CENTRAL CORRIDOR LIGHT RAIL TRANSIT (GREEN LINE) QUALITY ASSURANCE REVIEW

PROGRAM EVALUATION AND AUDIT

METROPOLITAN COUNCIL

December 10, 2014

INTRODUCTION

Background

The $957 million Central Corridor Light Rail Transit Project-Green Line (Green Line) links downtown St. Paul and downtown Minneapolis along Washington and University avenues via the state Capitol and the University of Minnesota. Passengers have the ability to board or alight from Green Line vehicles at 18 new stations plus five existing stations shared with the Blue Line-Hiawatha LRT (Blue Line).

The Metropolitan Council (Council) is the grantee of federal funds and charged with building the Green Line in partnership with the Minnesota Department of Transportation (MnDOT). The Central Corridor Management Committee, which includes commissioners from Ramsey and Hennepin counties, the mayors of St. Paul and Minneapolis and the representatives of University of Minnesota, provide advice and oversight. Funding is provided by the Federal Transit Administration (FTA), Counties Transit Improvement Board (CTIB), State of Minnesota, Ramsey and Hennepin counties' regional railroad authorities, City of St. Paul, Metropolitan Council and the Central Corridor Funders Collaborative.

The Central Corridor Project Office (CCPO) management staff has been tasked with the development, implementation and oversight of the project's Quality Assurance (QA) program. To a large degree, the success of the Green Line depends on the development and execution of a sound QA program. The FTA's Quality Assurance and Quality Control Guidelines (QA/QC) define QA as planning for quality management activities and verifying that those activities were carried out. QA emphasizes actions at a management level that directly improve the changes that quality control (QC) actions will result in a product or service that meets requirements. The FTA's QA/QC defines QC as techniques that are used to assure that a product or service meets requirements and that the work meets the product or service goals. Generally, QC refers to the act of taking measurements, testing, and inspecting a process or product to assure that it meets specification. The Green Line has now entered into revenue operations. The Green Line represents one of the largest projects the Council has undertaken thus far; the QA function is an important component to the effectiveness of this project.

Assurances

This audit was conducted in accordance with the Institute of Internal Auditors' International Standards for the Professional Practice of Internal Auditing and the U. S. Government Accountability Office's *Government Auditing Standards*.

Scope

This review was limited to the processes used by CCPO to comply with the project's QA Plan and FTA's Quality Assurance and Quality Control Guidelines. In addition, a review of CCPO's QA oversight and monitoring process for the project was performed.

Methodology

To understand the implementation of the CCPO's QA Plan and oversight of the project's QA function, the following methods of inquiry were used:

- Reviewed FTA Quality Management System Guidelines
- Reviewed CCLRT QA Plan
- Reviewed CCLRT QA policies and procedures
- Reviewed PMOC audits
- Reviewed CCLRT quality oversight audits
- Interviewed PMOC staff
- Interviewed field inspectors
- Interviewed CCLRT QA Program Manager
- Interviewed CCLRT Project Management staff

OBSERVATIONS

Inspections and Test Plans

Contractors and subcontractors on the CCLRT project are required to establish appropriate quality control and quality assurance procedures for inspections and test status. It is the responsibility of the Quality Assurance Program Manager (QAPM), with support of the Council's Authorize Representative (CAR) and field office staff, to provide oversight for this quality requirement. Each of the four prime contractors, PCL with the Operations and Maintenance Facility (OMF) contract, Walsh with the Civil East contract, Aldridge-Collisys Joint Venture (ACJV) with the Systems contract, and Ames-McCrossan Joint Venture (AMJV) with the Civil West contract, submitted a Quality Control/Quality Assurance Testing and Inspection Plan to the Council. Each plan is designed to provide the project office with detailed information on the type of test or inspection that is needed on specified required work. These plans are approved by the QAPM. The review of these plans is as follows:

- AMJV does not include the party responsible for conducting the test or inspection in its plan.
- The quality assurance function does not have an efficient process in place that verifies completion of each item listed on the test and inspection plans.
- The majority of test and inspection verification documents were found in e-builder under these locations: Construction Submittals (CSUB), Daily field observation reports from inspectors, and Deliverables (DLV).
- Searching e-Builder for verified test and inspection documentation was not always successful without project office staff with extensive background on that particular item.

The QAPM conducts random samples of submittals and focuses on comments pertaining to those submittals as an oversight process, but the QAPM is not responsible for the approval of the submittals.

Audit began its review by taking three of the four inspection and test plans (Walsh, ACJV, and PCL) and dividing it's components out by volume and subtitle. Then a random sample was taken from each subtitle of Walsh's Testing and Inspection plan. Audit met with the QAPM for guidance in searching for the inspections and test items, but wasn't able to successfully find items. Audit then requested help from the Project Control Manager, Construction Manager, and a field office inspector. It was agreed that a judgmental sample would be appropriate in this matter since there was difficulty in finding items. The judgmental sample consisted of inspection and test items from each plan. The field office inspector was asked to write down the step by step process taken in finding each item in e-Builder. The judgmental sample consists of the following items:

- Compressive Strength (concrete test) – AMJV
- Temperature (concrete test) – AMJV
- Standard Proctor: ASTM D 698 (soil test by independent testing firm) – PCL
- Punchlist Inspection (steel decking inspection) – PCL

- DACS Management System (configuration inspection) – ACJV
- Track Appurtenances & Other Track Material (track inspection) – ACJV
- Flexible Porous Pavement (pre-Installation inspection) – Walsh
- PVC Drainage System (pipe deflection test) – Walsh
- Hydrostatic Testing of Ductile Iron Watermains (leakage test) – Walsh
- Cured-In-Place for Gravity Sewers (in-process inspection)
- Direct Fixation Track Construction (electrical testing) – Walsh
- Direct Fixation Track Construction (electrical testing) – Walsh

Overall, it took on average about seven minutes for the field inspector to search and locate the inspection and testing documentation; with two outliers in the search taking 16 minutes and 32 minutes respectively. The field office inspector provided detailed explanations on how he found each item and he has extensive knowledge on many of the items that were searched.

