
Office of Inspector General

Audit Report

ACTIONS NEEDED TO IMPROVE FTA'S OVERSIGHT OF THE DULLES CORRIDOR METRORAIL PROJECT'S PHASE 1

Federal Transit Administration

Report Number: MH-2012-155

Date Issued: July 26, 2012





Memorandum

**U.S. Department of
Transportation**

Office of the Secretary
of Transportation
Office of Inspector General

Subject: **ACTION:** Actions Needed To Improve FTA's
Oversight of the Dulles Corridor Metrorail
Project's Phase 1
Federal Transit Administration
Report No. MH-2012-155

Date: July 26, 2012

From: Joseph W. Comé 
Assistant Inspector General for
Highway and Transit Audits

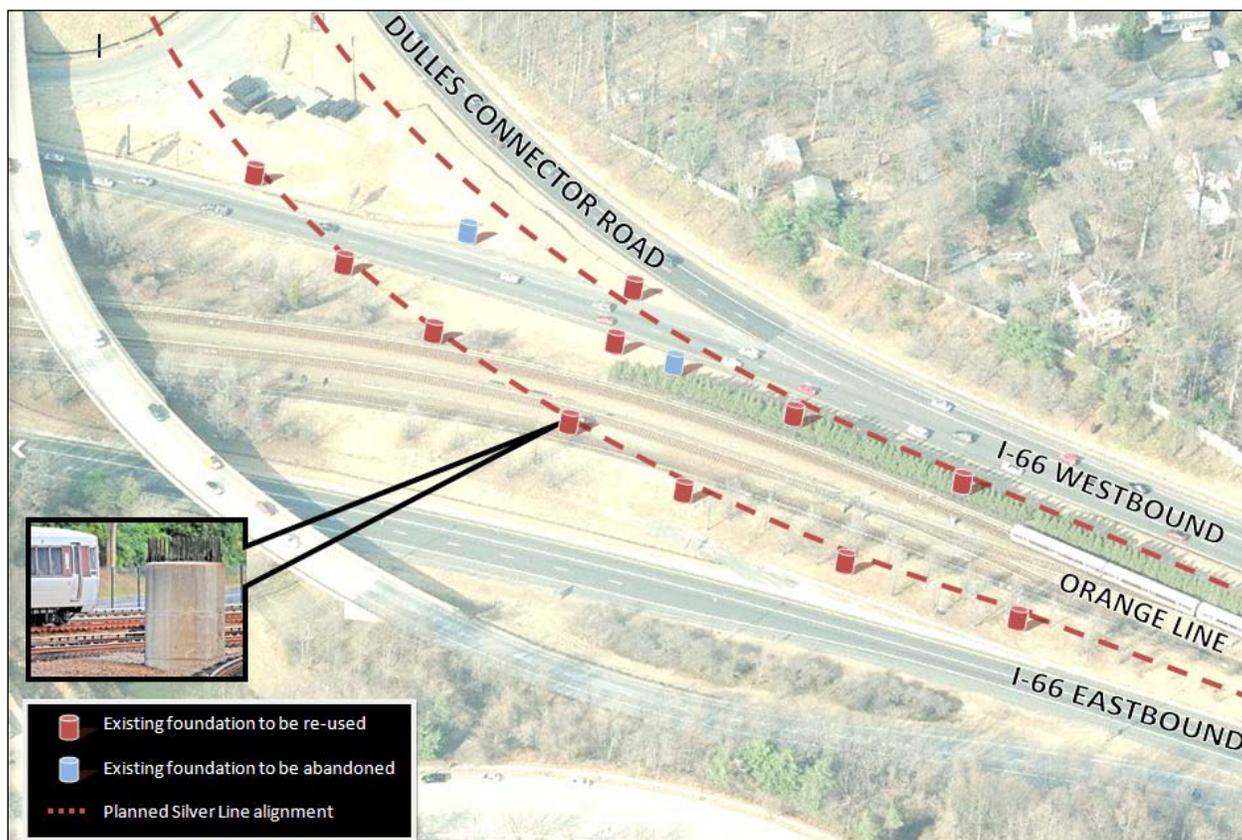
Reply to
Attn. of: JA-40

To: Federal Transit Administrator

The Dulles Corridor Metrorail Project (the Dulles project) is one of the most prominent transportation projects in the national capital region, with the ultimate goal of providing a mass transit link to Dulles International Airport in Northern Virginia. The Metropolitan Washington Airports Authority (MWAA) is constructing the first of two phases of the project, although MWAA will turn over operation of both phases to the Washington Metropolitan Area Transit Authority (WMATA) as they are completed. The Federal Transit Administration (FTA) is responsible for overseeing the Federal Government's significant investment in phase 1 of the Dulles project—a \$900 million grant from FTA's New Starts program including \$77.3 million from American Recovery and Reinvestment Act (ARRA) funds. Phase 1 has a total estimated cost of \$3.1 billion.

The project has been the subject of significant public and congressional scrutiny, including safety issues that emerged 3 years ago. In October 2009, our office issued a management advisory to FTA (see exhibit D) expressing concern about the safety of using 11 pier foundations to support part of the Dulles project's guideway (see figure 1 on the next page). These foundations are composed of 30-year-old steel piles topped with a concrete cap. We requested that FTA work with MWAA to develop a plan for ensuring the foundations would undergo sufficient safety testing. FTA assured us it would require MWAA to develop a comprehensive testing plan. The FTA Administrator also committed FTA to providing enhanced oversight, stating that MWAA would incorporate the results of the safety tests into the Dulles project's final design.

Figure 1. Location of Existing Pier Foundations on the Dulles Project



Source: OIG with photograph insert from The Washington Post

In our advisory, we also announced our plan to evaluate the effectiveness of FTA's oversight of phase 1 and assess potential safety concerns. Specifically, our objectives were to determine whether (1) FTA's oversight of MWAA's process to test the 30-year-old foundations was sufficient to resolve safety concerns and (2) FTA's oversight activities effectively addressed significant project schedule, cost, and funding risks.

In conducting the audit, we interviewed officials at FTA and its oversight consultant, Hill International. We also spoke with officials at MWAA and its design-build contractor, Dulles Transit Partners (DTP); WMATA; and the Virginia Department of General Services. In consultation with our engineers, we assessed key documents, including results of the foundation tests and project management oversight contractor (PMOC)¹ assessments of the testing process. We stayed abreast of project developments by reviewing monthly project reports and

¹ FTA uses PMOCs to oversee projects, in accordance with FTA guidance, and report regularly on needed corrective actions. PMOCs evaluate a grantee's cost estimates and technical and management capacity, and later monitor implementation.

through periodic inquiries to FTA, MWAA, and WMATA. In June 2011, we contracted with the Army Corps of Engineers to enhance our review of stray current tests and service life. We conducted this audit in accordance with generally accepted Government auditing standards for performance audits. We provided FTA with our draft report for review and comment on February 15, 2012. We received its technical comments on June 5, 2012, and its formal response on June 7, 2012. We periodically met with FTA officials during the 4-month period between the issuance of our draft report and the date we received FTA's formal response. We also updated our report to reflect additional information provided and actions taken by the parties involved during that period. Exhibit A describes our scope and methodology and related work; exhibit B identifies the organizations we visited or contacted; exhibit C details compliance with ARRA obligation, oversight, and reporting requirements; and exhibit E provides FTA's response to our management advisory and FTA's related letter to MWAA.

BACKGROUND

The Dulles project will add a new line—the “silver line”—to the WMATA Metrorail system, as shown in figure 2 on the next page. Phase 1 of the new construction will run from near the existing West Falls Church Station through the Tysons Corner area to Wiehle Avenue in Reston, Virginia. Phase 1 will be largely above ground with a short tunnel under the Route 7 and Route 123 interchange. The planned phase 2, not yet under construction, would continue Metrorail service into Loudoun County, Virginia, passing through Dulles International Airport. When completed, the silver line will originate at the Stadium Armory Station and will share existing track with the blue and orange lines. The silver line will continue to share existing track with the orange line up to the East Falls Church Station.

Figure 2. Dulles Project's "Silver Line" Extension of the Metrorail System, Phases 1 and 2



Source: WMATA

MWAA is responsible for design and construction of both phases and is the FTA grantee for phase 1 and, therefore, subject to FTA oversight for phase 1 of the Dulles project.² Once MWAA completes each phase, WMATA will operate the rail line. At present, WMATA has a consulting role in the Dulles project under an interagency agreement. WMATA also has a direct role in project execution on a reimbursable basis from MWAA, mainly for the acquisition of railcars. Table 1 shows the organizations involved in the oversight and construction of the Dulles project.

Table 1. Organizations With Roles in the Dulles Project

| | |
|---------------------------------|--|
| FTA | The Federal agency responsible for determining whether New Starts projects, such as the Dulles project, are eligible for Federal funding and, later, overseeing the construction of projects. |
| MWAA | Separately from its airport responsibilities, the grantee responsible for execution of the project. In order to finance the major portion of both phases, MWAA has also taken over the operating responsibilities and the revenues of the Dulles Toll Road. MWAA also provided a quality assurance review of the pier foundation testing performed by DTP. |
| DTP | MWAA's design-build contractor for the project. DTP subcontractors performed the tests of the historic pier foundations. |
| WMATA | As the eventual owner and operator of the project, WMATA serves as a technical advisor to MWAA, with a particular focus on compliance with WMATA design standards and criteria. WMATA is also acquiring the railcars for the project, and MWAA reimburses WMATA using project funds. |
| Hill International | FTA's PMOC for the Dulles Project. |
| Fairfax County, Virginia | The county where the phase 1 project is located and a significant source of project funding through taxes on businesses within a special tax district. |
| CTI | MWAA's consultant to oversee DTP's testing of the historic foundations. |
| Commonwealth of Virginia | Source of about \$177 million of project funding. Depending on the exact location, the Commonwealth Department of General Services or Department of Transportation is responsible for providing permits for some portions of the construction. |

Source: OIG based on the Dulles Corridor Metrorail Project Extension to Wiehle Avenue Project Management Plan

FTA oversees major projects using its staff and PMOCs to ensure the adequacy of a grantee's technical capability; assess the reasonableness of a project's scope, schedule, and estimated cost; and assess cost and schedule estimates. PMOCs identify problems, suggest solutions, perform analyses, and report their findings and recommendations to FTA.

² Although some phase 2 issues might affect phase 1, and FTA has no official oversight role in phase 2 at this time, the Secretary and FTA Administrator have facilitated the process by encouraging the parties involved in phase 2 to reach consensus on certain issues vital to sustain the project.

