



Metropolitan Transportation Authority

State of New York

August 13, 2019

Honorable Andrew M. Cuomo
Governor of New York State
NYS State Capitol Building
Albany, NY 12224

Honorable Thomas P. DiNapoli ✓
Office of the State Comptroller
59 Maiden Lane, 31st Floor
New York, NY 10038

RE: Response to Final Report #2017-S-54 – Bus Wait Assessment and Other Performance Indicators

Gentlemen:

On May 7, 2019, the Office of the State Comptroller issued the above referenced audit report. As required by Section 170 of the Executive Law, I am providing you with the attached response which addresses the recommendations contained in the report.

Additionally, I will be working with staff to ensure that management is following up on and enforcing the audit's recommendations, where appropriate, and requesting regular, interim reports to that effect.

A copy of the final audit report is attached for your convenience.

Sincerely,

Patrick J. Foye
Chairman and Chief Executive Officer

RECEIVED
EXECUTIVE CORRESPONDENCE

AUG 16 2019

OFFICE OF THE STATE COMPTROLLER
THOMAS P. DINAPOLI
COMPTROLLER

c: Helene Fromm, MTA Chief of Staff
Michael J. Fucilli, Auditor General, MTA Audit Services

Attachment

The agencies of the MTA

MTA New York City Transit
MTA Long Island Rail Road

MTA Metro-North Railroad
MTA Bridges and Tunnels

MTA Capital Construction
MTA Bus Company

Memorandum



New York City Transit

Date August 2, 2019

To Patrick Foye, Chairman, MTA

From Andy Byford, President, New York City Transit *AB*

Re Response to Bus Wait Assessment and Other Performance Indicators NYS 2017-S-54

In response to the requirements of Section 170 of the Executive Law to respond 90 days after receipt of the above referenced audit report from the State Comptroller, we hereby provide you with steps taken by MTA New York City Transit (NYCT-DOB) and MTA Bus Company (MTABC) to implement the recommendations or to state why implementation is not practical. The audit covers the period January 1, 2015 to July 5, 2018.

Below is our response to the State Comptroller's recommendations and summary comments.

Response to Executive Summary Key Recommendations

Key Recommendation #1: Ensure the WA statistics reported to the Committee and the public are accurate.

Agency Response: MTABC already complies with this recommendation. As stated in our initial response, NYCT-DOB already has in place comprehensive and thorough process to calculate and validate the accuracy of Wait Assessment for both MTABC and NYCT-DOB routes. No further action is required on this recommendation.

Key Recommendation 2: Document the procedure for creating the daily bus ridership file used for scheduling.

Agency Response: NYCT-DOB disagrees with this recommendation. The recommendation is based on a misconception that NYCT-DOB relies on daily ridership data for bus scheduling purposes, which is inaccurate. However, regarding documentation, by the end of the second quarter of 2019, NYCT Operations Planning completed documentation of the bus ridership model process that includes detailing each step taken to run the model, including the monthly averaging process and the procedures and assumptions used for developing boarding and alighting patterns, as well as

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documentation of model inputs and data sources. This documentation includes assumptions and methodologies used to validate the model.

Key Recommendation 3: Analyze the two methodologies used to assess demand for service and document the results that show the best outcome for the organization and the customers.

Agency Response: NYCT-DOB and MTABC agreed to implement this recommendation by Q1 2020; this evaluation is in progress.

Key Recommendation 4: Calculate the weekend WA and share the results with the Committee and the public.

Agency Response: NYCT-DOB and MTABC agree with this recommendation. NYCT-DOB and MTABC agreed to explore the feasibility of adding weekend performance metrics, including weekend wait assessment, to the dashboard. As part of President Byford's Fast Forward plan, NYCT has committed to continue improving its public bus performance reporting.

Key Recommendation 5: Develop and document proactive corrective action plans and procedures to improve WA performance.

Agency Response: NYCT-DOB and MTABC agree with this recommendation and will continue to ensure appropriate documentation of current and future efforts that are used to proactively address factors that affect Wait Assessment by Q1 2020.

Response to Recommendations

Comptroller Recommendation #1: Document the procedure for creating the daily bus ridership file used for scheduling.

Agency Response: NYCT-DOB and MTABC disagree with this recommendation. (See response to Key Recommendation #2). However, NYCT Operations Planning completed documentation of the bus ridership model process that includes detailing each step taken to run the model, including the monthly averaging process and the procedures and assumptions used for developing boarding and alighting patterns, as well as documentation of model inputs and data sources. This documentation includes assumptions and methodologies used to validate and calibrate the model. As stated in our initial response, NYCT Operations Planning does not rely on daily ridership for bus scheduling purposes; rather, schedule adjustments are based on monthly ridership averages that better adjust for surges that might occur in daily data.

Comptroller Recommendation #2: Document and maintain a list of input variables used to operate the model and develop results.

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Agency Response: NYCT-DOB and MTABC agree with, and have, implemented this recommendation. (See response to Key Recommendation #2). NYCT has documented bus ridership model data sources, including inputs such as AFC, schedules, bus GPS tracking, fare evasion and cash fare payment data. This documentation includes assumptions and methodologies used to validate and calibrate the model.

Comptroller Recommendation #3: Require OMB to provide the information in a timely manner.

Agency Response: NYCT-DOB and MTABC agree with, and have, adopted this recommendation. OMB currently provides cash fare data to NYCT Operations Planning monthly on a one-month lag.

Comptroller Recommendation #4: Document the procedure for deriving Figure 1 and 2 reports, including maximum load point.

Agency Response: MTABC agrees with this recommendation and will schedule meetings with NYCT-DOB during Q4 2019 to review the documentation procedures used to prepare the reports and to assess ridership demands.

Comptroller Recommendation #5: Require schedulers to record their work to explain which passenger level was selected and where the recommended service is not in compliance with the Guidelines.

Agency Response: MTABC agrees with this recommendation and has included this in the overall documentation and review of procedures noted in the audit. This is scheduled to be completed by the end of Q4 2019.

Comptroller Recommendation #6: Analyze the two methodologies used to assess demand for service and document the results that show the best outcome for the organization and its customers.

Agency Response: MTABC agrees with this recommendation. A joint review between MTABC and NYCT-DOB is in progress. A decision along with supporting documentation is expected by Q1 2020.

Comptroller Recommendation #7: Ensure WA statistics reported to the Committee and to the public are accurate, based on the published definition.

Agency Response: MTABC and NYCT-DOB disagree with this recommendation and already have in place comprehensive and thorough processes to calculate and validate the accuracy of Wait Assessment. No further action is required on this recommendation.

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Comptroller Recommendation #8: Examine the Bus Trek System and determine why it did not capture all the real-time bus information and performance as identified. Take corrective actions.

Agency Response: NYCT-DOB and MTABC disagree with this recommendation. However, NYCT-DOB and MTABC agree to improve the review process of the Bus Trek System and will take corrective actions as are necessary. This will be an ongoing process.

Comptroller Recommendation #9: Provide the correct MDBSI to the Committee.

Agency Response: NYCT-DOB and MTABC disagree with this recommendation. The MDBSI indicators reported on the monthly operations report were found to be correct for the audit period covering January 1, 2017 through September 30, 2017. However, a footnote to a chart that graphs the 12-month average was incorrect. This footnote error was corrected prior to the publication of the December 2017 report and the agencies continue to monitor the calculation and reporting of MDBSI results.

Comptroller Recommendation #10: Ensure that quality assurance steps are performed to confirm that the formulas correctly calculate MDBSI.

Agency Response: NYCT-DOB and MTABC already comply with this recommendation. A review of the formulas in the model itself were found to be accurate.

