

MONTHLY MONITORING REPORT

December 2016

Central Subway Project

San Francisco Municipal Transportation Agency (SFMTA)
San Francisco, CA

Draft Report Delivered to FTA on January 12, 2017

Final Report Delivered to FTA on January 20, 2017

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 November 2016, the project was 63.7% complete based on expenditures and there was one active construction contract: 1300 Stations and Systems/Trackwork. That contract was 49.60% complete on the basis of incurred cost at the end of November 2016.* Substantial completion was originally scheduled for February 2018, *but the latest master program schedule update forecasts substantial completion on March 19, 2019, a delay of 403 days (no change from October'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 August 29, 2019. This is 175 days later than the required RSD in the Full Funding Grant Agreement (FFGA). ***The Project Management Oversight Contractor (PMOC) notes that the forecast substantial completion dates for the 1300 Contract and the RSD were maintained in November, indicating that the accumulation of delays has been arrested, at least temporarily. This positive development suggests that the contractor has been able to achieve planned production rates for work on the critical path. The planned rates need to be maintained for a longer period in order to have increased confidence in the project schedule going forward.***

SFMTA and the contractor have established goals for completion of construction milestones for each of the work packages. A new milestone—completion of the first ring of the platform cavern by March 28, 2017—has been set for CTS. *SFMTA reports that this milestone may be achieved, despite delays to the initial phases of mining work for the platform caverns. In the opinion of the PMOC, arresting the accumulation of delays for the CTS mining work significantly improves the schedule outlook for the project. If the production rates for mining work can be sustained, the overall schedule can be projected with much more certainty.* SFMTA noted that work for the

schedule milestone for placement of struts and walers at the mezzanine level of UMS will be completed early due to underground work that continued through the holiday construction moratorium.

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 Rail Activation Plan (RAP) to determine if it is possible to partially recover the accumulated delays to the project. Implementation of the RAP will require support from SFMTA's Transit Division, and planning of the 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.

In the opinion of the PMOC, additional delays to ongoing work will make it challenging to improve on the current forecast for the RSD and, as a result, the PMOC will continue to focus its oversight efforts on the status of ongoing construction as well as SFMTA's efforts to make changes in the work sequence to save time for work scheduled to occur toward the end of the project.

Table 1 - Core Accountability Items

Project Status: <i>(as of November 30, 2016)</i>		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 <i>(decreased \$75,000 from October)</i>
	Total Contingency (Allocated Plus Unallocated, Including Approved Contract Changes)	\$185,500,000	\$79,206,236 <i>(no change from October 2016)</i>
Schedule	Revenue Service Date	12/26/2018	08/29/2019 (forecast)
Total Project Percent Complete	Based on Expenditures	63.74%	
	Based on Earned Value	63.69%	
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. The PMOC convened a schedule recovery workshop in June 2016. Several potential schedule recovery strategies were identified and are under evaluation by SFMTA. A follow-up schedule workshop is planned for the second quarter of 2017.	

Cost Contingency	The current Total Contingency is \$79.2 million. The FTA recommends a minimum contingency level of \$60 million.	The availability of excess cost contingency may make it possible to implement strategies to accelerate the construction work at an increased project cost, while maintaining the overall program budget.
Technical Capacity and Capability	All management positions in the organization are filled.	<i>The SFMTA Quality Manager will be leaving his position for a new assignment in Muni Operations. The PMOC will monitor for impacts to the CSP quality program.</i>
Date of Next Quarterly Meeting:		February 2, 2017

Earned Value (EV): \$1,005,221,845, an increase of \$9.73 million from October.

Planned Value (PV): \$1,302,951,194, an increase of \$20.68 million from October.

Actual Cost: \$1,006,007,800, an increase of \$8.40 million from October.