RESULTS IN BRIEF

In response to our management advisory, FTA implemented an oversight process for ensuring that MWAA tested the 30-year-old pier foundations, but as of February 2012, when we issued our draft report, it had yet to take sufficient follow-up actions to resolve all the issues that emerged from the test results. To carry out its oversight process, FTA engaged a PMOC to verify that MWAA's design-build contractor (DTP) conducted the tests and used an independent third party (CTI) to oversee them. While FTA concurred with the PMOC's November 2010³ determination that "the existing piers are suitable for re-use," our review of the testing reports identified areas where FTA's initial review and MWAA's quality assurance review overlooked omissions in the testing and errors in the test results. These included the need to further analyze foundational steel piles that varied from industry standards⁴ and inconsistencies among the three reports (MWAA's, DTP's, and CTI's) for the same piles. MWAA and DTP took actions to resolve these and other deficiencies we brought to their attention in 2011. However, our review of testing documents since then found that FTA still had not resolved two key issues.

- First, although the 2010 testing results appeared to demonstrate that the foundations could support vertical loads of the infrastructure constructed upon them, FTA did not fully address issues we identified with the foundations' ability to withstand lateral loads (horizontal forces that push from the side)⁵ until June 2012. At that time, an FTA PMOC reported that the lateral load capacity of the foundations is adequate, citing technical references to support the assumption that the untested load capacity of battered piles is equivalent to the capacity of nearby tested vertical piles that underlie the foundations. Figure 3 describes key engineering terms. The PMOC's overall approach was supported by other experts in the Department of Transportation and by other FTA consultants, although the consultants did not comment on the PMOC's specific assumption about untested battered piles. Ultimately, the additional information FTA provided is responsive to our concerns about the foundations' capacity to withstand lateral loads, but the extended process in reaching this point supports the need for FTA's plans to assess elements of its oversight processes.
- Second, the testing process has not yet provided assurance that the structures being turned over to WMATA will at least meet the 50-year service life

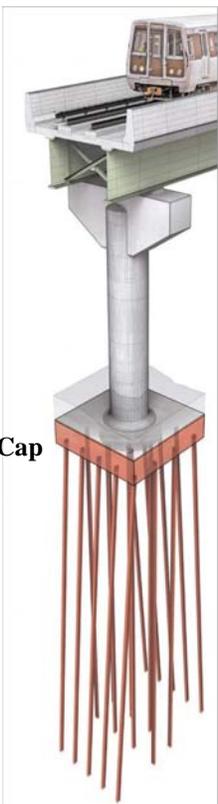
³ The reports reviewed consisted of a DTP report, the independent third party's report, and MWAA's summary quality assurance report.

⁴ ASTM International, formerly the American Society for Testing and Materials, set industry standards that are used on the Dulles project.

⁵ Lateral load is a horizontal force transferred to a pile that pushes from the side and that comes, for example, from wind; movement of rail cars; and seismic forces, such as the one experienced in the Washington Metropolitan Area on August 23, 2011.

specified in FTA guidance. Stray electrical current along the piles was not sufficiently tested to determine the effects of corrosion on the foundations' service life. Stray current is picked up by the piles closest to the rail tracks, and over time, these piles lose steel due to corrosion. With assistance from the Army Corps of Engineers, we found that the testing depth, measurements, and criteria used were insufficient to validate FTA's and MWAA's conclusion that negligible corrosion from stray currents is occurring on the steel piles. In June 2012, FTA agreed to direct MWAA to conduct additional corrosion testing to provide further assurance that the expected 50-year service life will be met before turning the structure over to WMATA.

Figure 3. Description of Key Engineering Terms

| | | |
|--|-------------------------------|--|
|  | Pier | A vertical structure that supports the elevated guideway. |
| | Foundation | The portion of a structure, usually below ground, used to transfer the loads from the pier to the underlying earth or bedrock. |
| | Pile | A vertical pile is a long steel component of the foundation that is driven deep into the ground to give support to the structure above it. A battered pile is an inclined pile that is driven into the ground at an angle. |
| | Pile Cap | Part of the foundation, a large concrete block that sits on top of the piles from which a pier is extended to support the elevated guideway. |
| | Axial or Vertical Load | A vertical force transferred to a pile that pushes down from the top and that, for example, comes from the weight of the structure and railcars. |
| | Lateral Load | A horizontal force transferred to a pile that pushes from the side and that comes, for example, from wind and movement of the railcars. |
| | Stray Current | The flow of electricity from the powered rail of a transit system that can flow through the ground, be picked up by buried metal elements, and cause corrosion. |

Source: OIG with Illustration from The Washington Post

As of February 2012 when we issued our draft report, FTA had not taken sufficient mitigation actions to address key project issues, such as receiving delivery of new railcars and funding a reserve account, that put the schedule, cost estimate, and funding from the 2009 Full Funding Grant Agreement (FFGA)⁶ at risk. FTA still faces the significant challenge of following through to carry out actions it has promised in response to our draft report. Specifically:

⁶ The FFGA is an instrument that defines the scope of a Project, the Federal contribution to that Project, and other terms and conditions.

- FTA had not effectively addressed schedule risks, including late delivery of the 64 railcars needed to make the Dulles project operational for Metrorail users. WMATA officials stated that it can make up a shortfall by using cars from its existing fleet. However, as of June 2012, FTA had not yet accepted WMATA's updated Rail Fleet Management Plan, which could determine whether that plan is feasible. Another risk that could still impact the scheduled completion date is disagreements between DTP and MWAA over whether the expansion of the West Falls Church Yard should be included in the Dulles project's critical path.⁷ At the time of our draft report, MWAA had a longstanding disagreement with DTP's estimated completion date because it did not include the West Falls Church Yard expansion in its schedule estimates. After we issued our draft report, FTA worked with MWAA and DTP to resolve the scheduling issue on the West Falls Church Yard. Although MWAA and DTP reached agreement on the schedule issue, this risk could reemerge unless FTA closely monitors implementation of the agreement as construction progresses.
- FTA had not taken sufficient actions to mitigate the cost risks of the Dulles project. In March 2011, the PMOC began expressing concerns about the adequacy of the project contingency and projected budget overruns. In July 2011, the PMOC reported that the estimated budget overruns of \$115 million⁸ would exceed the remaining contingency of \$87 million, leaving a \$28 million deficit and by September 2011, the remaining contingency had declined to \$82.3 million. However, at the time of our draft report in February 2012, FTA had not yet accepted a key plan addressing these risks. Given the forecasted magnitude of the budget overruns, the Dulles project could exceed the cost estimate contained in the FFGA, unless MWAA or DTP is able to identify significant cost savings or secures additional funding, including the potential need to fund a \$200 million Capital Reserve Account (CAPRA)⁹ that was called for in the FFGA. To date, FTA has not required MWAA to fully fund the CAPRA. Subsequent to our draft report, FTA approved MWAA's Risk and Contingency Management Plan, which addresses cost overruns and could negate the need for the CAPRA—if FTA ensures that MWAA carefully follows the plan for the duration of project construction.

We are making a series of recommendations to strengthen FTA's oversight of the Dulles project.

⁷ A critical path is a sequence of activities that must be completed on schedule to ensure that the entire project is completed on schedule. For example, if an activity on the critical path is delayed by 1 day, then the entire project could be delayed by 1 day.

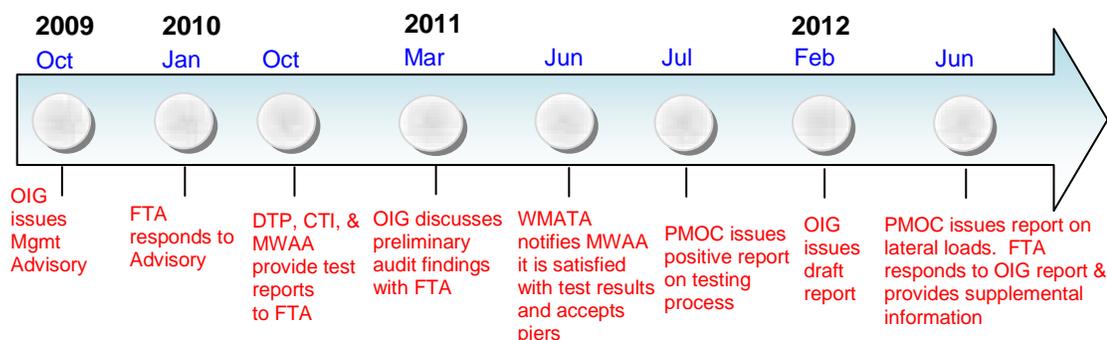
⁸ Estimated overruns include \$59 million in allowance items yet to be awarded and nearly \$56 million in open Directive Letters.

⁹ The CAPRA is committed solely to the Project to serve as additional contingency beyond the Project's contingency, should MWAA fail to maintain its current baseline cost estimate.

FTA HAD NOT RESOLVED IMPORTANT ISSUES RAISED BY THE TEST RESULTS

MWAA's design-build contractor tested the 30-year-old pier foundations using a process consistent with steps established by FTA, in response to our management advisory. However, as of February 2012, FTA's oversight of the testing process and its subsequent actions had not resolved all issues that emerged from the tests or issues our review identified, which we discussed with FTA in March 2011 (see figure 4 for a timeline of the testing process). In particular, at the time of our February 2012 draft report to FTA, MWAA and DTP had not yet resolved two key issues: (1) the structures' ability to withstand lateral loads and (2) the potential corrosion of the piles and possible reduction of their service life due to the effect of stray current. In its June 2012 response to our draft report, FTA reported that it had taken action to resolve these issues by endorsing a PMOC's report attesting to the adequacy of the foundations' lateral load capacity and directing MWAA to conduct additional corrosion testing on the effect of stray current. FTA also stated that it plans to conduct an internal review of its PMOC process given the issues we identified in this report.

Figure 4. Roles and Timeline of the Testing and Testing Oversight of the Pier Foundations in Response to OIG Management Advisory



FTA Had Not Resolved Safety Issues Related to the Pier Foundations' Ability To Withstand Lateral Loads

FTA had not ensured at the time of our draft report that the pier tests and subsequent follow-up activities clearly determined the foundations' ability to resist lateral loads (horizontal forces that push from the side).¹⁰ In March 2011, we told FTA officials that the Dulles project design documents lacked sufficient information on the capacity of the existing piles to adequately support lateral loads

¹⁰ Vertical piles were tested and the testing results appeared to demonstrate the foundations' ability to support adequately the infrastructure constructed upon them.

as required by design codes.¹¹ In May 2011, a month after we told MWAA about our concerns with the lateral loads, MWAA issued a revised report that included a new DTP analysis of pile lateral load capacity for the foundations. In this report, the analysis appeared to have been based on results from battered pile tests. However, when we later requested testing documentation through FTA, MWAA provided a revised analysis that had removed references to testing the existing battered piles. The revised analysis was based on results from select vertical pile tests. It still did not sufficiently demonstrate how the load capacity of each of the untested existing battered piles could be determined.

As a result of our continued inquiries into this matter, DTP revised its analysis and the PMOC issued a report detailing the basis for determining the capacity of the pier foundations to withstand lateral loads. In its June 2012 report, the PMOC concluded that lateral load capacity could be determined by analyzing untested battered piles, assuming that their load capacity is equal to the tested capacity of vertical piles in the vicinity of the battered piles. The PMOC supported this assumption citing technical references such as the uniformity of the soil in the foundation area, standard practices for driving piles, and application of an American Society for Testing and Materials (ASTM)¹² standard that was used for 5 of the 11 pile foundations. The PMOC's overall approach was supported by experts in the Department of Transportation's Federal Highway Administration, and other FTA consultants. However, these experts did not comment on the PMOC's specific assumption about the untested battered piles or how the cited references supported that assumption.