Comptroller Recommendation #11: Make the OTP statistical results public or revise the official listing of the Title VI metrics.

Agency Response: MTABC agrees with this recommendation. The reason why MTABC releases OTP is to fulfill a Federal mandate of Title VI of the Civil Rights Act of 1964 (FTA C4702.IB). MTABC and NYCT-DOB use other metrics that better reflect the customer experience that they publicly report. MTABC will adopt these established metrics and seek to adjust the Title VI requirement to use Wait Assessment.

Comptroller Recommendation #12: Calculate the weekend WA and share the results with the public and MTA Board.

Agency Response: NYCT-DOB and MTABC agree with this recommendation. As discussed in Key Recommendation #4, NYCT-DOB and MTABC agreed to explore the feasibility of adding weekend performance metrics, including weekend wait assessment, to the dashboard. As part of President Byford's Fast Forward plan, NYCT has committed to continue improving its public bus performance dashboard.

Comptroller Recommendations #13: Develop and document proactive corrective action plans/procedures/ guidelines or any combinations that are intended to address conditions

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– such as such as street repaving or construction - that impact WA before they occur.

Agency Response: NYCT-DOB and MTABC agree with this recommendation. NYCT-DOB and MTABC will continue to ensure appropriate documentation of current and future efforts that are used to proactively address factors that affect Wait Assessment by Q1 2020.

We have also addressed the overall comments from the Comptroller that directly related to some of his recommendations.

Comptroller's Comment #1: The MTA claims it has comprehensive and thorough processes to calculate and validate the accuracy of WA, and no further action is required. However, there was no documentation for Transit's process. Additionally, the methodology was developed by a former MTA employee and MTA officials could not recreate the files used to calculate WA statistics. Moreover, the audit determined different processes were used to calculate WA statistics at MTA Bus and Transit (e.g., Transit used a model based on AFC data to calculate WA for its buses, and MTA Bus used a manual process). However, neither Transit OP nor MTA Bus OP officials provided any formal explanation for why they used two different processes.

Agency Response: Wait Assessment is a mature performance indicator that is well documented internally, and its details have been published publicly. A case study which explained the Wait Assessment calculation in detail was submitted to the 2009 Transportation Research Board (TRB) conference. It is still available online: <https://pubsindex.trb.org/view/2009/C/881015> . Moreover, the claim that there are two processes for calculation of Wait Assessment is also incorrect; both MTABC and NYCT-DOB use the same Wait Assessment calculation.

Comptroller's Comment #2: Monthly ridership is based on daily ridership; if daily ridership is calculated incorrectly, monthly ridership will be inaccurate. Moreover, in response to our preliminary findings, the MTA replied, "Operations Planning agrees to adopt the recommendation and by the end of the second quarter of 2019, will complete documentation of the process that includes detailing each step taken to run the model, including the monthly averaging process." We urge the MTA to reconsider its response.

Agency Response: Our statement was that we do not rely on daily ridership for bus scheduling purposes. This does not imply that daily ridership data is incorrect but rather that we have averaging models that lessens the "noise" in daily data. The agreement to the audit recommendation "Document the procedure for creating the daily bus ridership file used for scheduling" meant that by the end of Q2 2019, NYCT Operations Planning would complete documentation of the process that includes detailing each step taken to run the model, the monthly averaging process, procedures and assumptions used for developing boarding and alighting patterns, as well as documentation of model inputs. NYCT Operations Planning has implemented this recommendation and completed the

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documentation.

Comptroller's Comment #3: Logic dictates that, with changes in trends in ridership in New York City as well as recent changes in the strategies of New York City and the MTA regarding bus service, that the MTA would want to consider the most up-to-date data when determining demand for service rather than assuming traditional patterns remain unaffected. Moreover, the use of outdated OMB data and the elapsed time was included in our preliminary findings. Transit's response to our preliminary findings stated, "By the end of the second quarter of 2019, OMB will begin providing cash fare data to Operations Planning monthly on a one-month lag.

Agency Response: NYCT has implemented this recommendation, and OMB provides cash fare data on a one-month lag. MTA does not rely on the referenced "traditional patterns" to determine service demands. As have been outlined in demonstrations, data examples and discussions, such a process is multifaceted. The "Fast Forward" program that includes route realignment in each borough, is partly the result of analyzing current data and trends.

NYCT Road Operations units provide daily real-time adjustments in response to service demands and or the operating environment. As explained, seasonal and other more permanent adjustments do consider a wider range of variables including the use of the aforementioned models. For an operation the size of both agencies, a one-month lag is necessary to collect, verify and analyze data.

Comptroller's Comment #4: We did not use the bus observations to calculate or verify the WA statistic. However, the information captured by Bus Trek at the timing points regarding the departure of the bus is part of the data used to calculate WA, which measures the time between buses, plus 25 percent. Thus, it is essential that the tool used to record the time be accurate and complete. Where MTA officials provided additional information, we adjusted the observations for Queens. However, MTA officials did not provide any documentation to support their statements for the other boroughs. The MTA did agree to review the performance of the Bus Trek system and make upgrades, as necessary.

Agency Response: NYCT-DOB and MTABC agreed to improve the review process of the Bus Trek System but must again reemphasize the intent and use of this system as it pertains to the calculation of WA. It is not used for this purpose and was developed as a real-time tool to assist Road Operations personnel in determining where real-time adjustment to service is needed.

Comptroller's Comment #5: Operations officials agreed with the observation and determined the reports to the Committee from August 2017 to November 2017 were incorrect. It is therefore difficult to understand the basis for MTA officials' disagreement

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with the recommendation, as the data they provided to the Committee was incorrect and they subsequently corrected it.

Agency Response: The disagreement is in the significance of the issue. As noted in our initial response, the MDBSI indicators reported on the Monthly Operations Report were correct for the audit review period covering January 1, 2017 through September 30, 2017. The charts that graph the 12-month average reported on the Monthly Operations Report were also accurate for the audit period. A footnote to the chart that restates several numbers from the Monthly Operations Report had an error that resulted in a discrepancy in the 2017 YTD results. Since accurate results were provided throughout the primary Monthly Operations Report we do not believe that the report was misleading. Furthermore, the issue was discovered and corrected by NYCT staff prior to the publication of the December 2017 year-end report

Conclusion

We have carefully considered your recommendations and subsequent comments and will continue to implement the accepted recommendations.

cc: C. Cipriano
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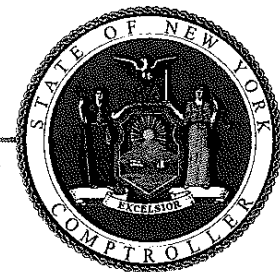
Metropolitan Transportation Authority – New York City Transit and MTA Bus Company

Bus Wait Assessment and Other Performance Indicators

Report 2017-S-54 | May 2019

**OFFICE OF THE NEW YORK STATE COMPTROLLER
Thomas P. DiNapoli, State Comptroller**

Division of State Government Accountability



Audit Highlights

Objectives

To determine whether the Metropolitan Transportation Authority's (MTA) New York City Transit (Transit) and MTA Bus Company (MTA Bus) provide passenger service on all of their bus routes to meet minimum service frequency standards that are reasonable and consider the demand for service and other factors. We also sought to determine whether Transit and MTA Bus record and report accurate statistics on the operation of their buses to both management and the public and, where performance indicators are not met, whether Transit and MTA Bus take corrective actions. The audit covers the period January 1, 2015 to July 5, 2018.

About the Program

The MTA has six constituent agencies, two of which – Transit and MTA Bus – provide bus service within New York City. Transit and MTA Bus report key performance statistics monthly to the MTA Board's Transit and Bus Committee (Committee), and the public can access these statistics on the MTA's website in the monthly Committee meeting books and on the "Transparency, Performance Indicators" menu.

