For Action

Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Auditor General Recommendations Progress Update

Date: June 5, 2024
To: Audit and Risk Management Committee
From: Chief Operations and Infrastructure Officer

Summary

At the TTC Board meeting on November 22, 2023, the City of Toronto's Auditor General presented the findings of their report: Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Asset Failures and Service Delays. The report identified risks and control gaps in the oversight of the overhead asset maintenance and repair function. The Board subsequently requested that staff report back to the Audit and Risk Management Committee by the end of Q2 2024 on the state of the preventative maintenance for the overhead system, and that the report include a remediation plan, if required.

Management acknowledges that improvements to the streetcar infrastructure maintenance and repair program should be made to reduce the risks outlined in the audit report. This report includes a formal progress update on the action plans, which describes the key steps management will take or has taken at the time of reporting to address the audit findings.

Recommendations

It is recommended that the Audit and Risk Management Committee:

1. Receive this report for information.

Financial Summary

There are no additional financial implications from the adoption of this report.

TTC's 2024 Operating Budget for the Streetcar Overhead Department and the 10-year Capital Plan approved by the TTC Board on December 20, 2023 and by City Council on February 14, 2024 provides staff the necessary resources and capital funding, to implement the Management Action Plans (MAPs) that will address the Auditor General's recommendation regarding risks and control gaps in the oversight of the overhead asset maintenance and repair function. The 10-year Capital Plan also provides funding for the

Maximo technology project that will enable staff to mature and improve its asset management practices.

The Chief Financial Officer has reviewed this report and agrees with the financial impact information.

Equity/Accessibility Matters

Ensuring that overhead assets are in an optimal state directly ensures that all of the TTC's modes of transportation are readily available, including all services that may impact equity groups.

The Overhead Section will ensure all facets of this Management Action Plan (MAP) are executed to ensure the TTC will deliver as efficient a service as possible.

Decision History

The City of Toronto Auditor General's report, Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Asset Failures and Service Delays, was presented to the Audit and Risk Management Committee on November 14, 2023.

Auditor General Report –
Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Asset Failures and Service Delays

Based on the observations in the audit report and in discussions between management and the City of Toronto Auditor General Office, Executive Management acknowledges the gaps in overhead infrastructure maintenance programs and has prepared a MAP to address the identified risk/control gaps, which will presented at a future Audit and Risk Management Committee meeting for information.

This report was subsequently forwarded to the TTC Board for action on November 22, 2023.

Board Report –
For Action: Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Asset Failures and Service Delays

At its meeting on November 22, 2023, the Board directed staff to report back to the June 5, 2024 Audit and Risk Management Committee meeting on the MAP.

TTC Board Decision: Audit of the Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Asset Failures and Service Delays

This report contained the MAP that outlined the key steps that management committed to taking at the time of reporting, to address the audit observations identified by the City of Toronto Auditor General's Office in its report.

Issue Background

In its report, the City of Toronto Auditor General's Office audited the TTC's streetcar overhead assets and made several recommendations for strengthening the maintenance and repair program to minimize asset failures and service delays.

The report outlined opportunities for the TTC to strengthen its streetcar overhead maintenance and repair program by:

A. Minimizing asset failures through effective preventative inspection corrective maintenance, and investigations into emergency maintenance incidents.

B. Performing and documenting preventative inspections in a consistent manner.

C. Strengthening corrective maintenance and repairs.

D. Leveraging technology to improve streetcar overhead operations.

E. Enhancing data collection and performance reporting.

Comments

Management has commenced and will continue to take the following key steps to address the risk and control gaps outlined in the Auditor General's report:

A. Minimizing asset failures through effective preventative inspection, corrective maintenance, and investigations into emergency maintenance incidents. This action plan addresses some of the risks and control gaps identified in Recommendations 1 and 2, listed in Auditor General's report:

    i. Updated Root Cause Form with clear indications on which situations require a Root Cause Analysis. The form has been updated to include preventative actions and clearly differentiate between immediate cause of incident and root cause. Weekly status tracker of Root Cause Form has been implemented to ensure the completion of Root Cause Forms.

    ii. Recurring weekly meetings have been scheduled with all relevant stakeholders (Transit Control, Streetcar Infrastructure, Streetcar Transportation and Streetcar Maintenance) to discuss switch incidents in an effort to analyze trends to mitigate future incidents. Meetings began on April 18, 2024.

B. Performing and documenting preventative inspections in a consistent manner. This action plan addresses some of the risks and control gaps identified in Recommendations 3, 4, 5, 6, 7, 8, 10, 11, 13, and 14, listed in the Auditor General's report:

   i. The Preventative Maintenance (PM) Schedule has been updated to include all assets required to be inspected.

   ii. Asset maintenance has been properly calendarized through its PM Schedule. All asset maintenance has been calendarized through its PM Schedule.

   iii. Specific maintenance intervals (every six months, every 12 months, etc.) have been specified for each asset type and have been updated in the PM Schedule.

   iv. All inspection targets have been reviewed and finalized.

   v. Standardized time expectations (planned shifts/hours) have been established for each asset, which will be compared to the actual times spent to complete a preventative maintenance task.

   vi. A flowchart has been created to outline the PM and corrective maintenance (CM) creation process. The flowchart will inform how maintenance teams will address an incomplete PM.

C. Strengthening corrective maintenance and repairs. This action plan addresses some of the risks and control gaps identified in Recommendation 12, listed in the Auditor General's report:

   i. All CMs are now tracked in the Maintenance Schedule with an open/closed status.

   ii. A flowchart has been created to outline the PM and CM creation process, specifying how to address an incomplete PM.

D. Leveraging technology to improve streetcar overhead operations. This action plan addresses some of the risks and control gaps identified in Recommendations 9, 15, 16, 17, 18 and 19, listed in the Auditor General's report:

   i. The Information Technology (IT) team working alongside the Overhead Section will establish Asset Locations/Hierarchy/Family within Maximo, to work towards uploading Asset Templates, creating PMs and Job Plans, automatic generation of work orders and assignment.

   ii. Maximo Anywhere within Overhead Section will be implemented once the initial framework is set up.

iii. Plan to enable Global Positioning System (GPS) on Overhead Operations fleet vehicles underway.

E. Enhancing data collection and performance reporting. This action plan addresses some of the risks and control gaps identified in Recommendation 20, listed in the Auditor General's report:

i. Key Performance Indicators (KPIs) are being reviewed each month within Streetcar Infrastructure (SCI) and continuous improvements are being reflected in the KPI file. Long-term goals are clearly defined. Appropriate, outcome-focused KPIs, and targets will be implemented on an ongoing basis.

A full detailed review of all Management Action Plans (MAPs) and actions undertaken are contained in Attachment 1 of this report.