In its June 2012 response to our draft report, FTA cited work done by technical experts, including the PMOC, attesting that the lateral load capacity of the foundations is adequate. The additional information FTA provided is responsive to our concerns about the foundations' capacity to withstand lateral loads, but the extended length of time it took to reach this point supports the need for FTA's plans to assess elements of its oversight processes. In responding to our draft report, FTA stated that it intends to review its existing processes and requirements for project management oversight to ensure that it is as effective as possible. Given that information we received from FTA, MWAA, and DTP during this audit on the lateral load issue was, on multiple occasions, inaccurate, incomplete or inconsistent with other documents provided, we agree that FTA could benefit from a comprehensive review. The importance of early proactive identification of safety issues is illustrated by the concern we raised about the foundations' capacity to withstand lateral loads. The analysis FTA provided with its June 2012 response

¹¹ The design codes are listed in the Basis of Design Report, Design Criteria and Standards for the Dulles Corridor Metrorail Project.

¹² ASTM is a globally recognized leader in the development and delivery of international voluntary consensus standards. There are about 12,000 ASTM standards that are used around the world to improve product quality, enhance safety, facilitate market access and trade, and build consumer confidence.

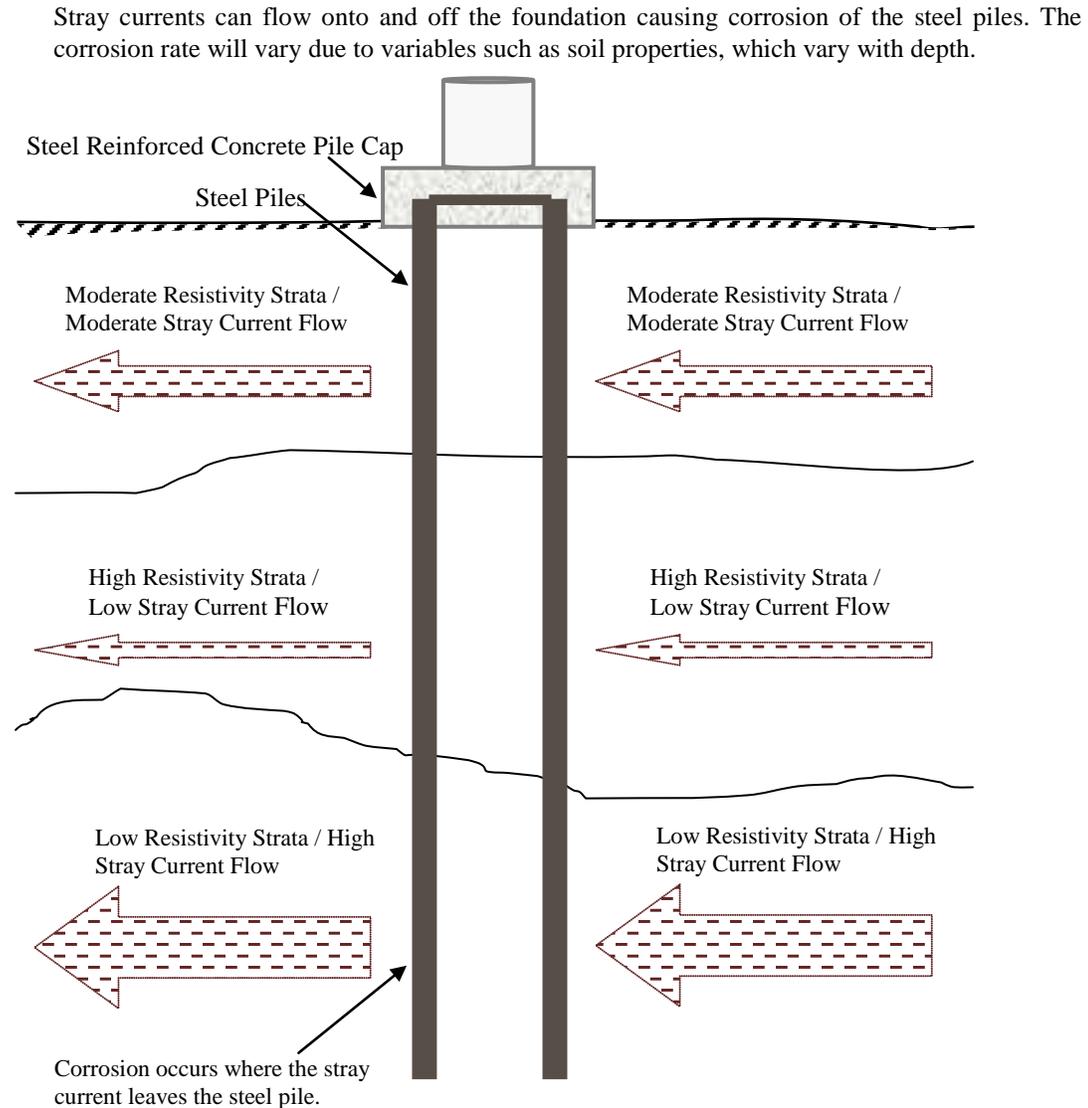
relies on a number of assumptions on foundations due to the lack of historical data, such as pile driving records and as-built drawings, and the degree of prior testing performed. Moreover, had FTA addressed lateral load capacity testing earlier, the almost completed construction atop the foundations would not have constrained actual tests of the battered piles.

FTA Has Not Resolved the Effect of Stray Current on the Foundations' Service Life

FTA has yet to resolve the issue of the corrosive effect of stray current along the piles that underlie the foundations; but it has agreed that further tests are needed to address the issue. For over 25 years, the steel piles have been exposed to electric current from the rails of the orange line that stray from the intended path into the soil. The piles closest to the tracks are most likely to pick up these currents that can, over time, cause significant pile corrosion. While stray current testing was addressed in the testing plan, based on documentation we received, the DTP testing did not adequately measure the effect of stray currents on the corrosion and service life of the existing steel piles. Figure 5 illustrates stray current flow based on soil strata resistivity (a measure of the corrosiveness of soil layers)¹³ at varying depths.

¹³ Soil strata resistivity is a measure of the corrosive ability of soil layers. The lower the resistivity of a soil layer is, the higher the magnitude of the corrosion current that flows through it will be, and more corrosion can be expected at that layer.

Figure 5. Illustration of Stray Current Flow Based on Soil Strata Resistivity at Various Depths



Source: OIG and Army Corps of Engineers

Based on work we conducted with assistance from Army Corps of Engineers' corrosion experts, the stray current testing used insufficient measurements and criteria and was not conducted at sufficient depth. Further, our review of the testing plan and the two rounds of tests conducted on the piles in 2008 and 2010 found that the tests did not include a critical test essential for measuring stray current. While an admittedly complicated issue, these testing deficiencies were not identified through FTA's oversight. As a result, without this additional testing it is not feasible to calculate the piles' service life and determine the need for corrosion control measures.

Specifically, we found that more measurements and documented support for the testing criteria was needed. The tests performed, such as pile-to-earth potential and earth-potential gradient,¹⁴ included measurements that, although useful for indicating the presence of stray currents, are not useful to calculate stray current density on the pile.¹⁵ The current density is essential for determining the rate of pile corrosion. Determining the rate of corrosion (i.e., the amount of steel lost over time) is necessary to estimate the piles' remaining service life. Further, the testing plan established a threshold to describe stray current activity that was not supported by a technical reference.

DTP drew incorrect conclusions from the stray current and soil resistivity testing. DTP's stray current testing was not conducted deep enough in the ground. The measurements accounted only for conditions close to the earth's surface and not for the entire length of the piles. Because the measurements were taken at shallow depths, test results are inconclusive regarding the overall condition near the bottom of the piles. Further, DTP's soil resistivity tests conducted at various depths indicated a potentially corrosive environment for steel. However, DTP dismissed the soil resistivity test results due to the lack of oxygen in the soil below the pile caps, and concluded that the minimal amount of corrosion detected in the piles did not warrant corrosion control measures. Contrary to DTP's conclusion, the soil resistivity recorded at different depths indicates that the stray current corrosion will vary with pile depth regardless of the oxygen content in the soil. Without resolution of this complex issue, MWAA has no assurance that the structures will meet service life expectations.

Although DTP stated that it completed all planned tests and inspections in 2008 and 2010, our review identified a planned test that was not completed. Further, we found that MWAA and DTP have not determined the service life for the existing pile foundations. Moreover, FTA's oversight had not identified the missing test or sufficiently pushed for resolution of the service life issue. Specifically:

- DTP did not measure or obtain historical data on track-to-earth resistance in accordance with the testing plan. As a result, MWAA formally instructed DTP to measure the track-to-earth resistance. The Corps experts maintain that the track-to-earth tests should have been conducted concurrently with tests to determine stray current density in order to establish accurate "baseline" conditions for future evaluations of stray current conditions.

¹⁴ Pile-to-earth potential and earth-potential gradient measure general stray current activity and direction of stray current flow at the test locations. Both the structure-to-earth potential and earth potential gradient values are a function of soil resistivity, overall circuit resistance, placement of the measuring electrodes, and stray current magnitude.

¹⁵ Current density, which is the amount of current over an affected area, is measured in amperes per unit area. The pile-to-earth potentials and earth-potential gradients are measured in volts and do not provide the current density.