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 \$79,206,236, which is above the minimum required contingency of \$60 million *and unchanged from October. No contract modifications were executed in November. Unallocated contingency is now \$4.67 million, reflecting a shift of \$75,000 from unallocated contingency to contingency for the 1300 Contract. In the opinion of the PMOC, the overall available cost contingency remains 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 now shows negative buffer float and a forecast RSD nearly 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 the 1300 contractor was able to achieve the planned production rates for critical mining work at CTS, in November, improving the outlook for the overall schedule. In the opinion of the PMOC, arresting the accumulation of delays for the CTS mining work significantly improves the schedule outlook for the project. If the production rates for mining work can be sustained, the overall schedule can be projected with much more certainty. In the opinion of the PMOC, although setting and working toward the short term milestones 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 schedule goal for UMS will be completed two weeks early, which reduces the risk of that work package becoming critical to the overall completion date. Although the schedule for the projects appears to have stabilized, much of the original station construction schedule has been consumed, leaving relatively little time to recover the accumulated delays.

Recovering substantial amounts of the accumulated delay will require that time savings be identified for all of the lines of work (sequences) that are driving the RSD, including Surface, Track, and Systems (STS) work in the tunnels and work at UMS. A more comprehensive view of the lines of work that are driving the RSD must be taken by TPC and SFMTA, and efforts must be made to improve the work sequence and advance elements of systems construction and transit systems testing and commissioning activities near the end of the project in order to improve the RSD. *More effective use of the established partnering process may be a tactic for enhancing the team's ability to creatively address the current and future schedule issues facing the project.*

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. Implementation of the RAP will require support from SFMTA's Transit Division, and planning of the work will require a reliable forecast of when the testing and commissioning can start, based on an achievable schedule for the remaining construction work.

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.

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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 was scheduled to occur in mid-January*.

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 percent of the contract amount.

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 November 2016, the construction of the Stations and Surface, Track, and Systems Contract was 49.60% complete on the basis of cost and 51.66% complete based on the value of completed construction.*

Union Square/Market Street Station (UMS): A new goal—placement of the mezzanine level walers and struts by February 14, 2017—has been established for this work package. *This work was forecast to be completed on January 31, 2017, two weeks ahead of the target.* 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 station box, installation of struts at temporary level 1 was due to be completed on January 11. Excavation to the next level of struts mezzanine level was ongoing and due to be completed January 18. Installation of walers is due to begin on January 9 and is forecast to be completed at the end of January, with installation of struts occurring in parallel and also due to be completed at the end of January. Work on emergency egress stairs 3 and 4 continued and was due to be completed on January 23.*

At the north concourse, repairs to the Muni power duct bank that feeds trolley buses operating on the surface were completed on December 5, with pulling of power cables planned to be complete in January. At the fan level of the north concourse, work for the foundation of a duct chase and forming and pouring of the chase were projected to be ongoing through January. In the Union Square Garage area, unanticipated fuel tanks were encountered at the bottom of the excavation (the second occurrence of buried fuel tanks). Removal was expected to be completed in January. Concrete repairs in the garage also were projected to be completed in January. Base slabs for escalators and escalators leading to the north entrance were to be poured once the joint pattern and reinforcing steel submittals were completed and approved.

Chinatown Station (CTS): *Work on mining of the top left and top right side drifts for northbound platform cavern was underway at the beginning of January. Work also was underway on the top right side drift of the southbound cavern, and work on the top left side drift of this cavern was due to start January 9. 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 planned work for November was completed and that no further slippage of the overall schedule for CTS occurred in the most recent reporting period. SFMTA is hopeful that the latest schedule performance milestone can be achieved. **In the opinion of the PMOC, arresting the accumulation of delays for the CTS mining work significantly improves the schedule outlook for the project. If the production rates for mining work can be sustained, the overall schedule can be projected with much more certainty.** SFMTA has stated that a more accurate projection of the project completion date will be possible in the second quarter of 2017, when progress on the remaining Sequential Excavation Method (SEM) work can be evaluated. **A schedule workshop is planned for the second 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 latest schedule goal for YBM is to complete the station box invert slab by February 14, 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 expected to continue through January. The completion of street restoration 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.*

The first section of the mud slab at the base of the station box invert was completed in December, followed by waterproofing that was completed on January 4. Mechanical equipment to be embedded in the invert slab will be placed over most of January, with the first section of the invert slab planned to be poured on January 25. **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.** Interior walls and rough-in work for mechanical, electrical, and plumbing systems continued at the mezzanine and concourse levels. Although the latest schedule performance target for work at this station was not documented or discussed at the status meeting, the work at this station appears to be progressing well, with minimal risks of delays.