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Attachments

Attachment 1 – Grouped Responses to 20 Recommendations in the Audit of Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Failures and Service Delays

Attachment 1
Grouped Responses to 20 Recommendations in the Audit of Toronto Transit Commission's Streetcar Overhead Assets: Strengthening the Maintenance and Repair Program to Minimize Failures and Service Delays

This document presents a progress update on the TTC's action plans in response to the Auditor General's 20 Recommendations resulting from their audit of the TTC's Overhead Assets.

The progress updates are categorized into five groups: A, B, C, D, and E.

Group A

Minimize the Risk of Asset Failures through Effective Preventative Inspections and Corrective Maintenance, and Investigations into Emergency Maintenance Incidents

Progress Updates on Action Plans related to Recommendations 1 and 2

- ✓ Updated Root Cause Form with clear indications on which situations require a Root Cause Analysis. Form updated to include preventative actions and clearly differentiate between immediate cause of incident and root cause. Weekly status tracker of Root Cause Form implemented to ensure completion of Root Cause Forms.

- ✓ Recurring weekly meetings have been scheduled with all stakeholders to discuss switch incidents in efforts to analyse trends to mitigate future incidents. Meetings started on April 18, 2024.

The details of Recommendations 1 and 2, along with the audit findings and TTC management's action plan are provided below:

Recommendation 1: The Board requests the Chief Executive Officer, Toronto Transit Commission, to support continuous improvement and increase streetcar service reliability by:

a. Reassessing and strengthening existing policies and procedures in Streetcar Overhead Operations to provide more criteria and clarity on the nature and extent of the root cause analysis and investigation required for service delays;

b. Determining the root causes for those delays that require investigation according to the policy, in order to prevent the same issues from recurring; and

c. Developing and implementing a process in Streetcar Overhead Operations to ensure compliance with the policies and procedures regarding root cause analysis and investigations of service delays.

Audit findings:

- Overhead Operations' policy is to fill out a root cause analysis for service delays greater than five minutes.

- No root cause analysis and investigation were completed for service delays that exceeded five minutes.

- Understanding the root cause of a service delay is required to prevent the same type of issue from recurring.

- The root cause was determined for 86% of Automatic Drop Down (pantographs) incidents, and undetermined for 14%.

TTC's Action Plan:

The TTC agrees with the above recommendations and as part of the ongoing comprehensive review of the current policies and procedures, will focus on investigating the root cause of service delays. Specific criteria and clarity for root cause analysis and investigations for service delays will be established by Q1 2024. Although we currently conduct investigations and determine the root cause to prevent the same issues from reoccurring on safety-critical incidents and incidents resulting in significant delays, such as Automatic Drop Down incidents, we commit to further investigations of root causes based on the criteria outlined above after reassessing and strengthening existing policies and procedures.

Ensuring compliance with policies and procedures will be achieved through a combination of strategies, such as defined documentation, training and awareness, consistent audits and inspections, well-established reporting mechanisms, employee feedback, continuous improvement, and management oversight to reinforce the importance of adherence to policies and procedures by Q4 2024.

The details of progress updates on the action plan related to Recommendation 1 are as follows:

Short-term goal:

- The Root Cause Form (RCF) has been updated to specify instances where an Incident Investigation is required to determine the Root Cause (collisions, wire downs, taken switches, defective hardware and Automatic Drop Downs (ADDs). Originally the RCF was only submitted for ADDs.

- Additional fields added to the RCF: Immediate corrective action by the crew leader and root cause and preventative actions decided by management.

- Additional fields will serve as a tool to improve employee reporting mechanism to management to help provide more information on the root cause.

- Root Causes are reported on Overhead's monthly KPIs and discussed with upper management to implement mitigative measures, whether by reinforcing

adherence to current policies and installation/maintenance procedures, or by initiating a new process to help mitigate incidents. Operating Supervisors will be overseeing this process.

Persons responsible: Forepersons, Engineering Technologists (ETs) and Operating and Capital Supervisors.

Recommendation 2: The Board requests the Chief Executive Officer of the Toronto Transit Commission to improve communication and information-sharing across relevant streetcar and other departments in order to support continuous improvements and reduce the number of fail-to-operate (FTO) switch emergency calls. Information collection and sharing across these departments should include:

a. Collecting and tracking appropriate and relevant data regarding FTO switch emergency calls, including but not limited to switch identity documents (IDs), number of calls, and their results; and

b. Using the data collected to perform root cause analysis and investigations with the goal of reducing the number of FTO switch emergency calls.

Audit findings:

- FTO switch emergency calls, and the resulting switch inspection results are not tracked.
- FTO switch inspections often result in “No Trouble Found” with the electrical components of the switch.
- Inspection results are not communicated to other related TTC departments.
- No cross-departmental effort to reduce the number of FTO switch emergency calls.

In 2022, 496 switch-related emergency calls were made, of which 268 (54%) were FTO switch emergency calls. These calls occurred 184 days in 2022, with 60 days having multiple FTO switch emergency calls.

Action Plan:

The TTC commits to improving the collection and tracking of appropriate and relevant data regarding FTO switch emergency calls, including but not limited to, switch IDs, the number of calls and their results by Q2 2024, with the support of an Engineering Technologist.

Currently, some of the data is captured in the delay logs, which can be data-mined to determine current frequency and trends at various switch locations across the network. In the short-term, an analysis for sharing the current data with all relevant stakeholder departments will be conducted. Reducing the number of FTO switch emergency calls and correlated delays has been an ongoing goal for Streetcar Overhead.

Furthermore, data collected and analyzed will be used to determine if incidents are discrete in nature or systemic for the purposes of implementing appropriate mitigation measures to address specific types of failures.

In the long-term, the TTC will engage the IT Services Department to assess the most suitable method to collect and track data related to FTO switch emergency calls in an enterprise database that can be shared across the TTC. Subsequently, we will proceed with their recommendation, taking into account budget and implementation considerations.

Progress Update:

The details of progress updates on the action plan related to Recommendation 2 are as follows:

- Weekly meetings have been scheduled where relevant stakeholder departments will be participating in a common call to review all switch-related incidents for the past week.

- The meeting is intended to analyze trends and engineer processes to help mitigate future switch incidents to ultimately reduce delays. First meeting with all stakeholders occurred on April 18, 2024.

Long-term:

- IT Service Department has been engaged in assessing the most suitable method to collect and track data related to FTO switch emergency calls in Maximo that can be shared across the TTC.

Persons responsible: Operating Foreperson assigned to switch maintenance, ETs, all stakeholders, Operating Supervisors.

Group B

Perform and Document Preventative Inspections in a Consistent Manner

Progress Updates on Action Plans related to Recommendations 3, 4, 5, 6, 7, 8, 10, 11, 13 and 14

Created new Maintenance Schedule (Excel spreadsheet) – effective as of May 1, 2024. Updates include:

✓ Schedule has been updated to include all assets required to be inspected.

✓ Planned Inspection month has been updated for all assets.

✓ Specific time intervals (every six months, every 12 months, etc.) have been specified for each asset.