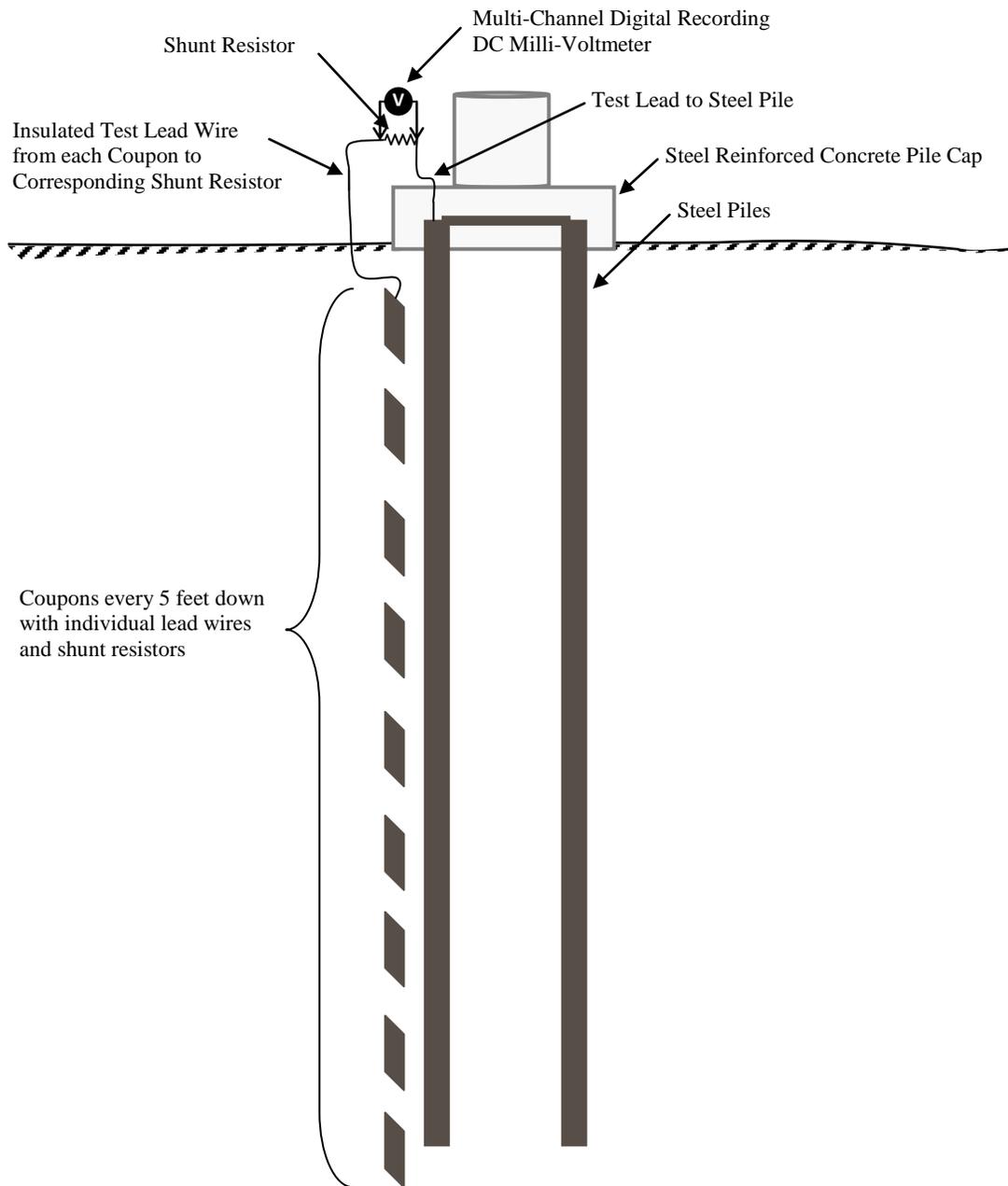
- MWAA and DTP installed steel electrodes, at the top of the piles at four foundations, for future monitoring of stray currents. According to experts from the Corps, these installations will not provide the data to determine the rate of corrosion along the pile length. Without the rate of corrosion, it is impossible to calculate the piles' service life and determine the need for corrosion control measures.
- DTP did not use a recognized engineering corrosion methodology to determine accurately the stray current densities, which is the amount of current over an affected area, at various soil depths. Experts from the Corps stated that a recognized corrosion engineering methodology involves installing coupons, or metal strips, along the length of a pile in each of the 11 foundations to calculate the piles' corrosion rates. See figure 6 on next page for an illustration of how coupons could be installed along the length of a pile to measure stray current densities.

It is important for FTA to resolve any issues associated with measuring stray currents to provide assurance that the structures being turned over to WMATA meet FTA's guidance for a 50-year minimum service life requirement for railroad and highway structures.¹⁶ In May 2008, WMATA had informed MWAA that the acceptance of the existing structures would be based on compliance with WMATA's design criteria including a demonstration that the life cycle performance of these structures will be commensurate with that required for the new construction atop them. In April 2011, WMATA informed us that it fully expects to see a demonstration that the foundations can safely carry the design loads for their expected service life before it accepts operation of the Dulles project. In June 2011, WMATA informed MWAA that it was satisfied with the service life issue, but it did not provide details on the number of years it considers acceptable for the service life of the foundations.¹⁷ According to the Corps' experts, the service life of these structures must be confirmed before project construction is completed.

¹⁶ FTA Circular 5010.1D.

¹⁷ FTA's PMOC reported on this correspondence in its June 2011 monthly report.

Figure 6. Illustration of Coupon Installation to Measure Stray Current Densities



Source: OIG and Army Corps of Engineers

In FTA's June 2012 response to our audit report, it concurred with our findings and stated that it will direct MWAA to conduct tests to directly measure stray current and address the remaining service life of the old foundations. Our review of a proposed plan for the tests found that the plan generally addresses the

deficiencies we identified in the earlier testing although we have outstanding concerns related to two areas.

- First, the proposed plan limits the stray current tests to 2 of the 11 re-used foundations but it is unclear whether these locations actually reflect the greatest stray current activity as the plan initially claimed. While there may be plausible factors that make it difficult to test certain locations, it is critical that locations not selected for testing, but susceptible to high levels of stray current activity, be included in the evaluation for metal loss and remaining service life. The proposed plan is not clear on how those untested locations will be accounted for and analyzed for their compliance with the established metal loss and service life criteria.
- Second, the proposed plan initially omitted the necessary baseline track-to-earth tests but our understanding now is that they will be scheduled to occur after track work upgrades in the vicinity of the old existing foundations are complete. While the scope of the upgrades to the existing track work is unclear, any improvements to the ballast, ties, and other track components in the vicinity of the old foundations will likely increase the track-to-earth resistance and consequently decrease the level of stray current activity in the area. This would consequently result in test data that do not reflect historical or worst-case conditions. Therefore, to quantify the impact from the track work upgrades, before and after baseline track-to-earth resistance measurements are necessary to ensure that past and future metal loss calculations are not underestimated.

FTA HAD NOT TAKEN SUFFICIENT ACTION TO ADDRESS RISKS THAT COULD AFFECT THE DULLES PROJECT'S SCHEDULE, COST, AND FUNDING CAPACITY

FTA had not taken adequate action at the time of our draft report to address the Dulles project's schedule, cost, and funding risks, such as receiving delivery of new rail cars on time, improving rail line operating systems, and funding a reserve account, that could impact MWAA's FFGA commitments to the Federal Government. While FTA took some action on cost, schedule, and funding issues in response to our draft report, such as approving MWAA's Risk and Contingency Management Plan, it has not fully addressed all risks we identified and still faces the significant challenge of closely monitoring MWAA's newly promised actions for the duration of construction.

FTA Had Not Addressed Potential Railcar Delivery or Rail Yard Expansion Delays That May Impact the Timely Completion of the Dulles Project

FTA had not taken sufficient action to ensure WMATA delivers railcars on schedule—a risk to meeting the FTA revenue operations date (ROD)¹⁸ specified in the FFGA. As FTA’s oversight procedures require, the PMOC has provided monthly reports to FTA citing schedule risks, including the possible delayed delivery of railcars needed to make the Dulles project operational. However, FTA has not yet accepted a plan addressing WMATA’s ability to cover a railcar shortfall. In November 2011, the PMOC reported that the 64 railcars to service the silver line would not be delivered until April 6, 2015, 4 months beyond the FFGA’s December 1, 2014, ROD. WMATA stated that it would use railcars from its existing fleet in the event of a delayed delivery but, as of February 2012, when we issued our draft report, FTA had not accepted a plan demonstrating that it could meet and exceed railcar requirements during peak operating hours for all Metrorail lines in case of delayed delivery of the silver line railcars.¹⁹ In May 2012, after we issued our draft report, FTA received another Rail Fleet Management Plan from WMATA, which FTA is reviewing and plans to finalize by January 2013. However, until it accepts WMATA’s plan, FTA cannot be sure WMATA’s assertions are correct. Further, the railcar manufacturer (Kawasaki) stated that because of the March 2011 earthquake and tsunami in Japan,²⁰ the new railcar delivery could be delayed an additional 6 months—adding more time to the initial delay already identified.

Delays in the expansion of the West Falls Church Yard, a critical facility for storing, inspecting, and servicing railcars, could also still negatively impact the phase 1 scheduled completion date. In February 2010, the PMOC began reporting that DTP and MWAA disagreed on whether to include the Yard’s expansion in the Dulles project’s critical path, the list of activities critical to ensuring the entire project is completed on schedule. This expansion is included in the FFGA’s scope of work for phase 1; therefore, the expansion’s completion is required by the FFGA’s December 1, 2014, ROD. If the Yard’s expansion is not included in the project’s critical path, it could result in the inaccurate reporting of the Dulles project’s scheduled completion. If project delays result in missing the FFGA deadline for revenue operations, MWAA would then have to request FTA to waive the delay and to extend the ROD.

¹⁸ The revenue operations date is the scheduled completion date for the project.

¹⁹ A Rail Fleet Management Plan should enable WMATA to properly plan for and carry out the overall management of its entire fleet of locomotives and railcars. To be effective, the plan should address existing and future equipment needs, including vehicle life expectancy; the requirements for peak and spare vehicles; strategies for the acquisition of new vehicles; and strategies for maintenance and operations.

²⁰ Several subcontractors for Kawasaki that are manufacturing parts for the railcars are located near Tokyo, Japan, and have experienced extensive power outages that have affected design and manufacturing.

According to FTA, MWAA and its contractor reached an agreement in May 2012, that settled the scheduling issue between the parties. In response to our draft report, FTA has promised to monitor the implementation of the agreement as construction work in the West Falls Church Yard continues.

FTA Had Not Taken Sufficient Action To Mitigate Potential Cost Increases or Depletion of the Budget Contingency

While monthly PMOC reports have repeatedly identified railcar procurements, rail line improvements, and utility relocations, among other things, as potential cost risks, FTA had not identified the effect these cited risks could have on the Dulles project or the probability of them occurring. For example, the PMOC reported potential risks with WMATA's automatic train control, traction power, and communication systems design upgrades; however, FTA did not quantify these risks. In March 2011, the PMOC reported concerns regarding the adequacy of the Dulles project's contingency, stating that the "remaining allowance items will utilize most of the remaining contingency." In July 2011, the PMOC expressed concerns that the estimated budget overruns were \$115 million,²¹ while the remaining contingency was \$87 million, leaving a deficit of \$28 million.

In September 2011, the PMOC again expressed concern about the remaining contingency, which at that time had declined to \$82.3 million. In December, the PMOC noted that it had further declined to \$49.8 million. To demonstrate how MWAA plans to manage cost risks and use its contingency through project execution, MWAA submitted an updated Risk and Contingency Management Plan to FTA. However, at the time of our draft report in February 2012, FTA had not accepted MWAA's plan. Given the forecasted magnitude of these cost overruns, the Dulles project could exceed the cost estimate contained in the FFGA, unless cost savings are identified or FTA amends the FFGA.

Despite the cost risks, FTA had not required MWAA to fund a \$200 million CAPRA called for in the FFGA, a key risk mitigation tool for dealing with cost overruns. The CAPRA would cover costs that exceed the contingency funding levels that were included in the original project budget. MWAA stated that it would address CAPRA funding in conjunction with the Dulles Project's phase 2 finance plan. The FFGA calls for financing the CAPRA through revenue bonds in the event of cost overruns on the project.