Surface, Track, and Systems (STS): The two newly revised schedule performance targets 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 (no change from the previous target for this area) and b) complete all utility work and pavement restoration through the Bryant Street/4th Street intersection to the portal May 31, 2017 (extended from the end of March 2017 due to ongoing utility conflicts). SFMTA is currently not projecting a date for the start of special trackwork at Bluxome Street, previously targeted for the end of 2016. This work package achieved a significant milestone with the completion of the renovations to the 78-inch brick sewer line, its connection to a manhole at 4th and Brannan streets, and a notch in the 78-inch line for a 36-inch sewer force main. 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 delayed completion 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.

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 attendant costs 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 CSP's senior management team on achievement of the short term performance milestones, these milestones have not yielded any schedule recovery, although the projected RSD was maintained during the latest reporting period. **As discussed in the Schedule section of this report, it is encouraging to note that the ongoing schedule slippage due**

to lower than planned production for the CTS SEM mining was at least temporarily arrested. This improved performance must be 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 August 29, 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. By this time, much of the original station construction schedule will have been consumed (the originally scheduled substantial completion date for the 1300 Contract was February 10, 2018), leaving little time to recover the accumulated delays.

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 to be completed in January 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 (SFPDW)

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, with the first cars due to be delivered to SFMTA well ahead of the CSP opening date. Production of the first two cars has been completed and testing is underway at the assembly facility, *including dynamic testing of the first car and compressive strength testing on the fourth car. Production work is continuing for an additional seven cars.*

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 percent to 30 percent 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. This discrepancy was shown to SFMTA and it was agreed that the issue would be addressed 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 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. ***There was a lull in the execution of contract changes over the holiday season, and SFMTA is encouraged to continue to push contract changes through the negotiation process to execution.***

The SFMTA Capital Project and Construction (CP&C) Quality Manager (QM) announced that he will be leaving this position for an assignment in Muni Operations. The CP&C QM provides oversight of the CSP Quality Assurance (QA) process. In the opinion of the PMOC, the effectiveness of the QA process could be affected by the impending 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 had observed some improvement in the progress of contract change processing in previous reporting periods 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. However, no new modifications to the contract were executed in November and only four additional modifications were executed between the end of November and January 4, 2017, the date of the latest trend summary. SFMTA is encouraged to maintain focus on the resolution and execution of warranted contract modifications.*

SFMTA's project management systems are now fully functional after the recent ransomware attack on SFMTA's computer systems disabled the construction management software for several weeks. The most recent versions of these documents is January 4, 2017 for the trend summary and trend log. A total of 47 contract modifications had been executed for the 1300 Contract as of January 4, with four CMods executed since November 18. The total value of executed CMods was \$4,818,402, which is an increase of \$791,788 in the six weeks since the date of the previous report reviewed by the PMOC. Note that tables 2 and 3 reflect the project status as of the end of November 2016 and show different values for approved contract changes.

Project Cost (as of November 30, 2016)

Cost estimate: \$1.5783 billion.

Total contingency: \$79.21 million (minimum contingency is \$60 million), unchanged from October.

Total net incurred costs: \$1,006,007,800, an increase of \$8.40 million from October (63.74% of the total project budget).

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

Earned Value (EV): \$1,005,221,845, an increase of \$9.73 million from October.

Planned Value (PV): \$1,302,951,194, an increase of \$32.05 million from October.

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.