✓ Overall inspection targets have been reviewed.

- ✓ Standardized time expectations (planned shifts/hours) has been recorded for each asset, which will be compared to the actual time required to complete a preventative maintenance (PM).

- ✓ Flowchart has been created to outline the PM and corrective maintenance (CM) creation process. Flowchart indicates how to address incomplete PM.

- ✓ The Technical Writing team in the Capital Project Delivery group has reviewed and prioritized overhead's standard operating procedures (SOPs) using a risk-based approach to updating them. In the interim, bulletins/PowerPoint training presentations are being developed while SOPs are being updated.

The details of Recommendations 3, 4, 5, 6, 7, 8, 10, 11, 13 and 14, along with the audit findings, and TTC management's action plan are provided below:

Recommendation 3: The Board requests the Chief Executive Officer develop and use a centralized database of Overhead Operations' assets across departments (Streetcar Infrastructure, Transit Control, Streetcar Transportation) to ensure Streetcar Overhead Operations is using an accurate and complete asset database, including a centralized switch inventory, to inform their operational decision-making and optimize their resource allocation.

Audit findings:

- Discrepancies and inconsistencies between the various asset lists and databases across departments/sections.

- 52 instances where the switch is not listed in all databases (i.e. is excluded from at least one source).

- 30 instances where discrepancies regarding whether the switch was manual or electrical were found among the separately maintained lists/map.

- Six electrical switches included in the 2022 Maintenance Schedule, which have not been added to Maximo; and

- Six instances where a source lists a switch that does not exist.

Action Plan:

The TTC agrees with the recommendation and will collaborate with the relevant departments to create a centralized switch inventory to be incorporated into an enterprise asset database to be used as a single source of truth when referring to any switch assets in the streetcar network. The target for establishing a centralized switch inventory system will be end of Q3 2024.

As part of the ongoing Enterprise Asset Management Program, the TTC is updating its asset hierarchy, establishing asset data model and data strategy, which will be used in

the data collection and data cleansing process prior to migrating Streetcar Overhead asset data into a centralized database of assets. This will be completed by Q4 2025.

Progress Update:

Short-term goals:

- All live and in-service (commissioned) switches have been recorded in the Maintenance Schedule (Excel spreadsheet), which are the switches that Overhead is required to inspect.

- Maximo has also been audited to check if switches that are required to be inspected exist in the database.

Medium-term goals:

- Additional switches (manual and non-commissioned) should be counted as part of a common switch database in Maximo for all departments to access. This exercise began in March 2024, where Streetcar Way and Overhead Engineering are working together to establish this common list. This list will then be migrated into Maximo as part of the medium-term goal.

Persons responsible: Forepersons and Operating Supervisors.

Recommendation 4: The Board requests the Chief Executive Officer implement policies and procedures in Streetcar Overhead Operations, including oversight and monitoring policies and procedures, to ensure the assets in the Maintenance Schedule are always accurate and complete, and that any required asset changes, additions, and/or removals are made to the Maintenance Schedule on a timely basis.

Audit findings:

- 2022 Maintenance Schedule did not include some assets that required inspections.

- 2022 Maintenance Schedule included assets that did not require maintenance or were not commissioned for use. Specifically, we identified six track switches that were either manual switches or not commissioned for use. In either case, these switches do not require Overhead Operations' preventative inspections.

Action Plans:

In order to satisfy the recently invoked Ontario Regulation 588-17, Streetcar Overhead recruited for asset management resources, with responsibilities that include but are not limited to, providing oversight in ensuring accuracy and completion of assets in the Maintenance Schedule. We concur with the recommendation and will continue to establish and implement policies and procedures within Streetcar Overhead, particularly focusing on oversight and monitoring, to ensure the Maintenance Schedule accurately and comprehensively represents our assets.

The ongoing review of the policies and procedures will include ensuring the swift and efficient incorporation of any required changes, additions, or removals into the enterprise asset database and the corresponding updates to the Maintenance Schedule. Please see Recommendation 5 for an applicable execution plan.

Progress Update:

- Maintenance Schedule (Excel spreadsheet) has been thoroughly reviewed to ensure all existing assets are accurately captured and any missing assets are updated.
- All live and in-service (commissioned) switches have been recorded in the schedule, which are the switches that Overhead is required to inspect.
- Any manual or non-commissioned switches have been noted as such in the tracker to prevent inspection of switches by Overhead.
- Target month for PM inspections for all assets have been added to the Schedule.
- Forepersons will be updating and monitoring the Schedule on a daily basis. Operating Supervisors will be overseeing this process.

Persons responsible: Forepersons and Operating Supervisors.

Recommendation 5: The Board requests the Chief Executive Officer, Toronto Transit Commission, to implement policies and procedures in Streetcar Overhead Operations to ensure all completed work orders are recorded on the Maintenance Schedule in order to plan, manage and schedule preventative inspections in an efficient manner that optimizes the use of time and resources.

Audit findings:

- Overhead Operations lacks policies and procedures to ensure all completed preventative inspections are recorded in the Maintenance Schedule.
- Found instances of repeated inspections as well as inspections that were completed within a short period.
- It is important for Forepersons to know when the last inspection was completed in order to plan and schedule the next one.
- Individual directional diode assets were not tracked properly on the maintenance schedule.

Action Plans:

The TTC concurs with the recommendation and will continue to establish and implement policies and procedures for work orders in the Maintenance Schedule to improve the planning, management, and scheduling of preventative inspections. As an extension of the action plan in Recommendation 4, we will utilize the recruited asset

management resources to improve the oversight of preventative maintenance management. In the short term, this will allow for better record-keeping and scheduling.

In the medium-term, there will be a Request for Proposal (RFP) reviewed and issued for onboarding support of a vendor that will review the current applications used for work management and provide recommendations toward consolidating through one source. The RFP is set for issuance in Q1 2024, with a year-end target of having the successful vendor awarded by the end of 2024. Long-term completion of this implementation is dependent on vendor resources and timelines.

Progress Update:

- Maintenance Schedule has been updated to schedule inspections in specified time intervals.

- To substantiate the clarity of specified time intervals, the Schedule has updated with the “time interval” column titles, to be consistent with industry best practices. The time intervals are now labelled ‘every three months’, ‘every six months’ or ‘every 12 months.’

- To satisfy the policies requirement, a flowchart has been established to outline the process of creating and closing CM/PMs and recording in the tracker.

Persons responsible: Forepersons and Operating Supervisors.

Recommendation 6: The Board requests the Chief Executive Officer to review, update, and approve all maintenance and inspection policies, procedures, and manuals in Streetcar Overhead Operations to ensure they are accurate, complete and relevant, and provide training to staff on them.

Audit findings:

- No formalized OCS maintenance and inspection manual.

- Current sources of operational guidance are incomplete, outdated or not formally documented.

- Standard Operating Procedures are incomplete and outdated.

- Job plans are outdated.

