operating Cost per Revenue Mile

Operating cost per revenue mile is another measure of cost efficiency. System-wide operating cost per revenue mile grew 11.4 percent from \$7.30 in FY 2012 to \$8.13 in FY 2015 as illustrated in *Chart 3* below.

- Bus: operating cost per revenue mile grew by \$.60, an increase of 7.7 percent.
- Light Rail: operating cost per revenue mile grew by \$11.40, an increase of 50.4 percent.
- Paratransit: operating cost per revenue mile grew by \$.70, an increase of 28.4 percent.

The growth in operating cost per revenue mile was a result of these factors:

- Operating Cost: System-wide operating costs increased by \$73.9 million or 17.8 percent. System-wide revenue service miles also increased, but at a slower rate. Between FY 2012 and FY 2015, revenue miles grew 3.2 million miles, an increase of 5.8 percent.
- Revenue Vehicle Miles: As with revenue vehicle hours, light rail revenue vehicle miles increased significantly. The 727,747 or 94.5 percent increase in hours from FY 2012 to FY 2015 was the catalyst for the increase system-wide. Bus revenue miles increased by 2.7 percent between FY 2012 to FY 2015. Bus and paratransit revenue miles also grew, though not as impactful as light rail at 1.0 million miles (2.7 percent) and 1.9 million miles (12.1 percent), respectively.



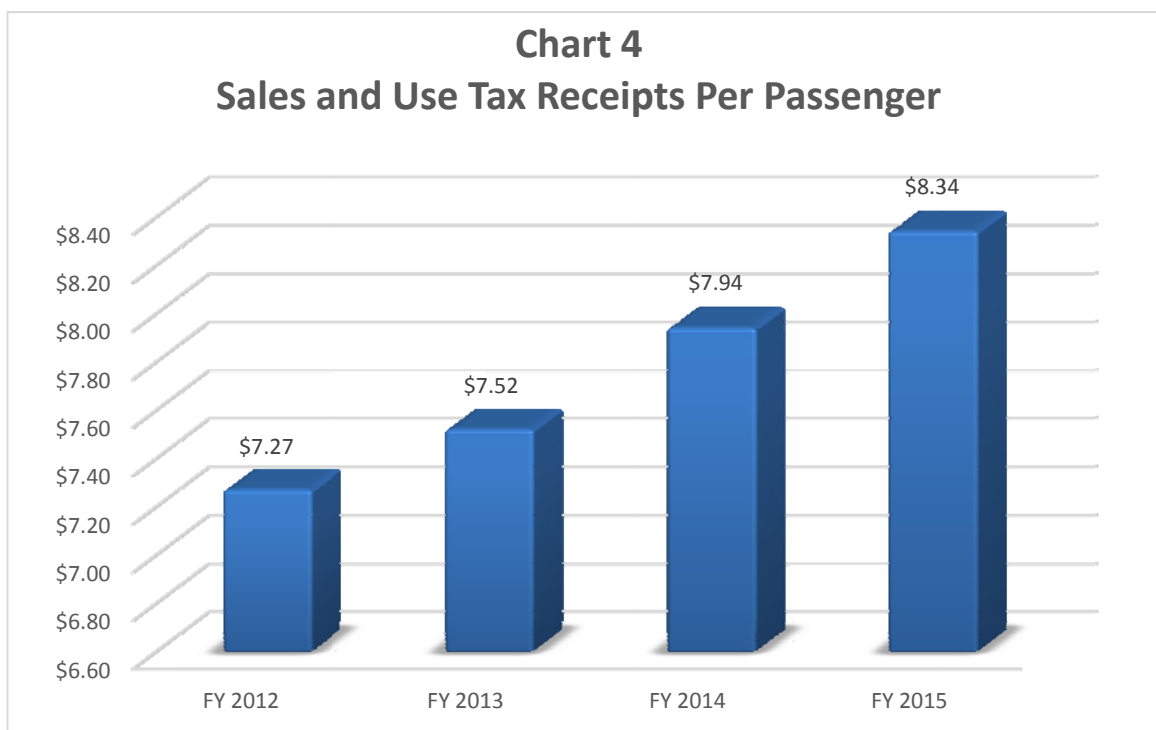
SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

3.4 Sales and Use Tax Receipts per Passenger

Sales and use tax receipts per passenger carried is a measure of the regional subsidization of METRO transit services. This measure grew from \$7.27 in FY 2012 to \$8.34 in FY 2015, an increase of 14.7 percent as illustrated in *Chart 4* below.

Sales and use tax receipts per passenger boarding improved as the local economy strengthened. The trends in sales and use tax receipts per passenger reflect the following:

- METRO saw growth in sales and use tax receipts, which increased by \$130.1 million (22.1 percent) from \$588.3 million in FY 2012 to \$718.4 million in FY 2015. Sales receipt growth increased every year during the audit period.



SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

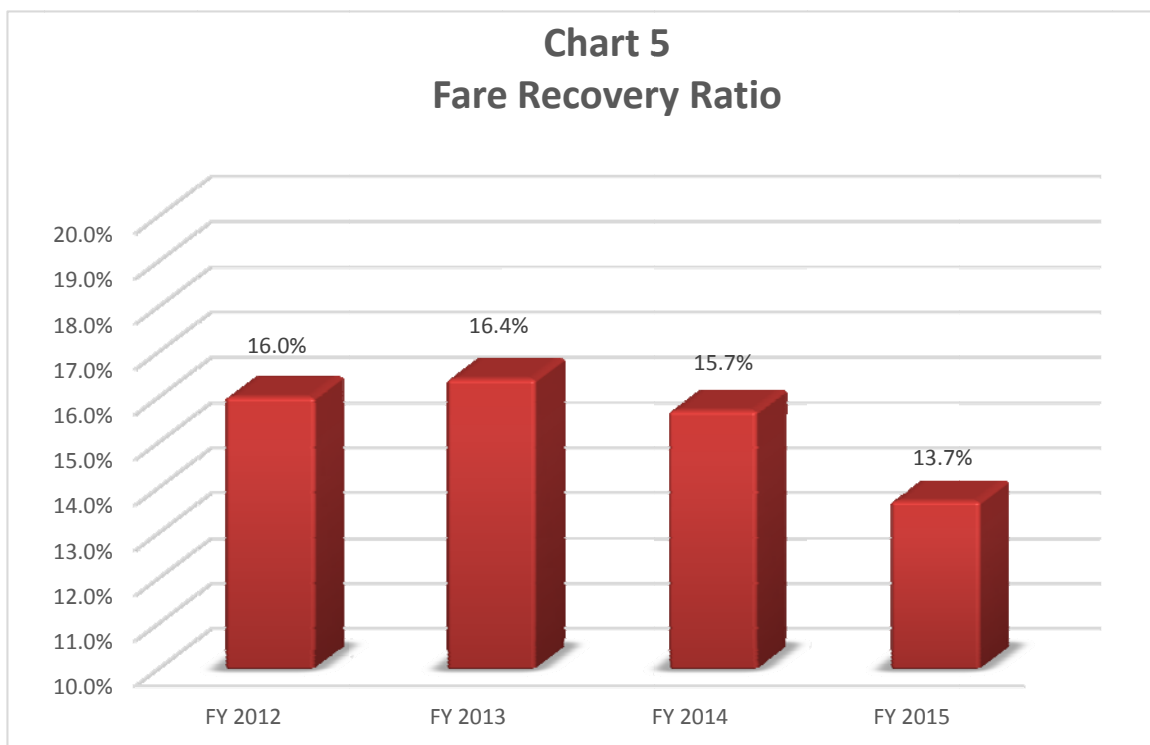
3.5 Fare Recovery Ratio

The fare recovery ratio is the percentage of METRO’s operating costs that is derived from passenger revenues. System wide, the fare recovery ratio decreased from 16.0 percent in FY 2012 to 13.7 percent in FY 2015, a decrease of 14.4 percent as illustrated in *Chart 5* below.

- Bus: the fare recovery ratio declined by 1.7, a decrease of 9.7 percent.
- Light Rail: the fare recovery ratio declined by 13.4, a decrease of 58.5 percent.
- Paratransit: the fare recovery ratio declined by .3, a decrease of 8.8 percent. Paratransit operating costs grew from \$40.5 million in FY 2012 to \$58.4 million in FY 2015 an increase of 44.2 percent.

The reduction in the fare recovery ratio was the result of these factors:

- Operating Cost: System wide operating costs increased by \$73.9 million or 17.8 percent, a direct correlation to the reduction in the fare recovery ratio.
- Fare Recovery Ratio: The main contributor to the declining fare recovery ratio is the increased light rail cost. The expansion of the Red Line and the opening of the Green and Purple Lines drastically increased operating cost, while fares were not increased exponentially. Light rail operating cost grew by \$33.4 million or 192.6 percent.



SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

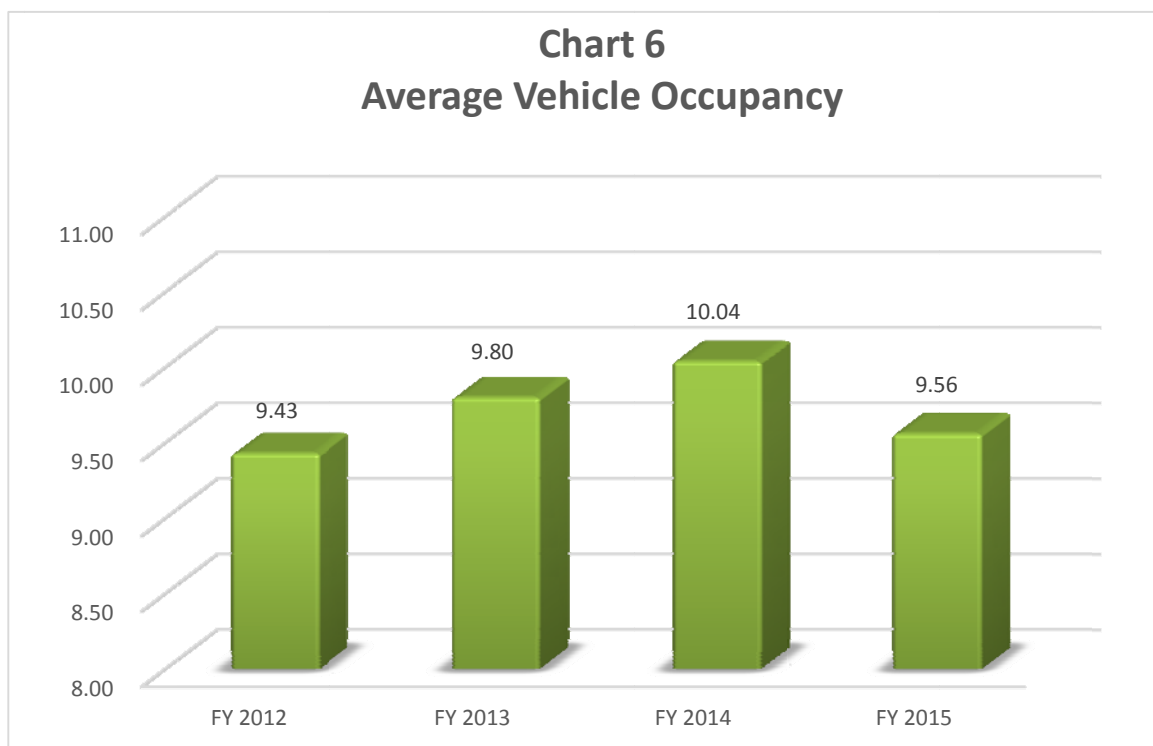
3.6 Average Vehicle Occupancy

Average vehicle occupancy is an indicator of vehicle utilization and productivity that is measured by dividing total passenger miles by total revenue vehicle miles. System-wide average vehicle occupancy increased slightly from 9.43 in FY 2012 to 9.56 in FY 2015, an increase of 1.4 percent as illustrated in *Chart 6* below.