The Quality Assurance Function currently does not have a process in place to verify that each inspection or test item has been verified. This is partially due to the fact that field office staff, assisting with the quality assurance function, is not using each firm's Test and Inspection Plan to confirm the completion of tests and inspections.

Quality Audits

The QAPM periodically conducts quality audits as stated in the CCLRT Quality Assurance Plan and works with the quality managers from each construction contract as well as the architectural and engineering contract. The completed quality audits are distributed to the Program Manager, project office management, and recipient. Audit located 72 audits, 33 audits were randomly sampled. These quality audits were retrieved from the project office's J: Drive and ApplicationXtender; which is the Council's document management system. Of the 33 audits sampled:

- Eight audits (24.2%) were determined not to require corrective action from the recipient.
- 19 audits (57.6%) identified that corrective action was necessary from the recipient.
- Five audits (15.2%) were unclear whether or not corrective action was needed from the recipient.
- 21 audits (67.7%) we were unable to determine if the recommendation(s) were followed by the recipient.
- One audit was not located in ApplicationXtender or the J: Drive.
- There were two instances in which the contractor disagreed with the audit findings.

Overall, the quality audits cover a range of topics and are detailed in nature. In addition, a random sample included audits from different firms working on the project.

Inconsistency of formatting

Audit found that there was not consistency in the style of the reports. This inconsistency is mainly found with recommendations, deadlines to the recommendations, and follow up reporting. Audit found five out of the 33 randomly sampled audits with information that appeared to be recommendations not labeled as recommendations. The recommendations were located in different sections of the quality audits. There were multiple instances where corrective actions were required, but no follow up sections or responses were shown. Audit found three quality audits with proposed recommendations without set deadlines for the recipient. Audit also found that in some instances The QAPM set deadlines for the recipients, follow up reporting on recipient responses, and clearly defined recommendations.

Procedures are not in place to ensure that recommendations are acted upon

It is currently outside the authority of the QAPM to ensure that the recipient of the quality audit follows through with corrective action. This responsibility dwell with project management staff. The QAPM informs the project management staff with quality audits. Decisions on potential follow through and type of corrective action resides with project management staff.

CCPO Quality Assurance Function: Staffing

The CCPO QAPM is responsible for assuring the development and implementation of the Quality Assurance Plan (QAP). This includes the administration of the QAP, training CCPO staff in the implementation of the QAP, monitoring and evaluating the effectiveness of the staff in implementing the QAP and arranging or conducting quality assurance oversight audits to be undertaken on contractors, consultants, suppliers, and CCPO Internal Process/Procedures. The CCLRT QAPM has direct oversight responsibilities of the design consultants and construction contractors, as it pertains to quality management and quality systems.

While the plan for this project initially was designed to have two positions in the quality assurance function, the CCPO QAPM currently oversees the quality assurance function for the Green Line, Green Line Extension, and the Blue Line Extension projects. The QAPM currently does not have any direct reports. However, the QAPM did utilize the Council's intern program with a summer intern in 2012 and 2013.

The QAPM works closely with field office staff (inspectors); this working relationship does assist in the quality assurance and quality control oversight process. One of the roles for the QAPM is to work with inspectors to ensure that contractors are adhering to contract documents. Inspectors play a key role in this oversight process. Field office inspectors work directly under the Council Authorized Representative (CAR) and field office staff ultimately report to the CCPO Construction Manager. However, it is neither reasonable nor efficient for one staff person to be responsible for assuring the development and implementation of the project's QAP, oversight responsibilities, and function in this role in two other light rail projects. The QAPM needs additional personnel and resources to effectively fulfill his role and responsibilities while working on multiple light rail projects; this seems to be especially true during construction season.

Collaboration with Metro Transit's Engineering & Facilities and Rail Operations Administrations

Metro Transit's Engineering & Facilities and Rail Operations Administrations expresses a desire for greater collaboration with Metro Transit's Transit System Development (TSD). Some quality assurance and quality control issues have surfaced from the CCLRT project. They believe their involvement during the design and construction phases of the project could have controlled some of the quality issues that surfaced since the opening of the line. Rail Operations would like to observe the QC and inspection process. This would assist the administration in their oversight process and prepare the administration for operation of the light rail line. Engineering & Facilities believes that greater dialog concerning QA/QC, would assist the administration in its role to operate any facilities associated with the light rail projects. These elements were lacking during the construction of the Central Corridor light rail line.

Both Rail Operations and Engineering & Facilities do not desire to take over the oversight responsibilities of future project office quality assurance functions. They express a strong desire and willingness to be involved throughout the lifecycle of future project. This collaboration would provide them with additional knowledge prior to the opening of the line.

Best Practices from RTD

Staffing

Audit reached out to the Director of Quality Assurance for the Regional Transportation District of Denver (RTD) for staffing and oversight planning best practices. RTD is a transit system in Denver that currently operates bus, commuter rail, and light rail routes. RTD was chosen due to the similarities of services and scope of transportation projects. RTD is currently in the middle of a multi-billion dollar comprehensive transit expansion plan called RTD FastTracks to build 122 miles of new commuter rail and light rail, in addition to 18 miles of bus rapid transit and enhanced bus service.