- Apprenticeship training materials focus more on installation rather than the maintenance of assets.

- On-the-job training is verbal and not documented.

The Standard Operating Procedures (SOPs) do not provide clear expectations as to how preventative inspections should be performed. For example:

- We noted that many of the SOPs are dated prior to the TTC's conversion from the trolley pole to hybrid to pantograph system. The SOPs should be regularly reviewed and updated for accuracy, completeness and relevance under the current Overhead Contact System (OCS).

- SOPs do not exist for all major inspection areas, such as intersections, tangent lines, underpasses, yards and tunnels (see Exhibit 1 for a description of these OCS areas). We also noted that SOPs typically focus on the installation of Overhead Operations' assets, but not the subsequent inspection and maintenance of these assets.

- Some SOPs, while still relevant to the pantograph system, are outdated. For example, the SOP titled "Diode Controlled Section Breaks Inspection and Maintenance" is dated April 6, 2009. The pictures of the diode assets included in the SOP do not align with the diode assets currently being used in the OCS. The activity tasks in the SOP's sample work order also do not align with current work orders completed by crews.

- Some SOPs are incomplete and still in draft form. For example, the SOP titled "Electric Track Switch (SEL/SESS) Inspection Procedure" is the first and only version of the SOP and the appendix of this document is incomplete (blank).

Action Plans:

The TTC concurs with the recommendation. Streetcar Overhead had previously engaged the consulting services of Gannet Fleming to produce a manual that would assist maintenance personnel with the maintenance and inspection of the TTC's Overhead Contact System (OCS). This manual was provided to the department in 2022 and is currently under review by the workforce for acceptance. Given the volume of content and shortage of dedicated reviewers, the targeted completion date is Q2 2025.

At an enterprise level, the organization has brought on consulting services to assist in establishing an asset management plan, which includes aligning all maintenance and inspection policies, procedures, and manuals in Streetcar Overhead to industry standards. The consultants, taking into consideration that the consultants will be supporting all departments within the organization, will identify this framework, along with resource requirements. In the interim, Streetcar Overhead will work with Overhead Engineering to conduct a review of the existing maintenance, inspection manuals, policies, and procedures to ensure that they are aligned with industry best practices and are accurate, complete, and relevant. Subsequently, Streetcar Overhead will update the relevant training accordingly.

Progress Update:

- The Maintenance manual has been fully reviewed by Overhead Operations as of April 2024 and several comments (three to five per page) have been made throughout the document.

- This document has been submitted to other departments within SCI for input.

- All of Overhead's SOPs have been reviewed and prioritized for updates in groups of high, medium and low, and sent to the Technical Writing Team.

- Bulletins and training are being used to communicate to the workforce in the interim to supplement fully developed SOPs, as well as the Gannett Fleming manual.

Persons responsible: Forepersons, ETs and Operating and Capital Supervisors.

Recommendation 7: The Board requests the Chief Executive Officer, Toronto Transit Commission, to:

a. Review and update the annual preventative inspection targets in Streetcar Overhead Operations on both an annual and as-needed basis; and

b. Establish policies and procedures to provide clear guidance in Streetcar Overhead Operations on which source data and information is needed for the reassessment.

Audit findings:

- No formalized process for reassessing and updating the annual inspection targets.

- Changes to preventative inspection targets should be supported by data analysis.

- Sometimes inspection targets changed informally without updating the Maintenance Schedule.

Action Plans:

The TTC agrees with the recommendation and immediately commenced the regular review and revision of the annual preventative inspection goals in Streetcar Overhead. In the short-term, a review and update of targets will be conducted by the Engineering Technologist and sections with a target completion date of Q1 2024. In the medium- to long-term, and as an extension of Recommendation 6, we will improve on and create policies and procedures that offer precise direction per the advice of the enterprise asset management consultants.

Progress Update:

- Maintenance Schedule has been updated with targets for the planned inspection months in specific frequencies (every three months, every six months or annually).

- Overall inspection targets have been reviewed and confirmed for 2024 but not changed from previous years based on original Overhead Engineering's

recommendations. Any change (addition) to current frequencies will require input from Overhead Engineering (OVHE) and additional Overhead resources.

- The Maintenance Schedule has been rolled out of as May 1, 2024, to all Forepersons and Supervisors via an e-mail and an in-person, peer-to-peer training session. Planned inspection months after May are more aligned with 2024 planning. January to April planned months were entered retroactively, but were not planned sufficiently to align with the May rollout.

- Planned inspection dates for yard inspections are pending due to the complex nature of several assets within each yard. We expect to have this item completed in May 2024.

- As part of the medium- to long-term, and as an extension of Recommendation 6, we will improve on and create policies and procedures that offer precise direction per the advice of the enterprise asset management consultants.

Persons responsible: Forepersons and Operating Supervisors

Recommendation 8: The Board requests the Chief Executive Officer, Toronto Transit Commission, to establish and implement standard time expectations for common preventative inspections in Streetcar Overhead Operations and incorporate them into the employee performance evaluation.

Audit findings:

- Standard time expectations, i.e. the amount of time typically required to perform a:
  - Specified task or set of tasks under normal operating conditions;
  - Intersections (ranges from one-to-three 10-hour shifts);
  - Underpasses (ranges from one-to-two 10-hour shifts); and
  - Loops (ranges from one-to-two 10-hour shifts).

- Use GPS technology to improve operational efficiency.

Action Plans:

The TTC concurs with the recommendation and commit to its implementation. Streetcar Overhead will assess existing activities within the section that can serve as benchmarks to establish and enforce standardized time expectations for routine preventative inspections. The Employee Performance Appraisal template will be revised once measurable benchmarks are established and expectations are clearly defined. Target completion for the revised Employee Performance Evaluation is dependent on both the request for proposal and findings of the consultants that are identified in Recommendation 4 and 5. We will also be incorporating the action plan from Recommendation 7 to satisfy this recommendation.

Progress Update:

- Maintenance Schedule: actual shifts will be compared to planned shifts to measure/compare how long it actually took to complete the specific inspection.

- This comparative data can be extended for use in Employee Performance Evaluation when ratings are under or over the benchmarks – the timeline for this will be dependant on the advice from EAM consultants in Recommendations 4 and 5.

Persons responsible: Forepersons and Operating Supervisors.

Recommendation 10: The Board requests the Chief Executive Officer to:

a. Ensure policies, procedures, and manuals in Streetcar Overhead Operations provide clear directions as to how preventative inspections' activity tasks, results, and observations should be performed (including the measurement method) and documented; and

b. Develop and implement an oversight process in Streetcar Overhead Operations (i.e. Quality Assurance Audit program, spot checks, increased supervision) to ensure the accuracy, completeness and reliability of the documented work orders and consistency of the work performed.

Audit findings:

- Variability in how crews perform the same task and how inspections are documented.

- Variability in how wire measurements were taken.