Table 2 - Contract, Budget, and Trends for Active Construction Projects¹

	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	4,026,613
Current Contract (1252 does not include non-project costs)	235,078,785	843,703,013
Remaining Contingency	834,715	35,973,387
Potential Changes (Trends)	170,654	27,302,003
Estimate at Completion	235,249,439	871,005,016
Contingency Less Trends	664,061	8,671,384
Spent to Date	233,793,900	436,293,219
Potential Left to Spend	1,455,539	434,711,797
Contingency Less Trends as % of Potential Cost to Complete	45.6%	2.0%

¹ As reported in the November 2016 Central Subway Project Monthly Progress Report – SFMTA.

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 \$8.7 million in contingency remaining for Contract 1300. The resulting contingency of 2.0% 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 \$10.50 million or 2.4% 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 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. **As shown, the total contingency, including unallocated contingency and subtracting identified trends, represents 9.9% 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.**

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		Remaining FFGA Budget	Committed		Trends/risks	Estimate to Complete	Estimate at Completion	FFGA Budget Forecast Variance
						\$	% of FFGA		Contract Amt.	Change Orders				
10	GUIDEWAY & TRACK ELEMENTS	\$ 315,926,081		\$ -	\$ 285,227,879	\$ 213,398,664	68%	\$ 102,527,417	\$ -	\$ -		\$ -	\$ -	\$ -
10.02	Guideway: At Grade, Semi-exclusive	\$ 2,395,143		\$ -	\$ 2,860,000	\$ 145,000	6%	\$ 2,520,143						
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	\$ 146,303,471	65%	\$ 78,629,786						
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		\$ -	\$ 590,734,169	\$ 306,259,754	71%	\$ 126,438,981	\$ -	\$ -		\$ -	\$ -	\$ -
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	\$ -		\$ -	\$ 3,616,013	\$ -	#DIV/0!	\$ -						
20.03	Underground station	\$ 412,084,888		\$ -	\$ 557,813,462	\$ 301,230,269	73%	\$ 110,854,619						
20.07	Elevators, escalators	\$ 19,838,934		\$ -	\$ 21,701,837	\$ 3,493,708	18%	\$ 16,345,226						
40	SITWORK & SPECIAL CONDITIONS	\$ 232,551,627		\$ -	\$ 209,781,145	\$ 188,728,139	81%	\$ 43,823,488	\$ -	\$ -		\$ -	\$ -	\$ -
40.01	Demolition, clearing, earthwork	\$ 8,887,028		\$ -	\$ 11,296,936	\$ 10,815,829	122%	\$ (1,928,801)	\$ -					
40.02	Site utilities, utility relocation	\$ 29,562,587		\$ -	\$ 58,453,542	\$ 59,276,425	201%	\$ (29,713,838)	\$ -					
40.03	Haz. Material, contam'd soli removal, ground water	\$ 2,957,442		\$ -	\$ 7,345,298	\$ 4,324,595	146%	\$ (1,367,153)	\$ -					
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		\$ -	\$ 9,755,506	\$ 2,278,655	16%	\$ 12,115,255	\$ -					