The RTD quality assurance function has three quality assurance managers reporting to the Director of Quality Assurance. Each manager is located at a rail project office. The organization contracts out all verification testing and those contractors report directly to RTD. There are also five full time quality consultants hired by RTD to administer process audits and inspections.

Risk Assessment & Priority Planning

RTD quality assurance function uses a risk based approach and priority planning concerning its oversight responsibilities. RTD defines Priority Planning as the following:

- A technique based on Failure Mode and Effect Analysis (FMEA) to prioritize oversight efforts.
- A risk assessment based approach for allocating oversight inspection resources.
- A process to incorporate actual performance and trend results on an ongoing basis, as part of the risk assessment.

A risk assessment is conducted and priority planning is initiated for managing risk during quality oversight. An initial risk level is assigned to all known contractor work components and this risk level will drive the sampling frequencies when assigning oversight inspection resources. There is an evaluation of actual inspection results to track performance and any updates to risk levels for future projects. As a result of this approach, RTD has experienced better scheduling of inspection resources, greater efficient use of inspection resources, and continuous improvements.

Nonconformance Reporting and Resolution Process

Description of the Nonconformance Reporting and Resolution Process

NCRs are issued when work does not conform to the specifications of the contract. Having procedures to document and deal with nonconforming work is an essential element of a Quality Management System, according to the FTA Quality Management System Guidelines.

The process for dealing with nonconforming work is outlined in the CCPO Procedures Manual. An NCR can be originated by the CAR, a design reviewer, CCPO staff, or inspectors. The NCR is filled out on e-Builder using a specified template. The recipient, usually the Quality Assurance Manager for the contractor, is notified in e-Builder and should respond using the template provided. The procedure states that the status of NCRs will be reviewed during weekly Quality meetings and at other meetings. According to the procedure, NCRs will be reviewed by the CCPO QAPM on a weekly basis, and will only be "Closed" on e-Builder when each item has been resolved and conforms to contract specifications.

When a NCR is spawned in e-Builder, the contractor's staff member who receives the report is expected to respond by completing a disposition description. The format of the disposition description in e-Builder requests that the contractor's personnel address the following:

1. Immediate fix for the nonconformance
2. Root cause of the nonconforming condition
3. Plan to prevent reoccurrence of the type of nonconformance

The FTA Quality Management System Guidelines allow the following dispositions for nonconforming work:

1. Reworking it to meet requirements
2. Accepting it with or without repair
3. Using it for alternative applications
4. Scrapping it

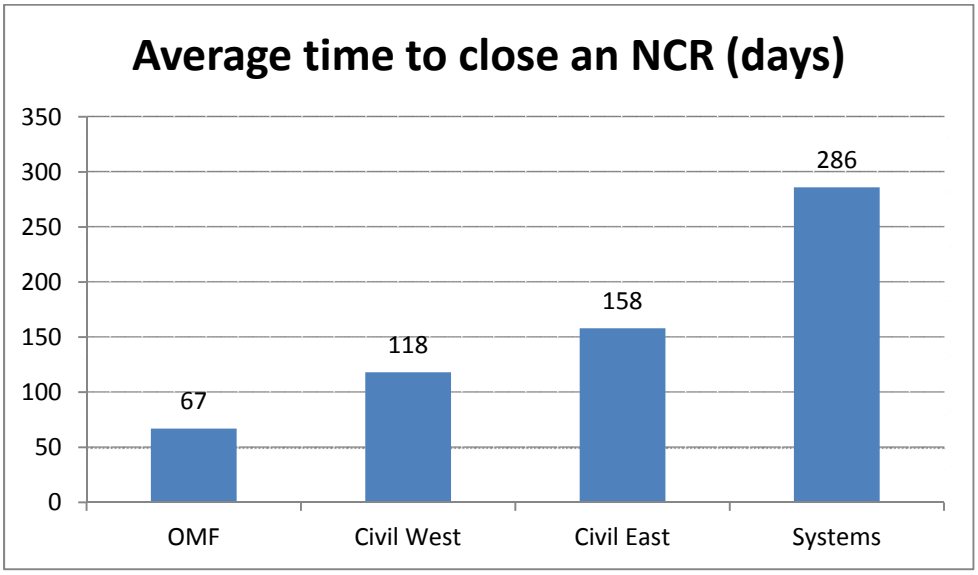
The guidelines state that accepting work with or without repair should have the concurrence of the Engineer of Record. Also, the disposition of nonconforming work should be determined by appropriate personnel and documented for the record. Re-inspections should take place with reworked or repaired work.

The CCLRT Quality Assurance Plan allows nonconforming work to be resolved by: taking action to prevent the nonconforming work from being used; repairing or reworking the product with re-inspection; and/or receiving authorization for its use, with release or acceptance by a relevant authority. In e-Builder, the possible dispositions for nonconforming work are: repair, rework, remove and replace, or use as-is.

