MONTHLY MONITORING REPORT
January 2017

Central Subway Project
San Francisco Municipal Transportation Agency (SFMTA)
San Francisco, CA

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PMOC Contract No.: DTFT6014D00010
Task Order No. 5
Project No.: FTA-13-0294

Work Order Number: 002
OPs Referenced: 01 and 25
CLIN 0002B

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Time on project: 2.5 years

EXECUTIVE SUMMARY

Project Description

The Central Subway Project (CSP) involves constructing a 1.7-mile extension of Muni's T Third Line along 4th Street and Stockton Street in downtown San Francisco. The CSP is Phase 2 of the San Francisco Municipal Transportation Agency's (SFMTA) T Third Light Rail Transit (LRT) Project. Phase 1 of the project constructed a 5.1-mile light rail line along the densely populated 3rd Street corridor. Revenue service commenced on the T Third Line in April 2007. The CSP will extend the T Third Line from the 4th Street Caltrain Station to Chinatown, providing a direct, rapid transit link from the Bayshore and Mission Bay areas to South of Market (SoMa), Union Square, and downtown.

Four new stations are being constructed as part of the project—an at-grade station at 4th and Brannan streets and three underground stations at Yerba Buena/Moscone Center (YBM), Union Square/Market Street (UMS), and Chinatown (CTS). Four light rail vehicles (LRVs) are included in the budget for the CSP as part of a larger procurement that will replace the entire LRV fleet. Average weekday boardings are projected to be 43,521 in 2030.

Project Status

The project has been under construction since February 2010. *At the end of December 2016, the project was 64.4% complete based on expenditures* and there was one active construction contract: 1300 Stations and Systems/Trackwork. *That contract was 50.62% complete on the basis of incurred cost at the end of December 2016. Substantial completion was originally scheduled for February 2018, but the latest master program schedule update forecasts substantial completion on March 28, 2019, a delay of 412 days (nine days later than November's forecast).* The contractor's schedule updates continue to be rejected, and the master schedule information for the project is based on SFMTA's latest update of the construction schedule, which indicates a forecast Revenue Service Date (RSD) of *September 10, 2019. This is 187 days later than the required RSD in the Full Funding Grant Agreement (FFGA). SFMTA reported that it expects to receive an acceptable schedule update from the contractor for October 2016 in early Feb*ruary *as the result of opinions rendered by the Dispute Review Board (DRB) for the project.*

The Project Management Oversight Contractor (PMOC) notes that although the forecast substantial completion dates for the 1300 Contract and the RSD were maintained in November, the trend of increasing project delays resumed in December. It appears that the contractor may be unable to meet planned production rates for work on the critical path. *SFMTA has been working with the contractor to improve the production rates and has convinced the contractor to obtain equipment that may be able to advance the excavation more efficiently. That equipment has not yet been placed into service, so its effectiveness has not been confirmed.*

In the opinion of the PMOC, it is not yet possible to project the progress of construction with confidence and the ongoing month-by-month extension of the projected RSD is detrimental to effective management of the project. SFMTA and the contractor are encouraged to develop a

mutually agreed, achievable schedule for completion of the remaining work, including any realistic schedule recovery strategies and appropriate schedule float to absorb future delays that will inevitably occur. Such a schedule should be developed as soon as possible, taking advantage of experience with the new equipment that is to be put into service at CTS.

The PMOC encourages SFMTA to complete its ongoing update of the Rail Activation Plan (RAP) to determine if it is possible to partially recover the accumulated delays to the project. Planning of the testing, commissioning and start-up work will require a reliable forecast of when the testing and commissioning can start, including opportunities for phased testing, based on an achievable schedule for the remaining construction work. *SFMTA plans to complete its update of the RAP and the schedule for testing, commissioning, and start-up in April 2017.*

Table 1 - Core Accountability Items

Project Status: *(as of November 30, 2016)*		**Original at FFGA:**	**Current Estimate:**
Cost	Cost Estimate	$1,578,300,000	$1,578,300,000
Contingency	Unallocated Contingency	$74,722,000	$4,674,924 (*same as November 2016)*
	Total Contingency (Including Approved Contract Changes)	$185,500,000	*$78,414,454 ($781,782 less than November 2016)*
Schedule	Revenue Service Date	12/26/2018	*09/10/2019* (forecast)
Total Project Percent Complete	Based on Expenditures	*64.42%*	
	Based on Earned Value	*64.20%*	
Major Issues	**Status**	**Comments/Planned Action**	
Schedule Contingency	Based on the latest program master schedule, there is negative schedule float of approximately eight months.	The minimum schedule contingency agreed to at this stage of the project is 6.0 months. Several potential schedule recovery strategies are under evaluation by SFMTA. A follow-up schedule workshop is planned for the second or third quarter of 2017.	
Cost Contingency	*The current Total Contingency is $78.4 million.* The Federal Transit Administration (FTA) recommends a minimum contingency level of $60 million.	*Accumulating delays will likely lead to an increase in project soft costs that could consume some of the contingency but should not result in a cost overrun.*	

Technical Capacity and Capability	All management positions in the organization are filled.	*The SFMTA Quality Manager has left his position for a new assignment in Muni Operations. The Quality Manager, who is continuing in his current role, will report directly to the Director of Transportation.*
Date of Next Quarterly Meeting:		*May 4, 2017*

Earned Value (EV): *$1,013,189,752, an increase of $7.97 million from November.*

Planned Value (PV): *$1,311,501,826, an increase of $8.55 million from November.*

Actual Cost: *$1,016,766,869, an increase of $10.76 million from November*.

Cost Performance Index (CPI): 1.00. A value greater than 1 means that value of the work completed is more than the cost of the work (under budget) and less than 1 means that the value of the work is less than the cost of the work (over budget).

Schedule Performance Index (SPI): 0.77. SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90; the current SPI indicates unacceptable schedule performance.

Contingency

Cost Contingency

The total available contingency (approved contingency less approved contract changes) is $*78,414,454*, which is above the minimum required contingency of $60 million *and down about $791,000 from November. A total of 47 contract modifications had been executed for the 1300 Contract with a total value of $4.82 million as of the end of December. Unallocated contingency remains at $4.67 million.* ***In the opinion of the PMOC, SFMTA's cost forecasts should recognize the possibility of increased soft costs due to project delays. Despite the potential for higher soft costs,*** **the available cost contingency appears to be sufficient to provide reasonable assurance of on-budget completion of the project. SFMTA and the contractor are encouraged to identify schedule recovery strategies to reduce the potential for delay-related costs and to continue to work to resolve long-standing time impact claims.**

Schedule Contingency

The program master schedule for the CSP continues to show negative buffer float and a forecast RSD more than eight months later than required. The agreed level of schedule contingency after demobilization of the tunnel work is 6.0 months. **In the opinion of the PMOC, there continues to be a significant risk that the RSD will be missed by several months.**

PMOC Observations, Opinions, and Concerns

The PMOC notes that although the forecast substantial completion dates for the 1300 Contract and the RSD were maintained in November, the trend of increasing project delays resumed in

December. In the opinion of the PMOC, although setting and working toward the short term milestones, or *Big Hairy Audacious Goals (BHAGs)* may be intended to encourage cooperation and collaboration between Tutor Perini Corporation (TPC) and SFMTA in advancing the current work, this practice*, by itself, likely will not result in significant time savings or meaningful improvement in the RSD for the project. The PMOC notes that work for the BHAGs for UMS remain on track, limiting the risk of that work package becoming critical to the overall completion date. Ongoing delays will be increasingly difficult to recover, since* much of the original station construction schedule has been consumed, leaving relatively little time to recover the accumulated delays.

The ongoing month-by-month extension of the projected RSD is detrimental to effective management of the project. However, in the opinion of the PMOC, it is not yet possible to project the future progress of construction with confidence. The production rates achievable with the new mining equipment at CTS need to be established before a reliable schedule forecast can be developed. SFMTA and the contractor are encouraged to develop an achievable schedule for completion of the remaining work including any realistic schedule recovery strategies and appropriate schedule float to absorb future delays that will inevitably occur.

The PMOC remains concerned that unresolved responsibility for the accumulated delays to date is hindering SFMTA and TPC from working together to identify schedule mitigation measures. Time impact allowances on the remaining contractor delay claims should be negotiated as soon as possible. SFMTA and the contractor should make appropriate use of the partnering and DRB processes to facilitate resolution of any disputes regarding allowable time impacts.

The PMOC encourages SFMTA to complete its planning for the sequences of work that will allow building systems and transit systems testing to start and finish its ongoing update of the RAP to determine if it is possible to partially recover the accumulated delays to the project. A schedule workshop is planned for the second or third quarter of 2017 to assess the likely range for the Revenue Service Date (RSD) of the project and to evaluate potential time saving measures.

Based on the latest information from the SFMTA's contract change and trend reports, the total cost contingency less identified trends of 10.2% of the potential remaining spending is sufficient to provide reasonable confidence of on-budget completion of the project. The available contingency is well above the recommended minimum of $60 million. SFMTA and the contractor are encouraged to identify schedule recovery strategies to reduce the potential for delay-related costs. SFMTA should also continue its efforts to evaluate the causes of and responsibilities for previous delays to the 1300 Contract and attempt to reach agreement with the contractor on the amount of delay to be granted and the extent to which the delays are compensable.

The PMOC notes that SFMTA has given proper attention to assuring that all embedded items are properly located in the YBM invert slab prior to issuing approval for the slab pours to proceed. The process for locating and confirming the conformance of embedded items to contract requirements prior to invert slab pours at the other underground stations should benefit from lessons learned at YBM.

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A. PROJECT STATUS

Full Funding Grant Agreement (FFGA)

The FFGA was signed on October 11, 2012.

Design

Design is complete.

Construction

Contract 1250 (UR #1). This completed contract relocated utilities within the footprint of the proposed Yerba Buena/Moscone Center (YBM) Station. All cost claims by the contractor have been settled.

Contract 1251 (UR #2). This completed contract included the relocation of utility lines within the footprint of the proposed Union Square/Market Street (UMS) Station and temporarily rerouted existing trolley coach lines around the construction zone. There is an outstanding cost claim by the contractor for this contract.

Contract 1252 Tunnel. This completed contract included the construction of 1.5 miles of twin tunnels excavated by tunnel boring machines and construction of the tunnel portal and retrieval shaft. Final completion has been achieved, and financial close out should occur in early 2017. The contractor needs to repair leaks in the tunnel and some of the cross passages before the contract can be closed out. Coordination of access to the tunnel for this work with ongoing station construction has been challenging, and this work is scheduled to be completed once the contractor regains access to the tunnel locations. Instrumentation must be removed from the Bay Area Rapid Transit (BART) tunnels, and the work *started in January. Work is scheduled to be completed in early February, with a backup date in late February if needed. Close out of the contract also will be affected by several claims of extra work by the 1300 contractor due to non-conforming work completed by the 1252 contractor.*

It appears likely that this contract will close out with a final cost less than $2 million over the original contract value, with change orders of less than 1% of the contract amount, which is very good cost control performance.

Contract 1300 (Combination of UMS, CTS, YBM, and STS). This contract includes the construction of three underground stations, one surface station, all surface works required for the installation of Light Rail Transit (LRT) between 4th and King streets and the tunnel portal, and all LRT track and systems components. *As of the end of December 2016, the construction of the Stations and Surface, Track, and Systems Contract was 50.62% complete on the basis of cost and 53.07% complete based on the value of completed construction.*

Union Square/Market Street Station (UMS): The latest Big Hairy Audacious Goal (BHAG) for this work package was placement of the mezzanine level walers and struts by February 14, 2017.

This work had been forecast to be completed on January 31, 2017, two weeks ahead of the target. The contractor began excavation to the next level of the station box below the mezzanine sooner than originally planned in order to expedite the overall station box excavation. The advancement of work at the lower levels will result in a later completion of the work at the mezzanine level, but SFMTA considers the overall progress as of the end of January to be equal to or greater than the amount of work reflected in the BHAG. The mezzanine level struts are now scheduled to be complete on February 21, and the first struts are scheduled to be placed at the next lower level of the box on February 14. Work on emergency egress stairs 3 and 4 on O'Farrell Street continued and was due to be completed in early March.

The triangle formed by Market Street, the westbound lane of Ellis Street, and the western end of the Ellis Street Annex remained uncovered pending the placement of utilities in their final location prior to backfilling and paving the area. Work under the deck to place the invert slab in the south concourse area has been completed and work has shifted away from this portion of the station.

At the north concourse, pulling of Muni trolley coach power cables through modified duct banks, planned to be complete in January, was delayed to early February. Other work in the north concourse awaits completion of the soil nail walls for the fan room in the Union Square Garage work area.

In the Union Square Garage area, unanticipated fuel tanks were encountered at the bottom of the excavation (the second occurrence of buried fuel tanks) and have been removed. At the fan level of the garage, contaminated soil associated with fuel tanks (see below) will be removed during February. Soil nail walls for the fan room were scheduled to be constructed in early February. Concrete repairs in the garage were completed in January, and the new public ramp into the garage is nearly ready for use. Base slabs for escalators and escalators leading to the north entrance were poured in January.