Key bus performance indicators include Wait Assessment (WA) and Mean Distance Between Service Interruptions (MDBSI). WA is the percentage of bus arrivals that occur within 3 minutes of the scheduled interval time during peak periods or within 5 minutes of the scheduled interval time during non-peak hours. Global Positioning System devices on MTA's buses report their location and bus departure time. This data is used by Transit and MTA Bus for multiple purposes and is a factor in calculating WA. Since February 2017, WA is reported monthly to the Committee as a "system" statistic, covering both Transit and MTA Bus, for weekdays only. The MDBSI measures the average distance traveled by a bus before an interruption in service occurs. MTA Bus also monitors on-time performance: the requirement that each bus trip of a particular route must not be earlier than 1 minute before or not be later than 5 minutes after its scheduled departure time at each of its assessed (terminal or en route) time points.

Schedulers at both Transit and MTA Bus are responsible for reviewing the need for bus service and aim to schedule service that meets the demand within the official service guidelines. MTA Road Operations dispatching staff are responsible for overseeing bus service of both Transit and MTA Bus, making adjustments in service based on field conditions and addressing operational performance. (Road Operations is a unit within the Department of Buses, a division of Transit, but with responsibility for overseeing both Transit and MTA Bus operations.)

Key Findings

- Transit's Service Guidelines Manual (Guidelines) was issued in 2010 and revised in 2013. The Guidelines contain Transit and MTA Bus minimum service frequency standards; however, we found that the Guidelines are not always met. Further, there was insufficient documentation to determine if scheduled service was reasonable. In the absence of documentation to support how the number of buses placed into service was determined,

there is a risk that the number of buses may have been inappropriate to meet customer needs.

- While MTA Bus relies on Traffic Checkers to gather bus ridership information, Transit relies on an advanced computer model based on automated fare card data to determine demand. Demand, in turn, is the basis of determining service under the Guidelines. The computer model relies on numerous assumptions. For instance, because fare card data does not include where the rider boarded and exited the bus, the model makes assumptions as to boarding and exiting points. Additionally, because even more limited information is available on cash and non-paying customers, trip information for these groups is created based on assumptions made by Transit's Division of Operations Planning. The computer model's algorithm was not provided and its assumptions are not documented; therefore, the accuracy of the model's logic cannot be verified. According to Transit officials, they use Traffic Checkers to validate the information from the model. However, traffic checks were not done for 77 of 209 Transit routes (37 percent) during the period under review. Determinations made by Schedulers to provide more or less service than the official service Guidelines are not documented.
- Transit and MTA Bus record and report statistics on the operation of their buses to both management and the public; however, we question whether WA was always accurate. For the first six months of 2015, the MTA-reported WA was 75.5 percent, but we calculated 80.3 percent – a 4.8 percent difference. For September 2017, the MTA reported 76 percent WA, but we calculated 80.4 percent – a 4.4 percent difference. While in this case the number we calculated was higher, the month-to-month improvement was lower. Consistent and accurate calculation of performance metrics is very important over time in helping to understand whether on-time performance is improving. Although Road Operations officials told us they take corrective action to address WA declines, and they provided documents of the day-to-day actions taken to address issues that can impact WA during service, there was no support for actions taken to specifically address underlying causation. This is of concern, as during the period March 2016 to March 2017, Transit calculated WA declines of 5.9 percent in the Bronx and 4.4 percent in Brooklyn.
- Transit and MTA Bus calculate WA for weekends, but do not publish the statistic; ridership on the weekends is approximately 2.2 million.
- While the MTA has methods to address WA concerns, the plans and procedures it describes are reactive, not proactive, in addressing underlying causes for not meeting WA goals.

Key Recommendations

- Ensure the WA statistics reported to the Committee and the public are accurate.
- Document the procedure for creating the daily bus ridership file used for scheduling.

-
- Analyze the two methodologies used to assess demand for service and document the results that show the best outcome for the organization and customers.
 - Calculate the weekend WA and share the results with the Committee and the public.
 - Develop and document proactive corrective action plans and procedures to improve WA performance.



**Office of the New York State Comptroller
Division of State Government Accountability**

May 7, 2019

Mr. Patrick J. Foye
Chairman
Metropolitan Transportation Authority
2 Broadway
New York, NY 10004

Dear Mr. Foye:

The Office of the State Comptroller is committed to helping State agencies, public authorities, and local government agencies manage their resources efficiently and effectively. By so doing, it provides accountability for tax dollars spent to support government operations. The Comptroller oversees the fiscal affairs of State agencies, public authorities, and local government agencies, as well as their compliance with relevant statutes and their observance of good business practices. This fiscal oversight is accomplished, in part, through our audits, which identify opportunities for improving operations. Audits can also identify strategies for reducing costs and strengthening controls that are intended to safeguard assets.

Following is a report of our audit of Metropolitan Transportation Authority – New York City Transit and MTA Bus Company, entitled *Bus Wait Assessment and Other Performance Indicators*. This audit was performed pursuant to the State Comptroller's authority under Article X, Section 5 of the State Constitution and Section 2803 of the Public Authorities Law.

This audit's results and recommendations are resources for you to use in effectively managing your operations and in meeting the expectations of taxpayers. If you have any questions about this report, please feel free to contact us.

Respectfully submitted,

Division of State Government Accountability

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Glossary of Terms

Abbreviation	Description	Identifier
AFC	Automated Fare Collection	<i>Key Term</i>
Committee	MTA Board's Transit and Bus Committee	<i>Key Term</i>
Form	Bus Ride Check Form	<i>Key Term</i>
GPS	Global Positioning System	<i>Key Term</i>
Guidelines	Service Guidelines Manual	<i>Key Term</i>
MDBSI	Mean Distance Between Service Interruptions	<i>Key Term</i>
MTA	Metropolitan Transportation Authority	<i>Auditee</i>
MTA Bus	MTA Bus Company	<i>Constituent Agency</i>
OMB	Office of Management and Budget	<i>Department</i>
OP	Operations Planning	<i>Department</i>
ORCA	Operations Research Computational Analysis	<i>Key Term</i>
OTP	On-Time Performance	<i>Key Term</i>
SBS	Select Bus Service	<i>Key Term</i>
Transit	New York City Transit	<i>Constituent Agency</i>
WA	Wait Assessment	<i>Key Term</i>

Background

The Metropolitan Transportation Authority (MTA) is a public authority created by Article 5, Title 11 of the Public Authorities Law. The MTA has six constituent agencies, two of which provide bus service within New York City: New York City Transit (Transit) and the MTA Bus Company (MTA Bus). Together, Transit and MTA Bus operate the nation's largest bus fleet. Transit operates 4,451 buses on 238 local, limited, and express bus routes (in all five boroughs) and MTA Bus operates 1,255 buses on 82 local and limited (Queens and Brooklyn) and express bus routes between Manhattan and Brooklyn, Queens, and the Bronx. Transit and MTA Bus report key performance statistics monthly to the MTA Board's Transit and Bus Committee (Committee), and the public can access these statistics on the MTA's website.

The MTA maintains several key performance indicators covering bus operations, including Wait Assessment (WA), the Mean Distance Between Service Interruptions (MDBSI), and On-Time Performance (OTP). The MDBSI measures the average distance traveled by a bus before an interruption in service occurs. OTP measures whether a bus is on time according to the bus' schedule with a leeway of 1 minute before and 5 minutes after the scheduled departure time at each assessed time point (bus stops along a route selected for recording time). WA is the percentage of bus arrivals that occur within 3 minutes of the scheduled interval time during peak periods or within 5 minutes of the scheduled interval time during non-peak hours. WA measures whether scheduled headways – the time intervals between two buses traveling in the same direction on the same route – are maintained during the hours of most frequent service. A decline or increase of less than 1 percent is considered statistically unchanged. Declines greater than 4 percent are a significant change.