- Crews did not document where the wire measurements were taken from.

- Variability in the extent of observations and measurements recorded for preventative inspections.

- Format of measurements being taken was inconsistent.

- Use of exception reporting was not standardized.

- Many potential causes for blank activity tasks on job plan.

- Need for consistent documentation of work orders for effective monitoring.

Based on our inquiries with Overhead staff, blank activity tasks on the job plan could indicate the following:

o Incomplete tasks – Crews were unable to perform the activity tasks for various externally caused factors, such as traffic, areas where the crew could not stop,

blocked curbs, inclement weather, the crew being sent to attend another call (i.e. emergency repairs) or insufficient time in the crew's shift.

- No issue found – The activity task was performed, but the result was not documented as no issue was found. For example, according to Overhead staff, for "Span Condition" activity tasks, which examine the condition of the span wire (see Exhibit 1 for a description of this asset), crews will record if the span has issues, but leaves the task blank if it does not.

- Irrelevant tasks – The activity task was considered, but not performed as it was not applicable. For example, for "Splice type" activity tasks, crews are expected to inspect and document the type of splice present (see Exhibit 1 for a description of this asset). However, according to Overhead staff, splices are not always present because this piece of hardware is only added to the OCS when two pieces of contact wire need to be joined (i.e. in corrective maintenance when a section of the contact wire needs to be replaced). In cases where no splice is present, crews leaves this activity task blank.

- Outdated tasks – The activity tasks and assets included in the work orders are outdated (inaccurate and incomplete) and, therefore not applicable.

Action Plans:

The TTC agrees with the recommendation and is dedicated to its prompt execution and will conduct an immediate audit of the existing documentation, which includes policies, procedures, manuals and the crew's documented work orders, by taking a risk-based approach to prioritizing those in most need of improvement. Furthermore, we will explore the most efficient means of implementing these improvements. As identified in Recommendation 4, in order to meet the Ontario Regulation 588-17 by July 2025, Streetcar Overhead will utilize consulting support for overall process oversight and improvement, while in the short-term will be utilizing an Asset Management Planner to provide increased supervision and quality control to ongoing audit programs and spot checks.

Progress Update:

- As identified under Recommendation 6, a review has been conducted for all existing SOPs by taking a risk-based approach. The Technical Writing Team will be helping with the formal update. In the meantime, bulletins have been communicated to the workforce to standardize the format of measurements being taken and standardize exception reporting.

- Two bulletins have been communicated (Section Break and Track Switches inspections, respectively), and another two bulletins are pending review of the Inspection Job Plan by Overhead Engineering (Line and Intersection inspections, respectively).

- Going forward, a signature will be required by each Foreperson after completion of each Work Order review.

Persons responsible: Forepersons, ETs and Operating and Capital Supervisors.

Recommendation 11: The Board requests the Chief Executive Officer, Toronto Transit Commission, to develop and implement formalized processes in Streetcar Overhead Operations to:

a. Ensure preventative inspections comply with annual inspection targets; and

b. Ensure preventative inspections are scheduled and completed in accordance with Overhead Operations' specified time intervals.

Audit findings:

- No formalized process to ensure preventative inspections are completed in accordance with their annual inspection targets.

- We sampled 44 assets from the Maintenance Schedule and found that for 21 (48%) of these assets, the actual number of inspections was below the preventative inspection target. For example:

  - A section insulator had a target of four preventative inspections per year, but only three inspections were completed in 2022.

  - An intersection had an annual target of two preventative inspections, but only one inspection was done in 2022.

  - A diode had a target of four preventative inspections per year, but only one inspection was recorded as completed in 2022.

- 48% of assets sampled were below the preventative inspection targets.

- 16% of assets sampled exceeded the preventative inspection targets.

- No formalized process to ensure inspections are scheduled and completed at specified time intervals.

Action Plans:

We agree with the recommendation. Streetcar Overhead Operations will continue to create and put into operation formalized procedures to ensure preventive inspections comply with annual inspection targets. These procedures will serve the dual purpose of ensuring that preventative inspections align with the annual inspection targets and that they are scheduled and executed within specified time intervals. In the short-term, our IT Service Department has been engaged to assess the most suitable method and strategy to leverage the existing Maximo software features for generating work orders to help deliver this recommendation. In the medium- and long-term, as an extension to Recommendation 5, this strategy includes the RFP as well as the enterprise asset management rollout of Maximo. Subsequently, we will proceed with their

recommendation, taking into account budget and implementation considerations.

Progress Update:

Short-term:

- IT Services Department is assessing the most suitable method and strategy to leverage the existing Maximo software features for generating work orders.

- In the meantime, the Maintenance Schedule (Excel spreadsheet) has been updated with targets for the planned inspection months in specific time intervals (every three months, every six months or annually).

Persons responsible: Forepersons and Operating Supervisors

Recommendation 13: The Board requests the Chief Executive Officer, Toronto Transit Commission, to develop and implement policies and procedures for Streetcar Overhead Operations' Preventative and Corrective Maintenance program, which includes, but is not limited to providing:

a. A set of criteria for each asset type to determine if corrective maintenance and repair work orders need to be generated, based on risks and implications;

b. Clear timing expectations for reviewing completed preventative inspections and generating any necessary corrective maintenance work orders; and

c. Clear criteria and timing expectations for the prioritization and completion of corrective maintenance work orders, based on risks and implications.

Audit findings:

- Need to establish clear criteria and standards for when CM is required.

- No measurable metrics or standards for assessing certain assets.

- 58% of sampled preventative inspections had no CM work order generated to address issues identified by crews.

- No formal policy, procedure and sign-off for supervisory review of preventative inspections.

- Need to establish response times for CM work orders.

- No policy or procedures on timing expectations for reviewing completed preventative inspections.

- 14% of preventative inspections sampled took two-to-under four weeks and 14% took four-to-nine weeks to generate CM work orders after the completion of the preventative inspection.

Specifically, for OCS hardware assets (i.e. frog, section insulator, glider, adjustable crossover and hanger), crews perform a visual inspection of the asset, then use their knowledge, experience and judgment to determine whether the asset is worn enough to require a repair or replacement. We noted that crews documented on their inspection sheet the condition of the asset, with comments, including but not limited to, “worn,” “heavily worn,” “very bad,” or “needs replacing,” but there are no measurable metrics or standards to ensure the assessment of these assets’ conditions are made correctly and consistently by crew members.

Action Plans:

Streetcar Overhead to actively participate in Institute of Electrical and Electronics Engineers Standards Committee meetings with industry peers. This is to ensure internal KPIs are being measured effectively against other agencies. We are also participating in meetings with Network Rail Consulting, American Public Transportation Association and International Association of Public Transport. It is important that we are engaging and constantly measuring ourselves against industry standards and practices.