- Bus: average vehicle occupancy grew by .18, an increase of 1.7 percent.
- Rail: average vehicle occupancy declined by 5.13, a decrease of 15.8 percent.
- Paratransit: average vehicle occupancy remained constant, with less than a percentage change over the audit period.

The increase in the average vehicle occupancy was the result of these factors:

- Passenger Miles: System wide passenger miles increased by 39.1 million or 7.3 percent, primarily attributable to the increase in rail passenger miles which more than doubled over the audit period at 63.8 percent. There were also relatively small increases in bus and paratransit passenger miles at 4.5 and 11.8 percent, respectively.
- Revenue Vehicle Miles: System-wide revenue vehicle miles increased slightly at 6.6 percent. Even though light rail revenue vehicle miles increased significantly at 94.5 percent, this only represented two percent of all revenue vehicle miles. Bus and paratransit revenue vehicle miles, which represent 98 percent of total revenue vehicle miles, increased by 2.7 and 12.1 percent, respectively.

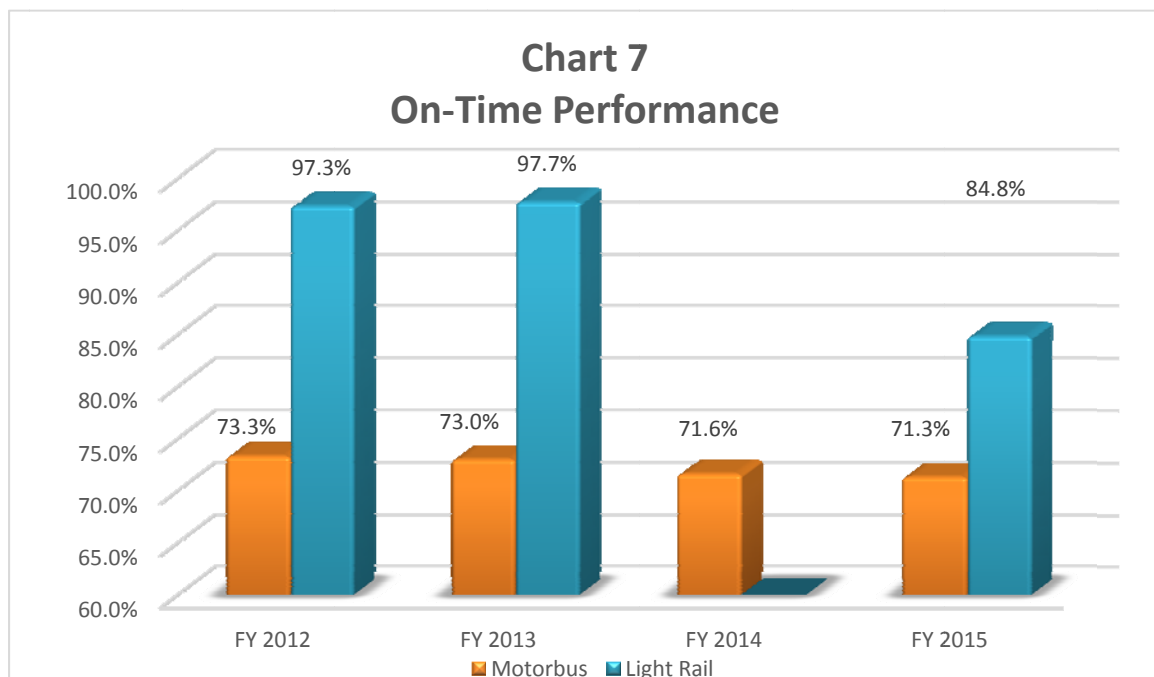


SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

3.7 On-Time Performance

On-time performance is a measure of service quality. On-time performance is reported separately for each mode, except for paratransit which is not required to be measured as a part of this audit.

- **Bus:** Reported on-time performance for directly operated METRO bus services decreased slightly by 2.7 percent from 73.3 percent in FY 2012 to 71.3 percent in FY 2015 as illustrated in *Chart 7* below. In FY 2008, METRO implemented the IVOMS-based on-time reporting methodology for bus service. IVOMS provides data when every bus passes a time point, generating hundreds of thousands of data points per month and on-time performance indicators that are significantly more accurate than those previously derived from point checks.
- **Rail¹:** Reported on-time performance for METRORail services decreased by 12.8 percent from 97.3 percent in FY 2012 to 84.8 percent in FY 2015 as illustrated in *Chart 7* below. Rail on-time performance was negatively impacted by a failure of the axle counter signal interface system. The axle counter box overheats and significantly delays trains. METRO is in the process of replacing the system.



¹ The light rail on-time performance for FY 2014 is unavailable. METRO advises that this information was only available for two months of the fiscal year, due to challenges encountered with the contractor to which the data collection responsibility was outsourced. This function was subsequently brought in-house and is now being performed by METRO's staff.

