Tri-State Oversight Committee

Three-Year Safety and Security Review

of the Washington Metropolitan Area Transit Authority

Track Maintenance and Associated Training

Elements 15 and 16

Review Conducted: March, August, and September 2015

Final Report: March 22, 2016

Introduction

Representatives from the Maryland Department of Transportation (MDOT), the District of Columbia Department of Transportation (DDOT), and the Virginia Department of Rail and Public Transportation (DRPT) comprise the Tri-State Oversight Committee (TOC), which provides regular oversight of the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system. To comply with State Safety Oversight Final Rule 49 Code of Federal Regulations Part 659 (Part 659), the Federal Transit Administration (FTA) requires states to designate a State Safety Oversight (SSO) agency to administer safety and security programs for rail transit and fixed guideway systems within their jurisdictions. Specifically, 49 CFR Part 659 requires TOC to conduct an on-site safety review of each element of the WMATA System Safety Program Plan (SSPP) at least once every three years. These reviews must assess WMATA's implementation with all 21 elements of its SSPP and seven elements of its Security and Emergency Preparedness Plan (SEPP), along with related plans and procedures. Beginning in 2013, the TOC has split its Three-Year Safety and Security Review topic areas into separately occurring reviews spread out during a three-year period.

The following report documents the observations and findings of the TOC's review of WMATA's track maintenance. Generally, this review focused on whether WMATA's maintenance program complies with its own written plans as well as industry standards and best practices. These topics are the responsibility of the Office of Track and Structures (TRST), with support and internal auditing from the Department of Safety and Environmental Management (SAFE) and Quality Assurance and Warranty (QAAW). The relevant SSPP elements for this review were all or part of:

- Element 15: Maintenance Audits/Inspections
- Element 16: Training and Certification

The TOC Program Standard and Procedures defines WMATA requirements for these elements in Section 12 and in Appendix B. Specific requirements are cited further, below.

Methodology

The Federal Transit Administration conducted a series of Safety Management Inspections (SMI) of WMATA in March, 2015. The TOC was a participant in the FTA SMI review of Track Maintenance conducted March 26-27, 2015. This report reflects the activity by the TOC both during the SMI as well as a separate abbreviated triennial review conducted in September of 2015. Information obtained during the FTA review including interviews, documentation and field observations is also incorporated in this report.

In advance of the abbreviated review, the TOC requested and reviewed relevant WMATA plans, procedures, checklists, and reports. The on-site portion of the review occurred September 10, 2015. During the on-site review sessions, the review team interviewed WMATA personnel and reviewed various documents and records to assess compliance with procedures. The reviewers also talked with front-line personnel. Persons interviewed

(except front-line personnel) and documents reviewed are noted at the end of this report. As the review progressed, TOC representatives discussed preliminary findings and addressed questions from WMATA personnel. This report identifies conditions evident during the review period, regardless of the current progress of potential remediation activities.

Additionally, TOC performed a field inspection of track conditions on August 21, 2015, between Smithsonian and Federal Triangle Stations. This field inspection was a follow-up activity of the WMATA investigation committee convened to investigate the August 6, 2015, derailment near Smithsonian Station. This content of this report includes TOC's observations from the August 21, 2015 field inspection.

Findings refer to instances of WMATA operating out of compliance with an applicable internal or external written requirement, plan, policy, rule, standard, or procedure. A Findings may also refer to a condition whereby WMATA may technically be conducting business in compliance with existing WMATA, TOC, or FTA procedures and requirements; however, there may be no relevant written plan, policy, or procedure in place, or the existing plan, policy, or procedure is not in accordance with industry best practices. Findings may be safety-critical in nature regardless of whether the issue identified is "non-compliant."

After publication of the Final Report, TOC will transfer the report to FTA for further action. FTA will then determine the appropriate mechanism by which the findings documented in this report will be addressed by WMATA.

The TOC would like to thank WMATA personnel for their time, cooperation, and forthrightness throughout the review process.