As required by the Ontario Regulation 588-17, by the end of 2025, we will assess what other agencies similar to the TTC are doing to ensure that we capture the best-known practices. Additionally, we accept the recommendations, and Streetcar Overhead Operations will develop and implement a maintenance program based on, but not limited to, the following elements:

- Establishing specific criteria for each asset type to determine the necessity of generating corrective maintenance and repair work orders.

- Defining clear timeframes for reviewing completed preventative inspections and initiating any required corrective maintenance work orders.

- Providing distinct criteria and timing expectations for prioritizing and executing corrective maintenance work orders.

Progress Update:

- Clear timeframes to complete PMs: Number of planned shifts have been added to the Maintenance Schedule for PM inspections by each Foreperson, which will be used to communicate the timeframe required to complete each PM.

Long-term goals:

- A risk-based approach will be taken to prioritize CM Work Orders to completion.

- Specific criteria for each asset type to determine the necessity of generating corrective maintenance and repair work orders will be developed as part of the long-term plan, in tandem with the completion of review of the Gannett Fleming Maintenance Manual.

Persons responsible: Forepersons and Operating Supervisors.

Recommendation 14: The Board requests the Chief Executive Officer, Toronto Transit Commission, to develop and implement in Streetcar Overhead Operations:

a. Standard Operating Procedures that outline the steps to be taken to ensure the measuring tools used by crews during inspections (i.e. calipers) are in good working order; and

b. An oversight process to monitor and ensure compliance with the Standard Operating Procedures.

Audit findings:

- Reliability of inspection measurements dependent on tools and equipment being in good working order.
- About 7% of CM work orders did not actually require any maintenance or repair work.
- Discrepancies in wire measurements could be due to faulty measuring tools.
- No process to audit or verify the accuracy of data recorded on work orders.

For example, in a preventative inspection performed on September 21, 2022, the crew measured the contact wire size to be nine mm, which would typically require a replacement. Therefore, the Foreperson generated a CM work order for the wire replacement. Subsequently, on October 18, 2022, the CM crew measured the wire to be 11 mm, which does not require a replacement. Hence, the contact wire was not replaced by the CM crew for this work order. It could not be determined which of the two wire measurements was accurate.

Action Plan:

The TTC agrees with the recommendations. Streetcar Overhead Operations will formulate Standard Operating Procedures (SOPs) delineating the necessary steps to guarantee the proper use of measuring tools by inspection crews. Additionally, we will establish a periodic review process to maintain the quality of data and both crew documentation and documented work orders. By the end of Q2 2024, Streetcar Overhead Operations will conduct a review of all existing SOPs, noting any that are not available or outdated. Streetcar Overhead will continue to co-operate with the Capital Project Delivery Office to ensure timely and accurate issuance of SOPs and investigate if there is a need for additional resources. In the interim, an audit process will be established for oversight and compliance to current SOPs.

Progress Update:

Short-term goals:

- A Technical Bulletin has been communicated to workforce to outline steps to be taken to ensure measuring tools (calipers) used by crews are in good working order.

- Annual tool audits have been assigned to a Foreperson, who will be completing this task annually.

- Job Plan has been updated for Section Breaks to outline where exactly to measure. A bulletin has also been communicated to the workforce to standardize measurements. Additionally, Forepersons are reviewing the completed work order to ensure that the measurements recorded are following the bulletin for inspections.

Long-term goals:

- The Gannett Fleming Maintenance Manual will be the overarching guide to indicate when a CM is required to be initiated. For instance, the diameter required to replace wire will be standardized in the manual.

- A Foreperson has been tasked to annually complete an audit of all tools (including measuring tools) that are in the Crew Leader's possession to ensure standardization and that they are in good working order. This audit was completed in April 2024.

- Overhead is continuing to co-operate with the Capital Project Delivery Office to ensure timely and accurate issuance of SOPs, and at the same time, a training deck, such as one completed for Limits of Approach and Toronto Hydro Hold-off Radio Use Training, is being completed to supplement/replace training SOPs.

Persons responsible: Forepersons, ETs and Capital and Operating Supervisors.

Group C

Strengthen Corrective Maintenance and Repairs

Progress Updates on Action Plans related to Recommendation 12

✓ All CMs are tracked in the Maintenance Schedule with open/closed status.

✓ Flowchart has been created to outline the PM and CM creation process. Flowchart indicates how to address incomplete PM.

The details of Recommendations 12, along with the audit findings, and TTC management's action plan are provided below:

Recommendation 12: The Board requests the Chief Executive Officer to develop and implement policies and procedures in Streetcar Overhead Operations to:

a. Provide clear expectations and training as to how crews should communicate and document preventative inspections that are only partially completed; and

b. Track and ensure partially completed inspections are appropriately rescheduled to be fully completed.

Audit findings:

- Lack of policies and procedures on how crews should communicate and document partially completed preventative inspections.

- Variability in how incomplete work was documented.

- Incomplete preventative inspections were not rescheduled, tracked or followed up on, but were instead logged as completed and closed.

Action Plan:

We accept the recommendation and will continue to carry out the following actions by Q4 2024:

- Update the inspection form to provide greater clarity on the specific inspection areas that were not fully completed and still require attention.

- Provide additional training to our workforce to ensure they furnish comprehensive information on the inspection sheet.

- Provide comprehensive training to new employees as they enter Streetcar Overhead.

- Conduct audits of inspection sheets through a predetermined review process.

- Use the TTC's enterprise database to track partially completed work orders until they are fully completed. We will involve the IT Services Department to assess the most suitable method for fulfilling this request. Subsequently, we will proceed with their recommendation, taking into consideration budgetary and implementation factors.

Progress Update:

- A flowchart has been created to outline the PM and CM creation process as well as to indicate how the Crew Leader should notify staff of an incomplete PM inspection.

- Partially completed PMs will be immediately rescheduled for the next available

opportunity, until complete. Currently this is being tracked in Maintenance tracker, using colour codes and legends, which was not previously performed. Previously we were only tracking fully completed PMs.

- Monitoring diodes for both directions is being done in the Maintenance Tracker in the notes if inspection for one of the sides has not been submitted.

- Flowchart will be incorporated into training for all existing and new employees in Overhead.

- All CMs are tracked in the Maintenance Schedule with open/closed status.

- Forepersons will continue to audit inspection sheets. Feedback process from Crew Leader to Foreperson for any clarifications is outlined in the process via flowchart.

- Maximo is capable of tracking partially completed Work Orders until they are fully complete.

Persons responsible: Forepersons and Operating Supervisors.

Group D

Leverage Technology to Improve Streetcar Overhead Operations

Progress Updates on Action Plans related to Recommendations 9, 15, 16, 17, 18 and 19:

- ✓ IT team working alongside Overhead Section to establish asset Locations/Hierarchy/Family within Maximo. Working toward uploading Asset Templates. Creating PMs and Job Plans, automatic generation of work orders and assignment.

- ✓ Maximo Anywhere within Overhead Section will come in once initial framework is set up.