The MTA has affixed Global Positioning System (GPS) devices to its buses to electronically capture bus departure times and locations to document all bus departure times, which is one of the components used to calculate WA. WA is used to improve bus service by adjusting routes and/or the number of buses in accordance with the WA results. Furthermore, the location of each bus can be displayed for Dispatchers on the MTA's Bus Trek system so they can actively manage bus service. Both Transit and MTA Bus employ Schedulers who review the demand for bus service and who aim to schedule service that meets the demand within the service guidelines. The MTA's Road Operations dispatching staff is responsible for overseeing bus service of both Transit and MTA Bus, making adjustments in service based on field conditions and addressing operational performance. Demand (ridership) is determined based on a computer algorithm for Transit and by Traffic Checkers for MTA Bus.

Audit Findings and Recommendations

Transit's Service Guidelines Manual (Guidelines) was issued in 2010 and revised in 2013. The Guidelines contain Transit and MTA Bus minimum service frequency standards; however, we found that, on multiple occasions within our sample, service did not meet the minimum Guidelines. Additionally, even when standards were met, the Guidelines allowed wide discretion in service levels, and the basis for differences in the frequency of service was not clearly documented. Therefore, the reasonableness of these decisions cannot readily be determined. For example, the Guidelines for midday (9:01 a.m. to 3:59 p.m.) express bus service call for between 20 and 50 passengers per bus per hour. Thus, if there were 200 riders in an hour, the Scheduler could provide anywhere from 4 to 10 buses and meet the Guideline requirements. However, with no supporting documentation and no written procedures to explain any deviation from the Guidelines, it is unclear how Schedulers determine, within that range, what level of service to provide. Moreover, the Guidelines base service level on demand, which is determined by Transit using computer modeling. This model is heavily reliant on assumptions that are not documented and whose accuracy is unclear. Based on all of these factors, there is a significant risk for both Transit and MTA Bus that the number of buses placed in service may not match need.

Additionally, during the period March 2016 to March 2017, WA declined 5.9 percent in the Bronx and 4.4 percent in Brooklyn. Both declines are considered significant changes. In response to our request for information about actions taken, the MTA provided a memorandum dated March 2, 2018 detailing corrective action steps; however, we found that most of the actions taken were a reaction to events that occurred on a specific date and not an overall plan of action that would determine the cause of the decline and provide a course of action to avoid recurrences or stabilize service. Additionally, when we recalculated WA and MDBSI, we found significant discrepancies – both positive and negative – between what the MTA reported and our recalculations.

Guidelines and Service

The goals of Transit's Guidelines are to develop and maintain comprehensive, cost-efficient transit service that meets the needs of those who live, work, and travel in New York City, and to provide a structure for consistent and fair evaluation of existing and proposed services by determining when, where, and how frequently service should be offered. The Guidelines are applied to both Transit and MTA Bus.

Demand for Service – Transit

Under the Guidelines, service is linked to demand. To determine demand, Transit's Operations Planning (OP) unit designed a model/process to determine daily ridership calculations for each Transit bus and route. Transit began using this model in 2015. The model uses data from the Automated Fare Collection system (AFC). The AFC records data such as the card number, date, time, route, and bus number or station booth for any MetroCard swipe either on a bus or at a turnstile.

Our analysis of OP's model/process indicates several assumptions are made as part of the process regarding riders' use of the service. It is important that those assumptions be documented, as faulty assumptions could result in inappropriate calculations of demand, potentially affecting service. The most critical of these assumptions covers the stops at which each rider boarded and exited the bus, as the AFC system cannot determine exactly where a passenger boards or exits. These assumptions include:

- Swipes are recorded based on a 6-minute interval – not exact time – so that the origination point of a rider cannot be determined by the time of the swipe. OP thus randomly assigns each rider to an origin stop that occurred within the 6-minute interval that the rider boarded the bus. If a rider's previous swipe is at a subway station or Port Authority Trans-Hudson station, the rider will be assigned to the bus stop closest to that station.
- When a rider has only one trip for the day – OP considers them to be unknown riders – OP will assign the rider to a destination using a two-step "probability function." The function considers the proportion of people who are known to get off the bus at the remaining bus stops and assigns riders to one of these stops.
- OP assumes a rider returns to his/her origin on the last trip of the day (if there is a second or more swipes during the same 24-hour period). However, if the last trip is illogical (not a possible return trip to origin on that route), the rider's destination is assigned based on the proportion of people traveling that route.
- Non-paying riders are estimated by an annual fare-evader survey. These riders include fare evaders, employees who did not swipe, and children who are not required to pay, as well as others. OP calculates a one-year survey percentage and a three-year survey percentage of the riding population these groups represent for each route, then compares the two survey results. If the one- and three-year results are similar, OP

uses the one-year results (provided the sample size is large enough). If the results are "significantly different," the three-year results are used. Otherwise, the average of the two surveys is used.

- OP adds a percentage of riders as cash fares, based on the information obtained from bus fare boxes and summarized by Transit's Office of Management and Budget (OMB). OMB provides this information on a multiple-month lag, and OP will use the same percentage for several months.

The mechanism for adding the cash and non-paying rider trips randomly duplicates the trip pattern of a fare-paying customer.

We reviewed the ridership file for October 19, 2017 that was generated by OP and used to create the bus schedules for the winter pick (three or four times a year, employees select the work schedule and route based on seniority). We found that of the 2,676,167 entries, 483,362 (18 percent) of the trips were generated based entirely on OP's model.

As an additional control, OP informed us that they use Traffic Checkers to validate the ridership from the model. Traffic Checkers ride buses on a sample basis to count passengers as they board and exit the bus. According to OP, Traffic Checkers conduct ridership counts on all high-volume routes once every two years and on the remaining routes once every four years. To determine the completeness of Traffic Checkers' ridership counts, we examined the routes that they counted for the period January 16, 2015 to December 18, 2017. During that period, Transit had 209 bus routes. We found that the Traffic Checkers did not count 77 routes (37 percent). We requested documentation for the 77 routes without counts. However, Transit has not provided the information. Consequently, there is less assurance that the ridership generated by the model is an accurate reflection of the actual ridership.

OMB generates a listing for each route of the number of cash customers and AFC customers. OP determines the percentage of riders using cash for each route based on this data [Cash Riders/(Cash Riders + AFC Riders)]. OP also determines the number of non-paying riders (e.g., children under 44 inches, employees who did not swipe, and fare evaders) for each route and also develops a percentage factor for these riders. These two percentage factors are added together, and the process increases the number of riders (by randomly duplicating the travel patterns of AFC riders) to account for this percentage of cash and non-paying riders.

For example, if cash and non-paying customers account for 25 percent of the trips on a particular route, the model will take every third MetroCard rider and duplicate the entry, using the same origin and destination pairs as the MetroCard rider. The resulting file will be composed of 75 percent AFC customers and 25 percent cash and non-paying riders.

For each day, the resulting ridership data file is uploaded to OP's Data, Research, and Development team's database and viewed through Operations Research Computational Analysis (ORCA) to determine peak load points to schedule buses. Another computer program uses these data to develop reports that show the maximum load point (bus stop where the highest number of passengers are on a bus) for each direction on a route, during specific time intervals (one-hour intervals off peak, half-hour intervals peak). Schedulers, in turn, use these reports (called Figure 1/Figure 2 reports) to ensure sufficient bus service is provided to carry the peak number of passengers for each time interval, in accordance with the Guidelines.