Current Conditions

The WMATA Office of Track and Structures (TRST) is responsible for the maintenance and performance of WMATA's track infrastructure. TRST is led by the General Superintendent of TRST, who oversees the Assistant General Superintendent of Track & Structures Maintenance, the Assistant General Superintendent of Track Inspections, Structure Inspection, and Track Geometry Vehicle (TGV), the Assistant General Superintendent of Track Capital Programs, and the Manager, Administrative Services.

The upkeep of WMATA track is primarily divided into three functional areas: inspection, under the Superintendent of Track Inspection & TGV, who reports to the Assistant General Superintendent of Track Inspections, Structure Inspection, and TGV; maintenance, under a Superintendent of Track Maintenance for each of the North and South territories; and production, under the Superintendent of Track Production. Inspection covers track walks and TGV runs to inspect track conditions, to identify defects in track infrastructure; Maintenance covers corrective maintenance, to correct defects in track infrastructure; and Production covers preventive maintenance, to improve existing

track infrastructure for better performance and ride quality. Production's present work chiefly consists of installing new rails and de-stressing continuously-welded rail.

Maintenance Requirements

The WMATA track maintenance program ostensibly consists of three elements: inspection, corrective maintenance, and preventive maintenance.

Inspection

The Inspection Group within TRST has responsibility for inspecting WMATA tracks and supporting infrastructure for defects. TRST has 58 track inspectors to cover 21 segments of track, covering the entire territory of the Metrorail system and including inspections of running rails, third rails, track switches, and supporting components, including clips, fasteners, and other related components. Inspection of the Metrorail system is divided into geographical regions: Dulles, which covers the N-Line, which opened in July 2014; Brentwood, which covers the A- and B-Lines; Branch Avenue, which covers the E-, L- and F-Lines; New Carrollton, which covers the D- and G-Lines, and the C-Line from Metro Center to Rosslyn; and Alexandria, which covers the C-Line from Arlington Cemetery through Huntington, the J-Line, and the K-Line. Inspection Supervisors assign Track Inspectors' (track walkers') inspection territories. Track is physically inspected two times per week; Tracks 1 and 2 on all lines are inspected Mondays and Tuesdays; yards and switches are inspected on Wednesdays; and Tracks 1 and 2 on all lines are inspected Thursdays and Fridays. Track Inspectors will inspect track from aboard revenue trains during inclement weather, particularly during winter. Track access is limited from 10:00 am to 2:00 pm daily. TRST may perform some work in the evenings when Inspectors are behind schedule or when Supervisor verification of reported deficiencies warrants further inspection. This process can be cumbersome, since TRST must obtain track rights after 7:00 pm on weeknights in order to gain access to the roadway to inspect track.

The length of each segment of track to be inspected is pre-determined. Track Inspectors typically work in crews of two: one performs inspection, whereas the other serves as Roadway Worker in Charge (RWIC) for oncoming rail traffic. Since Track Inspection crews typically walk twice a week, between the hours of 10:00 am and 2:00 pm, the two Inspectors will reverse duties between inspection and RWIC. (Exception: if one Inspector is not certified to Roadway Worker Protection (RWP) Level 4, which is a prerequisite to serving as RWIC. In this case, the two inspectors will not reverse roles.) This practice of reversing roles over two shifts is not documented. See **Finding 6** below. Track Inspectors typically perform work in possession of a printout of the track defects database, along with a pocket version of WMATA-1000, WMATA's track inspection manual, and track inspection forms with pre-filled fields. Upon completion of the assigned field inspections, Track Inspectors return to their bases and enter new defects found into the track defects database, at which time Inspectors may also enter comments. Paper inspection records are retained for cross-reference. Track Inspectors also assign color-coded priorities: "Black," "Red," "Yellow," and "Green." "Black" and "Red" defects require immediate removal of the segment of track in question from service and immediate repair, and

"Black," "Red," and "Yellow" defects also require notification of Track Maintenance and the corresponding Supervisor of Track and Way. Inspectors have the authority to react to Black, Red and Yellow defects in the field immediately, i.e. order immediate repairs. Inspectors will note defects and open work orders in the Maximo Maintenance Management Information System (MMIS). (Please see the corresponding MMIS section below for further discussion on Maximo.) Once the defect is logged, the noted defects become the responsibility of Maintenance.