- ✓ Plan to enable GPS on Overhead Operations fleet vehicle underway.

The details of Recommendations 9, 15, 16, 17, 18 and 19, along with the audit findings, and TTC management's action plan are provided below:

Recommendation 9: The Board requests the Chief Executive Officer, Toronto Transit Commission, to install and enable GPS on Streetcar Overhead Operations' non-revenue vehicles to effectively monitor and assess performance.

Audit findings:

Enabling GPS on Overhead Operations' vehicle fleet can be an effective tool to monitor performance and improve operational efficiency.

Action Plans:

The TTC agrees with the recommendation and have been working with Vehicles Group to finalize an agreement for purchasing GPS equipment for departments to evaluate the optimal approach for installing and activating GPS systems on non-revenue vehicles to efficiently monitor and evaluate employee performance. The target in the short-term is to have the agreement issued by Q1 of 2024. In the medium-term, GPS tabs will be installed in 2024, with expected completed installation by Q2 2025.

Progress Update:

- The TTC has a contract with Geotab and hardware has been received.

Long-term:

- Installation target date of May 1 was delayed due to the potential of strikes. Currently, we are moving ahead with getting the background software in place from Geotab to IT and then Industrial Financial System (IFS).

Persons responsible: ITS, Non-Revenue

Recommendation 15: The Board requests the Chief Executive Officer, Toronto Transit Commission, to develop a comprehensive Maximo implementation plan to ensure Maximo is implemented as both an enterprise asset management system and workflow process management system for Streetcar Overhead Operations. This implementation plan should include, but not be limited to:

a. Detailed implementation target dates and timelines; and

b. Implementation of Maximo Anywhere to all crews, not just emergency crews.

Audit findings:

- The TTC has future intentions to expand the use of Maximo, but no implementation strategy or roadmap developed at time of audit.

Action Plans:

The TTC agrees with the recommendation and commit to the implementation. Streetcar Overhead Operations has identified a need for a more comprehensive use of Maximo in conducting functional requirement workshops with the IT Services Department. As outlined in Recommendation 5, the scope of service of the RFP aims to ensure Maximo and Maximo Anywhere is implemented as both an enterprise asset management system and workflow process management system. A timeline along with target dates will be established once a vendor has been selected.

a. As part of the ongoing Enterprise Asset Management Program, the TTC is conducting an as-is assessment of current asset management practices and will establish a comprehensive roadmap for the program. By Q1 2024, the TTC will re-baseline its Maximo implementation project to align with the Asset

Management roadmap and establish updated implementation target dates for Streetcar Overhead Operations.

b. The Enterprise Asset Management Program's scope includes the rollout of mobile devices with the ability to interface with the work order system, which will be rolled out by Q4 2025.

Persons responsible: ITS, AM Planner, Operations Supervisors and Forepersons.

Progress Update:

Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will be developed.

Recommendation 16: The Board requests the Chief Executive Officer, Toronto Transit Commission, to provide appropriate Maximo training to responsible frontline crews/technicians/staff and management in order to fully leverage existing Maximo technology for Streetcar Overhead Operations.

Audit findings:

- Overhead Operations frontline crews do not use Maximo.
- No formal Maximo training provided to Overhead Operations staff.
- Manual and paper-driven work order process.
- Inefficiencies due to manual data entry.
- Risk of data loss.

Under the current process, crews need to document their results and observations on paper printouts when they perform their work orders. Then, the Senior Clerk must manually input the information into Maximo. In 2022, the Senior Clerk spent approximately 840 hours per year performing data entry and manually closing work orders in Maximo. This is an inefficient use of the Senior Clerk's time, which could be better used on continuous improvement activities, such as performing data analytics.

TTC employees noted examples of closed work orders in Maximo that had no observations included, while the paper file had documented notes. If paper files are lost or misplaced before the Senior Clerk inputs the data into Maximo, observations and results from the work order will be permanently lost. During our audit, we noted many instances where Overhead Operations staff were unable to locate and provide us with copies of paper files.

Action Plans:

The TTC fully supports the recommendations, and as identified in Recommendation 16, formal training will be provided once the rollout of Maximo and Maximo Anywhere has been completed. As part of the ongoing Enterprise Asset Management Program, end-to-end life cycle management processes for Streetcar Overhead will be re-engineered and implemented within Maximo by Q4 2025.

This includes establishing SOPs, and the development of a formal training program that will be available and delivered as required to responsible frontline crews, technicians, and staff. It is important to note that following the evaluation of the consultants, there will be changes to processes and maintenance activities, which will impact the tools and facilitation of the training. However, in the short-term, Streetcar Overhead Operations will continue to follow a "train-the-trainer" approach.

Progress Update:

Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will be developed.

Persons responsible: ITS for delivery, Foreperson for using Maximo.

Recommendation 17: The Board requests the Chief Executive Officer to review and update Streetcar Overhead Operations' asset inventory and job plans/activity tasks in Maximo to ensure they are complete, accurate, and up-to-date to support the planning and completion of repair and maintenance work.

Audit findings:

- Assets and job plans in Maximo are incomplete and inaccurate.

- Overhead Operations manually schedules preventative inspections, whereas other streetcar departments/sections use Maximo to automate scheduling.

- Not all assets have Maximo job plans.

- Some Maximo job plans are incomplete and outdated.

For those work orders with job plans set up in Maximo, we found instances of the following:

  - Assets were missing from the job plan – As a result, either these assets were not inspected and/or observations were not documented by crews (see sections B. 2. and B. 3. for details);

- Activity tasks in the job plan were incomplete or outdated – As a result, crews did not perform certain activity tasks and did not report the need for corrective maintenance and repairs, which increased the risk of asset failures and service delays (see sections B. 2. and B. 3. for details); and

- Assets listed in the job plan do not exist – If these errors go unnoticed, confusion can arise and crews may mistakenly record measurements and observations for the wrong assets. We noted work orders where crews crossed out their observations after realizing the job plan listed an asset ID that did not exist.

Action Plans:

The TTC accepts the recommendations to assess and revise the asset inventory and job plans/activity tasks within Maximo for Streetcar Overhead Operations. We will initiate an immediate examination of the existing documentation and establish a timeline to improve those sections that are in the most suboptimal condition. Furthermore, the effort will aim to ensure their completeness, accuracy and currency, facilitating the planning and execution of repair and maintenance tasks.

The RFP mentioned in Recommendation 3 includes reviewing and improving current Maximo usage of Streetcar Overhead. Once a vendor has been awarded, expected in Q1 2024, a clearer implementation plan to technological improvements can be shared. In the interim, Streetcar Overhead Operations will audit available job plans for completion and accuracy, as well as identifying any missing job plans of repair and maintenance work that can be generated.

- Job plans for all assets are being reviewed for completion and accuracy with Overhead Engineering (OVHE), while IT team is also working in tandem to establish asset location/hierarchy/family within Maximo.