The Guidelines establish the minimum service frequencies (known as policy headways) for bus service. The policy headways for service may vary by time of day, day of week, type of service (local/express), and type of bus (coach, local bus, and articulated bus). To accommodate higher ridership levels, routes may need to be operated at shorter intervals than the policy headways require. When this occurs, Schedulers use Loading Guidelines to match the number of buses to the number of riders using a particular route. The calculation is made separately for each direction of travel. There are no written policies or procedures for developing the ridership process/model used by OP in determining daily bus ridership for scheduling purposes. In the absence of written procedures, there is a risk that the process may not be implemented as expected. Moreover, as there is a multiple-month lag in the data being provided by OMB, the data used by OP in its model is several months old, potentially causing its Schedulers to make inaccurate adjustments to the number of buses placed into service, as ridership can vary over time. For example, we compared ridership for October 2017 to April 2017 and found 202,307 more riders in October than in April. If we were to use a 40-passenger load per bus, then the model using April data would recommend 5,058 fewer buses than what was actually required (202,307/40), potentially exacerbating overcrowding on buses.

To determine whether the number of scheduled buses met the minimum standards, we examined a sample of 15 bus routes, including 732 time intervals for local bus trips (express buses were not included in the population). Our examination included reviewing the recommended number of buses from the "Summary of Ridership and Average Passengers Per Trip" in both directions – east and west bound – and comparing them to the Guidelines.

We found that the scheduled number of buses did not always comply with the minimum standards in the Guidelines. Our review of local buses found 66 instances – 29 peak and 37 off peak – where the minimum Guidelines were not met. Moreover, in some cases, more buses were scheduled than the

Guidelines required. In our sample, we found 323 such instances, including 72 peak and 251 off peak. It was difficult to determine how these decisions were made, as no written guidelines or procedures exist and the basis of the decisions was not documented. In response to our preliminary findings, OP officials agreed with the exceptions and indicated they will implement the following three recommendations going forward.

Recommendations

1. Document the procedure for creating the daily bus ridership file used for scheduling.
2. Document and maintain a list of the inputs and variables used to operate the model and develop the results.
3. Require OMB to provide the information in a timely manner.

Demand for Service – MTA Bus

Unlike Transit, MTA Bus uses Traffic Checkers rather than a computer model to assess ridership demand. MTA Bus officials believe it provides more accurate ridership results because fewer assumptions are involved. Each of the 82 routes is counted at least once over a four-year period. Each count requires two days of observations per route.

Traffic Checkers manually document the passenger count on a Bus Ride Check Form (Form), which includes all the stops for the particular bus route being counted. Traffic Checkers record the number of passengers getting on and off the bus at every stop, keeping a running total of remaining passengers. MTA Bus OP scans the completed Forms and converts them into Excel spreadsheets. For each route observed, and for each direction, the spreadsheets are populated with the results of the count, the averages for the two days, the calculated maximum load point,¹ the number of buses observed, and the number needed per the Guidelines. This data is used by Schedulers, who prepare the Figure 1 and 2 reports by matching the maximum load point to the MTA's Loading Guidelines, and by adding the number of buses they determine are needed based on their knowledge and experience.

However, our review of MTA Bus' methodology raises certain concerns:

¹ The maximum of a seated load on express buses at all times, up to a maximum of a seated load on local buses during off-peak periods and up to a maximum of approximately 50 percent standees in addition to a seated load on local buses during peak. Express buses seat 55. Local buses vary; a 40-foot bus peak seated load ranges from 36 to 48, and a 65-foot articulated bus peak seated load ranges from 70 to 85.

-
- Although MTA Bus conducts traffic checks on all 82 bus routes, its analysis is based on two days of observation in a month for each route at a minimum of once every four years. These limited observations may not be representative of the annual ridership.
 - The maximum load point is derived from these observations. For the most recent cycle, January 2013 to December 2016, MTA Bus traffic-checked all 82 routes, ranging from one to eight times. Schedulers aim to provide the number of buses suggested by the Loading Guidelines. The Schedulers may adjust service based on factors such as their knowledge of the route; however, MTA Bus does not have written procedures on how such adjustments should be made.

To determine whether the number of scheduled buses met the minimum standards, we examined a sample of eight bus routes, including 181 time intervals for local bus trips and 126 for express buses. Our examination included reviewing the Traffic Checkers' tally sheets and comparing them to the Figure 1 and 2 reports and to the Guidelines for both local and express bus routes.

We found that the scheduled number of buses did not always comply with the minimum standards. Our review of local buses found in 26 instances – 11 peak and 15 off peak – the minimum standards were not met. In 89 instances – including 37 peak and 52 off peak – more buses were scheduled than the Guidelines required; however, it was unclear why, as the rationale for the decision was not documented. The number of buses provided for the 126 express bus intervals reviewed showed that, in 52 instances, more buses were scheduled than the Guidelines required; no interval had fewer buses scheduled. We presented six of the eight routes examined to MTA Bus officials. Although they proposed various explanations for the differences, they did not provide any documentation to support their explanations.

In the absence of documentation of the procedures used to determine the actual number of buses, there is a risk that the methodology may not be consistently applied and the actual number of buses in service may be inappropriate for the needs of the customer.

Recommendations

4. Document the procedure for deriving the Figure 1 and 2 reports, including the maximum load point.
5. Require Schedulers to record their work to explain which passenger level was selected and where the recommended service is not in compliance with the Guidelines.

-
- Analyze the two methodologies used by Transit and MTA Bus and document the results that show the best outcome for the organization and its customers.

WA Calculation

The GPS on each bus sends data to the MTA's data center on bus location and route every 30 seconds. This data is provided to the MTA's Bus Trek system, which electronically tracks the departure times of all buses. The bus location information is also uploaded to ORCA. ORCA includes information such as the departure times of all buses, bus and train schedules, and AFC data. OP calculates WA using the bus location data along with bus schedule information in ORCA.

Weekday WA percentages are reported to the Committee as well as the public. In 2015 and 2016, the MTA reported WA to the Committee as six-month averages on a select 42 high-volume routes. In 2017, the MTA began reporting WA on all bus routes.

There are no written procedures to explain how the MTA calculates its WA percentage and thus, there is little assurance that the calculation is performed in the same manner month to month. Per MTA officials, their calculation is based on intervals; failing WA are scheduled intervals in which no bus arrives.

We calculated the MTA's WA for the six-month period January–June 2015, and the months September, October, and November 2017 based on the written definition of WA. (We did not calculate the WA for 2016 as we were unable to obtain complete files from the MTA for this period.) Our recalculation found discrepancies with what the MTA reported publicly (see following table).

Month/Year	WA per Audit (percent)	MTA Reported WA (percent)	Difference (percent)
January–June 2015	80.3%	75.5%	4.8%
September 2017	80.4%	76.0%	4.4%
October 2017	80.5%	76.5%	4.0%
November 2017	80.8%	76.5%	4.3%

Recommendation

- Ensure WA statistics reported to the Committee and to the public are accurate, based on the published definition.

Verification of WA Data

GPS bus time and location data are referred to as “raw data,” and they are part of the information used by Transit OP to calculate WA. To determine whether the data was accurate, we observed 1,682 bus departures in Queens, Brooklyn, Manhattan, and the Bronx for 33 bus routes during peak and off-peak hours on various dates from November 2017 to July 2018. We compared this data to information within OP’s system.