Chinatown Station (CTS): *Work on mining of the top left and top right side drifts for both the northbound and southbound platform caverns was underway at the beginning of February. The contractor is continuing to work two 12-hour shifts six days per week on the mining work at CTS. The Project Management Oversight Contractor (PMOC) notes that the trend of increasing delays to work at CTS that had been halted in November returned in December, with the completion date slipping nine days. The critical path work for the entire program is currently the mining of the northbound and southbound platform caverns. The planned rate of advancement of the mining is about six feet per day, and the actual rate being achieved is only three feet. The contractor has been using a rock bolting machine with limited reach that requires soil ramps to be temporarily built to reach the upper portions of the excavation. SFMTA has encouraged the contractor to obtain an articulated machine that would not require the soil ramps to be repeatedly built up and removed. A machine has been identified and was being modified for the CTS work in early February. SFMTA is hopeful that the new machine will improve production significantly, but is not confident that the planned production rates can be achieved even with the new machine. It*

appears that the latest BHAG of completing the first ring of the platform cavern at the end of March will not be achieved.

SFMTA has stated that a more accurate projection of the project completion date will be possible in the second quarter of 2017, when the production rate for mining with the new machine at CTS has been determined. **A schedule workshop is planned for the second *or third* quarter of 2017 to assess the likely range for the Revenue Service Date (RSD) of the project and to evaluate potential time saving measures.**

Yerba Buena/Moscone Station (YBM): The previous BHAG for YBM was to complete the station box invert slab by February 14, 2017. *That goal has been revised to completing both the station box and headhouse invert slabs by April 12, 2017.* Traffic was shifted from the west side of 4th Street to the east side to allow final utility placements and pavement restoration to be started on the west side of the street. *Utility work is continuing into mid to late February. Paving of the west side of 4th Street is tentatively scheduled for February 22, but may be delayed by utility work. Remaining utility work in Clementina Street and subsequent restoration of that street will need to be coordinated with the planned opening of a new hotel that is currently under construction on the northwest corner of 4th Street and Clementina Street.* The most recent projection for the opening date was in May 2017.

Mud slabs and waterproofing for the first four planned invert slab pours had been completed as of early February. The mud slab for the final two invert slab sections is now planned for February 17, followed by waterproofing. Mechanical equipment to be embedded in the invert slab was placed over most of January, with the first section of the invert slab planned to have been poured on January 25. The planned pour was delayed pending review and approval of coordination drawings to confirm the proper placement of all required mechanical and electrical ducts and conduits. The latest 4-week look-ahead schedule indicated that the pour would occur on February 1, but that date was also missed. ***Subsequent planned pour dates will likely be pushed back as well, although the process of completing and securing approvals of coordination drawings is likely to improve with the later pours.***

Preparatory work for the placement of the invert slab in the headhouse was underway in early February. Excavation to below the mud slab was complete and required demolition of the slurry walls to accommodate the pour was underway. Artifacts uncovered during excavation of the headhouse are planned to be placed below the mud slab in early February. The first mud slab pour in the headhouse is schedule for February 13.

In the opinion of the PMOC, placement of the invert slab at YBM will represent a significant achievement, signaling that third party and differing site conditions risks should be nearly eliminated for the YBM station. Interior walls and rough-in work for mechanical, electrical, and plumbing systems continued at the mezzanine and concourse levels. *SFMTA projects that the revised BHAG for placement of the station and headhouse invert slabs will be achieved.* ***In the opinion of the PMOC, the process for locating and confirming the conformance of embedded***

items to contract requirements prior to invert slab pours at the other underground stations should benefit from lessons learned at YBM.

Surface, Track, and Systems (STS): The two latest BHAGs for this work package are: a) complete all utility work and pavement restoration south of Bryant Street by the end of the first quarter of 2017; and b) complete all utility work and pavement restoration through the Bryant Street/4th Street intersection to the portal May 31, 2017. Conflicts with a Pacific Gas & Electric Co. (PG&E) electrical trunk line and a 16-inch gas main continued to delay work on the new 48-inch sewer line at 4th and Bryant streets, leading to the revised BHAG target date. In addition to PG&E, new conflicts with private communication facilities that are too shallow to accommodate the new roadway profile have been identified. The affected companies will need to lower their lines in the coming weeks. *Work on Muni power ductbanks and Overhead Catenary System (OCS) poles was proceeding, along with sewer and water work that is not impacted by the various conflicts with other utilities.*

Preparations to lay the first track for the project in the tunnel portal area were planned to start in early February. Work to investigate and repair problems with the track switch machine and the track circuits at 4th and King streets is planned over the Presidents Day weekend. Work on the invert/track slabs in the tunnel is complete, except for the station areas, which will be completed after placement of the station invert slabs.

A further issue with the final grade of the sidewalk has been identified and is under evaluation by SFMTA. The project scope of work includes replacement of the first sidewalk concrete panel adjacent to the new curbs along 4th Street. The profile of the curb and the new panel to be installed will not match up with the edges of the existing second panels along the sidewalk, which have uneven profiles due to shifting that has occurred over the life of the sidewalk. The STS Resident Engineer (RE) will review conditions in the field to determine if and how a safe and comfortable walking surface can be provided without increases in work and cost. **In the opinion of the PMOC, SFMTA may be required in some areas to expand the coverage of sidewalk replacement to provide a smooth walking surface. The costs for expanded sidewalk replacement may be recoverable from adjacent property owners, who are responsible for the cost of maintaining the sidewalks abutting their properties.**

Despite the focused attention of the Central Subway Project's (CSP) senior management team on achievement of the short term BHAGs, *these goals have not yielded any schedule recovery, and the projected RSD moved 12 days later in the latest reporting period. As discussed in the Schedule section of this report, the trend of schedule slippage due to lower than planned production for the CTS Sequential Excavation Method (SEM) mining resumed in December. **Improved performance for the mining operation must be achieved and sustained and additional time savings must be identified for all four lines of work that are driving the current RSD in order to improve on the current forecast RSD of September 10, 2019.*** **In the opinion of the PMOC, the effectiveness of SFMTA's current efforts to improve schedule performance will be evident late in the second quarter of 2017.** ***In the opinion of the PMOC, the ongoing month-by-month extension of the***

projected RSD is detrimental to effective management of the project. SFMTA and the contractor are encouraged to develop a mutually agreed and achievable schedule for completion of the remaining work including any realistic schedule recovery strategies and appropriate schedule float to absorb future delays that will inevitably occur. Such a schedule should be developed as soon as possible, taking advantage of experience with the new excavation equipment that is to be put into service at CTS.

Third Party Agreements Including Utilities, Railroads, Other Agencies, Etc.

Bay Area Rapid Transit

The close out of Contract 1252 depends on the removal of monitoring equipment from BART facilities. *Completion of the removals is now scheduled in February 2017.*

California Department of Transportation (Caltrans)

An Encroachment Permit is needed to install electrical equipment at the I-280 off ramp. SFMTA is working to obtain the permit for the work, which is not on the critical path.

CPUC

The California Public Utilities Commission (CPUC) is participating in the various safety meetings, including the Safety and Security Certification Review Committee (SSCRC) and Fire and Life Safety Committee (FLSC) meetings. Representatives of the CPUC also regularly attend the SFMTA/Federal Transit Administration (FTA) Quarterly Progress Review Meetings (QPRMs). The FLSC has begun to address the certifiable items list for the Stations Contract. Rail crossing permits from CPUC are required for the at-grade portion of the project alignment. CPUC has provided the permits but they will need to be extended as the permits call for the crossings to be in operation before the scheduled completion of the CSP project.

San Francisco Public Utilities Commission (SFPUC)

Coordination is ongoing for the installation of new water and sewer facilities along 4th Street.

San Francisco Department of Public Works (SFDPW)

No updates to report.

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

All real estate acquisitions have been completed. There will be a need to extend the duration of some of the licenses for compensation grouting. A number of private property owners and businesses have issued claims for damage associated with the project construction. These claims should be handled by the contractors' builder's insurance policies, and the contractor has

demonstrated improved responsiveness to damage claims that are associated with ongoing construction work.

Status of Vehicle Design, Procurement, Testing, and Integration

Vehicle design and fabrication is underway by Siemens Corporation for 4 Light Rail Vehicles (LRVs) for the Central Subway, 20 LRVs for near-term fleet expansion, and 151 LRVs for fleet replacement. Options for up to 85 additional vehicles are available for fleet expansion. The vehicle design and assembly process is reported to be on schedule, *and the first car has been delivered to SFMTA. Acceptance testing for that vehicle is underway, while production of the other cars continues.*

Real Estate

All project right-of-way has been acquired, and all commercial and residential relocations are complete.

Labor Relations and Policies

Appendix G of the Project Monthly Report details the Small Business Enterprise (SBE) goals and actual participation on each contract as of *September 2016.* SFMTA contract goals range from 6% to 30% on each of the contracts. The majority of the contracts have met these goals to date.

Compliance with Applicable Statutes, Regulations, Guidance, and FTA Agreements

At the October station construction status meetings, the 1300 contractor raised the possibility of Buy America compliance issues with cooling equipment and components of the glazing systems for the three underground stations. In the case of the cooling equipment, the contract specifications for the Variable Refrigerant Flow (VRF) cooling units identify four manufacturers that are all foreign, and the contractor has not been able to identify a domestic supplier that can meet the specifications. SFMTA has indicated that it intends to seek a waiver of Buy America requirements for this equipment, citing examples from other FTA-funded projects where waivers were granted by FTA for similar equipment. SFMTA is assembling information in advance of scheduling a meeting with FTA to discuss the proposed waiver request.

In the case of the glazing system components, the contractor did state that he was unable to identify Buy America compliant materials for several items. SFMTA and its designer are researching the affected materials and equipment and are confident that domestic sources are available.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

The latest update of the PMP was received by the PMOC in early April 2016. The PMOC conducted a review of the revised PMP, focusing on the quality program and the organizational reporting structure for the quality functions. The PMOC concluded that SFMTA had addressed its

comments relative to the independence of the quality function from the project management team. However, one section of the PMP text contained a minor inconsistency regarding the reporting hierarchy for the SFMTA Quality Manager. *The reporting relationships for the quality function have been revised due to the departure of SFMTA's Capital Programs and Construction Quality Manager. The current reporting relationship will be documented in the next update of the PMP.* Another minor discrepancy in the position title for one of the project staff members was identified, and it was also agreed that this issue would be addressed in the subsequent update of the PMP due in April 2017. The 2017 update is expected to include a detailed Rail Activation Plan (RAP) *and a schedule of testing, commissioning, and start-up activities* as a referenced document.

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the Third Quarter 2016 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on November 16, 2016. The PMOC will review this report in early 2017.

Real Estate Acquisition Management Plan (RAMP)

The RAMP Revision 5, dated September 26, 2013, was submitted to FTA on November 19, 2013. All required real estate for the project has been acquired in accordance with the RAMP, and the last real estate payment has been made.

Quality Assurance/Quality Control (QA/QC) Program Plan

See section F.

Safety and Security Management Plan (SSMP)

See section H.

Risk and Contingency Management Plan (RCMP)

See section I.

C. PROJECT MANAGEMENT CAPABILITY AND CAPACITY

The latest version of the PMP is dated April 1, 2016. The PMOC's review of the PMP identified minor clarifications in team reporting structure to be included in the 2017 update.

Agency Staff

Total project staff levels are close to the planned values. Several CSP project staff members are focused on development of an as-built record of the construction for the 1300 Contract, and SFMTA has hired another experienced scheduler to work on this effort. **The PMOC notes that progress is being made in resolving the backlog of change order requests by the contractor, with contract modifications continuing to be executed on a relatively regular basis.** Several long-standing major change orders and time impact claims remain to be resolved, but SFMTA has

completed discussions with the contractor on some of the oldest issues, including the impacts of a PG&E power pole on demolition work at the CTS headhouse.

The SFMTA Capital Project and Construction (CP&C) Quality Manager (QM) *has left this position* for an assignment in Muni Operations, *and an acting QM has been assigned*. The *previous* CP&C QM *provided* oversight of the CSP Quality Assurance (QA) process. *SFMTA reported that the CSP QM, who has been on the project since the beginning of the construction phase, will now report directly to the Director of Transportation.* **In the opinion of the PMOC, the effectiveness of the QA process could be affected by the staffing change. The PMOC will monitor the QA program as part of its routine monitoring activities.**

Contractor Staff

There have been no significant changes in contractor project management staff.