Corrective Maintenance

The Maintenance Groups (one for the North territory, one for the South) are responsible for performing corrective maintenance on defects to tracks and other supporting infrastructure. Maintenance Managers review the work orders opened by Track Inspectors, assign labor codes to each work order, and set priorities for corrective maintenance work for the next 24 hours. Work is typically assigned based on descending order of priority. TRST reported both during the FTA SMI and the TOC Abbreviated Triennial Review having difficulty completing all of the open work orders in the track time allotted to its maintenance crews. As of September 24, 2015, TRST has 11,544 Maximo work orders in various stages of being open for track corrective maintenance to be performed. The earliest open work orders date from 2008 (of which there are 255), while the most open work orders date from 2015, the current year (4,698 as of September 24, 2015). **Please see Finding 3 below.**

Preventive Maintenance

TRST reported during the FTA SMI and the TOC Abbreviated Triennial Review that very little preventive maintenance is being performed. Production will install new rails and perform de-stressing of continuously-welded rail. WMATA management stated during both the FTA SMI and the TOC Abbreviated Triennial Review that little preventive maintenance is performed due to the lack of sufficient track time. See **Finding 4** below**.**

Inspections by Track Geometry Vehicle

In 2012, WMATA took delivery of a track geometry vehicle (TGV) to enhance its inspections of track geometry and to perform ultrasonic testing on rails, both of which were previously performed by a third-party contractor. The TGV runs through the entire Metrorail system quarterly. As the TGV is operated through the Metrorail system, a technician aboard the vehicle operates the track geometry measurement and ultrasonic testing equipment. The Assistant Superintendent TGV is also aboard the machine. In measurements of track geometry, the machine produces raw data of track gauge, as well as an exception report. The technician has the ability to electronically delete instances of any gauge measurements in the exception report, which is recorded by chain marker. Gauge measurements are typically deleted if, in the technician's professional judgment, the measurement is unrealistic. Such examples include when the TGV travels over a switch, and the gauge is recorded to be extremely wide, when in fact the measurements may be distorted by the presence of the switch. TRST reported that the procedures for

operating and using the equipment on the TGV have been in draft form since WMATA took possession of the TGV. See **Finding 7.** Following the August 6, 2015 Smithsonian derailment, TSRT has added an additional step to add the practice of having the TGV technician and the Assistant Superintendent TGV review the raw gauge data against the gauge exception report at the end of each TGV run or during layovers at terminal stations to review for possible discrepancies, i.e. unintended deletion of actual instances of wide gauge. TRST stated that this change in practice is documented in a memorandum. As of the publication of this report, TOC has not had an opportunity to review this memorandum.

Once the TGV returns to its base at Alexandria Yard, TRST personnel download the track geometry and ultrasonic testing data to an external hard drive and upload the data to TRST's MMIS systems.

Maintenance Management Information System (MMIS)

TRST employs multiple MMISs. TRST, like other WMATA departments, uses Maximo to open, close, and track work orders. TRST also employs Optram, which is a software that visually depicts all revenue tracks in the entire Metrorail system. A user can click on any segment of track in Optram, and Optram will cross-reference any work orders associated with that segment of track.

As discussed above, Track Inspectors will open work orders in Maximo for defects found in the field. Maintenance Managers then assign additional work orders for the associated tasks to be completed to resolve the defect. TRST employs a "parent-child" work order hierarchy. The "parent" work order represents the segment of track for which Track Inspectors report defects; the "child" work orders represent the individual tasks performed to resolve the defect. TRST employs the parent-child work order hierarchy to avoid duplication of work orders and to systematically track work to be performed by track segment.