We identified 441 departures on 33 routes for which the MTA could not provide records that fully matched our observations: in 386 instances, there were no records; in 55 other instances, the MTA recorded more departures than we observed. The 441 departures include: 181 from Queens, 128 from Brooklyn, 112 from the Bronx, and 20 from Manhattan.

Responding to our preliminary findings based on the Queens observations, MTA officials said that the auditors’ work focused on the differences in a single support tool (Bus Trek), a GPS-based system that is subject to transmission and reception failures and is also somewhat dependent on human/manual interaction that can also introduce errors. They claimed that data from Bus Trek captured the correct information and provided a Bus Trek report as support. However, it was incomplete. While we made some changes based on this information, the vast majority of differences were not resolved. MTA officials claimed that the raw data feed from Bus Trek would support their claims. However, despite being provided two additional meetings solely for the purpose of providing this information, the raw data was not provided. MTA officials state that they still needed to validate the information.

Recommendation

8. Examine the Bus Trek system and determine why it did not capture all the real-time bus information and performance as identified. Take corrective actions.

Mean Distance Between Service Interruptions

Based on statements by MTA Road Operations officials, MDBSI has been reported to the Committee for at least 20 years. To determine whether the MTA’s MDBSI reports are accurate, we recalculated the MDBSI for the period from January 1, 2017–September 30, 2017 and compared it to the MTA’s 2017 MDBSI calculation for the same period. For the period, we calculated the MDBSI to be 2,815. However, the MTA reported 2,662, a difference of 153. When we pointed out the discrepancy, MTA Road Operations officials agreed that the MDBSI reported to the Committee in November 2017 was

inaccurate as was the MDBSI year-to-date formula from August 2017 to November 2017, and explained that it was due to an error in their Excel spreadsheet. They corrected the error in the formula as of the December 2017 report. However, we also determined that, in some instances, test data was improperly included in the data.

Recommendations

9. Provide the corrected MDBSI to the Committee.
10. Ensure that quality assurance steps are performed to confirm that the formulas correctly calculate MDBSI.

On-Time Performance

According to the System-wide Service Standards, MTA Bus has defined OTP as follows: "On-Time Performance assessment require that each bus trip of a particular route must not be earlier than one minute before or not be later than five minutes after its scheduled departure time at each of its assessed (terminal or en route) time points."

The MTA indicated that OTP is part of its Title VI Civil Rights statistical reporting. However, we found the MTA does not publicly disclose OTP statistics for bus service. We therefore attempted to calculate OTP based on our observations and using the MTA Bus definition. We observed 198 bus departure times and compared them to the MTA's bus schedule. Of the 198 observations, we found that 52 buses (26 percent) did not depart on time. Based on responses from MTA officials, we learned that delays could be attributed to a number of factors, such as inclement weather, road repairs, accidents, mechanical failures, and passengers who can keep the bus from departing on time because they need additional time to get on and off the bus.

Recommendation

11. Make the OTP statistical results public or revise the official listing of Title VI metrics.

Weekend WA

In addition to not publishing OTP, our review of publicly available information also found that the MTA has not published WA for Saturdays, Sundays, and holidays. For the 2016 year, the MTA served 2.2 million passengers during the weekends. MTA officials advised us that they only use the weekend WA internally based on their policy. However, MTA officials agreed that the

information should be publicly available. They explained that they expanded WA in 2017 from a semi-annual report of 42 routes to a weekday and monthly report of all routes. MTA officials said that they are currently evaluating approaches for further improvement, and our recommendation will be evaluated in this context.

Recommendation

12. Calculate the weekend WA and share the results with the public and the MTA Board.

Corrective Action to Improve WA

For 2015 and 2016, the MTA's WA goal was 81.4 percent, while the actual WA was 76.15 percent and 76.90 percent, respectively. Additionally, for the period March 2016 to March 2017, the MTA reported to its Board WA declines of 5.9 percent and 4.4 percent for the Bronx and Brooklyn, respectively, which are considered to be significant.

When asked for documentation to support the corrective action taken to address WA and its failure to meet the goal, Road Operations provided a memo dated March 2, 2018, outlining the steps/activities it has taken to improve WA performance and to improve the declining performance of bus routes.

The memo was prepared in response to the auditors' request. However, the memo appears only to address actions for Dispatchers and Bus Operators to take when service is interrupted, and not an overall strategy to deal with root causes of these problems. For example, these steps could include bus lane enforcement, training workshops for Dispatchers and Managers, bus stop relocation, review of schedules, and route observations. In addition, Road Operations provided a copy of the Road Control Training Manual, which describes steps that can be taken by Dispatchers and Bus Operators to restore bus service to the scheduled time.

Road Operations also directed us to Transit OP officials to validate that Road Operations restructured several bus routes and implemented Select Bus Service (SBS) to improve WA. We therefore examined the before and after WA results for the M5 bus route restructuring. OP reported that the restructuring improved WA by 1.3 percent on the M5. However, we determined that the restructurings were in Manhattan, whereas the WA declines were in Brooklyn and the Bronx. We also found that the SBS documentation showed that the goals were to increase bus speed and street safety, but did not reference any improvement to WA. We also noted that in

the July 2018 Committee report, June 2018 WA was reported as 77.2 percent system-wide. This is statistically unchanged from 2016.

Based on our discussions with Road Operations officials, we concluded that they lacked a written corrective action plan/procedures to address WA declines or to resolve unmet WA goals. Moreover, the methods described by them to deal with WA were reactive, not proactive, in addressing underlying causes for not meeting WA goals. Road Operations officials did not provide any documentation to support that they identified the root cause of the decline in WA.

By not improving WA to meet its goals, the MTA overlooked a key performance indicator that is underperforming. Therefore, any improvement to the affected bus service could be delayed.

Recommendation

13. Develop and document proactive corrective action plans/procedures/guidelines or any combinations that are intended to address conditions – such as street repaving or construction – that impact WA before they occur.

Audit Scope, Objectives, and Methodology

Our audit objectives were to determine whether MTA's Transit and MTA Bus provide passenger service on all of their bus routes to meet minimum service frequency standards that are reasonable and consider the demand for service and other factors and whether Transit and MTA Bus record and report accurate statistics on the operation of their buses to both management and the public and, where performance indicators are not met, whether Transit and MTA Bus take corrective actions. The audit covered the period January 1, 2015 to July 5, 2018.

To accomplish our objectives and to evaluate relevant internal controls, we observed bus departure times at selected time points as a basis for the WA and OTP calculations. We also met with MTA officials to gain an understanding of their WA calculation methodology and processes to monitor bus service. We calculated the WA and observed bus departures from selected time points as a basis for the WA calculation. We also observed bus arrivals and departures as a basis for our OTP analysis and compared them with records provided by the MTA. Finally, we calculated the MDBSI, comparing the results to the MTA's calculations.

We used both statistical and judgmental sampling methodologies to accomplish the audit. We selected a statistical sample of 335 road calls from a population of 41,240 to calculate the MDBSI. The confidence level was 95 percent, and the precision and error rate were 5 percent. To conduct WA and OTP bus observations, we selected two judgmental samples. For one, we selected the busiest route in each borough for a sample size of 5 bus routes from a population of 42. For the other, we selected a sample of 35 bus routes from a population of 325. The sample included the busiest route in each borough plus 10 percent of the bus routes for each type of service (express, select bus service, and limited bus service). Our samples were not designed to be projected to the entire population.

Statutory Requirements

Authority

We conducted our audit in accordance with generally accepted government auditing standards. These standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained during our audit provides a reasonable basis for our findings and conclusions based on our audit objectives.