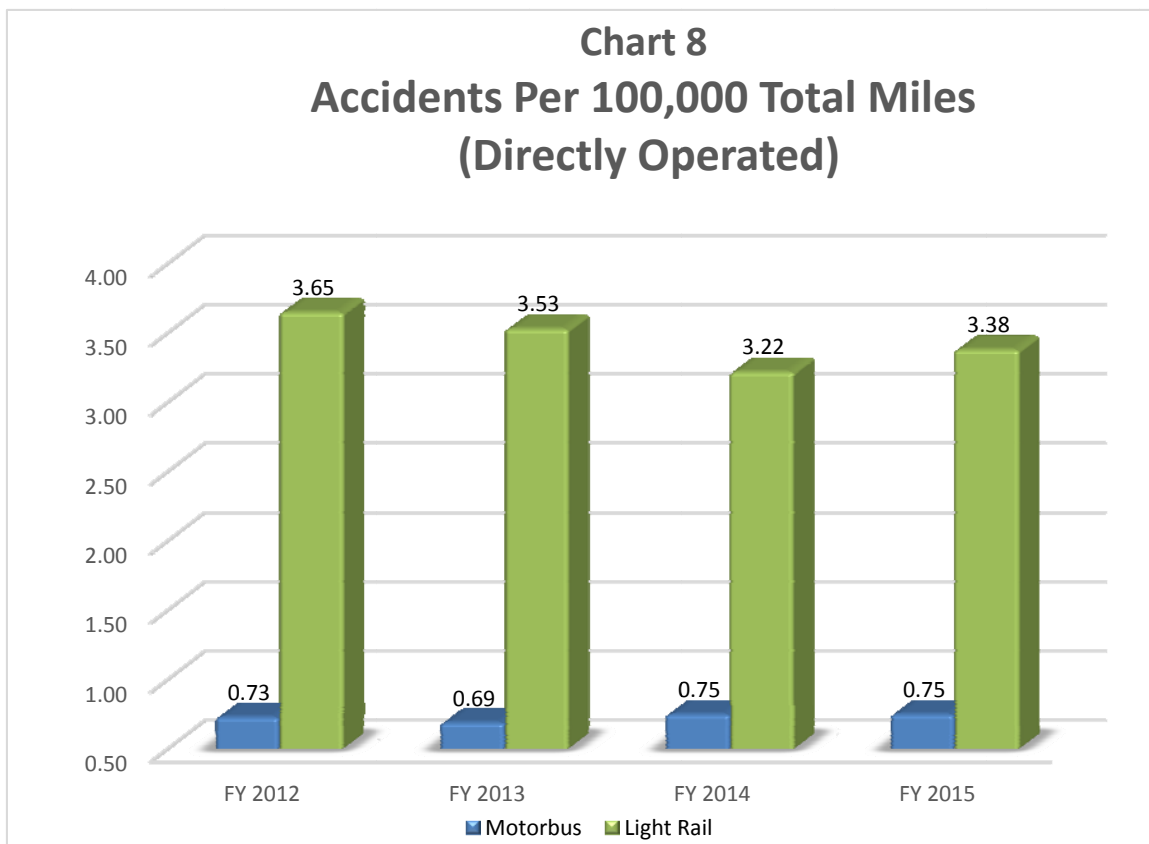
SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

3.8 Accidents per 100,000 Total Miles

Accidents per 100,000 total miles is an indicator of system safety. For directly operated service, accidents per 100,000 miles reported separately for each mode, except for paratransit which is not required to be measured as a part of this audit.

- **Bus:** Bus accidents per 100,000 total miles increased from .73 in FY 2012 to .75 in FY 2015 a change of 2.7 percent as illustrated in *Chart 8* below.
- **Light Rail:** The light rail accident rate per 100,000 total miles decreased by 7.4 percent, from 3.65 in FY 2012 to 3.38 in FY 2015; a relatively small change as illustrated in *Chart 8* below. Though accidents have decreased, miles have increased even more due to the addition of significant new service with the Green and Purple Lines.

METRO’s continued success in reducing accidents is due to its commitment to safety for both bus and light rail services. METRO monitors accident trends closely, conducts extensive training for new operators and refresher training for current operators, and also takes other steps to improve safety where feasible (such as improving signaling, signage, and back lights). These measures contributed to the reduction in numbers reported.