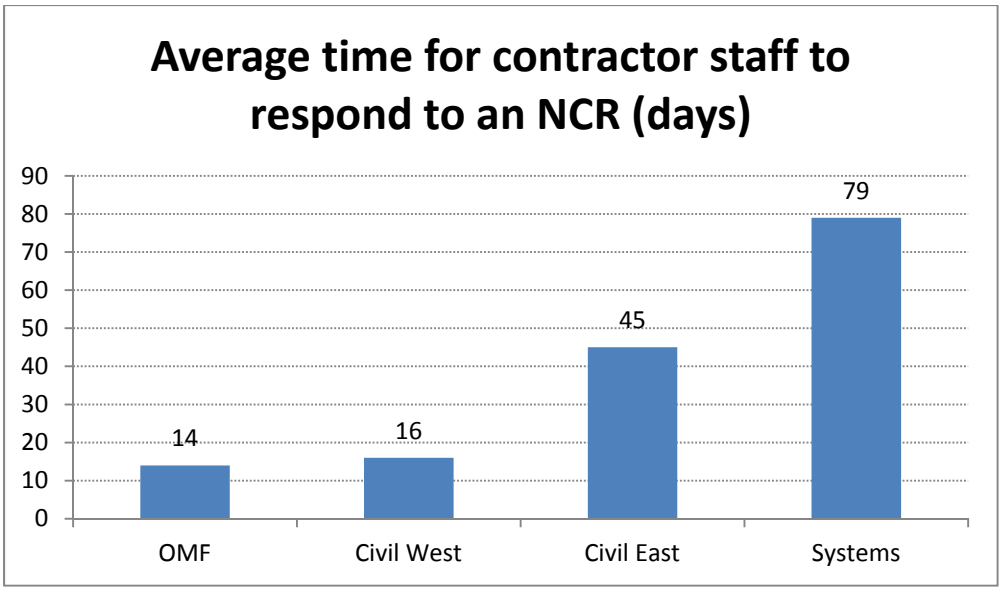
At the time of this audit, there were 254 NCRs generated for Civil East, 72 for Civil West, 55 for Operations and Maintenance Facility, and 84 for Systems. For the analysis of NCRs, Audit randomly selected a statistically significant sample from each project area to review.

NCRs remained open for extended periods of time

It took an average of 157 days to close an NCR from the time it was originated. The closure time varied across the NCRs sampled from the four areas.



Oftentimes, this delay was impacted by the contractor not responding to the NCR in a timely manner. The average time among the entire sample from opening an NCR to the first response by the contractor was 38 days. Again, the amount of time it took for the contractors' staff to respond varied across the areas.



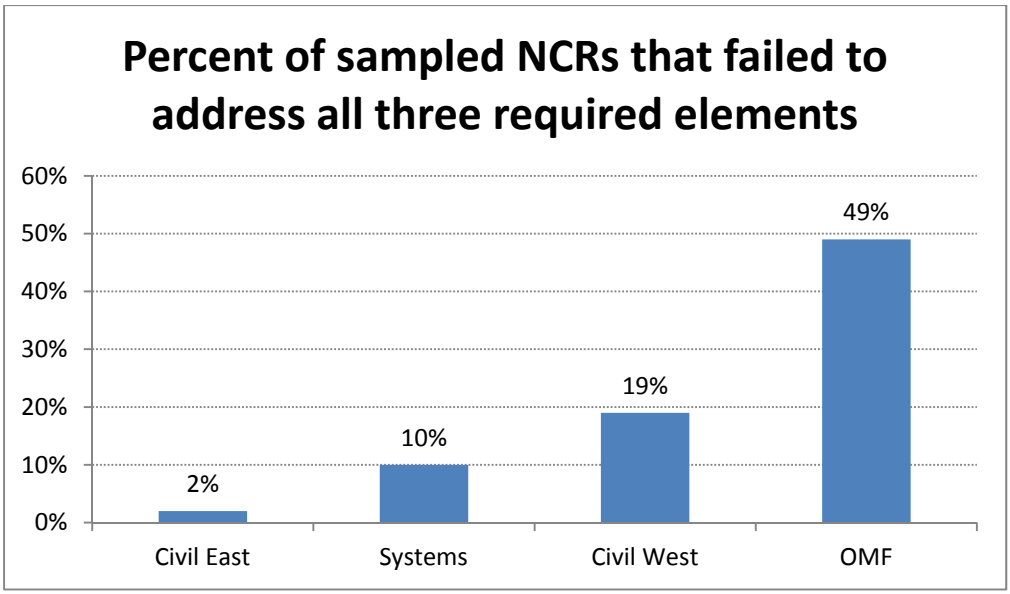
In some instances, the contractor was responding to the NCR several weeks after the repair, replace, or rework had already been done.

While the CCPO Procedures Manual section for NCRs states that it is the responsibility of the approved contractor personnel to respond to NCRs in a "timely manner," there are no written policies or procedures for how long it should take to close an NCR. None of the four primary contractors' Quality Assurance Plans describe a timeline for responding to or closing NCRs.

The QAPM expressed that many NCRs were left open because the repairs or reworking could not be completed due to weather or other delays. However, Audit found that weather-related issues apply to only a small number of the NCRs that took an extended period of time to close.

NCRs were closed without contractors' Quality Assurance staff completing the reports as required

Many NCRs were closed without a complete response to the three required elements from the contractor's staff. The inclusion of all three elements varied widely across the four areas.



Many of the NCRs from OMF were closed with the contractor's staff only describing the immediate fix for the nonconformance, but nothing else.

Each primary contractor was required to describe the process for responding to NCRs in their own Quality Assurance Plans, including the requirement to respond to the three elements. Contractor staff was trained by CCPO staff on how to use the e-Builder system, but were not trained to correctly respond to NCRs because the process was assumed to be standard.

Many NCRs were closed without the three required elements being addressed. In a few cases, the QAPM rejected NCRs for failure to provide either the correct documentation or failure to fulfill the requirements of nonconformance reporting on the part of the contractor. In a few other cases, the QAPM made comments requesting further documentation, information, or requesting that a proposed disposition description be re-written. However, rejections or comments requesting additional information did not occur often.