After we issued our draft report, FTA took action to ensure that MWAA has sufficient funding available to supplement existing contingencies. However, FTA contended that MWAA does not need to fund the CAPRA because it has identified alternative cost measures. Specifically, MWAA recently identified \$71 million in

²¹ Estimated overruns include \$59 million in allowance items yet to be awarded and nearly \$56 million in open directive letters.

finance cost savings, according to FTA. Further, in April 2012, FTA approved MWAA's final Risk and Contingency Management Plan and assured us that MWAA will have sufficient contingency funds available. While the plan could alleviate the need for a CAPRA, FTA faces the significant challenge of ensuring that MWAA takes risk mitigation measures for the duration of project construction, as called for in the plan.

CONCLUSION

The Dulles Project is a high profile, multibillion-dollar effort aimed at connecting Northern Virginia's fastest growing employment regions and providing access between the District of Columbia and its major international airport, through a high-capacity rail system. FTA is responsible for overseeing the \$3.1 billion phase 1 of the Dulles project to ensure it is constructed safely and efficiently. However, FTA was slow in responding to concerns we identified related to safety testing on foundations supporting part of the project. Also, FTA has not been sufficiently proactive in addressing risks that could impact the project's cost, schedule, and funding capacity, underscoring the need for FTA to assess the effectiveness of its oversight processes. While in recent months, FTA has addressed or provided specific planned actions to resolve remaining concerns we had, it is critical for FTA to continue working with MWAA to address all potential safety issues as well as risks that could lead to delays, cost overruns, and funding shortfalls on the project.

RECOMMENDATIONS

We recommend that the Federal Transit Administrator:

1. Verify that valid criteria exist to determine lateral load capacity of the existing foundations with analyses that are based on assumed, non-tested, capacity of piles, and provide oversight to ensure that the Metropolitan Washington Airports Authority executes any resulting changes to the analyses, design, and testing requirements.
2. Develop and implement a plan, with milestones, to ensure that the Metropolitan Washington Airports Authority carries out appropriate stray current tests to calculate the piles corrosion rate and estimate their remaining years of service. Specifically:
 - a. Measure the maximum stray current density with steel coupons installed vertically at multiple depths adjacent to the pile(s) selected for testing, and use the current densities measured to calculate the steel corrosion rate.

- b. Establish the thresholds for stray current density and corrosion rate that will achieve the desired service life, and calculate the remaining service life for the old foundations.
 - c. Test the track-to-earth resistance to establish baseline conditions concurrently with the stray current density.
 - d. Use the track-to-earth resistance and stray current density test results to design the corrosion protection measures that meet the service life goal.
3. Develop and implement a plan, with milestones, to ensure that the Metropolitan Washington Airports Authority installs any applicable corrosion protection measures that emerge from the stray current tests before the Washington Metropolitan Area Transit Authority accepts the final Dulles phase 1 project.
4. Require the Metropolitan Washington Airport Authority to resolve potential schedule delays by finalizing the Washington Metropolitan Area Transit Authority's Rail Fleet Management Plan to ensure that sufficient railcars will be available for the silver line, without negatively impacting Metrorail service on other lines.
5. Require the Metropolitan Washington Airport Authority to resolve potential schedule risks by working with the Metropolitan Washington Airport Authority and its contractor to make a final determination as to whether the full scope of the West Falls Church Yard's expansion is accounted for and falls within phase 1 of the Dulles project's critical path; and if so, properly adjust the project schedule and cost to reflect this.
6. Require the Metropolitan Washington Airport Authority to resolve potential funding risks by funding the \$200 million for the Capital Reserve Account.
7. Finalize the Metropolitan Washington Airport Authority's Risk and Contingency Management Plan to ensure mitigation plans are in place to address cost risks.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FTA with our draft report for review and comment on February 15, 2012. We received its technical comments on June 5, 2012, and its formal response on June 7, 2012. FTA's response is included in its entirety as an appendix to this report. In its response, FTA indicated that in addition to the actions it plans to take to address the seven recommendations in this report, it now intends to review the project management oversight contractor process to ensure

that it is as effective as possible. Based on the issues we encountered in the course of our audit, we agree with FTA's decision.

In addressing our seven recommendations, FTA concurred with recommendations 1, 2, 3, 5, and 7 and partially concurred with recommendations 4 and 6, but provided acceptable alternative actions. FTA's response to our draft report attested that its consultants have validated the criteria that MWAA used to determine the lateral capacity of the existing foundations with analysis based on assumed, non-tested capacity of piles. Therefore, we will consider this recommendation resolved and closed.

We consider FTA's planned action and timeframe to address recommendation 2 to be generally responsive, and therefore, will consider the recommendation resolved but open, pending completion and implementation of a testing plan. To ensure implementation of the appropriate stray current tests to calculate the piles corrosion rate and estimate their remaining years of service, the final testing plan and the report on the testing results should identify how untested locations will be accounted for and establish baseline track-to-earth resistance measurements before testing begins.

We consider FTA's planned actions and timeframes to address recommendations 3 and 4 sufficient, and therefore, consider them resolved but open pending completion of the planned actions. Similarly, FTA's actions to address recommendations 5, 6, and 7 are responsive to the intent of our recommendations; and we consider the recommendations resolved but open pending receipt of documentation of the actions taken by FTA.

ACTIONS REQUIRED

In accordance with follow-up provisions in Department of Transportation Order 8000.1C, we request that FTA provide us within 30 days documentation of the April 2012 final Risk and Contingency Management Plan and the May 2012 agreement that settles the scheduling issue on the West Falls Church Yard. After we receive acceptable documentation, we will close recommendations 5, 6, and 7. We also request that FTA continues to provide the monthly PMOC reports to our office for the duration of the Dulles project. For recommendation 2, we request a copy of the final stray current test plan MWAA will implement, including a plan for accounting for untested locations and for collecting baseline track-to-earth resistance measurements. For recommendations 2, 3, and 4, we also request that FTA provide us with documentation of the actions taken within 10 days after they are completed.

We appreciate the courtesies and cooperation of the Federal Transit Administration during this audit. If you have any questions concerning this report, please call me at (202) 366-5630 or Wendy M. Harris, Program Director, at (202) 366-2794.

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cc: Angela Dluger, FTA Audit Liaison
Martin Gertel, DOT Audit Liaison

EXHIBIT A. SCOPE AND METHODOLOGY AND RELATED WORK

We conducted this audit from December 2009 to February 2012 in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

To assess potential safety concerns, we documented several sources used for criteria to assess the safety of existing foundations used to support a section of guiderail. We reviewed pile testing plans proposed by DTP, the contractor, and MWAA, the Dulles project sponsor, and the evaluation of the testing plans by FTA and by WMATA, the eventual operator of the system. We interviewed key FTA and PMOC officials and officials from MWAA, DTP, and WMATA to ask specific questions and obtain information regarding required load testing, testing to evaluate stray current corrosion and corrosion protection measures, and projected service life of the existing foundations. We reviewed testing results as documented in (1) an inspection and test program final report from DTP, (2) an inspection and testing report from the special inspections agent for MWAA, and (3) an MWAA quality assurance report. We evaluated FTA's and WMATA's reviews of the reports. We also reviewed a large amount of new and updated information generated after we discussed preliminary audit findings with FTA in March 2011. We contracted the services of the U.S. Army Corps of Engineers for its expertise in infrastructure projects, in support of the findings and conclusions of our own engineers regarding service life.

To evaluate the effectiveness of FTA's general oversight, we reviewed material collected from an earlier monitoring effort of the Dulles project that resulted in our July 2007 baseline report. We then got an updated picture of project status, particularly through PMOC monthly progress reports from September 2009 through December 2011. We reviewed FTA oversight policies and procedures, including those specifically applicable to PMOC oversight requirements. We interviewed key FTA and PMOC officials to ask specific questions, obtain information, and evaluate their general knowledge of and involvement in the Dulles project. We obtained information from key personnel via telephone and e-mail as well as through site visits. We reviewed the Dulles project's project management plans, project schedules, and other routine project documents. We reviewed MWAA monthly progress reports dated August 2008 through November 2011. We reviewed the project's latest financial capacity assessment, the 2008 Risk and Contingency Management Plan, and the efforts to complete an updated Risk and Contingency Management Plan.

Related Work

On July 27, 2007, we issued Report *MH-2007-060*, “*Baseline Report on Major Project Monitoring of the Dulles Corridor Metrorail Project.*” We issued the baseline report during the time period that FTA was considering whether to fund the Dulles project. In this report, we identified key indicators, including MWAA’s lack of experience in transit construction and the complicated nature of the project because of the number of parties involved. The report stressed the need for vigilant FTA oversight. All of our recommendations were closed by May 19, 2008.

In October 2009, we followed up with a management advisory requesting FTA to review the PMOC’s performance, develop a plan outlining how sufficient testing would take place, and specify oversight enhancements. FTA responded in January 2010 stating that (1) the PMOC had requisite expertise; (2) it would require MWAA to develop a comprehensive testing plan involving all 11 foundations; (3) it would employ a full-time, on-site PMOC representative; and (4) MWAA’s testing regime was adequate, subject to the fulfillment of certain conditions. Two key conditions were that (1) MWAA would hire an inspections contractor to oversee testing and (2) MWAA would audit DTP’s design to ensure the testing results were incorporated into the final design documents. MWAA hired CTI Consultants to oversee testing, and assist in MWAA’s quality assurance review.

EXHIBIT B. ORGANIZATIONS VISITED OR CONTACTED

Federal Transit Administration

Hill International

Metropolitan Washington Airports Authority

Washington Metropolitan Area Transit Authority

Dulles Transit Partners

CTI Consultants

Virginia Department of General Services

Fairfax County Government

U.S. Army Corps of Engineers

Deloitte Touche Tohmatsu

Bushman & Associates

EXHIBIT C. COMPLIANCE WITH ARRA OBLIGATION, OVERSIGHT, AND REPORTING REQUIREMENTS

FTA obligated ARRA funding for the Dulles project in about 90 days, ahead of the required deadline. ARRA provided \$750 million for New Starts and Small Starts projects under the Capital Investment Grants Program, and required FTA to select projects currently in construction or those in which funds could be obligated within 150 days of ARRA’s enactment on February 17, 2009. FTA met the obligation requirements on the Dulles project by allocating \$77,260,000 to the Dulles Corridor Metrorail project in May 2009. The Dulles project had only recently received its requested FFGA of \$900 million in March 2009, and the ARRA funding became a portion of that funding—it was not in addition to it.

While FTA exempted its New Starts projects, such as the Dulles project, from additional ARRA oversight mechanisms required by the Office of Management and Budget, MWAA met the supplementary requirement FTA put in place for ARRA grantees. FTA exempted New Starts projects receiving ARRA funds from the oversight requirements because it considered the existing oversight program, such as PMOC reviews, for these major projects to be more effective. However, FTA added a question to its annual grantee assessment concerning ARRA on whether the grantee “lacks adequate resources necessary to manage FTA-funded programs, including ARRA, in accordance with FTA requirements.” MWAA answered that it did not lack such resources.