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continued to maintain the Trend Log and logs of Change Order Requests (CORs) and Proposed Contract Changes (PCCs) for Contract 1300 using CM13. The Trend Log includes all potential changes in contract value, including items that, in the opinion of the CSP staff, are not merited and new items for which merit has not been determined. The companion contract change management log includes items that have been determined to have merit and are progressing through negotiations toward a contract modification (CMod). SFMTA is working to improve the timeliness of processing determinations of merit as well as the progression of pending contract changes and completion of CMods by creating summary tables of the numbers of items that are in the various stages of processing. **In the opinion of the PMOC, the trend log tracking should include the amount of time that has passed from the initial identification of the trend. The average time taken to resolve trends should also be tracked.** The PMOC has observed some improvement in the progress of contract change processing reflecting the emphasis of the management team in reducing the backlog of contractor change requests. CSP senior managers review the status of pending changes with RE staff members for each work package every other week in an attempt to reduce this backlog and have set an objective of having fewer than 10 change requests that require merit determination. *Five new modifications to the contract were executed between January 4 and February 1, 2017.*

The most recent versions of the Trend Log and Trend Summary documents is February 1, 2017. A total of 52 contract modifications had been executed for the 1300 Contract as of February 1. The total value of executed CMods was $5,312,249, which is an increase of $493,847 since early January. Note that tables 2 and 3 reflect the project status as of the end of *December 2016* and show different values for approved contract changes.

Project Cost (*as of December 31, 2016*)

Cost estimate: $1.5783 billion.

Total contingency: *$78.41 million* (minimum contingency is $60 million), *a decrease of $792,000 from November.*

Total net incurred costs: *$1,016,766,869, an increase of $10.76 million from November (64.42% of the total project budget).*

Current funding level: $1,329,794,000 (84.3% of the total project budget).

Earned Value (EV): *$1,013,189,752, an increase of $7.97 million from November.*

Planned Value (PV): *$1,311,501,826, an increase of $8.55 million from November.*

Cost Performance Index (CPI): *1.00.*

CPI is a measure of cost efficiency on a project. It is the ratio of EV to actual cost value. A CPI equal to or greater than 1 indicates a cost underrun, and a value of less than 1 indicates a cost overrun. A value of 0.9 or greater is considered acceptable, considering the margin of error in estimating the value of completed work.

An outstanding claim by the 1251 contractor of $3.8 million is still pending resolution. SFMTA is of the opinion that the claim on the 1251 Contract has less merit than the previously settled claim on the 1250 Contract. Potential costs for the 1251 Contract claim are not being carried in the project Trend Log.

Project Cost Trends

SFMTA tracks potential changes in project cost, calling these potential changes "trends." Trends include all potential changes in the contract value. As the status of an identified trend changes, it may become a contract modification, it may become an item that is paid on a force account basis, or it may be denied/closed with no impact to the project cost. Extra cost items identified by the 1300 contractor that CSP management concludes have no merit are carried in the total trend amount at 50% of the contractor's estimate of extra costs.

Table 2 summarizes the trends for the two construction contracts that have not attained financial close out. The remaining contingency, less identified trends, represents about *45%* of the potential left to spend for Contract 1252. In November, SFMTA transferred $75,000 from unallocated contingency into the 1300 Contract. *After potential changes are accounted for, there is now $8.83 million in contingency remaining for Contract 1300.* **The resulting contingency of *2.1*% of potential remaining spending after potential changes are accounted for is tight, but unallocated contingency and excess contingency for other elements of the program are likely sufficient to allow on-budget completion of the CSP**. *The combined allocated contingency for all construction work less identified trends is now $10.66 million or 2.5% of the potential remaining work.* **In the opinion of the PMOC, the allocated contingency for the 1252 Contract is greater than the amount required to assure final close out of the contract within the budget.**

The allocated contingency for the 1300 Contract is more in line with the likely contract cost given the pending contract changes, but there is a significant likelihood that additional contingency will need to be allocated to this contract prior to completion.

Table 2 - Contract, Budget, and Trends for Active Construction Projects[1]

	1252 – Tunnel	1300 Stations, STS
Original Contract	233,584,015	839,676,400
Approved Contingency	2,329,485	*40,000,000*
Extra Budget for Non-Project Costs	6,173,508	
Approved Budget	235,913,500	*879,676,400*
Approved Changes	1,494,770	*4,818,395*
Current Contract (1252 does not include non-project costs)	235,078,785	*844,494,795*
Remaining Contingency	834,715	*35,181,605*
Potential Changes (Trends)	170,654	*26,348,412*
Estimate at Completion	235,249,439	*870,843,207*
Contingency Less Trends	664,061	*8,833,193*
Spent to Date	233,793,900	*445,262,157*
Potential Left to Spend	1,455,539	*425,581,050*
Contingency Less Trends as % of Potential Cost to Complete	45.6%	*2.1%*

[1] *As reported in the December 2016* Central Subway Project Monthly Progress Report – SFMTA

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. **The total contingency, including unallocated contingency and subtracting identified trends, represents *10.2%* of the potential remaining spending, which, in the opinion of the PMOC, is sufficient to provide reasonable confidence in an on-budget completion of the project.**

Change Order Control

SFMTA continues to estimate that additional CMods with a net increase in contract value of $170,654 will be executed as part of contract close out for the 1252 Contract. Based on the expected final contract value, change orders for the base work are forecast to represent less than 1% of the original contract amount, which represents exceptionally good change order control.

Table 3 - Budget and Contingency Status for Central Subway Project

Standard Cost Category (SCC)	Description	Budget Authority (FFGA) $	Approved Current Budget	Contingency	TOTAL Approved Budget	Expenditures $	Expenditures % of FFGA	Remaining FFGA Budget	Committed Contract Amt.	Committed Change Orders	Trends/risks	Estimate to Complete	Estimate at Completion	FFGA Budget Forecast Variance
10	**GUIDEWAY & TRACK ELEMENTS**	$ 315,926,081		$ -	$ 285,227,879	$ 215,799,204	68%	$ 100,126,877		$ -	$ -	$ -	$ -	$ -
10.02	Guideway: At Grade, Semi-exclusive	$ 2,395,143		$ -	$ 2,860,000	$ 145,000	6%	$ 2,250,143						
10.06	Guideway: Underground cut and cover	$ 74,407,195		$ -	$ 69,816,407	$ 61,683,677	83%	$ 12,723,518		$ -				
10.07	Guideway: Underground tunnel	$ 224,933,257			$ 201,340,746	$ 148,704,011	66%	$ 76,229,246						
10.09	Track: Direct fixation	$ 7,293,157			$ 6,761,089	$ 2,647,916	36%	$ 4,645,241						
10.10	Track: Embedded	$ 1,601,763			$ -	$ -	0%	$ 1,601,763						
10.12	Track: Special	$ 5,295,566			$ 4,449,637	$ 2,618,600	49%	$ 2,676,966						
20	**STATIONS, STOPS, TERMINALS,**	$ 432,698,735		$ -	$ 589,942,387	$ 311,125,923	72%	$ 121,572,812		$ -	$ -	$ -	$ -	$ -
20.01	At-grade station	$ 774,913		$ -	$ 7,602,857	$ 1,535,777	198%	$ (760,864)		$ -				
20.02	Aerial station, stop, shelter, mall, terminal, platform	$ -			$ 3,508,728	$ -	#DIV/0!	$ -						
20.03	Underground station	$ 412,084,888			$ 557,128,965	$ 306,096,438	74%	$ 105,988,450						
20.07	Elevators, escalators	$ 19,838,934			$ 21,701,837	$ 3,493,708	18%	$ 16,345,226						
40	**SITEWORK & SPECIAL CONDITIONS**	$ 232,551,627		$ -	$ 210,572,927	$ 190,126,967	82%	$ 42,424,660		$ -	$ -	$ -		-
40.01	Demolition, clearing, earthwork	$ 8,887,028			$ 11,296,936	$ 10,843,480	122%	$ (1,956,452)		$ -				
40.02	Site utilities, utility relocation	$ 29,562,587			$ 59,133,711	$ 60,059,124	203%	$ (30,496,537)		$ -				
40.03	Haz. Material, contam'd soli removal, ground water	$ 2,957,442			$ 7,345,298	$ 4,490,650	152%	$ (1,533,208)		$ -				
40.04	Environmental mitigation	$ 3,146,216			$ 1,020,165	$ 641,366	20%	$ 2,504,850						
40.05	Site structures, including retaining walls, sound walls	$ 2,894,074			$ 2,706,431	$ 2,706,431	94%	$ 187,643		$ -				
40.06	Pedestrian and bike access and accommodation,	$ 14,393,910			$ 9,790,995	$ 2,299,140	16%	$ 12,094,770		$ -				
40.07	Automobile, van, bus accessways, including roads	$ 11,919,550			$ 6,579,099	$ 2,923,314	25%	$ 8,996,236		$				
40.08	Temporary facilities and other construction indirect	$ 158,790,820			$ 112,700,292	$ 106,163,462	67%	$ 52,627,358		$				
50	**SYSTEMS**	$ 108,429,774		$ -	$ 95,245,310	$ 22,539,714	21%	$ 85,890,060		$		-	$ -	$ -
50.01	Train control and signals	$ 37,447,116			$ 28,031,423	$ 7,144,219	19%	$ 30,302,897						
50.02	Traffic signals and crossing protection	$ 3,013,232			$ 12,562,529	$ 8,796,381	292%	$ (5,783,149)						
50.03	Traction power supply	$ 20,379,634			$ 21,465,073	$ 5,077,861	25%	$ 15,301,773						
50.04	Traction power distribution	$ 16,239,951			$ 12,441,113	$ 1,356,249	8%	$ 14,883,702						
50.05	Communications	$ 28,545,305			$ 12,030,586	$ 165,003	1%	$ 28,380,302		$ -				
50.06	Fare collection system and equipment	$ 2,804,536			$ 6,100,000	$ -	0%	$ 2,804,536		$ -				
50.07	Central Control	$ -			$ 2,614,586	$ 1	#DIV/0!	$ (1)						
Construction Subtotal (10-50)		$ 1,089,606,217	$ 1,162,150,792	$ 18,837,711	$ 1,180,988,503	$ 739,591,808	68%	$ 350,014,409	$ 1,130,842,776	$ 12,969,408	$ 26,519,066	$ 430,739,442	$1,170,331,250	$ (80,725,033)
60	**ROW, LAND, EXISTING IMPROVEMENTS**	$ 37,398,029	$ 32,246,321	$ 5,265,478	$ 37,511,799	$ 30,731,457	82%	$ 6,666,572	$ 36,511,799	$ (4,036,559)	$ -	$ 1,514,864	$ 32,246,321	$ 5,151,708
60.01	Purchase or lease of real estate	$ 33,798,029	$ 30,065,810	$ 5,265,478	$ 35,331,288	$ 28,322,027	84%	$ 5,476,002	$ 34,331,288	$ (4,265,478)		$ 1,514,864	$ 29,836,891	$ 3,961,138
60.02	Relocation of existing households and	$ 3,600,000	$ 2,180,511	$ -	$ 2,180,511	$ 2,409,430	67%	$ 1,190,570	$ 2,180,511	$ 228,919		$ -	$ 2,409,430	$ 1,190,570
70	**VEHICLES**	$ 26,385,653	$ 13,309,000	$ 13,076,653	$ 26,385,653	$ 2,147,782	8%	$ 24,237,871	$ 13,309,000	$(10,799,712)	$ -	$ 11,161,218	$ 13,309,000	$ 13,076,653
70.01	Light Rail Vehicles	$ 26,385,653	$ 13,309,000	$ 13,076,653	$ 26,385,653	$ 2,147,782	8%	$ 24,237,871	$ 13,309,000	$(10,799,712)		$ 11,161,218	$ 13,309,000	$ 13,076,653
80	**PROFESSIONAL SERVICES**	$ 361,568,360	$ 310,518,041	$ 18,221,079	$ 328,739,120	$ 244,295,822	68%	$ 117,272,538	$ 328,739,120	$ -	$ -	$ 66,476,408	$ 310,776,649	$ 50,791,711
80.01	Preliminary Engineering	$ 46,317,094	$ 46,202,674	$ -	$ 46,202,674	$ 46,202,675	100%	$ 114,419	$ 46,202,674	$ -		$ -	$ 46,202,674	$ 114,420
80.02	Final Design	$ 86,053,240	$ 61,318,331	$ -	$ 61,318,331	$ 61,576,939	72%	$ 24,476,301	$ 61,318,331	$ -		$ -	*$ 61,576,939*	$ 24,476,301
80.03	Project Management for Design and Construction	$ 191,025,800	$ 89,012,544	$ 13,905,845	$ 102,918,389	$ 64,502,550	34%	$ 126,523,250	$ 102,918,389	$ -		$ 29,602,823	$ 89,012,544	$ 102,013,256
80.04	Construction Administration & Management	$ 15,495,521	$ 91,046,881	$ 2,956,812	$ 94,003,693	$ 60,619,220	391%	$ (45,123,699)	$ 94,003,693	$ -		$ 25,334,832	$ 91,046,881	$ (75,551,360)
80.05	Professional Liability and other Non- Construction	$ 6,800,000	$ 6,800,000	$ -	$ 6,800,000	$ 6,340,196	93%	$ 459,804	$ 6,800,000	$ -		$ 78,370	$ 6,800,000	$ -
80.06	Legal; Permits; Review Fees by other agencies, cities,	$ 7,242,340	$ 8,262,604	$ -	$ 8,262,604	$ 4,222,536	58%	$ 3,019,804	$ 8,262,604	$ -		$ 3,576,592	$ 8,262,604	$ (1,020,264)
80.07	Surveys, Testing, Investigation, Inspection	$ 234,036	$ 883,100	$ -	$ 883,100	$ 13,740	6%	$ 220,296	$ 883,100	$ -		$ 819,824	$ 883,100	$ (649,064)
80.08	Start up	$ 8,400,329	$ 6,991,907	$ 1,358,422	$ 8,350,329	$ 817,966	10%	$ 7,582,363	$ 8,350,329	$ -		$ 7,063,966	$ 6,991,907	$ 1,408,422
Subtotal (10-80)		$ 1,514,958,259	$ 1,518,224,154	$ 55,400,921	$ 1,573,625,075	$1,016,766,869	67%	$ 498,191,390	$ 1,509,402,695	$ (1,866,863)	$ 26,519,066	$ 509,891,932	$1,526,663,220	$ (11,704,961)
90	**UNALLOCATED CONTINGENCY**	$ 63,341,742		$ 4,674,924	$ 4,674,924	$ -	0%	$ 63,341,742	$ -	$ -	$ -	$ -	$ -	
Subtotal (10-90)		$ 1,578,300,001	$ 1,518,224,154	$ 60,075,845	$ 1,578,299,999	$1,016,766,869	64%	$ 561,533,132	$ 1,509,402,695	$ (1,866,863)	$ 26,519,066	$ 509,891,932	$1,526,663,220	$ 51,636,781
100	**FINANCE CHARGES**	$ -			$ -	$ -		$ -	$ -	$ -		$ -	$ -	$ -
TOTAL PROJECT COST (10-100)		$ 1,578,300,001	$ 1,518,224,154	$ 60,075,845	$ 1,578,299,999	$1,016,766,869	64%	$ 561,533,132	$ 1,509,402,695	$ (1,866,863)	$ 26,519,066	$ 509,891,932	$1,526,663,220	$ 51,636,781