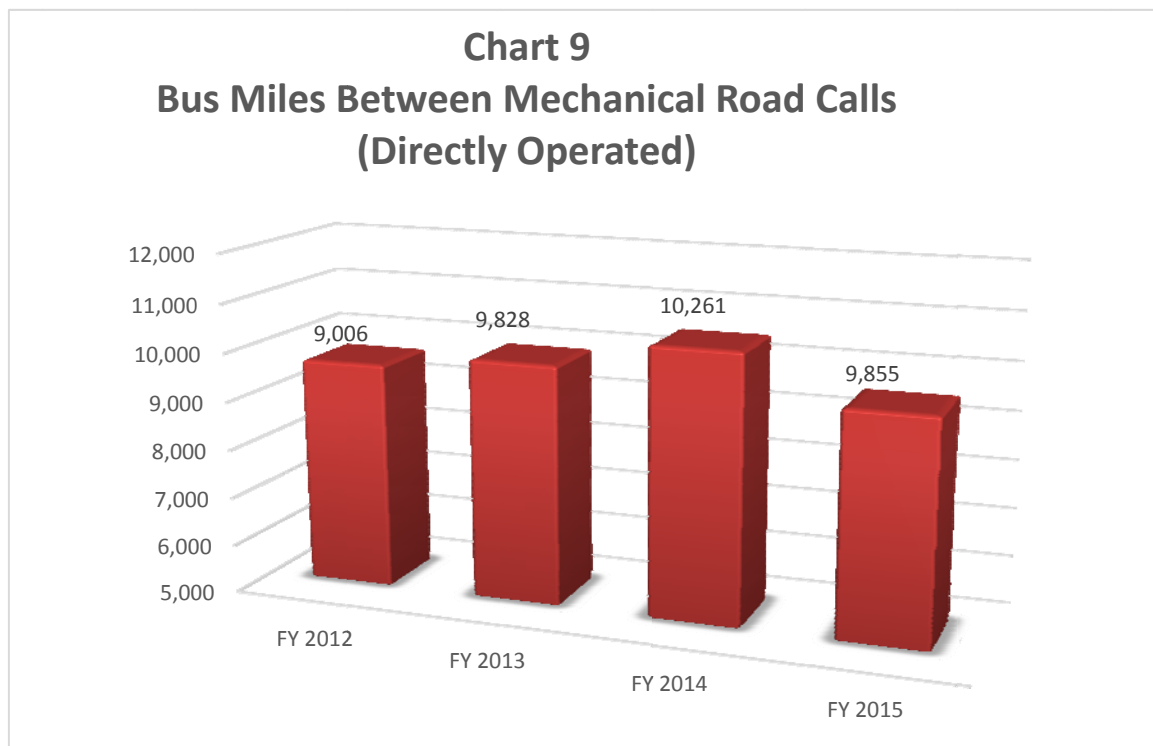


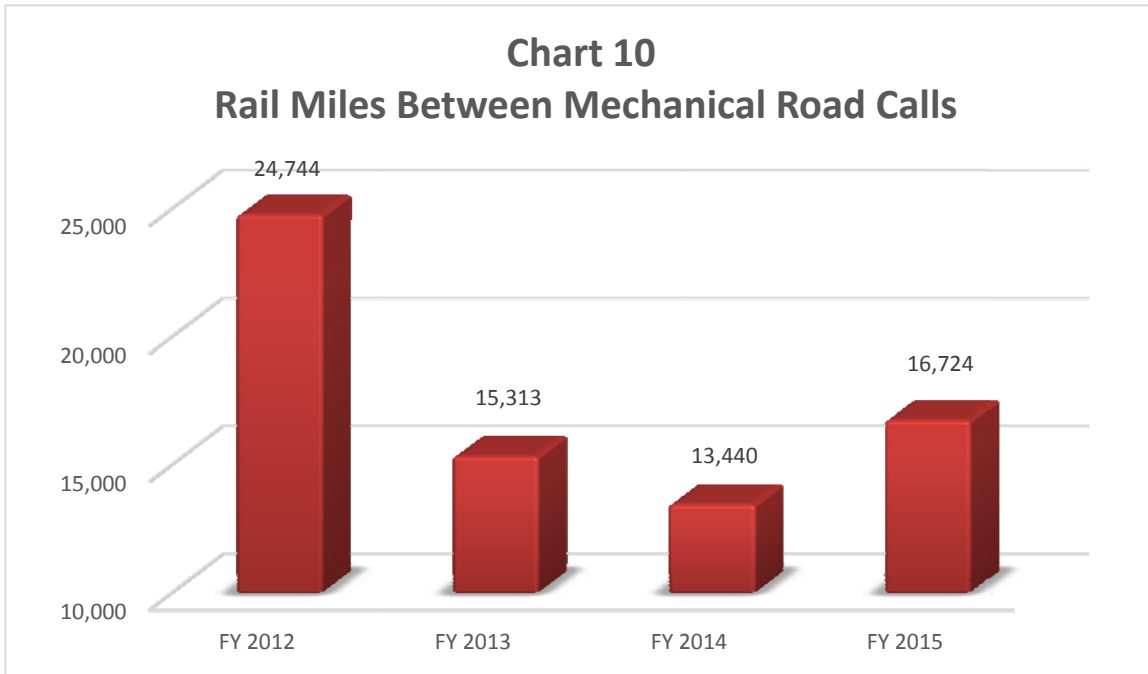
SECTION 3. STATE-REQUIRED PERFORMANCE INDICATORS

3.9 Miles Between Mechanical Road Calls

Miles between mechanical road calls is an indicator of system safety. Overall miles between mechanical road calls for directly operated services is reported separately for each mode, except for paratransit which is not required to be measured as a part of this audit. decreased an average of 10.6 percent, from between FY 2012 and FY 2015 as illustrated in *Charts 9 and 10* below.

- **Bus:** Miles between mechanical road calls increased 9.4 percent from 9,006 to 9,855 miles between FY 2012 and FY 2015, as illustrated in *Chart 9* below. However, METRO saw change in the direction from this upward trend between FY 2014 and FY 2015 when miles between mechanical road calls dropped from 10,261 to 9,855 or 4.0 percent. METRO’s program for replacing older buses and annual preventive maintenance campaigns have begun contributing to reducing potential bus mechanical road calls and expanded miles between road calls.
- **Light Rail:** The number of miles between mechanical road calls decreased significantly at 32.4 percent from 24,744 miles in FY 2012 to 16,724 in FY 2015, as illustrated in *Chart 10* below. The decrease in miles between mechanical road calls is due in part to the signal interface problem that METRO is in the process of resolving as discussed in *Section 3.7, On-Time Performance*.





Section 4. Findings and Recommendations

4.1 Findings

4.1.1 Compliance with Data Definition and Data Collection

The audit team reviewed METRO's data definitions and data collection methodologies to verify that the base data used to develop the state-mandated performance indicators conform to state definitions. METRO is in compliance with all data collection and verification requirements.

4.1.2 Transit Performance

During the audit period, METRO managed its system through a significant bus service change. METRO realigned all of its local bus routes and made a significant increase in rail service. The increase in service negatively impacted service and cost effectiveness – operating costs per passenger, and cost efficiency – operating cost per hour/mile.

- Bus: Operating cost per passenger increased by 9.3 percent during the audit period. Operating cost per revenue hour and per revenue mile also increased by 3.4 percent and 7.7 percent, respectively. Average vehicle occupancy increased by 1.7 percent. Bus on-time performance decreased by 2.7. Accidents per 100,000 total miles increased by 2.7 percent for directly operated service. Miles between mechanical road calls improved by 9.4 percent.
- Light rail: Operating cost per passenger increased 116.6 percent during the audit period. Operating cost per revenue hour and per revenue mile increased by 44.2 percent and 50.4 percent, respectively. Average vehicle occupancy decreased by 15.8 percent. On-time performance decreased of 12.8 percent. Accidents per 100,000 total miles also decreased by 7.4 percent. Miles between mechanical road calls decreased by 32.4 percent.
- Paratransit: Operating cost per passenger increased by 26.5 percent during the audit period. Operating cost per revenue hour and per revenue mile increased by 19.1 and 28.5 percent, respectively. Average vehicle occupancy remained constant over the audit period.
- Revenue: System-wide fare recovery ratio decreased 14.4 percent from 16.0 in FY 2012 to 13.7 in FY 2015, as fare revenues increased at a slower rate than operating costs. Sales and use tax receipts per passenger trip increased by 14.7 percent from \$7.27 in FY 2012 to \$8.34 in FY 2015.

SECTION 4. FINDINGS AND RECOMMENDATIONS

4.2 Recommendations

Findings from this report indicate both positive performance and opportunities to improve transit service efficiency and productivity. Two recommendations are offered below for METRO's consideration.