The true root cause of nonconforming work was not always appropriately addressed in NCRs

One of the required elements to be addressed by contractors' QA staff when responding to an NCR is to identify the root cause of the nonconformance, then to use that root cause to develop a plan to prevent future nonconformance. In the cases where NCRs actually had all three elements addressed, there were multiple instances where the root cause was either not identified correctly, or the plan to prevent future issues did not address the true cause of the nonconformance.

This is especially the case for Civil East, where the contractor would often attach correspondence from a subcontractor to address the disposition description that was inadequate or would not address the actual root cause of the nonconformance. Civil East is the only area where the contractor's Quality Assurance Plan states that it is acceptable to forward

the nonconformance report to the responsible party (i.e. subcontractor, vendor, etc.) for response.

In some instances, the root cause was identified, but the plan to prevent future nonconformance did not seem to relate back to the root cause. In many cases, the root cause was identified as the timeline being pushed up or other time-constraint issues. However, the plan to prevent future nonconformance in these cases would not reference anything about how to deal with work being rushed in the future.

Along with being inconsistent in requiring contractors' staff to address all three required elements, the CCPO QAPM did not reject or request a revision to disposition descriptions where the contractor's staff did not identify a legitimate root cause, or where a plan to prevent future nonconformance did not accurately address the true root cause.

NCRs were closed without physical documentation of corrective action attached or verified

Many NCRs with a disposition of "repair," "rework," or "remove and replace" were closed without physical documentation that the corrective action had been verified, or in some cases even approved. Some of them had a comment in e-Builder's routing history that stated corrective action had been completed or had been observed, but did not have physical verification (test results, photos, redline drawings, etc.). Others had neither comments nor physical documentation.

The CCLRT Quality Assurance Plan states that when corrective action takes place as a result of an NCR, that work will be subject to re-verification to demonstrate conformity to the requirements. The CCPO Procedures Manual states that all documentation, including supporting documents, comments, verification, etc., will be tracked via e-Builder, through closure.

The written expectation that documentation be attached and tracked through closure of NCRs was not followed. Before the CCPO QAPM closed an NCR, he would look at whether the originator commented, and whether or not they viewed the NCR. He may have called them to follow-up if he had questions. At the start of the project, the QAPM was not as strict about requesting as-built documents, but became more stringent as time went on. While he understood that documents should be directly attached to a NCR, they may exist somewhere else in e-Builder. His level of rigidity for requiring attached documentation depended on his level of confidence in the contractor.

NCR procedures did not prevent reoccurring issues

Audit found that certain construction areas had reoccurring nonconforming issues that were not prevented by the nonconformance reporting policies and procedures. Civil East had the most reoccurring nonconformance. In Civil East, there were four nonconformance reports (NCRs-88, 132, 164, and 166) documenting damage to grounding rings. A comment from the CCPO QAPM on NCR-88 stated that all ground rings to date had been damaged by the contractor. NCR-88 was opened on 8/19/2011, and QAPM's comment came on 12/2/2011. Damage clearly

continued before this NCR was resolved and closed. There was also at least one instance of damage to a ground ring in Civil West.

Additionally, Civil East had three NCRs opened to document theft of grounding tails (NCR-170, 226, and 228). There were three NCRs opened in Civil East to address mishandling and non-reporting of asbestos (NCR-58, 61, 72 and 94). For the first of these asbestos handling issues reported, the plan to prevent future nonconformance was to hire a subcontractor to work ahead. Even with the subcontractor, NCR-94 clearly documented that asbestos mishandling was an ongoing issue.

Many of the reasons that appear to have led to reoccurring nonconformance have already been described in the observations about NCRs and the NCR reporting process above.

The QAPM expected some level of nonconformance in a project of this size, so there was already an acceptance that some level of reoccurring nonconforming work was inevitable.

The QAPM believes reoccurring issues are often a result of work by a subcontractor, but CCPO has no contractual obligation to deal directly with subcontractors and must instead work through the primary contractor. The QAPM described his role as one of “raising awareness” of issues, but not having the authority to, for example, issue an order to stop work on the project.

Lastly, there were no written requirements for contractors to verify in the NCR process, or other format, that a plan to prevent future nonconformance had indeed been implemented. The majority of NCRs reviewed, that had a plan to prevent future nonconformance, had no physical documentation that the plan was indeed in place. For example, multiple NCRs mentioned training employees as part of a plan to prevent future nonconformance, however there would be no verification that training had occurred by, for example, attaching a sign-in sheet or dated agenda.

No written policy or procedure existed for when contractors claimed there was no nonconformance

There were multiple instances of contractors claiming no nonconformance in response to an NCR. There was no written policy or procedure to follow when handling these issues, but the CCPO QAPM followed a general unwritten procedure. This may have resulted in NCRs not resolved correctly or time wasted on duplicated reports.

The QAPM heavily relies on field office inspector’s experience and expertise that NCRs were generated for legitimate reasons. However, a plan should be in place in the event a contractor disagrees with the NCR.

As there was no written policy or procedure in place, the QAPM would send the NCR back to the designer of record to determine whether the work complied with specifications. Often in these cases, there was conflicting contract information that the contractors would use to justify the way the work was done. If indeed the work they did was specified somewhere in the contract, but was not what the designer of record wanted, then CPPO had to pay for the

change. There were often negotiations back and forth in these situations about whether the work was truly nonconforming.

Nonconforming construction work was accepted with Use As-Is disposition without proper documentation or concessions

The CCPO had conflicting policies on accepting Use As-Is dispositions for nonconforming construction related work.