Our review showed that the Dulles project met all ARRA Section 1512 reporting requirements, including those on expenditures and ARRA-funded jobs. These requirements state that not later than 10 days after the end of each calendar quarter, each recipient of recovery funds from a Federal agency shall submit a report to that agency that contains:

- (1) the total amount of recovery funds received from FTA,
- (2) the amount of recovery funds received that were expended or obligated to projects or activities,
- (3) a detailed list of all projects or activities for which recovery funds were expended or obligated, including,
 - (A) the name of the project or activity;
 - (B) a description of the project or activity;
 - (C) an evaluation of the completion status of the project or activity;
 - (D) an estimate of the number of jobs created and the number of jobs retained by the project or activity;

(E) for infrastructure investments made by State and local governments, the purpose, total cost, and rationale of the agency for funding the infrastructure investment with funds made available under this Act, and name of the person to contact at the agency if there are concerns with the infrastructure investment;

(4) detailed information on any subcontracts or subgrants awarded by the recipient to include the data elements required to comply with the Federal Funding Accountability and Transparency Act of 2006 (Public Law 109-282), allowing aggregate reporting on awards below \$25,000 or to individuals, as prescribed by the Director of the Office of Management and Budget.

According to the 1512 reports, MWAA expended all ARRA funds by the end of 2009. According to the reports, the Dulles project incurred expenditures of \$28,668,148 during the quarter ending September 30, 2009, which resulted in 827 jobs. The project reported expenditures of \$48,591,852 during the quarter ending December 31, 2009, and 883 jobs. In addition, the Dulles project made 14 payments totaling \$77,246,790 to “vendors greater than \$25,000” and 2 payments totaling \$13,210 to “vendors less than \$25,000.” With no remaining funds, the project reported no expenditures and no ARRA-funded jobs during the quarter ending March 31, 2010.

EXHIBIT D. OIG 2009 MANAGEMENT ADVISORY TO FTA**Memorandum**

**U.S. Department of
Transportation**

Office of the Secretary
of Transportation
Office of Inspector General

Subject: **ACTION:** Management Advisory on
Dulles Corridor Metrorail Project
Safety Concerns

Date: October 22, 2009

From: Joseph W. Comé 
Assistant Inspector General for
Surface and Maritime Program Audits

Reply to
Attn. of: JA-40

To: Federal Transit Administrator

A potentially serious safety issue regarding the adequacy of foundations at a segment of the Dulles Corridor Metrorail Project (Dulles Project) remains unresolved nearly a year after we first brought it to the Federal Transit Administration's (FTA) attention.¹ The Dulles Project involves a \$900 million Federal funding commitment and financial support through the American Recovery and Reinvestment Act (ARRA); and we previously reported on the need for FTA to provide vigilant oversight of this challenging, high-profile transit project.² In September 2008, a credible source contacted us asserting that the project sponsor had not conducted sufficient testing on eleven pier foundations and underlying steel piles that were built 30 years ago and will support a portion of the project's new guiderail. After a review of the source's information by our senior engineer advisor, we generated a Hotline complaint to FTA in November 2008. In a June 2009 response to the complaint, FTA reported that the issue had been resolved and asked us to close the Hotline case. However, our investigation of FTA's response found that it was incomplete and a subsequent review by FTA's own project oversight consultant concluded that additional testing of the 30-year old structures is still needed before the project's safety can be certified.

This safety concern, combined with the additional scrutiny required for projects receiving ARRA funding, has prompted us to plan an audit of FTA's oversight of the Dulles Project. Both the President and Congress called on Federal agencies to ensure

¹ OIG Hotline Number 09IH-A35-I-000, November 13, 2008.

² OIG Report Number MH-2007-060, "Baseline Report on Major Project Monitoring of the Dulles Corridor Metrorail Project," July 27, 2007. Our reports can be found on our website: www.oig.dot.gov.

unprecedented transparency, provide enhanced oversight, and prevent imprudent investments of ARRA funds. Accordingly, in advance of finalizing our Dulles Project audit plan, we are issuing this advisory to ensure that FTA promptly addresses our specific safety concern and provides effective oversight. Our conclusions can be found at the end of this advisory.

BACKGROUND

In July 2007, we reported on risk indicators that warranted FTA's close monitoring of the Dulles Project, including the project sponsor's, Metropolitan Washington Airports Authority (MWAA), lack of experience in transit construction. We stressed the need for vigilant oversight to prevent the cost increases, schedule delays, and construction quality problems that we had observed on other projects with similar risk indicators.

In September 2008, we became aware of assertions that insufficient safety testing was done on eleven 30-year old foundations and piles. Further, we learned that MWAA and its contractor, Dulles Transit Partners (DTP—a partnership of Bechtel Infrastructure, Inc. and Washington Group International—now URS Corporation), plan to use these existing foundations and underlying piles to support elevated track that will span part of Interstate 66 and merge with existing Metrorail track in the direction of East Falls Church Station.

In order to certify the safety of using the existing foundations for the new project, it is necessary to confirm the foundations' capacity to bear the required loads and verify their physical integrity. Critical elements necessary to evaluate the safety of the foundations include:

- “as-built” drawings to confirm the exact location and as-built configuration of the foundation structures, such as piles and their concrete caps, and determine how the load is distributed among these structures;
- original pile-driving records from when the foundation piles were driven into the ground, or subsequent pile load tests to confirm the load-bearing capacity; and
- knowledge of the physical condition of the site and the existing foundations to assess whether any damage has occurred over time that could reduce their service life.

In the absence of as-built drawings and other historical data, it is prudent to conduct comprehensive pile load testing and physical observation and measurements.

On November 13, 2008, our Hotline office requested that FTA respond to the assertions of insufficient testing. Specifically, we requested that FTA provide

(1) verification of the plan to use existing pile foundations and actions FTA was taking to ensure the safety of this approach; (2) information on the level of knowledge FTA's project management oversight consultant (PMOC) had of this approach and whether the PMOC opined on its safety; (3) confirmation that MWAA believed this approach would be safe; and (4) confirmation that the Washington Metropolitan Area Transit Authority (WMATA), the eventual operator of the transit extension,³ was aware of this approach and in agreement that it would be safe.

RESULTS OF OUR REVIEW OF FTA'S RESPONSE TO THE HOTLINE COMPLAINT

FTA's June 2009 response to our Hotline complaint was incomplete and inconsistent with subsequent information that FTA provided to us. FTA's response concluded that DTP had conducted adequate physical investigations and verification of the foundations' locations. Relying on assurances from MWAA and DTP, FTA's response provided an inventory of existing pier foundations; planned piles work at each location; the results of physical investigations on three of the existing foundations, and their condition; and the location of the piles as depicted in what FTA's response referred to as "as-built" plans. FTA further stated that DTP's visual inspections of the three foundations did not find any corrosion in the piles, and verified the location of all other piles by test pits. FTA recommended closing the Hotline case with no further action required.

Because FTA did not completely respond to our requests on whether other parties were aware of the planned use of the existing foundations and whether they agreed with the safety of this approach, we requested additional information. On September 16, 2009, FTA provided us with additional documentation including the following:

- A September 14, 2009, PMOC "spot report" on the safety issues involved with the eleven foundations. FTA's PMOC determined that it could not confirm the load capacity of the piles without as-built plans and pile driving data. Further, the PMOC concluded that two 2008 load tests were insufficient to confirm the capacity of all the piles and "due diligence" required that pile data analysis testing (PDA) be performed at all locations—not at six locations as the project's contractor proposed. The PMOC also recommended physical corrosion measurements at five specific locations.
- A February 2009 report by a consultant on corrosion and stray current measurements at three foundation locations. The report shows that, although the steel loss experienced over 30 years has not compromised the integrity of the piles, possible high stray currents from nearby existing Metrorail tracks could corrode the piles and affect their service life, leading to the need for greater

³ Upon completion of the project, MWAA will turn it over to WMATA. The project will then be operated as part of WMATA's larger Metrorail system.

maintenance over time. WMATA's eventual acceptance of the existing foundations is contingent on compliance with the design criteria, particularly a demonstration that the foundations meet WMATA's 100-year service life requirement for new structures.

Overall, our review of this engineering documentation showed that the information was inconsistent with FTA's June 2009 response. As a result, FTA and its PMOC did not have assurance that sufficient testing had occurred at the time FTA asked us to close the Hotline complaint. For example, according to the September 2009 documentation, there are no as-built drawings for the existing foundations, as FTA and the project sponsor initially stated.

In conclusion, we agree with the PMOC's recommendation for additional testing and measurements. The lack of as-built plans and pile driving records, and the fact that only two pile load tests were done, underscore the need for additional testing to confirm the location and load capacity of all the foundations that the contractor plans to use in the Dulles Project. Also, implementing the PMOC's recommendations is necessary to resolve WMATA's concerns about the service life of the foundations.

Further, we are concerned that the PMOC appeared to focus attention on these issues only after we raised questions about FTA's response to the Hotline complaint. We are also aware that FTA recently informed MWAA of the PMOC's recommendations and requested a response as to how the safety concerns will be addressed. However, given the seriousness of the issues raised in this management advisory and to mitigate any potential safety risks, FTA should conduct a review of its PMOC's performance to assess whether it is ensuring adequate oversight coverage of the project. FTA should also develop a plan outlining how FTA will ensure that sufficient testing of the existing foundations will take place before additional construction is undertaken at the locations in question. Finally, FTA should outline any additional steps FTA plans to take to enhance future oversight of the Dulles Project.

We request a written response detailing any actions FTA plans to take with regard to this potential safety issue within 4 weeks of the date of this memorandum. We will consider actions taken as a result of this management advisory as part of our planned audit of FTA's Dulles Project oversight, including cost, schedule, project management, financing, safety, and interagency coordination issues. We will contact your audit liaison before we begin our audit.

If you have any questions concerning this memorandum, please call me at (202) 366-5630.

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cc: Robert Tuccillo, FTA
Susan Schruth, FTA
Letitia Thompson, FTA
Brian Glenn, FTA
Scott Biehl, FTA
Robert Owens, FTA
Martin Gertel, OST
Heather Albert, Office of Inspector General Hotline

EXHIBIT E. FTA'S RESPONSE TO OIG'S MANAGEMENT ADVISORY AND FTA'S RELATED LETTER TO MWAA



U.S. Department
of Transportation
**Federal Transit
Administration**

Memorandum

Subject: Management Advisory on Dulles Corridor Metrorail Project Safety Concerns Date: **JAN 08 2010**

From: Peter Rogoff, Administrator  Reply to Attn. of:

To: Joseph W. Comé, Assistant Inspector General for Surface and Maritime Program Audits

In response to your October 22, 2009, Management Advisory, the Federal Transit Administration (FTA) has taken a number of steps to improve oversight of the Metrorail Extension to Wiehle Avenue (Dulles) project. In summary, FTA undertook a risk assessment process in which we concluded that based on the complexity, size, and risks involved for the successful completion of the project, an enhanced level of oversight was warranted and has been initiated. That being said, I want to acknowledge a serious performance lapse within FTA that resulted in an unacceptable delay in the FTA's response to issues your office raised in November 2008. This lapse also resulted in the FTA's attempt to close the issue without adequate cause and without appropriate sign-off by senior management. I have taken specific personnel and disciplinary actions as a result of this lapse and have also established improved processes to ensure that such lapses do not occur in the future.