4.2.1 *Market METRO's Service.*

Issues and Opportunities. METRO has room to increase its ridership on its newly implemented/expanded rail service. Targeting people who live and work in the downtown area may be the greatest potential for new riders.

METRO deploys a marketing program that includes television ads to publicize and attract riders to use its service; however, there is major competition for travel from single occupancy vehicles in its car-dependent service area. METRO has begun the process to change the way the service population thinks about travel, but there is still work to be done. This recommendation is not intended to be viewed negatively, but rather as an opportunity to help METRO meet its goals and objectives.

Recommended Actions. With the loss of major trip generators during the audit period from businesses such as Shell Oil Company, and ExxonMobil expected in 2017, projections of ridership in downtown Houston on METRORail have yet to be realized. METRO should focus its marketing campaign and outreach to other major trip generators, such as colleges and universities. Other agencies have built relationships with educational institutions to promote its service and increase ridership. A component of some of those relationships include negotiating the inclusion of transportation fees as part of student activity fees at the time of college registration. Such an arrangement provides benefit to educational institutions by reducing the internal costs and resources needed to operate its own transportation service. This can also reduce the individual student burden by spreading transportation cost amongst the student population. Most of all it demonstrates the institutions support and commitment to the public transit system and encourages students to use it, thereby increasing ridership with public transportation and reducing the need for students to drive.

Expected Results. Partnering with known trip generators will improve cost effectiveness, cost efficiency, and service productivity, as well as increase ridership.

4.2.2 *Develop Strategies to Increase Ridership Downtown as the Economy Improves.*

Issues and Opportunities. METRO's downtown ridership fell from FY 2012 to FY 2015 due to a loss of residents and businesses. During the audit period, METRO saw the relocation of major trip generators away from downtown Houston, where METRORail operates. In particular, major businesses such as Shell, left the City creating a vacuum of 10,000 jobs. Projected ridership that would have come from employees traveling to and from work were significantly reduced. Employees that would have resided in the area also left the City and moved elsewhere, also affecting METRO's projected ridership numbers.

SECTION 4. FINDINGS AND RECOMMENDATIONS

Recommended Actions. Metro should promote Transit Orientated Development (TOD) in downtown Houston. TOD involves the concentration of development around transit facilities. The goal is to create livable and sustainable places in which people can live, work and play without the use of a car. In creating an attractive community-oriented downtown with cultural and recreational amenities, METRO will play an active role in encouraging people to spend money in the community and increase economic vitality.

Consequently, as the regional economy strengthens, METRO should actively plan and implement market-based strategies to generate additional ridership. This includes increasing service frequencies on high performing routes, enhancing service connectivity, and adding new services in areas with high population and employment growth. Such service changes should be viewed in conjunction with potential fare changes.

Expected Results. TOD will attract potential patrons to move downtown and increase METRO ridership.

APPENDIX A: OPERATING DATA BY PERFORMANCE INDICATOR

Appendix A: Operating Data by Performance Indicator

Information in the table below includes both operating statistics and performance measures used to calculate the nine state-mandated performance indicators. Each performance indicator has been calculated at the mode level for each of the three services that METRO operates (i.e., bus, light rail, paratransit), as well as at the system-wide level.

Performance Indicators per Transportation Code Sec 451.454 (c) (3) (A-G)					
KPI	Code Sec	FY2012	FY2013	FY2014	FY2015
Operating cost per passenger	451.454 (c) (3) (A)	5.11	5.02	5.20	5.66
Operating cost per revenue mile	451.454 (c) (3) (A)	7.30	7.23	7.35	8.13
Operating cost per revenue hour	451.454 (c) (3) (A)	108.34	109.83	110.72	121.06
Sales and use tax receipts per passenger	451.454 (c) (3) (B)	7.27	7.52	7.94	8.34
Fare recovery rate	451.454 (c) (3) (C)	16.0%	16.4%	15.7%	13.7%
Average vehicle occupancy	451.454 (c) (3) (D)	9.43	9.80	10.04	9.56
On-time performance Bus	451.454 (c) (3) (E)	73.3%	73.0%	71.6%	71.3%
On-time performance Rail	451.454 (c) (3) (E)	97.3%	97.7%	N/A*	84.8%
Number of Bus accidents per 100,000 miles	451.454 (c) (3) (F)	0.73	0.69	0.750	0.75
Number of Rail accidents per 100,000 miles	451.454 (c) (3) (F)	3.65	3.53	3.220	3.38
Number of miles between mechanical road calls	451.454 (c) (3) (G)	9,664	9,932	10,493	9,568
Additional Data		FY2012	FY2013	FY2014	FY2015
Operating Cost		414,014,072	423,778,259	443,667,743	487,907,171
Passenger Fare Revenue		66,371,822	69,308,172	69,664,941	66,959,131
Unlinked Passenger Trips		80,941,271	84,461,053	85,396,225	86,142,484
Revenue Vehicle Hours		3,821,567	3,858,491	4,006,936	4,030,235
Revenue Vehicle Miles		56,684,878	58,608,515	60,357,393	59,983,144
Total Vehicle Miles		64,319,413	66,929,707	68,595,384	71,938,298
Passenger Miles		534,369,113	574,228,412	606,140,282	573,489,760
Accidents**		175	180	155	163
Mechanical Roadcalls		4,323	4,198	3,890	4,116
For Calculations Only					
Sales Tax Receipts		588,278,273	635,541,981	677,912,303	718,386,911
NTD Passenger Miles		534,369,113	574,228,412	606,140,282	573,489,760
Rail - DO	LRDO	24,960,750	26,539,382	33,086,541	40,873,954
NonRail-CB-DO	CBDO	98,265,706	111,621,454	113,922,475	104,341,266
NonRail - CB - PT	CBPT	33,177,914	36,610,457	36,879,518	37,675,477
NonRail-DR-PT	DRPT	17,543,948	17,653,456	18,415,314	18,303,305
NonRail-DT-PT	DTPT	1,305,541	1,589,420	2,385,192	2,779,128
NonRail-MB-DO	MBDO	235,148,457	254,630,331	277,366,204	249,047,779
NonRail-MB-PT	MBPT	54,461,474	56,169,997	54,511,638	48,976,992
NonRail-VP-PT	VPPT	69,505,323	69,413,915	69,573,400	71,491,859
* N/A - Not Available; in FY2014 there is only OTP data available for two months due to problems with a contractor who was at the time responsible for collecting this data. This function was subsequently brought in-house.					
** NTD reportable accidents including rail and bus operated by METRO					

The operating expenses/revenues used to calculate the performance indicators by mode of transportation include rail, bus, and paratransit as reported in the National Transit Database. HOV/ HOT Lane and vanpool revenue and expenses have not been included in this worksheet.