In addition to being the State Auditor, the Comptroller performs certain other constitutionally and statutorily mandated duties as the chief fiscal officer of New York State. These include operating the State's accounting system; preparing the State's financial statements; and approving State contracts, refunds, and other payments. In addition, the Comptroller appoints members to certain boards, commissions, and public authorities, some of whom have minority voting rights. These duties may be considered management functions for purposes of evaluating organizational independence under generally accepted government auditing standards. In our opinion, these management functions do not affect our ability to conduct independent audits of program performance.

This audit was performed pursuant to the State Comptroller's authority under Article X, Section 5 of the State Constitution and Section 2803 of the Public Authorities Law.

Reporting Requirements

We provided a draft copy of this report to MTA officials for their review and formal comment. Their comments were considered in preparing this final report and are included in their entirety at the end of the report.

In their response, MTA officials generally agreed with the audit recommendations and indicated the action they have taken or will take to implement them. However, MTA officials disagreed with our finding that the WA statistics were not accurate and that certain statistics were not used in the manner described in the report. We maintain our position that the report accurately reflects the process followed by Transit and MTA Bus officials. Our response to this comment is included in the report's State Comptroller's Comments.

Within 90 days of the release of our final report, as required by Section 170 of the Executive Law, the Chairman of the Metropolitan Transportation Authority shall report to the Governor, the State Comptroller, and the leaders of the Legislature and fiscal committees, advising what steps were

taken to implement the recommendations contained herein, and if the recommendations were not implemented, the reasons why.

Agency Comments

2 Broadway
New York, NY 10004
212 878-7000 Tel

Patrick J. Foye
Chairman and Chief Executive Officer



Metropolitan Transportation Authority

State of New York

April 12, 2019

Ms. Carmen Maldonado
Audit Director
The Office of the State Comptroller
Division of State Government Accountability
59 Maiden Lane, 21st Floor
New York, NY 10038

**Re: Draft Report #2017-S-54 (New York City Transit and MTA Bus Company:
Bus Wait Assessment and Other Performance Indicators)**

Dear Ms. Maldonado:

This is in reply to your letter requesting a response to the above-referenced draft report.

I have attached for your information the comments of Andy Byford, President, MTA NYC Transit, and Darryl C. Irick, President, MTA Bus Company which address this report.

Sincerely,

A handwritten signature in black ink that reads 'Patrick J. Foye'.

Patrick J. Foye
Chairman and Chief Executive Officer

c: Veronique Hakim, MTA Managing Director
Michael J. Fucilli, Auditor General, MTA Audit Services

The agencies of the MTA

MTA New York City Transit
MTA Long Island Rail Road

MTA Metro-North Railroad
MTA Bridges and Tunnels

MTA Capital Construction
MTA Bus Company

Memorandum

Date April 10, 2019
To Patrick Foye, Chairman, Metropolitan Transportation Authority
From Andy Byford, President, MTA New York City Transit
Darryl C. Irick, President, MTA Bus
Re New York State Comptroller's Request for Response to the Audit Report
"Bus Wait Assessment and Other Performance Indicators" 2017-S-54

New York City Transit and MTA Bus Company have reviewed the Office of the State Comptroller's Draft Audit Report on Bus Wait Assessment and Other Performance Indicators (2017-S-54).

Below is our response to the Office of State Comptroller's draft audit recommendations.

Response to Key Recommendations

Comptroller Key Recommendation 1: Ensure the WA statistics reported to the Committee and the public are accurate.

MTA Bus already complies with this recommendation. NYCT already has in place comprehensive and thorough processes to calculate and validate the accuracy of Wait Assessment. This recommendation is implemented and no further action is required on this recommendation.

* Comment 1

Comptroller Key Recommendation 2: Document the procedure for creating the daily bus ridership file used for scheduling.

NYCT disagrees with this recommendation. NYCT does not rely on daily ridership for bus scheduling purposes; rather, schedule adjustments are based on monthly ridership averages that better adjust for surges that might occur in daily data.

* Comment 2

Comptroller Key Recommendation 3: Analyze the two methodologies used to assess demand for service and document the results that show the best outcome for the organization and the customers.

NYCT and MTA Bus agree with this recommendation. A joint review is in process and documentation will be established to support a decision by Q12020.

Comptroller Key Recommendation 4: Calculate the weekend WA and share the results with the Committee and the public.

NYCT and MTA Bus agree with this recommendation. As part of NYCT's Fast Forward plan, NYCT has committed to continue improving its public bus performance dashboard. We will explore the feasibility of adding weekend performance metrics, including weekend wait assessment, to the dashboard.

Comptroller Key Recommendation 5: Develop and document proactive corrective action plans and procedures to improve WA performance.

NYCT and MTA Bus agree with this recommendation. NYCT and MTA Bus Company will continue to ensure full documentation of current and future efforts, such as working with NYCDOT to proactively address road construction by developing bus detours, working with NYPD on bus lane enforcement, and routinely reviewing bus routes to look for inefficiencies, and will proactively address Wait Assessment improvement by Q12020.

The remainder of this letter addresses the recommendations in the main audit report body.

Response to Demand for Service - Transit

Regarding the OSC's assessment that the use of old data will lead to an inaccurate number of scheduled buses due to changes in ridership over time: this would only be true if we were using data that was several *years*, not *months*, old. The most recent data isn't necessarily the best data to use, due to typical seasonal variations. The long-term changes in ridership to which OSC is referring are typically not visible on a timescale of a few months, because they are generally smaller than the normal seasonal variations. As standard practice, Operations Planning only uses May or October data to develop schedules for fall, winter, and spring service. This is because May and October are high-ridership months, and therefore ensures that we schedule enough service for the busiest times of year. (Summer schedules are developed separately using only summer ridership data, as summers have notably different ridership patterns.)

*** Comment 3**

Regarding the differences the OSC noted when comparing April and October 2017 data: for the reasons noted above, we do not use April ridership data for scheduling purposes. In addition, it is important to note that schedules are based on the number of passengers on buses leaving the peak load point, on a route, direction, and time band level, and not overall ridership figures.

Response to Recommendations:

1. *Document the procedure for creating the daily bus ridership file used for scheduling.*

NYCT and MTA Bus disagree with this recommendation. NYCT does not rely on daily ridership for bus scheduling purposes; rather, schedule adjustments are based on monthly ridership averages. Nevertheless, Operations Planning agrees to adopt

*** Comment 1**

the recommendation, by the end of the second quarter of 2019, will complete documentation of the process that includes detailing each step taken to run the model, including the monthly averaging process and the procedures and assumptions used for developing boarding and alighting patterns, as well as documentation of model inputs (discussed below).

2. *Document and maintain a list of the inputs and variables used to operate the model and develop the results.*

NYCT and MTA Bus agree with this recommendation. As part of the model procedure documentation discussed above, NYCT agrees to adopt this recommendation. By the end of 2019Q2, NYCT will update bus ridership model data sources documentation, including inputs (i.e., AFC, schedules, bus GPS tracking, fare evasion and cash fare payment data). This documentation will include assumptions and methodologies used to validate and calibrate the model.

3. *Require OMB provide the information in a timely manner.*

NYCT and MTA Bus agree with this recommendation. By the end of the second quarter of 2019, OMB will provide cash fare data to Operations Planning monthly on a one-month lag.

Response to Demand for Service – MTA Bus

Response to recommendations:

4. *Document the procedure for deriving the Figure 1 and 2 reports, including the maximum load point.*

MTA Bus agrees to a joint review with NYCT of the documentation procedures used to prepare the reports and to assess ridership demands.

5. *Require Schedulers to record their work to explain which passenger level was scheduled and where the recommended service is not in compliance with the Guidelines.*

MTA Bus agrees with this recommendation. MTA Bus will include this in the overall documentation and review of procedures as noted above. Due to the dynamic nature of service and ridership, individual observations may vary from observed averages.