Dulles Rail Project Receives Enhanced Oversight

FTA is making every effort, within the bounds of its statutory authority, to ensure that the completed Dulles project is both safe for passengers and constructed within established cost parameters. Based on FTA's review of project documents, interviews with MWAA staff, and our review of the OIG findings contained in your July 2007 report, we decided to implement an enhanced system management oversight for the Dulles project as we approved the Dulles project for Final Design and a Full Funding Grant Agreement (FFGA). FTA used two Project Management Oversight Contractors (PMOCs) to provide independent project cost estimates. We also performed a detailed risk assessment. Once the FFGA was signed, we further ramped up our direct oversight of the project by increasing our regular meetings with the project sponsors to twice each month. In addition, on November 17, 2009, my staff issued a task order to the PMOC, authorizing full-time, on-site PMOC personnel effective January 1, 2010 specifically for the Dulles Project. FTA implements this exceptional level of oversight when it determines that the complexity, size, or risks associated with the successful completion of a fixed rail transit project warrant it.

Exhibit E. FTA's Response to OIG's Management Advisory and FTA's Related Letter to MWAA

In accord with FTA's increasing focus on rail transit safety, the Dulles project will also be one of the first projects required to complete the safety certification process under FTA's Circular 5800.1 prior to initiating operations. This process has identified over 4,000 individual elements of design, construction, implementation, testing and operations related to safety that will be reviewed as the Project moves forward. While FTA is presently limited in its statutory authority to enforce these aspects as requirements, the Safety and Security Management Guidance circular provides a useful tool to ensure that all items are implemented properly.

Finally, with regard to specific concerns raised in the complaint about the safety of the piers, FTA has now thoroughly reviewed a second plan for the testing of the piers as proposed by MWAA. FTA rejected the first plan submitted by MWAA because we found it to be inadequate in addressing and eliminating all potential risks. Moreover, FTA was dismayed by MWAA's failure to take full responsibility for both the problem and the solution. The second plan submitted by MWAA did, in fact, take appropriate responsibility and proposed a testing regime that we have found to be adequate. FTA has, however, imposed certain conditions on the performance of that testing regime. Those conditions are articulated in our most recent letter to MWAA, which is attached. FTA will continue to monitor the inspection process and review the documentation from the inspection process to ensure that all appropriate steps are taken to ensure the structural integrity of the piers.

PMOC Has Requisite Expertise to Oversee the Project

In order to address the OIG's concerns with regard to the competency of the PMOC assigned to the Dulles project, I asked agency experts to review the performance of Hill International, the PMOC assigned to the project. Based on their review, we have concluded that this PMOC, which has been part of the PMO program since its inception, has the necessary capability and expertise to provide meaningful and effective oversight of the project, and has been thorough in its project management oversight responsibilities regarding the Dulles project. Please remember that the PMOC role does not ordinarily include design review. In this case, once appropriate FTA staff became aware of the Hotline Complaint, FTA did engage the PMOC to aid in our investigation of this matter.

It is also important to recognize that before selection, PMOC firms must demonstrate the capability to serve in this important role. Proposals to serve as a PMOC are evaluated by an agencywide team of engineers who rate the firms based on technical competence. Those firms that pass this initial technical qualifying round of review are subsequently interviewed and tested to evaluate their real-time, problem-solving capabilities. This is followed by additional review of technical and organizational capabilities. It is not until completing this rigorous evaluation process that a company can qualify to become a PMOC for FTA.

FTA Is Working to Resolve Issues Highlighted by Management Advisory

FTA is working to achieve final resolution of the issues relating to the structural integrity of the foundation piers highlighted in the management advisory. FTA has been engaged with the project sponsor, Metropolitan Washington Airports Authority (MWAA) and the ultimate system operator, the Washington Metropolitan Area Transit Authority (WMATA) to gain agreement on necessary actions. We have completed a series of interactions to ensure MWAA takes sufficient responsibility, as the project sponsor, for the solution instead of relying on the representations of its contractor. FTA, based on the findings of its PMOC, insisted that MWAA complete a comprehensive testing regime that is sufficiently thorough to address all safety concerns with regard to the structural integrity of the piers in question. FTA also insisted that any testing proposal be approved by WMATA prior to acceptance by FTA.

MWAA submitted its response to FTA on December 2, 2009. It addresses a comprehensive testing plan that involves all 11 piers to be re-used. An independent Special Inspections contractor will oversee the testing and construction of all structural elements and MWAA's QA/QC staff will ensure that testing results are incorporated into the final design. The sensitivity of the location of two piers requires close coordination with WMATA and VDOT to ensure safe travel and limited interruptions to Orange Line service and to traffic at I-66 and State Route 267 during testing in those areas. The criteria used are the same for the new structural elements of the project. The schedule will be coordinated with WMATA and VDOT and testing conducted at various times throughout 2010.

FTA Addressing Administrative Deficiencies Highlighted by the Management Advisory

While FTA's process for conducting project management oversight of rail projects is sound, the OIG management advisory exposed serious deficiencies in the manner in which FTA has handled hotline complaints from the OIG. Specifically, it highlighted several internal control weaknesses that resulted in untimely handling of the report and initial response, insufficient review of the response, and the lack of an approval mechanism for senior management. I am also concerned that individual performance issues may have further undermined our effectiveness. I have taken immediate action to address these deficiencies. Revised processes have been implemented for OIG hotline complaints handled by FTA. Our responses to the OIG will be fully and appropriately vetted within the agency to ensure they are complete, appropriate, and technically sound. Finally, I have taken personnel and disciplinary actions in response to our deficient performance by reassigning staff to provide appropriate focus to these matters.

We appreciate the OIG's efforts with regard to this matter and understand the basis for and rationale behind the concerns addressed in the management advisory. We have taken immediate corrective actions where possible and are now working to resolve the remaining issues. Please feel free to contact my office directly on (202) 366-4040 with any further questions.



U.S. Department
of Transportation
**Federal Transit
Administration**

The Administrator

1200 New Jersey Avenue, SE
Washington, D.C. 20590

JAN 08 2010

Mr. James E. Bennett
President and Chief Executive Officer
Metropolitan Washington Airports Authority
1 Aviation Circle
Washington, DC 20001-6000

Dear Mr. Bennett:

I write in response to your letter of December 2, 2009, in which you confirmed the ultimate responsibility of the Metropolitan Washington Airports Authority (MWAA) for compliance with all Federal requirements pertaining to the Dulles Corridor Metrorail Project. As the Federal grantor agency, the Federal Transit Administration (FTA) is obliged to ensure that MWAA understands its responsibility for all representations made to FTA regarding the Project, regardless of the contractual relationships MWAA maintains with Dulles Transit Partners (DTP) and other third party contractors.

After review of your submittal, I accept your proposed testing plan subject to the following conditions:

1. MWAA's approach to test all 11 pier foundations shall ensure their structural integrity. We understand the need to apply static versus dynamic testing techniques as the planned design and construction situation warrants. The static load testing previously performed on piers 1/IB and 2/IB must be compared to the dynamic testing results to calibrate the pile driving analysis to be done on those piers.

We believe that the Special Inspections process in Virginia will play an important role in ensuring that the project is constructed as designed. Subsequent to your letter, MWAA staff has confirmed verbally to FTA's Project Management Oversight Contractor (PMOC) that MWAA's Special Inspections contractor will witness the testing and document the results, and that MWAA's own Quality Assurance/Quality Control department will audit DTP's design to ensure that the testing results were incorporated into the final design documents. Two items have been added to MWAA's Safety Certification Inspections List. FTA expects close and careful monitoring of all of these activities by MWAA to ensure the attention necessary to successfully implement the piers testing plan.

Exhibit E. FTA's Response to OIG's Management Advisory and FTA's Related Letter to MWAA

2. We recognize the coordination efforts begun with WMATA and the Virginia Department of Transportation during the testing of piers 4/IB and 5B/OB, respectively. These efforts must be sustained to ensure safe travel and limited interruption to Orange Line service and to traffic at Interstate 66 and State Route 267.
3. FTA requires that the criteria for testing the piles in the 11 existing pier foundations will be the same as those applied to new pile foundations that are part of the Dulles Corridor Metrorail Project. Our PMOC will review the testing results. Should any of these testing results not meet the established criteria, MWAA must inform FTA immediately and advise us as to any proposed mitigation measures.
4. MWAA shall permit our PMOC to observe the testing as it proceeds over the upcoming months.

In sum, while FTA finds MWAA's current testing plan acceptable, its implementation must be carried out consistent with the conditions identified above. These steps demonstrate the needed focus and commitment to safety which must characterize MWAA's efforts on this project going forward. FTA looks forward to continuing its work with MWAA to guarantee the safety and timely delivery of the Dulles Corridor Metrorail Project.

Sincerely yours,



Peter Rogoff

cc: John B. Catoe, Jr.,
General Manager, WMATA

EXHIBIT F. MAJOR CONTRIBUTORS TO THIS REPORT

| Name | Title |
|-------------------|------------------|
| Wendy Harris | Program Director |
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| Harriet Lambert | Writer-Editor |

APPENDIX. AGENCY COMMENTS



U.S. Department
of Transportation
**Federal Transit
Administration**

Memorandum

Subject: **INFORMATION:** Management Response to OIG
Draft Report on FTA Oversight of the Dulles Corridor
Metrorail Extension Project

Date: June 7, 2012

From: Peter M. Rogoff 
Administrator

Reply to
Attn. of: Angela Dluger
(202) 366-5303

To: Calvin L. Scovel III
Inspector General

The first phase of the Dulles Corridor Metrorail project is vitally important to the national capital region's ability to plan for and manage future growth while providing balanced transportation choices for millions who live and work in the corridor. The Federal Transit Administration (FTA) is providing rigorous management and technical oversight to help ensure that this complex and important project is completed soundly, expeditiously, and according to plan—and above all, that the completed system is safe to ride.

FTA will continue to ensure that any issues relating to ongoing construction of the project's first phase, and particularly those raised in the Office of Inspector General (OIG) draft report, are fully and effectively resolved beyond any doubt. FTA will confirm that the project sponsor, the Metropolitan Washington Airports Authority (MWAA), and its construction contractor, Dulles Transit Partners (DTP), complete all measures necessary to demonstrate the structural integrity of the entire project according to standard FTA project oversight protocols, with particular emphasis on those few portions discussed in the OIG review.