40.07	Automobile, van, bus accessways, including roads	\$ 11,919,550		\$ -	\$ 6,579,099	\$ 2,643,939	22%	\$ 9,275,611	\$ -					
40.08	Temporary facilities and other construction indirect	\$ 158,790,820		\$ -	\$ 112,624,168	\$ 106,040,899	67%	\$ 52,749,921	\$ -					
50	SYSTEMS	\$ 108,429,774		\$ -	\$ 95,245,310	\$ 22,148,487	20%	\$ 86,281,287	\$ -	\$ -		\$ -	\$ -	\$ -
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	\$ 8,575,364	285%	\$ (5,562,132)	\$ -					
50.03	Traction power supply	\$ 20,379,634		\$ -	\$ 21,465,073	\$ 5,064,766	25%	\$ 15,314,868	\$ -					
50.04	Traction power distribution	\$ 16,239,951		\$ -	\$ 12,441,113	\$ 1,289,134	8%	\$ 14,950,817	\$ -					
50.05	Communications	\$ 28,545,305		\$ -	\$ 12,030,586	\$ 75,003	0%	\$ 28,470,302	\$ -					
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	\$ 730,535,044	67%	\$ 359,071,173	\$ 1,130,842,776	\$ 12,177,626	\$ 27,472,657	\$ 439,958,015	\$ 1,170,493,059	\$ (80,886,842)
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	\$ 242,593,518	67%	\$ 118,974,842	\$ 328,739,120	\$ -	\$ -	\$ 68,183,132	\$ 310,518,041	\$ 51,050,319
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	\$ -	\$ -	\$ -	\$ 61,318,331	\$ 24,734,909
80.03	Project Management for Design and Construction	\$ 191,025,800	\$ 89,012,544	\$ 13,905,845	\$ 102,918,389	\$ 63,759,507	33%	\$ 127,266,293	\$ 102,918,389	\$ -	\$ -	\$ 25,253,037	\$ 89,012,544	\$ 102,013,256
80.04	Construction Administration & Management	\$ 15,495,521	\$ 91,046,881	\$ 2,956,812	\$ 94,003,693	\$ 59,659,959	385%	\$ (44,164,438)	\$ 94,003,693	\$ -	\$ -	\$ 31,386,922	\$ 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	\$ -	\$ -	\$ 459,804	\$ 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	\$ -	\$ -	\$ 4,040,068	\$ 8,262,604	\$ (1,020,264)
80.07	Surveys, Testing, Investigation, Inspection	\$ 234,036	\$ 883,100	\$ -	\$ 883,100	\$ 13,740	1%	\$ 220,296	\$ 883,100	\$ -	\$ -	\$ 869,360	\$ 883,100	\$ (649,064)
80.08	Start up	\$ 8,400,329	\$ 6,991,907	\$ 1,358,422	\$ 8,350,329	\$ 817,966	6%	\$ 7,582,363	\$ 8,350,329	\$ -	\$ -	\$ 6,173,941	\$ 6,991,907	\$ 1,408,422
Subtotal (10-80)		\$ 1,514,958,259	\$ 1,518,224,154	\$ 55,400,921	\$ 1,573,625,075	\$ 1,006,007,801	66%	\$ 508,950,458	\$ 1,509,402,695	\$ (2,658,645)	\$ 27,472,657	\$ 520,817,229	\$ 1,526,566,421	\$ (116,608,162)
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	\$ 1,006,007,801	64%	\$ 572,292,200	\$ 1,509,402,695	\$ (2,658,645)	\$ 27,472,657	\$ 520,817,229	\$ 1,526,566,421	\$ 51,733,580
100	FINANCE CHARGES	\$ -	\$ -	\$ -	\$ -	\$ -	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
TOTAL PROJECT COST (10-100)		\$ 1,578,300,001	\$ 1,518,224,154	\$ 60,075,845	\$ 1,578,299,999	\$ 1,006,007,801	64%	\$ 572,292,200	\$ 1,509,402,695	\$ (2,658,645)	\$ 27,472,657	\$ 520,817,229	\$ 1,526,566,421	\$ 51,733,580