SCC Breakdown of Forecast Construction Costs Not Available

[2]As reported in the *December 2016* Central Subway Project Monthly Progress Report – SFMTA

SFMTA is maintaining its management tools for tracking potential contract changes for the 1300 Contract. The latest summary report is titled "CN1300 Trend Statistics" and is dated *February 1, 2017*. This report shows that 52 contract modifications have been approved (five *additional CMods since early January) for a net increase in the contract value of $5,312,249. CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined expected value of $24,722,271 in increased contract value, an increase of $442,000 since January 4. An additional 494 items are being tracked in the Trend Log with a net value of $20.34 million in possible contract value increases.* Of these, *247* have been judged by SFMTA to be without merit, but are being carried at a reduced value in the trend to address potential future claims. A further *213* items have been voided and are carried at no cost. *There are 18 items covered by certified claims and notices of potential claims by the contractor ($7.2 million total exposure), and 16 items are "open" or "new" and awaiting a determination of merit.*

The most recent version of the complete Trend Statistics Summary for the 1300 Contract dated February 1, 2017 shows a total potential increase in contract cost of $50,383,608 including the $5.31 million in contract cost increases executed thus far. The total estimated cost impact of the identified trends increased by about $1,230,600 from early January 2017 to early February 2017. The following trend items with potential cost increases in excess of $250,000 are identified in the Trend Log

1. TS and SL changes for STS - $298,307
2. Change to grade 50 steel from specified grade 70 steel (due to availability and issues) - $572,884
3. Extra trucking costs for contaminated soil at CTS - $2,274,225
4. Harder rock than anticipated for CTS slurry wall excavation - $2,820,600
5. Delays to installation of tangent piles at UMS - $1,082,380
5. UMS Garage underpinning requirements - $732,157
6. 12-inch waterline at UMS, added scope - $335,468
7. Utility conflicts with sewer line installation at UMS - $744,465
8. Changes in construction sequence for UMS Garage - $500,000
9. UMS art glass installation requirements - $382,976
10. Obstructions to jet grout placement at UMS - $2,062,420
11. Change in track switch machine manufacturer at STS - $391,909
12. Additional monitoring instruments at CTS - $429,777
13. Time impacts due to power pole conflict during demolition at CTS - $3,516,164
14. Extra work to prepare existing tunnel - $441,423

15. Additional traffic control requirements at 4th and King - $675,001
16. Incomplete interface design at STS - $300,001
17. Additional traffic control requirements for STS work package - $1,032,302
18. Cost of changes to the design of CTS to accommodate the plaza requested by the community - $4,618,428
19. Changes to utility design at YBM - $627,854
20. Claim for changed construction sequencing at CTS - $250,001
21. *Provision of new 12-inch waterline at YBM - $256,730 (new cost)*
22. Claim for missing conduits between manholes at UMS - $250,000
23. Change in vent for emergency generator at all stations - $500,001
24. Contractor-claimed change in contract requirements for pre-loading permanent struts at UMS - $1,853,352
25. Soil nail and shotcrete wall changes in Union Square Garage - $896,524
26. Contractor claim that wayside signals are extra - $1,512,373
27. Change to grout details and drainage piping at UMS - $630,104
28. Changes to drainage and waterproofing at Union Square Garage ramps - $292,754 (new cost)
29. Change in automatic train control system for reverse running - $400,001
30. *D*esign changes for UMS vertical drainage slots - $866,709
31. Costs associated with differing site conditions for Level 3 Duct Bank - $2,400,001
32. Escalator raceways at UMS - $492,065

In addition to these large potential cost increases, the Trend Log includes the following major cost savings:

1. Deletion of compensation grouting bid items at YBM - ($1,833,869)
2. Deletion of the Air Replenishment System (ARS) - ($4,689,000)

Funding and Expenditures

Federal, state, and local project funding and expenditures are shown in Table 4 with unchanged funding levels from the previous reporting period.

Table 4 - Project Funding

Source	Committed ($1,000)	Awarded ($1,000)
Federal		
New Starts	942,200	769,196
Congestion Mitigation	41,025	41,025
Federal Subtotal	983,225	660,221
State		
TCRP	14,000	14,000
State RIP	88,000	12,498
Prop. 1B / PTMISEA	307,792	307,792
Prop. 1A / HSR	61,308	61,308
State Subtotal	471,100	395,598
Local		
Prop. K Sales Tax	123,975	123,975
Local Subtotal	123,975	123,975
Project Total:	**1,578,300**	**1,179,794**

E. PROJECT SCHEDULE STATUS

SFMTA prepared a master program schedule update in January representing progress on the project through December 2016. SFMTA reported that it had again rejected the contractor's schedule submittal for October and November 2016 due to logic problems. *Formal comments have been transmitted to the contractor, and the issues causing repeated rejections of the contractor's schedule updates were raised to the project's Dispute Review Board (DRB). The DRB issued a verbal opinion that Tutor Perini Corporation (TPC) should implement SFMTA's comments in finalizing its schedule updates and that TPC should document any disputes with the comments in the schedule narrative. SFMTA expects to receive a revised October 2016 schedule update reflecting the DRB opinion in early February. Presuming that the SFMTA's comments on the schedule have been properly addressed, subsequent schedule updates for the rest of 2016 and the first two months of 2017 are anticipated to follow expeditiously. Meanwhile, the program master schedule forecasts are being developed using SFMTA's schedule update, which incorporates the findings of a schedule workshop held with the PMOC in November 2015.*

In the opinion of the PMOC, using the DRB was an effective means of achieving agreement between SFMTA and the contractor regarding schedule updates. The parties should continue to use the partnering process and the DRB as resources for resolving project issues. Resolution of the issues regarding contractor schedule updates is an important achievement that provides a firm basis for realistic and reliable project schedule evaluation. **An agreed project schedule from the contractor will be critical to the evaluation and agreement on schedule recovery strategies.**

The PMOC remains concerned that unresolved responsibility for the accumulated delays to date is hindering SFMTA and TPC from working together to identify schedule mitigation

measures. SFMTA has initiated discussions with TPC regarding long-standing delay claims *and has provided a formal proposal regarding the time allowance for one of the oldest claims (delayed removal of a power pole at CTS).* ***In the opinion of the PMOC, SFMTA should urgently finalize the time impact allowances on the remaining contractor delay claims. SFMTA and the contractor should make appropriate use of the partnering and DRB processes to facilitate resolution of any disputes regarding allowable time impacts.***

The PMOC facilitated a schedule workshop with SFMTA project management and project controls staff on November 18 and 19, 2015. As a result of the workshop, an initial proposed action plan for developing the necessary tools from the current TPC schedule includes the following steps:

1. SFMTA makes adjustments to schedule logic in TPC schedule.
2. SFMTA evaluates the resulting schedule and finalizes the recommended logic changes.
3. SFMTA reviews the resulting schedule tool with TPC.
4. SFMTA and TPC agree on refinements.
5. Final schedule refinements made by TPC or SFMTA, and revised schedule accepted for ongoing use.
6. Routine schedule updates continue with the revised schedule. SFMTA continues to make its own updates based on three-week look-ahead schedules and actual progress as a check on TPC schedules. Monthly meetings held to resolve any differences.
7. SFMTA (and TPC) evaluate changes to work sequence, options for acceleration, and other strategies for schedule recovery. Mutually agreed recovery strategies implemented in revised schedule.

If TPC and SFMTA cannot agree on the schedule refinements (step 4), SFMTA develops its own schedule forecasting tool in parallel with TPC and continues to work with TPC to accept the revisions through monthly schedule reconciliation meetings. *As of the December 2016 SFMTA Progress Report for CSP, SFMTA had completed items 1 through 6,* but the contractor had yet to accept SFMTA's recommended schedule improvements and had not submitted a schedule update that SFMTA would approve.

The December 2016 master program schedule update indicates that the projected RSD slipped 12 days in December. The critical path for the construction work continues to flow through the construction of CTS, but analysis by the PMOC indicates that there are a total of four lines of work that are influencing the RSD for the project. The projected RSD forecast is now September 10, 2019, eight-plus months later than planned. There is negative float on the project critical path, and major time savings must be identified for the remaining work if the project is to be completed on time.

The contractor has been working two 12-hour shifts and six days per week at CTS and is now excavating two drifts for both platform caverns from the cross cut cavern. *The planned work*

productivity for the month of December was not achieved, causing the slip in the projected RSD. SFMTA reported that the contractor has obtained a different rock bolting machine that is expected to improve the overall productivity of the mining work. This machine has yet to be placed into service, and the amount of improvement in the production rate for the mining work has yet to be established.

In the opinion of the PMOC, it will not be possible to forecast the project completion date with confidence until a reliable estimate of the sustainable production rate for mining at CTS can be developed. Such an estimate can only be made after the new rock bolting equipment has been in service for a few weeks. There is a significant risk that the production rates assumed in the baseline schedule cannot be achieved and that delays will continue to accrue until the mining work is complete. *More than 140 days of mining work appear to remain, based on the baseline schedule. If actual production rates are well below the rates assumed, substantial additional delay could accrue.*

SFMTA and TPC have established new BHAGs for each of the work packages. The BHAG for CTS is to complete the first ring of the south platform cavern by March 28, 2016. *SFMTA now expects that this milestone will be missed. Milestones established for the other work packages appear to be achievable based on current progress.* ***The PMOC notes that work on the excavation and support of the station box at UMS had progressed further than targeted in the most recent schedule milestone for January 31, 2017, which reduces the risk of that work package becoming critical to the overall completion date.***

Recovery of past and ongoing schedule delays will become increasingly difficult, as much of the original station construction schedule has been consumed, leaving relatively little time to recover the accumulated delays.

Table 5 shows the latest milestones and the current status for each work package in the 1300 Contract.

Table 5 - Interim Milestones for CTS Construction Progress[1]

Milestone	**Target Date**	***Status***
Complete first ring of the south platform cavern at CTS	March 28, 2017	*Production rates for the platform caverns have been well below plan making it likely that the target will be missed. New equipment may improve production.*
Install mezzanine level struts and walers at UMS	February 14, 2017	*Work sequence changed to advance excavation to the second temporary strut level ahead of mezzanine level completion. Overall work progress equal or better than target.*
Complete invert slab for station box at YBM	*April 12, 2017 (revised from February 14, 2017)*	*Two month delay to milestone due to challenges in achieving approved coordination drawings for embedded items.*

Milestone	Target Date	*Status*
Complete all utility work along 4th Street	March 31, 2017 south of Bryant May 31 through 4th and Bryant intersection	*Ongoing utility conflicts impacting progress of the work.*

[1] *SFMTA Management Meeting, 1/30/2017*

The PMOC convened a second schedule workshop for the project on June 22 and 23, 2016. The PMOC's analysis of the schedule indicates that four lines of work are driving the RSD:

- CTS work leading to tunnel electrical power and Advanced Train Control System (ATCS) testing;
- STS work (Radiax, Train Control and Software) leading to ATCS testing;
- CTS work leading to building startup and testing; and
- UMS work leading to building startup and testing.