APPENDIX B: PERFORMANCE DATA BY MODE

Appendix B: Performance Data by Mode

The performance indicators included in this appendix are reported by mode of each of the three modes that METRO operates (i.e., bus, light rail, paratransit).

In addition to the nine state-mandated performance indicators, two additional performance indicators are included that are often reported as a basis for evaluating performance: passengers per revenue hour and passengers per revenue mile.

Fare Recovery Ratios

Fare Recovery Ratios	FY2012	FY2013	FY2014	FY2015
METRO Rail				
Fare Revenue	3,978,767	4,483,444	4,735,304	4,830,770
Operating Cost	17,365,999	18,385,544	37,852,111	50,817,373
Recovery Ratio	0.2291	0.2439	0.1251	0.0951
Bus				
Fare Revenue	60,302,288	63,001,223	62,950,672	60,221,925
Operating Cost	334,021,714	352,301,591	341,877,097	369,542,750
Recovery Ratio	0.1805	0.1788	0.1841	0.1630
METRO Lift				
Fare Revenue	1,524,759	1,595,110	1,606,540	2,001,173
Operating Cost	40,594,214	46,189,792	48,994,159	58,419,757
Recovery Ratio	0.0376	0.0345	0.0328	0.0343
NTD Reported Op Exp (F-30)				
	FY2012	FY2013	FY2014	FY2015
CBDO - Commuter Bus Directly Operated	36,913,400	40,081,830	45,737,795	49,705,091
CBPT - Commuter Bus Purchased Transportation	7,209,288	7,314,721	9,452,738	9,620,651
DRPT - Demand Response Purchased Transportation	37,663,281	42,434,900	44,356,460	52,380,394
DTPT - Demand Taxi Purchased Transportation	2,930,933	3,754,892	4,637,699	6,039,363
LRDO - Light Rail Directly Operated	17,365,999	18,385,544	37,852,111	50,817,373
MBDO - Motor Bus Directly Operated	245,851,608	260,699,069	232,201,669	254,417,334
MBPT - Motor Bus Purchased Transportation	44,047,418	44,205,971	54,484,895	55,799,674
NTD Reported Rev (F-10)				
	FY2012	FY2013	FY2014	FY2015
CBDO - Commuter Bus Directly Operated	22,207,584	23,006,184	23,828,690	23,193,847
CBPT - Commuter Bus Purchased Transportation	5,492,565	5,878,857	6,029,881	6,867,337
DRPT - Demand Response Purchased Transportation	1,265,876	1,345,185	1,324,316	1,655,191
DTPT - Demand Taxi Purchased Transportation	258,883	249,925	282,224	345,982
LRDO - Light Rail Directly Operated	3,978,767	4,483,444	4,735,304	4,830,770
MBDO - Motor Bus Directly Operated	26,243,497	27,365,418	26,590,787	25,189,892
MBPT - Motor Bus Purchased Transportation	6,358,642	6,750,764	6,501,314	4,970,849

The operating expenses/revenues used to calculate the performance indicators by mode of transportation includes rail, bus, and paratransit as reported in the National Transit Database. HOV/ HOT Lane and vanpool revenue and expenses have not been included in this worksheet.

APPENDIX B: PERFORMANCE DATA BY MODE

Operating Cost Per Passenger

Operating Cost per Passenger	FY2012	FY2013	FY2014	FY2015
Total Operating Cost	391,981,927	416,876,927	428,723,367	478,779,880
% change		6.35%	2.84%	11.68%
Bus	334,021,714	352,301,591	341,877,097	369,542,750
% change		5.47%	-2.96%	8.09%
Rail	17,365,999	18,385,544	37,852,111	50,817,373
% change		5.87%	105.88%	34.25%
Paratransit	40,594,214	46,189,792	48,994,159	58,419,757
% change		13.78%	6.07%	19.24%
Total Passenger Trips	78,443,377	81,793,775	82,839,357	83,449,998
% change		4.27%	1.28%	0.74%
Bus	65,461,887	68,601,927	68,190,293	66,267,956
% change		4.80%	-0.60%	-2.82%
Rail	11,309,468	11,440,171	12,783,877	15,280,311
% change		1.16%	11.75%	19.53%
Paratransit	1,672,022	1,751,677	1,865,187	1,901,731
% change		4.76%	6.48%	1.96%
Total Operating Cost/ Passenger	5.00	5.10	5.18	5.74
% change		1.99%	1.54%	10.86%
Bus	5.10	5.14	5.01	5.58
% change		0.64%	-2.37%	11.23%
Rail	1.54	1.61	2.96	3.33
% change		4.66%	84.24%	12.32%
Paratransit	24.28	26.37	26.27	30.72
% change		8.61%	-0.38%	16.95%
NTD Data	FY2012	FY2013	FY2014	FY2015
CBDO - Commuter Bus Directly Operated	36,913,400	40,081,830	45,737,795	49,705,091
CBPT - Commuter Bus Purchased Transportation	7,209,288	7,314,721	9,452,738	9,620,651
DRPT - Demand Response Purchased Transportation	37,663,281	42,434,900	44,356,460	52,380,394
DTPT - Demand Taxi Purchased Transportation	2,930,933	3,754,892	4,637,699	6,039,363
LRDO - Light Rail Directly Operated	17,365,999	18,385,544	37,852,111	50,817,373
MBDO - Motor Bus Directly Operated	245,851,608	260,699,069	232,201,669	254,417,334
MBPT - Motor Bus Purchased Transportation	44,047,418	44,205,971	54,484,895	55,799,674
VPPT - Van Pool Purchased Transportation	13,119,035	9,213,857	10,692,505	10,934,421

The operating expenses/revenues used to calculate the performance indicators by mode of transportation includes rail, bus, and paratransit as reported in the National Transit Database. HOV/ HOT Lane and vanpool revenue and expenses have not been included in this worksheet.