SCC Breakdown of Forecast Construction Costs Not Available

²As reported in the November 2016 Central Subway Project Monthly Progress Report – SFMTA

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 percent of the original contract amount, which represents exceptionally good change order control.

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 *January 4, 2017*. This report shows that 47 contract modifications have been approved (four *additional CMods since mid-November*) for a net increase in the contract value of \$4,818,402. CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined expected value of \$24,280,413 in increased contract value, a decrease of \$1.20 million since November 18. An additional 466 items are being tracked in the Trend Log with a net value of \$20.05 million in possible contract value increases. Of these, 230 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 205 items have been voided and are carried at no cost. There are 16 items covered by certified claims and notices of potential claims by the contractor (\$7.1 million total exposure), and 15 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 *January 4, 2017* shows a total potential increase in contract cost of \$49,153,030 including the \$4.81 million in contract cost increases executed thus far. *The total estimated cost impact of the identified trends increased by about \$902,000 from mid-November 2016 to early January 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 (inadvertently excluded from previous PMOC monitoring reports)*
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 (inadvertently omitted from last month's monitoring report)*
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 (previous cost less than \$250,000)*
10. Obstructions to jet grout placement at UMS - \$2,062,420
11. *Change in track switch machine manufacturer at STS - \$391,909 (previous cost less than \$250,000)*
12. *Additional monitoring instruments at CTS - \$429,777 (new)*
13. Time impacts due to power pole conflict during demolition at CTS - \$3,516,164
14. *Extra work to prepare existing tunnel - \$441,423 (new cost)*
15. Additional traffic control requirements at 4th and King - \$675,001
16. *Incomplete interface design at STS - \$300,001 (new cost)*
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 (new cost)*
21. *Claim for missing conduits between manholes at UMS - \$250,000 (new cost)*
22. Change in vent for emergency generator at all stations - \$500,001
23. Contractor-claimed change in contract requirements for pre-loading permanent struts at UMS - \$1,853,352
24. Soil nail and shotcrete wall changes in Union Square Garage - \$896,524
25. Contractor claim that wayside signals are extra - \$1,512,373
26. Change to grout details and drainage piping at UMS - \$630,104
27. Change in automatic train control system for reverse running - \$400,001
28. *Design changes for UMS vertical drainage slots - \$866,709 (new cost)*
29. Costs associated with differing site conditions for Level 3 Duct Bank - \$2,400,001
30. 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)
<u>Federal</u>		
New Starts	942,200	769,196
Congestion Mitigation	41,025	41,025
<i>Federal Subtotal</i>	983,225	660,221
<u>State</u>		
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
<i>State Subtotal</i>	471,100	395,598
<u>Local</u>		
Prop. K Sales Tax	123,975	123,975
<i>Local Subtotal</i>	123,975	123,975
Project Total:	1,578,300	1,179,794

E. PROJECT SCHEDULE STATUS

SFMTA prepared a master program schedule update in December representing progress on the project through November 2016. SFMTA reported that it had again rejected the contractor's schedule submittal for October and November 2016 due to logic problems but had yet to deliver formal comments to the contractor. **The PMOC remains concerned that SFMTA and TPC are unable to agree on the requirements for the contractor's schedule update so that TPC can produce schedule updates that will be accepted. An agreed project schedule from the contractor is critical to the evaluation and agreement on schedule recovery strategies. The PMOC is further concerned that unresolved responsibility for the accumulated delays to date is hindering SFMTA and TPC from working together to identify schedule mitigation measures. Although SFMTA has initiated discussions with TPC regarding long-standing delay claims, the agency has yet to provide its formal proposals regarding time allowance. In the opinion of the PMOC, SFMTA should urgently finalize the time impact allowances on the oldest claims so that later claims can be addressed in a timelier manner.**

The November 2016 master program schedule update indicates that the construction work has not fallen further behind schedule. 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 remains August 29, 2019, eight 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 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 November 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. SFMTA and TPC have set schedule performance milestones for each work package in an attempt to keep all parties focused on advancing work that is critical to the overall program schedule. The PMOC notes that none of the most recent schedule achievement milestones was met but that the current milestones appear to be achievable.

*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 November was achieved, with no slippage of the projected substantial completion date for CTS. **In the opinion of the PMOC, arresting the ongoing slippage of the CTS schedule is a significant achievement, but the planned production rates will have to be achieved for a longer period before there can be increased confidence in the reliability of the project schedule.***

SFMTA and TPC have established new schedule performance goals for each of the work packages. The goal for CTS is to complete the first ring of the south platform cavern by March 28, 2016. **In the opinion of the PMOC, it will be possible to evaluate the effectiveness of SFMTA and TPC efforts to arrest the schedule slippage and possibly recover some of the accumulated delay sometime in the second quarter in 2017 after the current schedule milestone has been completed. The PMOC notes that work for the schedule goal for UMS will be completed two weeks early, which reduces the risk of that work package becoming critical to the overall completion date. Although the schedule for the projects appears to have stabilized, 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.