Improvements must be made in the overall durations of each of these lines of work in order to move the RSD earlier than the current projection, presuming that the ongoing schedule slippage at CTS can be arrested. The workshop identified several strategies for improving the schedule for each line of work. These strategies are now under review by SFMTA. Additionally, the SFMTA scheduling team and the PMOC's scheduling experts reviewed the schedule benefits of the current schedule performance milestones. Due to the fact that multiple lines of work are driving the RSD, the impact of achieving the milestones would be limited. Combined with the fact the many of the milestones have not been achieved, the PMOC's conclusion is that the practice of setting short term schedule performance targets has not been effective in achieving schedule recovery.

In the opinion of the PMOC, although setting and working toward the short term milestones may be encouraging cooperation and collaboration between TPC and SFMTA in advancing the current work, this practice has not, and most likely will not, result in overall time savings or any improvement in the RSD for the project. A more comprehensive view of the lines of work that are driving the RSD must be taken by SFMTA and efforts must be made to improve the work sequence and advance elements of the testing and commissioning activities near the end of the project in order to improve the RSD. SFMTA should engage its Transit Division in planning the testing and commissioning work as soon as possible, since Transit Division staff will have key roles in these activities.

SFMTA agreed to several action items that will lead to an updated schedule and projection of likely RSD outcomes (see Table 8). The PMOC notes that SFMTA *plans to complete an update of the RAP including a more detailed schedule of testing, commissioning, and start-up activities as part of the 2017 update of the PMP. The potential for schedule recovery can be evaluated with more confidence once the RAP update is complete. At that time, the likely completion date for the mining at CTS should be able to be determined with more confidence as well.* ***Based on the timing***

for the RAP update, completion of SFMTA's as-built schedule updates and expected delivery of up to date, acceptable schedule updates from the contractor, the PMOC expects to hold another schedule recovery workshop in the second or third quarter of 2017.

Project Schedule Data

Earned Value (EV): $*1,013,189,752, an increase of $7.97 million from November.*

Planned Value (PV): *$1,311,501,826, an increase of $8.55 million from November.*

Schedule Performance Index (SPI): *0.77.* SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90; the current SPI indicates unacceptable schedule performance. *The SPI remained unchanged from the previous reporting period.*

SPI is a measure of schedule efficiency on a project. It is the ratio of earned value to planned value. An SPI equal to or greater than 1 indicates more work was completed than planned and a value of less than 1 indicates less work was completed than planned. A value of equal to or greater than 0.9 reflects satisfactory performance, considering the margin of error in estimating both earned value and planned value. The current value of 0.77 indicates that the project is significantly behind schedule**.**

Table 6 shows the status of the schedule milestones established for the project.

Table 6 - Schedule Milestones

	(P = Planned Date, A = Actual Date, F = Forecast Date)
Preliminary Engineering (PE):	Authorized in July 2002 (A)
Record of Decision:	Issued November 26, 2008 (A)
Final Design (FD):	Authorized in January 2010 (A)
FFGA Request:	Submitted September 2011 (A)
FFGA Executed:	October 11, 2012 (A)
Ground Breaking: (Utility Relocation Contract)	February 9, 2010 (A)
Tunnel excavation complete (hole through):	June 2, 2014 (SB); June 11, 2014 (NB) (A)
Cross passages complete:	December 20, 2014 (P); April 15, 2015 (A)
Tunneling substantial completion:	April 15, 2015 (A)
Station construction Notice to Proceed (NTP):	June 17, 2013 (A)
Station construction substantial completion:	February 24, 2018 (P); *March 28, 2019* (F)
RSD:	December 26, 2018 (P); *September 10, 2019* (F)

Schedule Contingency Management criteria were developed from the FTA Risk Assessment prior to entry into Final Design (FD). Minimum schedule contingency levels at various project

milestones or "Hold Points" were agreed to with SFMTA at Risk Workshop #4, held on February 24 through 27, 2009. The FTA recommended schedule contingency for the current stage of the project is 6.0 months. As noted above, the current schedule reflects *more than eight months* of negative buffer float.

Critical Path Summary *(Baseline Schedule)*

CTS Install Guidewalls, Slurry Walls, and Install Surface Deck (complete)
CTS Excavate Headhouse and Bracing (complete)
CTS SEM and Install Supports (underway)
CTS Headhouse Structural Concrete/Remove Bracing
CTS Install Mechanical, Electrical, and Plumbing (M/E/P) Equipment
CTS Start Up and Testing
CTS P-1254R Commissioning of Station
Safety and Security Certification/Pre-Revenue Activities
RSD on December 26, 2018 (currently forecast *September 10, 2019*)

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract

UMS

Complete utility placement, backfill, and paving of Ellis Street.

Install guardrails and prepare the new vehicle ramps at Union Square Garage for use by the public

Remove contaminated soil (from fuel tanks that have been removed) from the bottom of the north entrance and begin building up the north entrance structure

Complete restoration of Muni traction power across the north concourse

Excavate to temporary strut level two and install temporary supports within the station box

Begin excavation to platform level

Complete construction of access shaft at O'Farrell Street

CTS

Continue excavation of the station platform caverns

Provide compensation grouting as needed

YBM

Install ducts and other sub-invert facilities and complete the station box invert slab

Install headhouse mud slab, waterproofing, and invert slab

Place final wall surfaces on the platform level

Continue interior wall construction and M/E/P rough-in at the mezzanine and concourse levels

Complete utilities in 4th Street above the station box and restore street pavement

STS

Sewer installation and repair

Waterline installation

Alternative Water Supply System (AWSS) installation

Muni ductbank installation

Continue street restoration and final paving

Start installation of tunnel lighting

Installation of overhead contact system support poles

Placement of tunnel walkways

The PMOC expects to attend the following meetings:

- Weekly Management (*March 7, April 3, and May 1)*
- Weekly Contract 1300 Construction Progress Meetings (*first Tuesday and Wednesday of March, April, and May*)
- Weekly Configuration Management Board (CMB) (first Wednesday of *March, April, and May*)
- Monthly CSP Risk Management Meetings (first Thursday of March, *April, and May)*
- CSP month-end meetings on *March 8, April 4, and May 2*
- FTA/QPRM scheduled for *May 4, 2016*

F. QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC Plan Implementation

Contractor QC, as detailed in the Contract Technical Specification, is the means by which the contractor ensures that construction complies with the requirements of the contract. The contractor conducts at least three phases of control (Preparatory Phase, Initial Phase, and Follow-up Phase) to ensure that all work is carried out per the contract.

The 1300 contractor's staff includes a Contractor's Quality Manager (CQM), who reports to the Contractor's Management at an organization level superior to the contractor's Project Manager.

The CQM is provided by a subcontractor. The reporting structure is to provide the CQM with direct access to the contractor's Principal Officers. A Contractor Non-conformance Report (CNCR) Log for identifying, correcting, documenting, and controlling non-conformances is maintained by the contractor and reviewed at weekly status meetings for each work package. Subsequent work may not progress for work that is the subject of a Corrective Action Request (CAR) until conditions averse to quality are corrected. In the event that the contractor does not issue a CNCR, SFMTA may issue a Non-conformance Notice (NCN) where non-conforming work is identified by SFMTA's quality assurance staff.

Construction crew attention to quality has been consistent, with the occurrence of critical non-conforming work being infrequent. The following quality concerns for the 1300 Stations Contract were identified in the SFMTA December monthly report:

- *As is typical to similar projects, work performed prior to receipt of approval status of required submittals/Requests for Information (RFIs) with/without knowledge of QC remains a potential area of concern.*
- *TPC's Record Document (as-built) development, including CNCRs and a timely record of work performed that is different than what is required by the latest approved Conformed Design Drawings needs improvement. Quality Assurance Surveillance QAS076 was conducted, posted to CM13 and provided to TPC for their action. The Quality Assurance Surveillance followed findings from a Quality Assurance Audit provided to TPC for corrective action in January of 2016. Lack of conformance to the requirements of the Record Document Specification Section 01 78 39 remains to be addressed.*
- Adherence to the required process for identifying, documenting, and implementing requirements for support of excavation as the SEM work progresses at CTS. Daily meetings are held to review the planned work for the upcoming shifts to assure that the proper excavation support and sequencing are implemented. No specific issues with compliance with the required procedures were identified, but the issue was properly noted as critical to the safe progression of work at CTS.
- *TPC has been reluctant to include documentation of the contractor's Quality Control process acceptance of completed work at UMS in monthly pay applications, resulting in extra effort being expended by the SFMTA* RE staff to confirm that only acceptable work is included in the invoices.

As of January 3, 2017, 267 CNCRs had been filed by TPC's Quality Manager (8 more than in early December), 14 new items were under review, 20 other items had responses identified but not yet approved, the proposed responses to 20 items were disapproved, and 20 items had approved responses that were not yet implemented. In addition, 161 items were closed and 35 items had been voided. None of the open or disapproved items is delaying progress of the work. *No new information was available for this PMOC status report.*

G. AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE

There are no ADA issues for the project at this time.

H. SAFETY AND SECURITY

Safety and Security Management Plan

An updated SSMP Revision 2, dated February 2, 2014, was submitted to FTA on May 2, 2014. The SSMP outlines the plans needed prior to revenue operations. These plans include the RAP, the System Integration Test Plan, the Safety and Security Certification Plan (SSCP), and the Pre-Revenue Operations and Start-up Plan. SFMTA has completed the SSCP, which is being used to guide safety certification activities. The initial draft of the RAP was completed with the latest update of the PMP. The System Integration Test Plan and the Pre-Revenue Operations and Start-up Plan have not been completed and are expected to be provided with the next PMP update.

Fire and Life Safety/Safety and Security Issues

The Construction Specification Conformance Checklists have been completed and approved for all construction packages. In September 2013, the CPUC staff began attending monthly as-built meetings to review the completed items. All items related to the tunnel construction have been certified and accepted by SFMTA's safety staff. The certification work will begin to address the station construction items in 2016. The San Francisco Fire Department (SFFD) regularly attends the now combined FLSC and SSCRC meetings. The SFFD will continue to coordinate with the Stations Construction Project to identify issues of importance during construction.

Construction Safety

The 1300 Contract is maintaining an excellent safety record, with a total of six recordable and four lost time incidents since the project start. *One safety incident (a first aid case) occurred in December, at UMS*. The performance metrics relating to accidents per working hour are well below the OSHA goals for similar construction. The current accident records for the 1300 Contract are shown in Table 7.

Table 7 - Construction Safety Data

Through December 2016	No. of Incidents	Incident Rate[1]	Goal
1300 Contract			
OSHA Recordable Accidents	*6*	*0.79*	<3.4
Job Transfer/Restricted Duty Incidents	0	0	NA
Lost Time Incidents	1	*0.13*	<1.6
Total Incidents	*7*	*0.92*	NA
Hours Worked	*1,517,827*		

[1]OSHA incident rate = incidents x 200,000/hours worked.

I. PROJECT RISK, RISK MANAGEMENT, AND RISK MITIGATION

RCMP Revision 3 was received by the PMOC on April 30, 2013. The outgoing PMOC provided its final Spot Report to FTA on July 19, 2013. SFMTA submitted a CSP "Contingency Management – Schedule 2012 Update" on May 22, 2013. SFMTA provided a further update of the schedule risk assessment in June 2015 that recommended a reduction of the minimum schedule contingency after demobilization of the tunnel work to 4.0 months. The updated risk assessment was conducted on the approved baseline schedule for the 1300 Contract without updates to reflect the then current status of the construction work and the accumulated construction delays.

The Contract 1300 baseline schedule was adopted in early December 2014. Schedule updates completed by the contractor have been rejected by SFMTA due to logic errors and have not been incorporated into the master program schedule. SFMTA has prepared its own revision of the construction schedule and is using updates to that schedule to maintain the master program schedule. SFMTA is continuing to refine the record of as-built construction activity incorporated in the master schedule. The schedule risk assessment update is now expected from the CSP after the schedule tool in P6 is further enhanced and a recovery schedule is produced. The risk assessment would be conducted to determine a range of likely actual RSDs based on the updated schedule, possible recovery of accumulated delays, and remaining schedule risks. The timing of the risk assessment will be determined in the coming months.