The CCLRT Quality Assurance Plan states under Section 11: Nonconformance that, “In construction related work, a resolution to accept nonconforming material or work with a ‘Use-As-Is’ resolution is NOT an option.” However, the CCPO Procedures Manual says that “any resolution to accept nonconforming work with a ‘Use-As-Is’ resolution shall have the concurrence of the ‘Engineer of Record’ and the CAR or designee and will be documented.” The CCPO Procedure Manual on this issue agrees with the FTA Quality Management System Guidelines.

The CCPO Procedure Manual was more often followed, with construction related work with a Use As-Is disposition requiring comment or instructions from the Engineer of Record. However, the QAPM prefers not to accept nonconforming construction work. He would only accept the Use As-Is disposition for work that functioned correctly but was possibly an issue of aesthetics, never for work that posed a safety risk or did not function.

Out of the NCRS sampled, four from Systems were closed with a “Use As-Is” disposition on construction related work, seven from Civil East, 10 from Operations and Maintenance Facility (OMF), and 15 from Civil West. Most of these had documentation verifying approval of the disposition. However, some had more documentation than others.

For a small number of NCRs with a Use As-Is disposition description for construction related work, the QAPM commented in e-Builder that CCPO should pursue concessions when an NCR fails to bring construction work into full compliance with contract requirements. Specification 01 44 00 1.01 E6 states that the Owner should “demand concessions when the resolution of NCR’s fails to bring completed Work into full compliance with contract requirements.” The amount of the concession is up to the discretion of the CAR. However, the QAPM’s recommendations in these instances were not always followed.

For example, the QAPM cited an example from the OMF area where the contractor did not place a grounding ring on the outside of the building, per specification, only inside. The QAPM requested in the NCR that a Change Order be generated to discount the cost before he closed the NCR with a Use As-Is disposition, since the work was never completed. This was approved by the Engineer of Record. The Change Order was generated, but it was withdrawn after the QAPM closed the NCR, and the concessions were not pursued.

CONCLUSIONS

1. The CCPO's Quality Assurance Function does not have an efficient process in place that verifies completion of each item listed on test and inspection plans. The lack of this internal control puts the Council at risk in its quality assurance oversight responsibility on the CCLRT Project.

2. There was difficulty in searching for inspections and test items in e-Builder without experienced project office personnel with insight on particular tasks or project events.

3. The QAPM quality audits lack a consistent formatting structure. The main areas of this inconsistency are with recommendations, deadlines of the recommendations, and follow up reporting.

4. Metro Transit's Engineering & Facilities Administration and Rail Administration would like to collaborate with the projects' quality assurance function. This information will assist these administrations in preparing to operate the light rail line.

5. The QAPM is currently overseeing the quality assurance function for the Green Line, Green Line Extension, and the Blue Line Extension without any direct reports. It is not reasonable for one person to bear the responsibility of assuring the development, implementation, and administration of the Quality Assurance Plan, in addition to the oversight responsibilities of multiple projects. Best practices from RTD (Denver) would indicate that it is not reasonable for one person to be responsible to oversee the quality assurance function on multiples projects.

6. The NCR process is the main lever for holding contractors responsible for complying with contract specifications. The nonconformance procedures and policies should ensure that nonconforming work does not reoccur and ensure that the Council does not end up paying the contractor for work that does not meet specifications.

7. Contractors should identify what went wrong and how to prevent future issues of the same type on NCRs. When the contractor does not complete this process adequately or include proper documentation of the corrective action, there is a risk that nonconformance will continue or corrective action was not approved through the proper channels. If contractors aren't required to respond to NCRs and Council staff are not required to close NCRs in a timely manner, there are risks that corrective action will be delayed, corrective action will have taken place before approval was granted, or that nonconformance will continue in future work.

8. There are risks to the Council when policies and procedures are not in place or are contradictory. Without a policy or procedure for dealing with instances where the contractor claims there is no nonconformance, there is a risk that this disposition will be accepted when nonconforming conditions still exist. As a result of conflicting policies, construction related

work may have been accepted as Use As-Is without proper documentation, or corrected instead.

9. The QAPM did not have the authority to enforce penalties against contractor(s) who wanted construction related work that did not conform to contract specifications accepted “Use As-Is.”

RECOMMENDATIONS

Program Evaluation and Audit recommendations are categorized according to the level of risk they pose for the Council. The categories are:

- **Essential** – Steps must be taken to avoid the emergence of critical risks to the Council or to add great value to the Council and its programs. Essential recommendations are tracked through the Audit Database and status is reported twice annually to the Council's Audit Committee.
- **Significant** – Adds value to programs or initiatives of the Council, but is not necessary to avoid major control risks or other critical risk exposures. Significant recommendations are also tracked with status reports to the Council's Audit Committee.
- **Considerations** – Recommendation would be beneficial, but may be subject to being set aside in favor of higher priority activities for the Council, or may require collaboration with another program area or division. Considerations are not tracked or reported. Their implementation is solely at the hands of management.
- **Verbal Recommendation** – An issue was found that bears mentioning, but is not sufficient to constitute a control risk or other repercussions to warrant inclusion in the written report. Verbal recommendations are documented in the file, but are not tracked or reported regularly.

1. (Essential) CCPO should revise Quality Assurance policies and procedures to:

1a. Ensure that there is less risk of recurring nonconformance

First, there must be clear expectations for both the contractors' and the Council's Quality Assurance staff for how long NCRs are allowed to remain open. This includes how long staff members of both parties have to respond to an NCR once it is in their queue. There should be clear procedures, for Quality Assurance staff to follow in the event that an NCR is not closed within the expected time frame, including documentation in e-Builder of the steps taken to resolve the delay.