6. *Analyze the two methodologies used by Transit and MTA Bus and document the results that show the best outcome for the organization and its customers.*

MTA Bus agrees with this recommendation. This joint review is in process and documentation will be established to support a decision by the Q12020.

Response to Wait Assessment Calculation

Regarding the audit finding that there is no written procedure to explain how the MTA calculated the Wait Assessment percentage, NYCT and MTA Bus disagree with this finding. Wait Assessment is a mature, well documented performance indicator which have been published publicly.¹

The data availability and the speed in which NYCT receives the required data have improved; additionally, the calculation has been automated.

Response to recommendations:

7. Ensure WA statistics reported to the Committee and to the public are accurate, based on the published definition.

NYCT and MTA Bus disagree with this recommendation. NYCT and MTA Bus Company already have in place comprehensive processes to calculate and validate the accuracy of Wait Assessment. No further action is required on this recommendation

* Comment 1

Response to Verification of Wait Assessment Data

NYCT and MTA Bus disagree with OSC's methodology used for data verification. OSC compared processed data to their raw observations. There are many legitimate reasons why records would not be included in the processed data. For example, OSC made observations at non-timepoints, and the processed data does not include non-timepoint data, since Wait Assessment is not calculated at these stops. NYCT provided processed data requested by the OSC to support verification of Wait Assessment calculations; however, the processed data is not suitable for comparison to raw observations.

Response to Recommendations:

8. Examine the Bus Trek system and determine why it did not capture all of the real-time bus information and performance as identified. Take corrective actions.

NYCT and MTA Bus disagree with this recommendation. The audit findings mainly focused on the differences between a single support tool, "Bus Trek", and observed or scheduled departure times. Bus Trek was developed as a real-time tool to assist road operations personnel in determining where real-time adjustments to service are needed. As discussed with the OSC, Bus Trek Wait Assessment reports are not used, nor planned to be used as the official source of data to measure Wait Assessment, but rather to provide an approximate benchmark to our service

* Comment 4

¹For example, see a case study which explained the Wait Assessment calculation in detail was submitted to the 2009 Transportation Research Board (TRB) conference, <https://pubsindex.trb.org/view/2009/C/881015>. Core calculation assumptions remain in place today as described in said report.

managers if and when the need may arise. Bus Trek is a GPS-based system that is dependent upon cellular coverage for transmission of vehicle positions. During the normal course of service, there is a potential for some vehicle position data to not be transmitted as a result of improper cellular coverage and/or hardware downtime. While NYCT and MTA Bus management do not expect or tolerate a preponderance of hardware or transmission failures, it inevitably occurs during regular operations. There are built in redundancies that will flag significant repeat occurrences of the above probabilities, with management follow-up to address these events. Management will, however, review the performance of the Bus Trek system and make upgrades as are deemed necessary.

Response to Mean Distance Between Service Interruptions

Response to Recommendations:

9. *Provide the corrected MDBSI to Committee*

NYCT and MTA Bus disagree with this recommendation. The MDBSI indicators reported on the Monthly Operations Report were found to be correct for the audit review period covering January 1, 2017 through September 30, 2017. A chart that graphs the 12-month average reported on the Monthly Operations Report was also accurate for the audit period. A footnote to the chart that restates several numbers from the Monthly Operations Report had an error that resulted in a discrepancy in the 2017 YTD results. The issue was discovered and corrected by Agency staff prior to the publication of the December 2017 report.

* Comment 5

10. *Ensure that the quality assurance steps are performed to confirm that the formulas correctly calculate MDBSI*

NYCT and MTA Bus have already complied with this recommendation. MTA Buses acknowledged and corrected the formula error prior to the publication of the December 2017 report and continues to monitor the calculation and reporting of MDBSI results.

Response to On-Time Performance

Response to Recommendations:

11. *Make the OTP statistical results public or revise the official listing of Title VI metrics.*

MTA Bus agrees with this recommendation. The sole reason that MTA Bus releases OTP is to fulfill a federal mandate of Title VI of the Civil Rights Act of 1964 (FTA C 4702.1B). MTA Bus and NYCT use other metrics that better reflect the customer experience that we publicly report. MTA Bus Company will adopt these established metrics and seek to adjust the Title VI requirement to use Wait Assessment.

Response to Weekend Wait Assessment

Response to Recommendations:

12. Calculate the weekend WA and share the results with the public and MTA Board.

NYCT and MTA Bus agree with this recommendation.

Response to Corrective Action to Improve Wait Assessment

Response to Recommendations:

13. Develop and document proactive actions plans/procedures/guidelines or any combination that are intended to address conditions, such as street repaving or construction, that impact WA before they occur.

NYCT and MTA Bus agree with this recommendation. NYCT and MTA Bus Company will continue to ensure appropriate documentation of current and future efforts to proactively address factors that affect Wait Assessment by Q12020.

Conclusion

We have carefully reviewed the findings and recommendations in the Draft Audit Report and will continue to maintain processes and procedures that will make the most effective and efficient use of our resources. As noted above, we are committed to implementing the open recommendations identified in this audit report.

Enclosure

cc:
Craig Cipriano
Judith McClain
Aaron Stern

State Comptroller's Comments

1. The MTA claims it has comprehensive and thorough processes to calculate and validate the accuracy of WA, and no further action is required. However, there was no documentation for Transit's process. Additionally, the methodology was developed by a former MTA employee and MTA officials could not recreate the files used to calculate WA statistics. Moreover, the audit determined different processes were used to calculate WA statistics at MTA Bus and Transit (e.g., Transit used a model based on AFC data to calculate WA for its buses, and MTA Bus used a manual process). However, neither Transit OP nor MTA Bus OP officials provided any formal explanation for why they used two different processes.
2. Monthly ridership is based on daily ridership; if daily ridership is calculated incorrectly, monthly ridership will be inaccurate. Moreover, in response to our preliminary findings, the MTA replied "Operations Planning agrees to adopt the recommendation and by the end of the second quarter of 2019, will complete documentation of the process that includes detailing each step taken to run the model, including the monthly averaging process." We urge the MTA to reconsider its response.
3. Logic dictates that, with changes in trends in ridership in New York City as well as recent changes in the strategies of New York City and the MTA regarding bus service, that the MTA would want to consider the most up-to-date data when determining demand for service rather than assuming traditional patterns remain unaffected. Moreover, the use of outdated OMB data and the elapsed time was included in our preliminary findings. Transit's response to our preliminary findings stated "By the end of the second quarter of 2019, OMB will begin providing cash fare data to Operations Planning monthly on a one-month lag."
4. We did not use the bus observations to calculate or verify the WA statistic. However, the information captured by Bus Trek at the timing points regarding the departure of the bus is part of the data used to calculate WA, which measures the time between buses, plus 25 percent. Thus, it is essential that the tool used to record the time be accurate and complete. Where MTA officials provided additional information, we adjusted the observations for Queens. However, MTA officials did not provide any documentation to support their statements for the other boroughs. The MTA did agree to review the performance of the Bus Trek system and make upgrades, as necessary.
5. In September 2017, auditors pointed out to the committee the

referenced error in the report and the incorrect year-to-date data provided. MTA Bus Operations officials agreed with the observation and determined the reports to the Committee from August 2017 to November 2017 were incorrect. It is therefore difficult to understand the basis for MTA officials' disagreement with the recommendation, as the data they provided to the Committee was incorrect and they subsequently corrected it.

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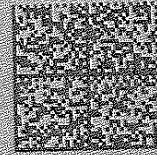


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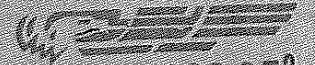
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