The most recent Risk Mitigation Meeting attended by the PMOC was the *February 2017* Risk Mitigation Meeting for the CSP, which included a review of the status of the top construction risks. *This meeting involved the routine review of the remaining high and medium ranked risks. There were no significant changes in the top risks, with the risk of being unable to recover from accumulating delays being by far the highest risk. During the discussion of the schedule risks, a potential new risk (or issue) was raised. It is apparent that some elements of the contractor's baseline schedule may have been unachievable under any circumstances. Major elements of work that appear to have unachievable schedule durations include:*

- *Installation of slurry wall panels at CTS. This work is complete, but took far longer than assumed in the baseline schedule. No significant differing site conditions were encountered that could explain the large variance between the assumed duration and the actual duration for this work.*
- *Placement of jet grout columns in the station box area of UMS. As with the slurry wall panels at CTS, the time required to place the completed jet grout in the UMS station box area was far greater than planned, with few major differing site conditions that could explain the slow progress.*
- *SEM excavation of the caverns at CTS. The actual production rates being achieved are approximately half of the planned rates. The contractor has been encouraged to upgrade the equipment being used for rock bolting, but it appears unlikely that the planned production*

rates can be achieved. SFMTA hopes that production will get closer to the planned rate, but equipment alone is not likely to double production.

If the production rates for the mining are truly unachievable, the projected completion date will continue to slip unless later work can be accomplished faster than planned in the baseline schedule. In the opinion of the PMOC, this potential risk should be studied in more detail over the coming months. It is possible that other future aspects of the work also have unachievable production rates that will cause further schedule erosion.

In the opinion of the PMOC, this was an effective meeting and the potential new risk should be assessed at future meetings.

A list of the top risks discussed at the *February 2017* Risk Mitigation Meeting is included in Appendix D.

J. ACTION ITEMS

Table 8 on the following page shows the current action items for SFMTA.

Table 8 - SFMTA Action Items for Central Subway Project

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
S	**165**	Develop recovery schedule	12/10/15	TBD		See action items below, which are precursors to the recovery schedule.
S, RA	**166**	Update schedule risks based on recovery schedule	12/10/15	TBD		Once the schedule tool and recovery schedule are complete.
S	**169**	Review and address logic errors and acceleration strategies in the schedule	6/23/16	12/15/16	Ongoing evaluation	Initial changes implemented by SFMTA. TPC needs to agree to some of the changes.
S	**171**	Provide a range of dates for the Revenue Start Date	6/23/16	TBD		Depends on results of other action items.
S	**172**	Provide completed as-built construction schedule	8/4/2016	1/23/17	*1/23/17*	*Updates completed through October 2016. Further updates in progress. CLOSED*
S	**173**	Integrate testing and commissioning tasks into master program schedule	12/6/2016	*5/15/2017*		*Updated RAP with detailed schedule to be delivered in April 2017. Integration into master schedule to follow.*

(Note: All closed items are removed a month after being closed. Changes to open items since last update are indicated in *italics.*)

Category Key:
C – Cost
FMP – Fleet Management Plan
IRP – Independent Review Panel
PMP –Project Management Plan
QA – Quality Assurance
RA – Risk
RE – Real Estate
S – Schedule
SC – Scope
SS – Safety
T – Tech. Cap. & Cap.
CH – Change Mgmt.

APPENDIX A. LIST OF ACRONYMS

ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ARS	Air Replenishment System
ATCS	Advanced Train Control System
AWSS	Alternative Water Supply System
BART	Bay Area Rapid Transit
BCE	Baseline Cost Estimate
BHAG	Big Hairy Audacious Goal
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CAR	Corrective Action Request
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
CMB	Configuration Management Board
CMod	Contract Modification
CNCR	Contractor Non-Conformance Report
COR	Change Order Request
CP&C	Capital Project and Construction
CPI	Cost Performance Index
CPUC	California Public Utilities Commission
CQM	Contractor's Quality Manager
CSP	Central Subway Project
CTS	Chinatown Station
DF	Designated Function
DRB	Dispute Review Board
EV	Earned Value
FD	Final Design
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FLSC	Fire and Life Safety Committee
FMP	Fleet Management Plan
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IRP	Independent Review Panel
LONP	Letter of No Prejudice
LRT	Light Rail Transit
LRV	Light Rail Vehicle
M/E/P	Mechanical, Electrical, and Plumbing

MMRP	Mitigation Monitoring Reporting Program
MOU	Memorandum of Understanding
MPS	Master Project Schedule
Muni	Common Public Reference to SFMTA
NCN	Non-conformance Notice
NCR	Non-conformance Report
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
O&M	Operations & Maintenance
OCS	Overhead Catenary System
OHA	Operational Hazard Analysis
OP	Oversight Procedure
PCC	Proposed Contract Changes
PE	Preliminary Engineering
PG&E	Pacific Gas & Electric Co.
PHA	Preliminary Hazard Analysis
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
PTMISEA	Public Transportation Modernization, Improvement, and Service Enhancement Account
PV	Planned Value
QA/QC	Quality Assurance/Quality Control
QM	Quality Manager
QPRM	Quarterly Progress Review Meeting
QTR	Quarter
RAMP	Real Estate Acquisition Management Plan
RAP	Rail Activation Plan
RCMP	Risk and Contingency Management Plan
RE	Resident Engineer
RFI	Request for Information
ROD	Record of Decision
RSD	Revenue Service Date
SBE	Small Business Enterprise
SCIL	Safety Certifiable Item List
SCP	Safety Certification Plan
SEIS	Supplemental Environmental Impact Statement
SEM	Sequential Excavation Method
SEPP	Security and Emergency Preparedness Plan
SFDPW	San Francisco Department of Public Works
SFFD	San Francisco Fire Department

SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SIT	Systems Integration Test
SoMa	South of Market (Street)
SOP	Standard Operating Procedure
SPI	Schedule Performance Index
SSCP	Safety and Security Certification Plan
SSCRC	Safety and Security Certification Review Committee
SSCVR	Safety and Security Certification Verification Report
SSMP	Safety and Security Management Plan
SSO	State Safety Oversight
SSP	System Security Plan
SSPP	System Safety Program Plan
STS	Surface, Track, and Systems
TBD	To Be Determined
TBM	Tunnel Boring Machine
TPC	Tutor Perini Corporation
TSA	Transportation Security Administration
TVA	Threat and Vulnerability Analysis
U.S.C.	United States Code
UMS	Union Square/Market Street Station
VRF	Variable Refrigerant Flow
YBM	Yerba Buena/Moscone Center Station
YOE	Year of Expenditure

APPENDIX B. SAFETY AND SECURITY CHECKLIST

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Safety and Security Management Plan	**2014**	**2011**	Revision 1 Update submitted to FTA 02/25/2011. Not submitted to FRA. Revision 2 submitted to FTA on May 2, 2014.
Safety and Security Certification Plan (SSCP)	**2011**		SSCP was revised 10/2011. Revision 1 was developed in November 2011. Not submitted to FRA.
System Safety Program Plan (SSPP)	**2009**	**2009**	SSPP dated 03/13/2009 submitted to FTA 07/31/2009. Not submitted to FRA.
System Security Plan (SSP) or Security and Emergency Preparedness Plan (SEPP)	**2009**		Not submitted to FTA. Not submitted to FRA.
Construction Safety and Security Plan	**2012**		Health and Safety. Construction Safety Standards Revision 3, June 27, 2012.
Safety and Security Authority	*Y/N*		**Notes/Status**
Is the grantee subject to 49 CFR Part 659 state safety oversight requirements?	Y		
Has the state designated an oversight agency as per Part 659.9?	Y		California Public Utilities Commission (CPUC) Consumer Protection & Safety Division 505 Van Ness Avenue San Francisco, CA 94102 (415) 703-1017 phone (415) 703-1758 fax Point of contact: Arun Mehta

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the oversight agency reviewed and approved the grantee's SSPP as per Part 659.17?	Y		SFMTA currently operates its LRT system in compliance with an SSPP approved by the CPUC. These plans will be revised, as required, to incorporate the addition of the CSP during the late construction and early testing phase and submitted to the CPUC for approval prior to the planned start of revenue operations.
Has the oversight agency reviewed and approved the grantee's Security Plan or SEPP as per Part 659.21?	Y		See above.
Did the oversight agency participate in the last Quarterly Program Review Meeting?	Y		
Has the grantee submitted its safety certification plan (SCP) to the oversight agency?	Y		SFMTA submitted the SSCP to CPUC staff for review and Commission approval during the preliminary engineering phase. The plan was approved in March 2009. The SSCP revised in November 2011 was submitted to the CPUC and was approved.
Has the grantee implemented security directives issues by the Department Homeland Security, Transportation Security Administration?	N/A		Currently, there are no TSA directives or programs applicable to the project. If any arise during the course of the project, the activities to comply will be developed and shown on a revision of the project safety and security activities schedule.
SSMP Monitoring			
Is the SSMP project-specific, clearly demonstrating the scope of safety and security activities for this project?	Y		The PMOC reviewed the CSP SSMP and provided a spot report to FTA in May 2011. FTA approved the CSP SSMP on May 16, 2011. A follow-up Adherence Audit was conducted September 14-16, 2011. The audit found that CSP is conducting its activities in accordance with the SSMP.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Grantee reviews the SSMP and related project plans to determine if updates are necessary?	Y		SSMP Revision 2 was submitted to FTA on May 2, 2014.
Does the grantee implement a process through which the Designated Function (DF) for Safety and DF for Security are integrated into the overall project management team? Please specify.	Y		Safety and security are under the direction of the SFMTA Safety and Security Manager and supplemented by Project Management/Construction Management consultant staff, including a Safety and Security Certification professional who has been dedicated to supervise project Safety and Security Certification.
Does the grantee maintain a regularly scheduled report on the status of safety and security activities?	Y		Safety and security certification status and activities are reported in the weekly construction progress meetings and the CSP Monthly Progress Report.
Has the grantee established staffing requirements, procedures, and authority for safety and security activities throughout all project phases?	Y		
Does the grantee update the safety and security responsibility matrix/organizational chart as necessary?	Y		The PMOC found the revised matrix in the SSMP, Rev. 1, 02/08/11, to be compliant.
Has the grantee allocated sufficient resources to oversee or carry out safety and security activities?	Y		
Has the grantee developed hazard and vulnerability analysis techniques, including specific types of analysis to be performed during different project phases?	Y		CSP has prepared a Preliminary Hazard Analysis Report, Rev. 0, April 23, 2009. Corrective actions and analysis for different project phases have been identified in the report.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Does the grantee implement regularly scheduled meetings to track to resolution any identified hazards and/or vulnerabilities?	Y		
Does the grantee monitor the progress of safety and security activities throughout all project phases? Please describe briefly.	Y		Safety and Security is an ongoing agenda item on the current construction contract (1300).
Does the grantee ensure the conduct of preliminary hazard and vulnerability analyses? Please specify analyses conducted.	Y		
Has the grantee ensured the development of safety design criteria?	Y		Design is complete and construction is underway.
Has the grantee ensured the development of security design criteria?	Y		Design is complete and construction is underway.
Has the grantee ensured conformance with safety and security requirements in design?	Y		Certification checklists are developed and certified through monthly meetings. Design is complete and construction is underway.
Has the grantee verified conformance with safety and security requirements in equipment and materials procurement?	Y		Safety and Security Conformance checklists have been prepared for each of the construction contracts. All certifiable elements of the Tunnel work have been certified and accepted by SFMTA Safety.
Has the grantee verified construction specification conformance?	Y		This is on-going as construction progresses.
Has the grantee identified safety and security critical tests to be performed prior to passenger operations?	N		Currently being developed.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Has the grantee verified conformance with safety and security requirements during testing, inspection, and start-up phases?	N		Project is in construction, with RSD about 2.5 years in the future.
Does the grantee evaluate change orders, design waivers, or test variances for potential hazards and/or vulnerabilities?	Y		
Has the grantee ensured the performance of safety and security analyses for proposed work-arounds?	N/A		
Has the grantee demonstrated through meetings or other methods, the integration of safety and security in the following: ☐ Activation Plan and Procedures ☐ Integrated Test Plan and Procedures ☐ Operations and Maintenance Plan ☐ Emergency Operations Plan	*In Process*		Currently being developed. An Integration Matrix has been implemented for all disciplines including safety and security concerns. Initial draft of the Rail Activation Plan has been completed.
Has the grantee issued final safety and security certification?	N		Project is in the construction phase.
Has the grantee issued the final safety and security verification report?	N		Project is in the construction phase.
Construction Safety			
Does the grantee have a documented/implemented Contractor Safety Program with which it expects contractors to comply?	Y		Health and Safety Construction Safety Standards Revision 3, June 27, 2012.

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Does the grantee's contractor(s) have a documented companywide safety and security program plan?	Y		
Does the grantee's contractor(s) have a site-specific safety and security program plan?	Y		The remaining active contractor has a plan. Contract documents require that the contractor develops an Environmental Health and Safety Program, specific to the contract work.
Provide the grantee's OSHA statistics compared to the national average for the same type of work?	Y		Provided in the Central Subway Monthly Progress Report.
If the comparison is not favorable, what actions are being taken by the grantee to improve its safety record?	N/A		Statistics are favorable. No action is needed.
Does the grantee conduct site audits of the contractor's performance versus required safety/security procedures?	Y		Safety walks are routinely conducted at each construction site.
Federal Railroad Administration			
If shared track: has grantee submitted its waiver request application to FRA? (Please identify specific regulations for which waivers are being requested.)	N/A		No shared track. No waivers are anticipated.
If shared corridor: has grantee specified specific measures to address shared corridor safety concerns?	N/A		
Is the CHA underway?	N/A		
Other FRA required Hazard Analysis – Fencing, etc.?	N/A		

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
Project phase (Preliminary Engineering, Design, Construction, or Start-up)	Construction		
Project Delivery Method (Design/Build, Design/Build/ Operate/Maintain, CM/GC, etc.)	Design-Bid-Build		
Project Plans	*Version*	*Review by FTA/FRA*	**Status**
Does the project have Quiet Zones?	N		
Does FRA attend the Quarterly Review Meetings?	N		

N/A = Not applicable.