Next, the current procedures for nonconformance reporting should be clarified to explain what documentation should be attached to NCRs and by whom. Documentation showing the implementation of a plan to prevent future nonconformance is essential. This policy should require the QAPM ensure the correct documentation is attached to NCRs before closing them.

Additionally, there should be a clear policy regarding whether contractor staff can claim that there is no nonconformance in response to an NCR, and a procedure for what the QAPM should do in the event of such a claim.

Management Response: *Management agrees that procedures should be revised to address this recommendation. The Met Council's standard General Conditions do not place restrictions on the time that an NCR can remain open because there are cases where it is appropriate for NCRs to stay open for an extended period of time including seasonal conditions, negotiations on disposition of more complicated NCRs, and/or advancement of the work away from the NCR location which requires re-mobilization and must account for business and/or traffic impacts. Procedures will not place a limit on the time an NCR can remain open for the reasons just stated, but the initial NCR response time is an appropriate focus area for improvements on future New Starts projects and will be addressed in procedures. Timely responses will also be discussed with the contractor quality assurance staff and the project field staff assigned the responsibility to oversee the work. Additionally, the contractors' Quality Assurance Plans (QAP) will be reviewed to ensure timely initial response to the NCR is addressed.*

Procedures will be revised for future New Starts projects to reinforce documentation requirements. In addition, the need for corrective action to prevent future occurrences will be determined on a case by case basis and will be documented in the NCR by the contractor as appropriate. The need to include documentation with the NCR as well as the corrective action to prevent additional occurrences will be discussed with the contractor quality assurance staff and the project oversight staff on future New Starts Projects.

Typically, when a contractor disagrees with the NCR, a decision is made regarding the contractor's claim by the project office staff, in consultant with the construction manager and "designer of record". An NCR process modification was implemented in the latter half of CCLRT construction that required all NCRs must be approved by the construction manager before being transmitted to the contractor. This ensured that the construction manager was in agreement before the NCR was sent which solidified the Met Council's position, helped the CCPO avoid submitting erroneous or inappropriate NCRs, and also allowed an opportunity in some cases for the parties to reach a resolution on the work prior to issuance of an NCR. This ultimately helped minimize some of those NCRs that had been disputed by the contractor and is a practice that will continue for New Starts projects and will be documented in procedures.

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

1b. Ensure that the Council receives concessions when work does not conform to specifications.

There should be one consistent policy for the QAPM and Quality Assurance staff to follow regarding the acceptance of Use As-Is dispositions for nonconforming construction related work. If the policy is that construction related work can be accepted Use As-Is, then the policy should clearly outline how the Council will be reimbursed by or receive concessions from the contractor for acceptance of work that does not conform to contract specifications. Audit suggests that this policy be strictly enforced, and include proper channels for the QAPM to follow in order to enforce penalties.

Management Response: *Management agrees that receiving concessions is a key requirement for accepting work as-is and will encourage construction staff to continue to make this a priority. The project office does negotiate concessions for the acceptance of an as-is disposition but this recommendation suggests that better documentation of those concessions would be an appropriate process improvement. When the project office staff determines that the non-conforming work will be accepted as-is, they take into account many considerations including what the negative consequences of rework may be for those most impacted by construction (businesses and the public) as well as if the non-conforming work would result in any diminishment of useful life of the asset. Ideally, the non-conforming work would be replaced by conforming work but it simply is not always possible or prudent. In the case where the asset's useful life is diminished, the Council should receive a credit compensation or additional contract work equal to that reduction in useful life. If, after an analysis of the non-conforming work shows the non-conformance is only aesthetic, the concessions may be slightly less and would be negotiated on a case-by-case basis. Each case is very uniquely different from the next which makes it impossible to develop a one-size-fits-all solution for the disposition. The project office will instead endeavor to better document the concessions made by the contractor for the Council to accept work as-is and that will be documented in the procedures. In addition, a reconciling credit/debit change order concept will be explored as a potential procedural enhancement to track non-conforming work that is accepted as -is.*

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

1c. Improve the effectiveness of the QA/QC audit process. Quality audit reports should be shared with Engineering & Facilities and Rail Operations staff on periodic bases.

This reporting relationship will assist Engineering & Facilities and Rail Operations in knowledge of any quality issues the QAPM has deemed important and provide both of these administrations with valuable information before operation of the line.

Management Response: *Management agrees with this recommendation and will extend an invitation for regular meetings with project office staff, Engineering & Facilities and Rail Operations to discuss quality audit reports with the QAPM.*

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

1d. The CCLRT QAPM provide consistent quality audit formatting that includes clear recommendations and deadlines.

Quality audits currently lack consistent formatting that may cause ambiguity for the recipient concerning required corrective action. Audit suggests a clearly defined recommendation section, deadlines for corrective action, a clearly defined recipient response section, and follow up section. Audit understand that not all quality audits will be the same, but clearly defined sections with any recommendation, deadline, and follow up reporting should be put in place on all future quality audits.

Management Response: *Management agrees and future audit reports will be formatted to include these recommendations.*

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

2. (Essential) The CCLRT Quality Assurance Function needs to create an efficient process that verifies completion of inspections and test plan items.

The CCLRT Quality Assurance Function currently does not have an efficient process in verifying required inspections and test items from each of the prime contractor's Testing and Inspection Plan. The complexity and scale of this project, and future light rail projects, require a process that ensures verification that certain inspections and tests have occurred. This internal control is essential for a more efficient verification process. Not knowing this information or relying on the contractor's word could put the Council at risk. If the project office is requiring the contractor to provide a list of all inspections and test, then there should be an efficient way of verifying that each and every action took place.