Training

The Office of Technical Training and Document Control (TTDC) has primary responsibility for administering and delivering track training. The training for Track Walkers is structured as an 18-week program, consisting of classroom instruction, on-the-job training (OJT), and written and practical examinations to demonstrate application of the skills learned for final certification as Track Walkers. Additionally, Track Walkers must pass a biennial examination of the Metrorail Safety Rules and Procedures Handbook (MSRPH) (per OAP 508-19).

Track Maintainers receive OJT for orientation to their job duties. However, as TRST management reported during the FTA SMI, TRST's track time is so limited that Track Supervisors prefer to assign experienced Maintainers to perform work in as expedient a fashion as possible, since training new personnel in parallel would be too time-consuming. As such, the OJT opportunities afforded to new Maintainers are limited. Such

limitations include during track inspections, which are limited to two inspectors and thus do not have room for a trainee.

Field Inspection of August 6, 2015 Smithsonian Derailment Site

On August 21, 2015, the WMATA Investigation Committee convened to investigate the August 6, 2015 derailment near Smithsonian Station conducted a field inspection of the derailment site. The TOC is a party to this investigation committee. TOC personnel made the following observations during this field inspection.

Within a 200-foot stretch of track, there were 22 locations where rail plate securing bolts and clips are either missing, bent, or loose. **See Finding 1 below.** Within this same stretch of track, only two of 10 observed gauge rods were secured to the rail. Other gauge rods were observed to be in position, but not connected. These gauge rods were observed 15 days after the August 6 derailment; the gauge rods were in place as more than the temporary mitigation for which they were designed. **See Finding 2 below.**

Findings

FTA Findings

In addition to the new issues identified in the TOC Findings section below, the TOC concurs with the following findings and recommendations from the FTA's SMI Final Report, dated June 17, 2015:

Finding R-16 Technical Training for operations and maintenance departments is under-resourced and fractured, currently provided by five different departments and IT, is insufficiently directed and resourced, and relies significantly on on-the-job-training (OJT) which is informal and lacks oversight.

- *R-2-16-a WMATA must conduct a coordinated study to prioritize technical training needs for maintenance personnel, and operations training for Rail Traffic Controller, Train Operators, and Field Supervisors.*

- *R-2-16-b WMATA must evaluate whether re-organization or consolidation of training functions would improve the agency's ability to manage, schedule, budget for, develop, oversee and assess training and ensure that training material remains up-to-date.*

- *R-2-16-c WMATA must establish a comprehensive training program to communicate the new "Fire Life Safety 1000 --Inspection, Testing and Maintenance Procedure" to WMATA Operations and Maintenance personnel.*

- *R-2-16-d WMATA must establish formal guidance for maintenance employees responsible for providing on-the-job training.*

Finding R-27 Documented maintenance procedures and standard operating procedures are not implemented as required.

- *R-4-27-a For all major departments with inspection and maintenance responsibilities for critical infrastructure, WMATA must establish and/or update a preventive maintenance and inspection testing quality audit process to ensure compliance with established maintenance and testing practices, and to monitor missed or incomplete preventive maintenance activities and/or inspections.*

Finding R-28 Walking track inspection resources have been cut in half.

- *R-4-28-a WMATA must review the workload and inspection territory assigned to track inspectors, and leverage non-track inspectors to perform watchman duties.*

Finding R-32 WMATA has no formal program for reviewing the proficiency of maintenance field staff.

- *R-4-32-a WMATA must ensure that each department within Transit Infrastructure and Engineering Services creates a formal program of Supervisory inspections to observe maintenance, look at quality of work in the field, and formally intervene to evaluate, re-train (if necessary), and enhance the professional development of employees.*

Finding R-39 Difficulties with WMATA's ELM have forced departments to use work-arounds resulting in poor documentation of initial and refresher training, certifications, professional licenses and recertifications.

- *R-7-39-a WMATA must evaluate the existing Enterprise Learning Management recordkeeping system and take corrective action, as necessary, to ensure accurate training, re-certification, and professional certification records are created, maintained, and readily accessible to appropriate managers and employees.*

The TOC does not require a separate response to these FTA findings. The TOC will monitor implementation of the recommendations through WMATA's CAP submissions to the FTA.