APPENDIX C. PROJECT MAP AND OVERVIEW

CENTRAL SUBWAY PROJECT: Project Overview and Map

Date:	*February 6, 2016*
Project Name:	Central Subway Project (CSP) New Starts Light Rail Transit
Grantee:	San Francisco Municipal Transportation Agency (SFMTA)
FTA Regional contact:	Mr. Jeffrey S. Davis
FTA Headquarters contact:	Ms. Kim Nguyen

Scope

Description:	The CSP will extend the Third Street Light Rail line from the Caltrain station at Fourth and King streets to Chinatown. It was incorporated in the FEIS/FEIR on the Third Street Light Rail project published in December 1998, but FTA did not include the CSP in the Record of Decision (ROD) issued in March 1999. A ROD for the CSP, however, was issued by FTA on November 26, 2008, and the U.S. Department of Transportation and FTA determined that the requirements of the National Environmental Policy Act (NEPA) of 1969 were satisfied for the CSP. The environmental record for the CSP is included in the Final Supplemental Environmental Impact Statement (SEIS), Volume II, dated July 11, 2008 and the Final SEIS, Volume I, dated September 23, 2008. These documents present the detailed statement required by NEPA and U.S.C. 5324 (b). SFMTA requested authority to enter Preliminary Engineering (PE) in March 2002 and submitted a Project Management Plan (PMP) in June 2002. FTA approved entry into PE in July 2002. Approval to enter Final Design (FD) was granted by FTA on January 7, 2010. The Full Funding Grant Agreement (FFGA) was signed on October 11, 2012.
Guideway:	The length of the CSP will be 1.7 miles of double-tracked line.
Stations:	The CSP includes three subway stations and one surface station.
Additional Facilities:	The CSP does not include any ancillary facilities.
Vehicles:	The CSP Service Plan dated October 2009 clarified that four vehicles will be required.
Ridership:	43,521 Average Weekday Boardings are projected in 2030.

Schedule

07/02	Approval Entry to PE	2016	Estimated Rev Ops at Entry to PE
01/10	Approval Entry to FD	2018	Estimated Rev Ops at Entry to FD
10/11/12	FFGA	2018	Estimated Rev Ops at FFGA
08/29/2019			Revenue Operations Date at date of this report

64.2% *Percent Complete Based on Progress* (*December 2016 data*)

Cost

$764 million	Total Project Cost ($YOE) at Approval Entry to PE
$1,578 million	Total Project Cost ($YOE) at Approval Entry to FD
$1,578 million	Total Project Cost ($YOE) at FFGA signed
$TBD million	Total Project Cost ($YOE) at Revenue Operations
$1,578 million	Total Project Cost ($YOE) at date of this report including $0.00 in Finance Charges
$1,016.8 million	Amount of Expenditures at date of this report from Total Project Budget of $1,578 million
64.4%	Percent Complete based on Expenditures at date of this report
$4.67 million	Unallocated Contingency remaining
$78.41 million	Total Project Contingency (allocated and unallocated contingency as reported by CSP)
$60 million	Minimum Total Project Contingency revised on September 5, 2012 PMOC review of Contingency Management Plan

	AT HOLD POINTS	QTR	Minimum Contingency Levels	Revised Levels
1A	Hold Point 1a – Tunnels 100% designed February 2011 (Actual)	1Q11	280	280
1B	Hold Point 1b – CTS 100% designed June 2012 (Actual)	4Q11	250	240
1C	Hold Point 1c – 40% Bid (Tunnel and CTS)	2Q12	225	200
1D	Hold Point 1d – FFGA Award October 2012 (Actual)	3Q12	-	180
2	Hold Point 2 – Commence CTS / UMS construction (Actual June 17, 2013)	2Q13	160	160
3	Hold Point 3 – Demobilize Tunnels *(Actual April 15, 2015)*	*2Q15*	140	140
4	Hold Point 4 – Stations to platform levels (CTS / YBM) November 2016	4Q16	60	60
5	Hold Point 5 – Complete CTS / Tunnels systems inst. April 2018	2Q18	25	25
RSD	PMOC / FTA RSD	4Q18		
CURRENT TOTAL CONTINGENCY *$78.41 Million*				


central T subway
Lombard St.
COIT TOWER
Columbus Ave.
Washington Square Park
Union St.
TUNNEL ONLY - NO SERVICE
Broadway
Broadway Tunnel
The Embarcadero
Washington St.
Ferry Building
CHINATOWN
Stockton St.
Kearny St.
Montgomery St.
Battery St.
EMBARCADERO
California St.
Leavenworth St.
Bush St.
FOLSOM
FUTURE TRANSBAY TERMINAL
Post St.
MONTGOMERY
Market St.
UNION SQUARE/ MARKET STREET
J K L M N T
Mission St.
1st St.
N
POWELL
Howard St.
2nd St.
Folsom St.
Harrison St.
BRANNAN
Golden Gate St.
4th St.
I-80
YERBA BUENA/ MOSCONE
5th St.
3rd St.
2ND ST. AND KING
CIVIC CENTER
7th St.
6th St.
4TH ST. AND BRANNAN
AT&T BALLPARK
King St.
4TH AND KING/BERRY N T
Bryant St.
Brannan St.
Caltrain
Townsend St.
MISSION ROCK
UCSF
UCSF MISSION BAY
LEGEND
T Third Phase 2
T Third Phase 1
Muni Metro
Caltrain
BART

APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in early 2015. All remaining project risks were discussed at the January 2017 risk mitigation meeting. *Top risks were discussed at the February 2017 meeting as noted below.*

Top Risks Discussed in the Previous Month:

#46 – Public complaints led to a need to revise the CTS work sequence, resulting in delays. SFMTA and the contractor have worked with the community to limit the noise impacts of the work, and there have been no recent complaints.

#52 – The risk of settlement of older utilities above the CTS cross-cut cavern and platform cavern excavations. The ground above and near the excavation is extensively instrumented, and daily meetings are being held to review the recorded data from the instruments. *Gate valves have yet to be installed on the water lines above the excavation. These will allow immediate shut-off of water in the event of a failure in one of the lines or ground settlement that could damage the lines and cause a leak.*

#232 – This is the top rated risk and is related to TPC being behind schedule and potentially unable to recover. This risk is increasing since delays *have been accruing and the time available to recover is decreasing. Mitigation measures underway were discussed.*

#233 – Related to the quality of the shotcrete lining substitution proposed by TPC being inferior. *This risk continues, and an executive level partnering meeting is scheduled.*

#234 – This risk that the contractor's proposed alternative Sequential Excavation Method (SEM) excavation method would cause subsidence will continue to be monitored until all SEM operations are completed. Closely related to risk #52 and appearing to be minimal.

#238 – This risk is that the Quality Program may be ineffective in processing the nonconformance issues causing schedule impacts. The process of tracking and processing the Non-conformance Reports (NCRs) through improved tracking logs is continuing. The CNCR log is being updated as appropriate. CNCRs are being identified timely and processed appropriately.

#240 – This risk that unresolved assignment of schedule delay responsibility may lead to increased cost continues. SFMTA and the contractor are working on schedule updates and on resolution of the causes for schedule delays that have occurred. Efforts continue to focus on how to reduce the accumulated delays. This risk is closely related to #232.

#244 – Risk that coordination with the ongoing construction of a new hotel at 4th and Clementina streets results in delays and increased cost. This risk continues, as the planned opening date for the hotel is approaching in 2017. The hotel's access requirements may restrict the contractors' work areas on Clementina Street.

#99 – Breakdown in relationship between SFMTA and contractors during construction results in increased claims and delays to the schedule. This risk remains.

237 – Risk that non-conforming work is not identified by the contractor's QC program. The contractor's program of identifying and documenting non-conformances has been working well. Contractor's management is supporting the program.

#36 – Risk of damage to adjacent buildings due to heave from grouting operations. Minor non-structural damage has occurred at some locations and is being repaired. The jet grouting operation is complete. Compensation grouting may be needed as excavation proceeds, with attended minor risks of damage.

#205 – The risk that the prolonged process for approval and execution of CMods results in bad blood between SFMTA and the contractor. CMods are now being processed more quickly and the backlog of unresolved changes is being reduced. SFMTA continues to try and streamline the CMod process.

#230 – Risk of delayed completion of SFMTA testing, commissioning, and pre-revenue service activities. This risk is being mitigated through development of a detailed Rail Activation Plan and identification of required resources from agency operating divisions.

APPENDIX E. ROADMAP TO REVENUE OPERATIONS

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Testing				
Finalize/update Systems Integration Test (SIT) Plan	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Prepare Schedule for Testing	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Finalize Test Procedures	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Conduct System Integrated Testing with trains, including procedures and reports	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Complete Testing Reports	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Operating Plan, Rules, and Training				
Finalize Operating Plan	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Finalize/revise SOPs, manuals, and rulebook as applicable	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Operations Manuals	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Staffing and Operations Plan	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Training of O&M personnel	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Emergency response plan, training, and drills	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Vehicle Maintenance Plan, Equipment, Facilities, and Training				
Rail Fleet Management Plan	TBD	TBD	TBD	

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Maintenance Schedules and Procedures	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Spare Parts Requirements	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Maintenance Manuals	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Maintenance Training	TBD	TBD	TBD	The LRV fleet is being replaced and expanded through a separate project. The CSP requires an expansion of the fleet of four vehicles.
Facility and Right-of-way Maintenance Plan, Equipment, Facilities, and Training				
Maintenance Schedules and Procedures	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Spare Parts Requirements	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Maintenance Manuals	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Maintenance Training	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Pre-Revenue Operations				
Finalize and/or update RAP and/or Pre-Revenue Operations Plan	4/2/2015	TBD	TBD	Initial draft, including task identification complete. Schedule for updating and completing task descriptions TBD.
Implement Rail Activation Committee	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Shadow operations	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Develop/revise SSPP & Security Plan (approved by SSO)	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
FTA Office of Safety & Security Readiness Review	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
PMOC OP-54 Readiness for Revenue Operations Review Report, Phase I	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Conduct Operational Hazard Analysis (OHA) and resolve other hazards/ vulnerabilities	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Pre-Revenue Operations	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Public Outreach				
Develop Safety Outreach Plan	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Provide Community Outreach	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Grand Opening Plan	TBD	TBD	TBD	Project is in construction, with RSD *2*+ years in the future.
Construction Close Out				
Close Out of Non-Conformance Reports	Ongoing	3/7/2019	TBD	NCRs are tracked and closed prior to follow-on work. Final closure of NCRs expected as of final completion date of 1300 Contract.
Punch List Complete	12/17/2018	3/7/2019	TBD	Punch list completion expected at final completion of 1300 Contract.
Certificates of Occupancy/Substantial Completion	TBD	3/7/2019	TBD	
Safety, Security, and Fire-life Safety Certifications				
Update/Finalize SSMP			2/18/2014	Revision 2 completed.
Finalize and/or update SCIL and SSCP			10/10/2008	Revision 0.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Implement Safety and Security Certification Committee			8/1/2010	Committee meets monthly to review certifiable items.
Implement Fire Life Safety Committee			8/1/2010	
Preliminary Hazard Analysis (PHA)				Need dates.
Threat and Vulnerability Analysis (TVA)				Need dates.
Design Criteria Reflecting Safety and Security Requirements				Need dates.
Review status of quality non-conformances	Ongoing	3/7/2019	TBD	
Close Out of non-safety critical items	Ongoing	Ongoing	TBD	
Close Out of safety critical items	Ongoing	Ongoing	TBD	
Complete Safety & Security Certification Verification Report (SSCVR)	TBD	1/7/2019		60 days before RSD - Check against latest regulations.
Document Workarounds/Open Items List	TBD	TBD	TBD	
Verify emergency drills, tabletops, training, etc. are completed	TBD	TBD	TBD	
State Safety Oversight (SSO) final certification/signature	TBD	7/10/2019		21 days before RSD - Check against latest regulations.
Third Party and Agency Agreements				
Third Party/Agency Agreements Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.
Third Party/Agency Approvals Necessary for Revenue Service	TBD	TBD	TBD	Project is in construction, with RSD *2+* years in the future.