An example of a best practice used by RTD (Denver) is a risk based approach along with priority planning. This would assist the QAPM in a more efficient way of verifying and tracking each inspection and test plan item.

Management Response: *Management agrees that the process to verify completion of the inspection and test plan items must be more efficient for future New Starts projects. For the CCLRT Project, the e-builder electronic Project Management System was implemented at the start of construction while the Test and Inspection Plan was still being developed by the contractor. This by itself resulted in deliverables to e-Builder being indexed incorrectly which lead to inefficiencies in verifying the thousands of tests and inspections that were completed.*

To resolve this issue, the QAPM has begun the process to develop the matrix of required deliverables by specifications section. This will become part of the indexing structure in e-Builder for deliverables/submittals from the contractor and will provide a simplified methodology for project office staff to verify compliance from the contractor for future New Starts projects.

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

3. (Essential) Metro Transit's Transit System Development (TSD) should identify ways to ensure that the Quality Assurance Function has the necessary resources to fulfill its oversight role and responsibility.

The QAPM is currently the only quality assurance personnel assigned to the CCLRT project. This is in addition to his oversight role with the Green Line Extension and Blue Line Extension projects. With multiple light rail project planned, it is important to have appropriate resources available that ensures the Quality Assurance Function performs efficiently.

Management Response: *Management agrees to review the staffing of the Quality Assurance function within the Transit Systems Development organization to ensure adequate resources are available.*

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

4. (Significant) Metro Transit's Transit System Development (TSD) should collaborate with Engineering & Facilities Administration as well as Rail Administration on quality assurance and quality control issues going forward on future light rail project; this includes dialog throughout the design and construction phases.

Engineering & Facilities Administration and Rail Operations Administration has requested greater involvement during the design and construction phases of the New Starts projects. The project's Quality Assurance Function plays a key role in the continued success of each of these administrations. Metro Transit's TSD should meet with these two administrations to discuss how the Quality Assurance Function can assist them in the operation of future light rail lines.

Management Response: *As stated in 1c, Management will extend an invitation for regular meetings with project office staff, Engineering & Facilities and Rail Operations to discuss quality audit reports with the QAPM. Management also wants to stress that staff-to-staff interaction with E&F and Rail Operations was a regular and integral part of the CCLRT Project implementation from design, through construction, testing and into revenue operations. Without the close coordination that did occur with these groups, delivery of the Green Line to its opening day in June 2014 would simply not have been possible.*

Rail Operations did have representation on the CCLRT Project Management Team (PMT) throughout design, construction, testing and implementation, however, during the design and early construction phases a Rail Operations representative did not typically attend the weekly PMT meetings. Once the project began to approach the testing phase, Rail Operations assigned a dedicated staff person to interface with the PMT which greatly enhanced communications between the departments. In addition to being part of the PMT, Rail Operations staff regularly met with project office staff to help inform many of the design and construction

aspects of the CCLRT Project. Rail Operations also did serve on the CCLRT's "Change Control Board" as a voting member to consider change orders that required tapping project contingency. There were also a number of weekly meetings outlined in the Integrated Testing Plan where quality was a regular focus that encouraged collaboration and communication between the departments. This collaboration will continue on future New Starts projects.

The meetings with Engineering and Facilities were more topic-specific and occurred as needed, however, E&F staff were also invited to and did regularly attend construction progress meetings, especially with the Operations and Maintenance Facility contract. This helped to ensure good communication and collaboration between parties. Although there was regular coordination with the Facilities group, there were not as many regularly scheduled meetings with the Engineering group outside of monthly "New Starts" meetings where the two departments briefed each other on a variety of projects. For future New Starts projects, Transit Systems Development management staff will explore additional opportunities to interface with management staff at E&F around the quality control and quality assurance issues identified in this recommendation.

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

5. (Significant) CCPO should provide training to contractors' staff on how to successfully complete NCRs.

Contractors' staff should receive training on how to respond to NCRs, beyond just how to use e-Builder or other technology. This would allow the QAPM to be confident that the contractors' staff understands the expectations and can reasonably be held to them. Audit suggests that the training includes how to accurately identify the root cause of a nonconforming condition, and how to then address that root cause when developing a plan to prevent future nonconformance. The training should include providing appropriate documentation needed to successfully resolve NCRs. Primary contracting staff should not be allowed to defer to subcontractors to complete the required elements of the disposition description.

Management Response: Management agrees and this training will be provided on future New Starts projects to contractor staff responsible for preparing responses to NCR and will include:

- *documentation required to fix and correct root causes*
- *need for timely responses*
- *any anticipated delays to closure explained and documented*
- *responsibilities of the Prime contractor in completing disposition descriptions*

This training will be conducted soon after contract notice to proceed, and will be included as part of the Project's QAMP.

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

6. (Significant) The QAPM should not close NCRs unless the contractor has responded appropriately and pertinent documentation has been provided.

NCRs should never be closed without the three required elements being addressed appropriately, or without appropriate documentation to confirm that the nonconforming condition and root cause have been appropriately addressed.

Management Response: *Management agrees and will focus efforts on training. While the documentation is available, that documentation will need to be properly attached or linked to the NCR in the electronic Project Management System, e-Builder. This will be a part of construction staff training on future New Starts projects.*

Staff Responsible: *Christine Beckwith, Deputy Program Director, Transit System Development*

Timetable: *Future New Starts projects*

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