FTA's project management oversight process has demonstrated its effectiveness at ensuring that major transit projects across the nation have been completed soundly. In response to the process issues raised by the OIG, FTA augmented its oversight of this project to provide additional assurance that the aspects relating to the relatively small number of foundation components (essentially a portion of the rail bridge), which are a primary focus of OIG's review, effectively fulfill their functional requirements. FTA also identified additional testing requirements to ensure that stray current and any effect it has on the piers is carefully monitored and addressed. Finally, FTA recognizes that the process issues discussed in the OIG review highlight the merit of FTA conducting an internal review of its Project Management Oversight Contractor (PMOC) process to help ensure that it continues to be as effective as possible in monitoring project construction.

FTA Providing Extensive Oversight of Project Construction

While FTA's PMOC process has proven effective in providing independent oversight of transit projects across the nation, based on an October 2009 OIG management advisory, FTA enhanced its typical oversight processes to resolve the issues raised on a relatively small number of foundation components. This included assigning an independent PMOC to work full time on-site at MWAA's project office for the duration of the Phase 1 project. FTA also engaged an outside PMOC to develop independent project cost estimates and perform a risk assessment that has been updated throughout the project. MWAA was also required to develop and implement a comprehensive test plan to address all safety concerns. FTA has monitored and reviewed this work to ensure that the specific requirements for testing established for this project were fully and effectively fulfilled.

FTA Completed Extraordinary Measures to Confirm Structural Integrity

Based on independent review by technical experts, FTA confirmed the foundation's essential components have been demonstrated to be structurally sound through design, testing and independent verification in accordance with industry standards and practices.

- **Foundation Design Exceeds Operational Requirements.** The foundations discussed in the OIG review are conservatively designed to withstand forces many times greater than they will be subject to during operation. The methodology used to design the foundations is well accepted in the engineering industry. FTA reconfirmed the design through recent reviews by three additional PMOC engineering firms that are not affiliated with the project.
- **Third-Party Testing Validates Foundations' Structural Integrity.** FTA ordered and is overseeing extensive third-party testing and analysis to confirm the strength, stability, and expected service life of the foundation's key components. For example, MWAA retained a special inspections contractor to oversee the testing of all existing foundation piers including soil conductivity testing, metallurgical review and strength testing. FTA's PMOC was on-site during these tests.
- **FTA Will Require Corrosion Monitoring.** MWAA must install equipment that will enable state-of-the-art testing to further assess and monitor the condition of the piles with respect to corrosion. This sophisticated testing regime will enable WMATA, which will operate the rail service when this project is complete, to periodically assess the amount of corrosion that the metal piles will experience over their full-service life.
- **Independent Computer Modeling Confirms Foundations' Strength, Stability.** FTA obtained additional assessment through computer modeling to further validate the ability of the rail bridge foundations to withstand horizontal forces known as lateral loads. Such forces are imposed by rail cars moving on the tracks above, crosswinds, and other elements. The modeling was conducted in May 2012 by an independent third-party engineering firm with expertise in this type of analysis. The results indicate that the rail bridge's foundations can support more than four times the load that would occur under normal operating conditions. In order to provide further confirmation, the design and analysis concepts and methods were reviewed by bridge experts in the Federal Highway Administration (FHWA). The FHWA bridge experts

concurred with the approach used in the analysis and the FB-MultiPier computer program used in the computer modeling.

FTA Will Further Strengthen its Project Oversight Processes

FTA has determined that a number of the issues in the OIG report highlight the potential benefit of conducting an internal review of existing processes and requirements for project management oversight. The processes used by FTA for conducting project oversight were innovative when implemented and have a demonstrated track record of success. However, many of the construction-related issues discussed in the OIG draft report may have been exacerbated by communication and review processes that could be strengthened. With the resolution of the immediate issues associated with this OIG review, FTA now intends to review the PMOC process to ensure that it is as effective as possible.

RECOMMENDATIONS AND RESPONSE

Recommendation 1: Verify that valid criteria exist to determine the lateral load capacity of the existing foundations with analyses that are based on assumed, non-tested, capacity of piles, and provide oversight to ensure that the Metropolitan Washington Airports Authority executes any resulting changes to the analyses, design, and testing requirements.

FTA Response: Concur and completed. The methodologies employed to design the rail bridge foundations and to test their safety and structural integrity—especially with respect to their capacity to withstand anticipated lateral, or horizontal, loads—are valid, reliable, and are in accordance with engineering standards and industry practices. The construction contractor followed standard industry procedures to determine the lateral load capacity of so-called “batter piles,” which, along with “vertical” piles, are underground steel supports that are critical to providing support and stability for the bridge. Batter piles, in particular, are installed on an incline to more effectively buttress and stabilize the foundation to withstand lateral forces. Moreover, the foundations are designed to offer more than enough individual batter piles to withstand lateral loads greater than the structure is expected to experience in service once rail cars are running on the tracks above, even under adverse conditions. At FTA’s request, three independent engineering firms confirmed that the design approach is sound.

These firms also confirmed the testing that was performed is wholly adequate to assess the safety of the structure and ensure that it meets industry standards. The American Society for Testing and Materials and the American Association of State Highway and Transportation Officials both have standards stating that it is acceptable to test nearby vertical piles to assess the load capacity of batter piles. Indeed, both types of piles are designed for the same capacity. Thus, no required tests or analyses were overlooked and no measures were omitted that would compromise the determination of the safety of the structure. Even so, FTA went further still, by asking another oversight contractor not engaged in the initial review of the work, to run computer modeling to analyze the foundation’s lateral load capacity. This modeling approach is an accepted industry practice and offers a valid criterion for assessing lateral load capacity. The analysis, conducted in May 2012, confirmed that, even when the pier experiences its maximum lateral load, the most load any one batter pile would experience

is much less than it is designed to support. In order to provide further confirmation, the design and analysis concepts and methods were reviewed by bridge experts in the FHWA. The FHWA bridge experts concurred with the approach used in the analysis and the FB-MultiPier computer program used in the computer modeling.

Recommendation 2: Develop and implement a plan, with milestones, to ensure that the Metropolitan Washington Airports Authority carries out appropriate stray current tests to calculate the piles' corrosion rate and estimate their remaining years of service.

FTA Response: Concur. In guidance provided to all recipients of Federal transit funds, FTA requires that railroad structures meet at least a 50-year service life. While MWAA's contractor did conduct corrosion testing, FTA agrees that there is benefit to additional corrosion testing in order to provide further assurance that the expected service life will be met. Moreover, FTA agrees that it would be constructive to establish thresholds for maximum acceptable metal loss resulting from the effect of stray electric current. As a result, FTA is requiring MWAA to implement a state-of-the-art testing plan that will make it possible to (1) estimate the degree of metal loss to date due to corrosion at various depths among the piles, (2) develop criteria for the amount of metal loss that is acceptable to achieve a 50-year life for the foundations and (3) identify any applicable corrosion protection measures that emerge from the stray current tests. This plan was designed by an independent leading corrosion expert and will be directly observed by the full-time on-site PMOC along with MWAA's inspection contractor. The appropriate thresholds for metal loss and the use of test results to identify any applicable corrosion protection measures will be completed by August 31, 2013 when the track is transferred to WMATA.

Recommendation 3: Develop and implement a plan, with milestones, to ensure that the Metropolitan Washington Airports Authority installs any applicable corrosion protection measures that emerge from the stray current tests before the Washington Metropolitan Area Transit Authority accepts the final Dulles phase 1 project.

FTA Response: Concur. FTA has already required MWAA to take necessary measures to protect piles from stray current based on the outcome of the testing described in response to recommendation 2. FTA established this as a condition that must be met before WMATA takes over operation of Phase 1 of the project. Once the tests described above are conducted, FTA will review the mitigation measures selected by MWAA and WMATA to ensure that all necessary and appropriate actions are taken in a timely manner. This plan will be in place by August 31, 2013 when the track is transferred to WMATA.

Recommendation 4: Require the Metropolitan Washington Airports Authority to resolve potential schedule delays by finalizing the Washington Metropolitan Area Transit Authority's Rail Fleet Management Plan to ensure that sufficient railcars will be available for the Silver Line, without negatively impacting Metrorail service on other lines.

FTA Response: Concur in part. FTA is aware of the operating equipment challenges WMATA faces in opening and operating the new Silver Line. In May, FTA received a Rail Fleet Management Plan and is now reviewing it. FTA will ensure this plan is finalized and appropriate measures are implemented prior to determining if there is any breach of the

revenue service date stated in the Full Funding Grant Agreement. We will work with MWAA and WMATA to finalize the plan by January 31, 2013.

It is important to recognize that the natural disaster resulting from a devastating March 2011 earthquake and tsunami in Japan has significantly impacted the timely fulfillment of WMATA's contract with Kawasaki for the procurement of rail vehicles. According to the rail fleet plan under review, WMATA is anticipating a five-month delay beyond the original date in the contract with Kawasaki. FTA continues to closely monitor the procurement schedule and its impact on integrating the Silver Line into the operations of the WMATA system as a whole.

Recommendation 5: Require the Metropolitan Washington Airports Authority to resolve potential schedule risks by working with Metropolitan Washington Airports Authority and its contractor to make a final determination as to whether the full scope of the West Falls Church Yard's expansion is accounted for and falls within Phase 1 of the Dulles project's critical path; and if so, properly adjust the project schedule and cost to reflect this.

FTA Response: Concur and completed. FTA has been closely monitoring this risk and has worked closely with MWAA to resolve this issue through the oversight process. FTA and its PMOC will monitor the implementation of a May 2012 agreement that settles the scheduling issue between MWAA and its contractor as the construction work in the West Falls Church Yard continues. The substantial completion date for this work is December 20, 2013, which is in advance of MWAA's projected revenue service date of January 2014 and well in advance of the revenue service date of December 1, 2014 as stipulated in the Full Funding Grant Agreement. FTA requests that OIG close out this recommendation.

Recommendation 6: Require the Metropolitan Washington Airports Authority to resolve potential funding risks by funding the \$200 million for the project's Capital Reserve Account (CAPRA).

FTA Response: Concur in part and completed. FTA agrees that MWAA must have sufficient funding available to address contingencies that could arise during the construction process. Based on current estimates of potential contingent liabilities as identified in the PMOC monthly reports, there is a need to ensure that at least \$37.7 million is available to address contingencies. In September 2011, MWAA identified over \$71 million in finance cost savings. While these funds are not held in a CAPRA per se, they are available to replenish the contingency line item to address potential funding risks. FTA requests that OIG close out this recommendation.

Recommendation 7: Finalize the Metropolitan Washington Airports Authority's Risk and Contingency Management Plan to ensure mitigation plans are in place to address cost risks.

FTA Response: Concur and completed. In April 2012, FTA approved MWAA's final Risk and Contingency Management Plan. FTA and its PMOC will ensure that MWAA follows the plan by continuously identifying risks and will work with MWAA to ensure that appropriate mitigation measures are implemented if needed. We will continue to closely monitor project costs and schedules. FTA requests that OIG close out this recommendation.

Appendix. Agency Comments