- Currently, track switches is the focus to integrate into Maximo as a short-term goal. To achieve this, a consolidated, true switch list is being finalized.

Progress Update:

Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will ensue.

Persons responsible: ITS for delivery, Operating supervisors to review overall Job Plan and Foreperson to ensure the review is being accurately performed.

Recommendation 18: The Board requests the Chief Executive Officer, Toronto Transit Commission, to develop and implement a process in Streetcar Overhead Operations using Maximo to track the real-time status of work orders to support ongoing work order management and supervision.

Audit findings:

- No electronic real-time work order status monitoring process.
- Work orders are not closed in Maximo in a timely manner.
- Maximo work order statuses are inaccurate.
- Other Streetcar department/section use Maximo to manage work orders more efficiently and effectively.

Action Plans:

The TTC acknowledges the recommendation and are committed to its adoption. Streetcar Overhead will maintain its partnership with our IT Services Department to assess the most suitable method for implementing Maximo Anywhere. Following this assessment, we will proceed per the specified implementation target dates and recommended timeline, considering budget and implementation considerations.

The RFP mentioned in Recommendation 3 includes reviewing and improving current Maximo usage of Streetcar Overhead. Once a vendor has been awarded, expected in Q1 2024, a clearer implementation plan to technological improvements can be shared.

Progress Update:
Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will ensue.

Persons responsible: ITS for delivery, Operating supervisors to review overall Job Plan and Foreperson to ensure the review is being accurately performed.

Recommendation 19: The Board requests the Chief Executive Officer to leverage Maximo to collect and track observations from Streetcar Overhead Operations' assets inspections, and information about maintenance and repairs activities that can be used for data-mining and trend analysis to support Key Performance Indicator reporting and inform decision-making.

Audit findings:

- Asset and related maintenance work details are incomplete in Maximo.
- Emergency maintenance details are not logged and tracked in Maximo.
- Maximo system data is incomplete and cannot be used for data analytics.
- Inefficient and limited data-driven analysis.

For example, predicting how often wire or fittings need to be replaced is based on historical data. As wear and tear depends on streetcar traffic, the replacement frequency will vary across the network. Historical data needs to be collected and analyzed to determine when assets will most likely fail, which could then dictate an optimal preventative inspection and asset replacement frequency.

Currently, to perform this analysis, staff would have to review thousands of paper copies of preventative inspections, corrective maintenance and emergency maintenance work orders, and records related to the asset. This would require considerable time to both find the paper copies and perform the analysis manually.

Action Plans:

The TTC acknowledged and endorsed the recommendation. Currently, Streetcar Overhead relies on certain Maximo features to monitor maintenance activities, but the majority of work orders are paper-based, which hinders efficient data-mining due to the labour-intensive process of reviewing hard-copy files. Streetcar Overhead is committed to collaborating with our IT Service Department to proactively implement Maximo Anywhere, as suggested.

This implementation will occur in advance of the TTC-wide Maximo enterprise rollout scheduled for the next few years. Maximo Application Suite 8.0 will be launched by Q4 2024, with functionalities, including dashboard customizations, data-mining and trend analysis of different types of activities. The updated application will allow for improved KPIs as a result better decision-making.

Progress Update:

Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will ensue.

Persons responsible: ITS for delivery, Operating supervisors to review overall Job Plan and Foreperson to ensure the review is being accurately performed.

Group E

Enhance Data Collection and Performance Reporting to Improve Streetcar Overhead Operations

Progress Updates on Action Plans related to Recommendation 20

- ✓ KPIs are being reviewed each month within SCI and continuous improvements are being reflected in the KPI file. Long-term goal of clearly defined, appropriate, outcome-focused KPIs and targets will be implemented on an ongoing basis.

The details of Recommendation 20, along with the audit findings, and TTC management's action plan are provided below:

Recommendation 20: The Board requests the Chief Executive Officer, Toronto Transit Commission, to improve the Key Performance Indicator reporting for Streetcar Overhead Operations by:

a. Establishing clearly defined, appropriate, outcome-focused KPIs and targets;

b. Developing short- and long-term strategies to meet these targets;

c. Regularly reassessing to determine whether KPIs and targets need to be revised; and

d. Retaining supporting data and verifying the accuracy of data used for KPI reporting, ongoing oversight and management decision-making.

Audit findings:

- Overhead Operations' KPI reporting process.
- Overhead Operations has been proactively making improvements to its KPI reporting process.
- More outcome-focused KPIs for timeliness and quality of maintenance and repair services.
- A KPI that measures the timeliness of maintenance and repair services.
- A KPI that tracks the number of overdue preventative inspections.
- KPIs that measure the quality and reliability of maintenance and repair services.

Timeliness of repairs and maintenance – This KPI will be useful for Overhead Operations as we identified 174 (46%) of 380 CM work orders in 2022 that were completed two weeks or more after the work order was generated.

Overdue preventative inspections – This KPI will also be useful for Overhead Operations as we identified that the annual preventative inspection target was not met for 21 (48%) of the 44 sampled assets tested.

Repeat emergency repairs, frequent corrective maintenance and unresolved problems – These KPIs will be helpful as we noted instances of reoccurring work orders for the same issue on the same assets at the same locations in 2022. These KPIs measure the quality and reliability of maintenance and repair services performed.

Action Plans:

Streetcar Overhead actively participates in Institute of Electrical and Electronics Engineers Standards Committee meetings with industry peers. This is to ensure internal KPIs are being measured effectively against other agencies. We are also participating in meetings with Network Rail Consulting, American Public Transportation Association and International Association of Public Transport. It is important that we are engaging and constantly measuring ourselves against industry standards and practices.

The TTC agrees with the recommendations. Streetcar Overhead will continue to work toward enhancing KPI reporting through the following actions to be completed by Q4 2024:

- Establishing well-defined and relevant outcome-focused KPIs and targets.
- Creating both short-term and long-term strategies to achieve these targets.
- Conducting regular reassessments to gauge the need for any revisions to KPIs and targets.
- Preserving supporting data and verifying its accuracy for KPI reporting, continuous oversight, and informing management decisions.

Progress Update:

Short-term:

- Enterprise Asset Management Systems Implementation – Maximo RFP: Bidding process is underway and target dates and timelines will be adjusted when a vendor has been selected (and approved by the board) in early Q3 2024. After this, a clearer Maximo implementation plan will ensue.
- Currently, we are reviewing and updating our KPIs monthly. Targets exist already for certain KPIs, such as target of Preventative Maintenance per month/period. However, certain KPIs, such as Occupational Injuries and Fleet availability, have inherent targets as 0 and 100%, respectively.

  Nevertheless, we will continue to observe and improve on our KPIs by improving our strategies, so that KPI trends improve.

Persons responsible: ITS for delivery, Operating supervisors to review overall Job Plan and Foreperson to ensure the review is being accurately performed.

Deferred to Q4 2025 as per Gantt chart.