Roadmap to Revenue Operations - Central Subway Project, San Francisco Municipal Transportation Agency – DRAFT				
Description	**Estimated Start Date**	**Estimated Completion Date**	**Actual Completion Date**	**Notes**
Revenue Service				
Target Revenue Service Date	-	*9/10/2019*		Current forecast RSD. Recovery schedule to be prepared.
FFGA Revenue Service Date	-	12/31/2018		

APPENDIX F. LESSONS LEARNED

LL#	Date	Phase	Category	Subject	Lesson Learned
1	09-30-10	FD	Management	Consultant Contracts	The project must have a full understanding of the agency and other approving governmental authorities to avoid delay of contract approval and consequential delay of the Master Project Schedule (MPS).
2	09-30-10	FD	Cost	Staffing Plan	The project staffing plan needs to be formulated during PE and updated at least quarterly during FD to manage Standard Cost Category 80 costs and monitor design production.
3	09-30-10	FD	Scope	Letter of No Prejudice (LONP)	A defined scope of grantee and PMOC responsibilities needs to be provided for content and acceptability of LONP requests.
4	09-30-10	FD	Management	SSMP	FD consultants should be trained, shortly after mobilization, in the format and their responsibility regarding the System Safety Consultant.
5	10-30-10	FD	Cost	Baseline Cost Estimate (BCE) Update	The BCE should be updated with current costs as soon as they are known by the project to allow mitigation of cost contingency usage.
6	02-21-12	FD	Management	Program Controls	Program Controls system/software selected for use for the duration of the project should be in place and functional prior to approval to enter FD. Doing so will avoid a transition during FD that could create a lag in timely reporting of cost and schedule status.
7	02-21-12	FD	Management	Risk Mitigation	Oversight Procedure (OP) 40 needs to be revised to establish minimum requirements for secondary mitigation at different phases of the project, similar to those for cost and schedule contingency. The PMOC recommends 5% of project cost at Entry into FD and 3% at execution of an FFGA.

LL#	Date	Phase	Category	Subject	Lesson Learned
8	02-21-12	FD	Scope	Third Party Agreements	All third party agreements need to be identified as soon as possible, but no later than 65% design completion. This includes leases, both temporary and permanent; MOUs; and licenses, specifically for preconstruction property surveys and settlement monitoring instruments (especially important for underground construction). These third party agreements need to be secured no later than the advertisement date of the construction that they affect. Third party agreements need to be tracked by the project continuously, reported monthly, and updated in a third party agreement matrix submitted quarterly to FTA.
9	02-21-12	FD	Cost	Cost Estimating Procedures	During the preliminary design phase, the project should establish the cost estimating procedures, format, and software to be used by all estimating entities for the entire duration of the project.
10	02-21-12	FD	Cost	Allocated Cost Contingency	In the BCE submitted to FTA for Entry into FD, the project should identify percentages of allocated cost contingency contained in the BCE that are apportioned for design risk, market risk, and construction risk.
11	02-28-12	FD	QA	Design Management Action Log	Design Management should develop a matrix as a tracking tool to document, track, and close out known elements that are missing from design submission packages.
12	08-15-12	FD	Environmental Mitigations	MMRP	Numerous mitigations identified in the MMRP are to be handled by incorporating specific design details and/or statements in the contract drawings and technical specifications. The grantee should note on the MMRP the relevant drawings and/or technical specifications.

LL#	Date	Phase	Category	Subject	Lesson Learned
13	08-31-12	FD	Management	Risk Contingency Levels and Hold Points	It became apparent, during the monitoring of the cost contingency drawdown curve for the project that the contingency levels and hold points no longer represented the current stage of project development and risk reduction/contingency usage related to project development. The project advanced through 100% project design; however, the project did not receive credit for the cost contingency usage established by the risk model. The PMOC recognized this deficiency and participated with the grantee in developing a cost contingency drawdown that reflects current project development and reduced risk.
14	06-30-13	Const.	Management	Change Order Process	Perform an audit of the project's procedures related to Change Orders and processing. The project should train staff and inform contractor of their obligations in the process.
15	1-30-14	Const.	Management	Independent Review Panel (IRP) Decision-makers	At the request of SFMTA, the American Public Transportation Association (APTA) formed a panel of geotechnical and tunnel experts to perform a peer review of the BART Undercrossing. Prior to crossing under the BART tunnels, the Independent Review Panel (IRP), contractor, SFMTA, and BART representatives convened at predetermined tunnel boring machine (TBM) locations to discuss the TBM progress and determine whether the tunneling should proceed. It is critical that decision makers from each organization attend these meetings. It was noted that BART Senior Management did not attend and instead deferred decisions to lower level staff.
16	6-30-14	Const.	Bid documents	Pre-Classification for Soil and Groundwater Disposal	Soils and groundwater generated from construction activities should be pre-classified with appropriate sampling and testing required by potential disposal facilities. Coordinate with the disposal facilities to get materials accepted.

LL#	Date	Phase	Category	Subject	Lesson Learned
17	4-10-15	Const.	Quality Control/Safety	Monitoring of soil conditions during underground construction	There was a breach of the excavation of frozen ground during construction of a cross passage between the twin bored tunnels followed by water and soil flowing into the tunnels, resulting in subsidence of the ground above and damage to underground utilities. Apparently the flow of materials into the tunnels went on for quite some time before the problem was detected and actions could be taken to arrest the flow. The construction site was not staffed when the breach started and there was no external warning system in place to notify the contractor or the agency of the condition. When the safety and structural integrity of a construction site depends on maintain soil conditions with the use of mechanical systems, the site should be continuously staffed or monitoring devices at the site should be continuously monitored from a remote location to assure that the expected soil conditions are maintained.
18	4-10-15	Const.	Environmental	Archeological data recovery protocols	Sensitive archeological materials were uncovered during the excavation of the roof area at YBM. The Program Manager took immediate action to notify the appropriate state officials and implemented protocols for protection of the materials. The most likely descendent of the remains was quickly identified and a representative was engaged and brought to the site to supervise the ongoing excavation. The quick action to involve the appropriate parties resulted in satisfactory handling of the artifacts with minimal delays to the construction schedule.

LL#	Date	Phase	Category	Subject	Lesson Learned
19	5-11-15	Const.	Quality Control	Use of latest design information for field inspection	After two roof pours were completed, it was discovered that required reinforcing steel was missing. Changes to the arrangement of the reinforcing steels were made as part of the submittal review and response process. Notes from the designer were included on the approved shop drawings but not in the contract design drawings. Field inspectors were using only the design drawings to confirm the proper installation of reinforcing steel prior to concrete placement. In the future, the latest design information, including submittals and related designer notes, will be used to inspect reinforcing steel prior to concrete placement.
20	9-28-15	Const.	Schedule	Maintenance of updated construction schedule and master program schedule	SFMTA was unable to obtain an acceptable baseline schedule from the station construction contractor for over a year. Then, SFMTA could not obtain acceptable updated status schedules from the contractor for another 8 months. As a result, the construction status and completion date could not be accurately determined for the first 20 months of the contract. This made schedule control impossible. SFMTA finally created its own schedule updates for the first 12 months of the construction contract using the pay applications and 3-week look-ahead schedules from the contractor. Lesson learned – owners should aggressively assert the need for accurate schedule updates from contractors and should withhold payment if such updates are included in the contract terms or specifications and are not forthcoming. If schedule updates are not received within the first few months of the project, the owner should create its own updates for the purpose of progress monitoring and schedule control.

LL#	Date	Phase	Category	Subject	Lesson Learned
21	11-30-15	Const.	Construction Planning	Installation of special trackwork in operating systems.	SFMTA needed to install special trackwork to provide the connection to the new alignment for Central Subway portion the T Third LRT line. The original plan was to install the special trackwork at the intersection in eight extended weekend shutdowns. Working with the contractor, the plan was revised to accomplish the necessary trackwork installations in two shutdowns. After considering the outcome of the first shutdown, where a portion of the special trackwork did not fit properly and needed adjustment during the shutdown, SFMTA decided to pre-assemble the second, more complex, special trackwork assembly at an off-site facility. The assembly was completed and the resulting track was surveyed to confirm the geometry and to assure that the assembly would fit into the existing field conditions. While conducting the assembly and disassembly of the track components, the contractor identified an approach that would reduce the time required to reassemble the trackwork in the field. As a result of the pre-planning and assembly of the complex trackwork, the final assembly was completed without the need for field adjustments and in less time than planned. This was an effective approach to mitigate the risks associated with the installation of complex custom track components in an operating transit line.

APPENDIX G. CONTRACT STATUS

The following sections provide the status of ongoing contracts associated with the CSP. Note that the DBE participation percentages are updated by SFMTA on a quarterly basis. The current values are through September 2016.

Contract No.	**1250**	
Contract Description:	**UR #1 (YBM)**	
Status:	Completed June 2011.	
Cost:	Original Contract Value	$9,273,939
	Approved Change Orders	$2,694,211
	Current Contract Value	$11,968,150
	Expended to Date	$11,968,150
	% Expended	100%
	SBE Participation	97%
Schedule:	NTP issued January 2010. Substantial completion in June 2011.	
Issues or Concerns:		

Contract No.	**1251**	
Contract Description:	**UR #2 (UMS)**	
Status:	Work is complete.	
Cost:	Original Contract Value	$16,832,550
	Approved Change Orders	$3,962,031
	Current Contract Value	$20,794,581
	Expended to Date	$20,794,581
	% Expended	100%
	SBE Participation	87%
Schedule:	NTP issued January 2011. Substantial completion in August 2012.	
Issues or Concerns:	Final total cost claim by contractor has not been resolved.	

Contract No.	**1252**	
Contract Description:	**Tunnels**	
Status:	Final completion achieved. Financial close out underway.	
Cost:	Original Contract Value	$233.58 million
	Approved Change Orders	$8.26 million
	Current Contract Value	$241.84 million
	Expended to Date	$234.88 million; $6.2 million is paid from non-project funds
	% Expended	97.1%
	SBE Participation	5.8%
Schedule:	Final completion achieved May 15, 2015.	
Issues or Concerns:	None.	

Contract No.	**1277**	
Contract Description:	**Pagoda Palace Demolition**	
Status:	Construction is complete; contract is in close out.	
Cost:	Original Contract Value	$498,995
	Approved Change Orders	*$149,981*
	Current Contract Value	*$648,976*
	Expended to Date	*$648,976*
	% Expended	*100%*
	SBE Participation	100%
Schedule:		
Issues or Concerns:	None.	

Contract No.	**1300**	
Contract Description:	**Three subway stations (YBM, UMS, and CTS) and STS**	
Status:	*Support of excavation work is complete. Placement of roof slabs is underway. Preparations underway for mass excavation.*	
Cost:	Original Contract Value	$839.68 million
	Approved Change Orders	$3.88 million
	Current Contract Value	$843.55 million
	Expended to Date	$422.76 million
	% Expended	50.1%
	SBE Participation	18.2%
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 10, 2018 and *forecast March 2019.*	
Issues or Concerns:	The work on this contract is behind schedule.	

Contract No.	**CS-155-1**	
Contract Description:	**Design Package 1 for Contracts 1250, 1251, and 1252. PB/Telemon**	
Status:	Design is complete. Construction support is ongoing for Contract 1252.	
Cost:	Original Contract Value	$5,795,000 (includes exercised options)
	Approved Change Orders	$2,145,159
	Current Contract Value	$7,940,159
	Expended to Date	$7,845,082
	% Expended	98.8%
	SBE Participation	29.7%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-155-2**	
Contract Description:	**Design Package 2 for UMS, CTS, and YBM. CSDG prime**	
Status:	Designs are complete for all of the station contracts. Construction support of Contract 1300 is underway.	
Cost:	Original Contract Value	$35,059,252
	Approved Change Orders	$1,460,360
	Current Contract Value	$36,519,612
	Expended to Date	$33,587,7471
	% Expended	92.0%
	SBE Participation	41.1%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-155-3**	
Contract Description:	**Design Package 3 for STS. HNTB-B&C Prime**	
Status:	Design is complete. Construction support of Contract 1300 is underway.	
Cost:	Original Contract Value	$16,822,238
	Approved Change Orders	$312,814
	Current Contract Value	$17,232,252
	Expended to Date	$25,495,248
	% Expended	148.0%
	SBE Participation	27.4%
Schedule:		
Issues or Concerns:	*Contract is significantly over budget.*	

Contract No.	**CS-149**	
Contract Description:	**Central Subway Partnership (Project Manager/Construction Manager)**	
Status:	On-going.	
Cost:	Original Contract Value	$85,139,092
	Approved Change Orders	$0
	Current Contract Value	$85,139,092
	Expended to Date	$68,209,372
	% Expended	68.4%
	SBE Participation	35.4%
Schedule:		
Issues or Concerns:		

Contract No.	**CS 156**	
Contract Description:	**Project Controls Consultant**	
Status:	On-going.	
Cost:	Base Contract Value	$17,112,873
	Approved Change Orders	$0
	Current Contract Value	$17,112,873
	Expended to Date	$9,413,265
	% Expended	55.0%
	SBE Participation	29.1%
Schedule:		
Issues or Concerns:		