TOC Findings

Finding 1: During a field inspection on August 21, 2015, TOC observed that within a 200-foot stretch of track near the site of the August 6, 2015 Smithsonian derailment, there were 22 locations where rail plate securing bolts and clips are either missing, bent, or loose. These conditions constitute non-compliance with WMATA-1000, January 1, 2015 Revision, Section 11.3 and should be repaired immediately, if repairs have not already been made.

Finding 2: 10 gauge rods were observed to be used on the D-Line track near the August 6, 2015 derailment site, 15 days subsequent to the derailment. WMATA's Track Walker instructional materials indicate that gauge rods are only a temporary mitigation, and permanent repairs are necessary to correct defects in track gauge.

Finding 3: As of September 24, 2015, TRST has 12,291 Maximo work orders for Track defects to be repaired that are in various stages of being open. These work orders date as early as 2008 and represent a large volume of track defects in the Metrorail system that remain uncorrected. These open work orders constitute non-compliance with WMATA-2000.

Finding 4: WMATA TRST management personnel stated during the FTA SMI and the TOC Abbreviated Three-Year Safety and Security Review that very little track preventive maintenance is currently being performed. TRST personnel stated that most track maintenance currently performed at WMATA is corrective maintenance. Thus, necessary preventive maintenance to track infrastructure and its supporting components is not being performed to maintain a state of good repair. This situation constitutes non-compliance with WMATA-2000.

Finding 5: WMATA-2000 Revision 6, Track and Structures Maintenance Control Policy, still in draft form. Revision 6 should be finalized so that any changes reflected in this revision are formally promulgated.

Finding 6: The practice of Track Walkers reversing roles between Inspector and RWIC in their twice-weekly inspections is not documented. When performing twice-weekly track inspections, Track Walkers teams will assign one person to be the Inspector on one day and the RWIC on the other day, with the other person having the roles reversed.

Finding 7: The Standard Operating Procedure (SOP) for the Track Geometry Vehicle (TGV) has not yet been finalized. WMATA took delivery of its TGV in 2012, but as of the time of this review, no final, executed SOP has been issued.

Finding 8: WMATA should conduct a resource assessment to evaluate the TRST's human resource availability and allocation. Such an assessment would provide WMATA with a comprehensive understanding of TRST's human resource needs, including the training needs in order to be a fully functioning, ready work force of track inspectors and maintainers at all skill levels.

Personnel Interviewed

- [redacted] TRST
- [redacted] TRST

- [redacted] TRST
- [redacted] TRST
- [redacted] TRST
- [redacted] TRST
- [redacted] TRST
- [redacted] QAAW
- [redacted] SAFE
- [redacted] SAFE

Documents Reviewed

- WMATA-1000, Track Inspection Manual, Revision 6, January 1, 2015
- WMATA-2000, Track and Structures Maintenance Control Policy, Revision 6, February 20, 2015 (draft)
- OAP 208-01, Track Maintenance Management, Maintenance of Way, Revision 8, July 31, 2006
- MH0604 Track Geometry Vehicle Volume 2 Technical Specifications, March 21, 2008
- OAP 200-02, Maintenance Operations Center, Revision 2, February 1, 2001
- OAP 200-03, Preventive Maintenance on Revenue Vehicles and Wayside Equipment, Revision 3, October 23, 2000
- OAP 508-19, Track Walker Qualifications Certification Procedure, Revision 0, November 30, 2009
- 2015 TRST Track Walker Analysis Report, TKIN Management
- Various Track Inspection Records, Calendar Year 2015
- TRST reports on open work orders, September 24, 2015
- Maximo work order process flow: corrective maintenance (entered by maintenance managers)
- Maximo work order process flow: defects (entered by track walkers)
- Track Walker training course materials
- Track Inspection Schedules (undated)
- Track Inspection Personnel (undated roster)
- TRST Organizational Chart, Effective January 22, 2015