APPENDIX B: PERFORMANCE DATA BY MODE

Operating Cost Per Revenue Hour

Operating Cost per Revenue Hour				
	FY2012	FY2013	FY2014	FY2015
Total Operating Cost	391,981,927	416,876,927	428,723,367	478,779,880
% change		6.35%	2.84%	11.68%
Bus	334,021,714	352,301,591	341,877,097	369,542,750
% change		5.47%	-2.96%	8.09%
Rail	17,365,999	18,385,544	37,852,111	50,817,373
% change		5.87%	105.88%	34.25%
Paratransit	40,594,214	46,189,792	48,994,159	58,419,757
% change		13.78%	6.07%	19.24%
Total Revenue Hours				
Total Revenue Hours	3,624,856	3,813,336	3,876,571	4,066,772
% change		5.20%	1.66%	4.91%
Bus	2,646,859	2,833,629	2,752,113	2,831,105
% change		7.06%	-2.88%	2.87%
Rail	65,203	64,900	85,014	132,321
% change		-0.46%	30.99%	55.65%
Paratransit	912,794	914,807	1,039,444	1,103,346
% change		0.22%	13.62%	6.15%
Total Operating Cost/ Rev Hour				
Total Operating Cost/ Rev Hour	108.14	109.32	110.59	117.73
% change		1.09%	1.16%	6.45%
Bus	126.20	124.33	124.22	130.53
% change		-1.48%	-0.08%	5.08%
Rail	266.34	283.29	445.25	384.05
% change		6.37%	57.17%	-13.75%
Paratransit	44.47	50.49	47.13	52.95
% change		13.53%	-6.65%	12.33%
NTD Data				
	FY2012	FY2013	FY2014	FY2015
CBDO - Commuter Bus Directly Operated	36,913,400	40,081,830	45,737,795	49,705,091
CBPT - Commuter Bus Purchased Transportation	7,209,288	7,314,721	9,452,738	9,620,651
DRPT - Demand Response Purchased Transportation	37,663,281	42,434,900	44,356,460	52,380,394
DTPT - Demand Taxi Purchased Transportation	2,930,933	3,754,892	4,637,699	6,039,363
LRDO - Light Rail Directly Operated	17,365,999	18,385,544	37,852,111	50,817,373
MBDO - Motor Bus Directly Operated	245,851,608	260,699,069	232,201,669	254,417,334
MBPT - Motor Bus Purchased Transportation	44,047,418	44,205,971	54,484,895	55,799,674
VPPT - Van Pool Purchased Transportation	13,119,035	9,213,857	10,692,505	10,934,421

The operating expenses/revenues used to calculate the performance indicators by mode of transportation includes rail, bus, and paratransit as reported in the National Transit Database. HOV/ HOT Lane and vanpool revenue and expenses have not been included in this worksheet.

APPENDIX B: PERFORMANCE DATA BY MODE

Operating Cost Per Revenue Mile

Operating Cost per Revenue Mile				
	FY2012	FY2013	FY2014	FY2015
Total Operating Cost	391,981,927	416,876,927	428,723,367	478,779,880
% change		6.35%	2.84%	11.68%
Bus	334,021,714	352,301,591	341,877,097	369,542,750
% change		5.47%	-2.96%	8.09%
Rail	17,365,999	18,385,544	37,852,111	50,817,373
% change		5.87%	105.88%	34.25%
Paratransit	40,594,214	46,189,792	48,994,159	58,419,757
% change		13.78%	6.07%	19.24%
Total Revenue Miles				
Total Revenue Miles	56,328,032	57,800,386	58,551,143	60,057,169
% change		2.61%	1.30%	2.57%
Bus	39,702,012	41,185,677	40,100,204	40,783,087
% change		3.74%	-2.64%	1.70%
Rail	769,903	766,205	1,059,792	1,497,650
% change		-0.48%	38.32%	41.32%
Paratransit	15,856,116	15,848,504	17,391,147	17,776,432
% change		-0.05%	9.73%	2.22%
Total Operating Cost/ Revenue Mile				
Total Operating Cost/ Revenue Mile	6.96	7.21	7.32	7.97
% change		3.64%	1.52%	8.88%
Bus	8.41	8.55	8.53	9.06
% change		1.67%	-0.33%	6.28%
Rail	22.56	24.00	35.72	33.93
% change		6.38%	48.85%	-5.00%
Paratransit	2.56	2.91	2.82	3.29
% change		13.84%	-3.34%	16.65%
NTD Data				
	FY2012	FY2013	FY2014	FY2015
CBDO - Commuter Bus Directly Operated	36,913,400	40,081,830	45,737,795	49,705,091
CBPT - Commuter Bus Purchased Transportation	7,209,288	7,314,721	9,452,738	9,620,651
DRPT - Demand Response Purchased Transportation	37,663,281	42,434,900	44,356,460	52,380,394
DTPT - Demand Taxi Purchased Transportation	2,930,933	3,754,892	4,637,699	6,039,363
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MBDO - Motor Bus Directly Operated	245,851,608	260,699,069	232,201,669	254,417,334
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VPPT - Van Pool Purchased Transportation	13,119,035	9,213,857	10,692,505	10,934,421

The operating expenses/revenues used to calculate the performance indicators by mode of transportation includes rail, bus, and paratransit as reported in the National Transit Database. HOV/ HOT Lane and vanpool revenue and expenses have not been included in this worksheet.

Significant Events

In FY 2014 the Red Line expansion opened for revenue service; increasing operating costs.

In FY 2015 the Green and Purple Lines opened for revenue service; increasing operating costs.