Table 5 - Interim Milestones for CTS Construction Progress¹

Milestone	Target Date	Status
Complete first ring of the south platform cavern at CTS	March 28, 2017	<i>Platform cavern excavation underway for NB and SB platforms.</i>
Install mezzanine level struts and walers at UMS	February 14, 2017	<i>Work is projected to be completed January 31, 2017, two weeks ahead of schedule.</i>
<i>Complete invert slab for station box at YBM</i>	<i>February 14, 2017</i>	<i>First invert slab pour scheduled for January 25.</i>
<i>Complete all utility work</i>	<i>March 31, 2017</i>	Target now—complete all work south of Bryant on listed date, with work to portal completed in May.
Start special trackwork at Bluxome	<i>None listed</i>	<i>Latest milestone missed</i>

¹ SFMTA Management Meeting, 1/3/2016

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 has produced an initial draft of the RAP, which is a good first step in planning for testing, commissioning, acceptance, and other start-up activities. *The updated version of the plan will be references in the next update of the PMP.*

Project Schedule Data

Earned Value (EV): \$1,005,221,845, an increase of \$9.73 million from October.

Planned Value (PV): \$1,302,951,194, an increase of \$32.05 million from October.

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 declined from the previous reporting period due to the very high increase in planned value for November, which was not matched by the earned value.*

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. *No changes in forecast dates occurred in November.*

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 19, 2019 (F)
RSD:	December 26, 2018 (P); August 29, 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 8 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 Sequential Excavation Method 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 August 29, 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

Complete concrete repairs at Union Square Garage and prepare the new vehicle ramps for use by the public. Remove fuel tanks from excavation area and begin building up the north entrance structure. Complete restoration of Muni traction power across the north concourse.

Complete installation of struts and walers for the mezzanine level of the station box. Excavate to temporary strut level two.

Complete construction of access shaft at O'Farrell Street

CTS

Continue excavation of the station platform caverns

Open sidewalk connections across the project site on Washington Street

Provide compensation grouting as needed

YBM

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

Start of 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 (*January 30, March 7, and April 3*)

- Weekly Contract 1300 Construction Progress Meetings (*first Tuesday and Wednesday of February, March, and April*)
- Weekly Configuration Management Board (CMB) (*first Wednesday of February, March, and April*)
- Monthly CSP Risk Management Meetings (*first Thursday of February, March, and April*)
- CSP month-end meetings on *January 31, March 8, and April 4*
- FTA/QPRM scheduled for February 2, 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 improving, with the occurrence of critical non-conforming work becoming less frequent. The following quality concerns for the 1300 Stations Contract were identified in the SFMTA November monthly report:

- TPC performing work prior to receipt of approval status of required submittals. SFMTA notes that additional Initial and/or Preparatory Phase Quality Meetings greatly contribute to preventing work prior to obtaining submittal/Request for Information (RFI) approval.
- TPC's refinement of its process to prepare record drawings (as-builts) to include CNCRs and timely recording of work that is performed that is inconsistent with the Conformed Design Drawings. Continued progress toward meeting the intent of the contract with regard to as-built records was noted in the latest SFMTA monthly progress report.

- *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.*

As of January 3, 2016, 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.

The PMOC conducted a Quality Review of the CSP in September 2015, and a draft report was delivered to FTA for review late that month. The report documenting this review was finalized in early November 2015. The report identified recommended refinements to the organization charts and descriptions of certain staff positions' quality-related responsibilities to clarify the quality assurance organization. The report also recommended that executive management support for the quality program be demonstrated through approval signatures on quality plans by TPC and SFMTA executive management. The PMOC's Quality Review of the project concluded that the SFMTA staff is implementing the SFMTA QA Program as described in the SFMTA Quality Management Plan (QMP). The fundamental implementation of the SFMTA quality program and SFMTA management's support of the program were readily apparent during the PMOC's QA program review.

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. *No incidents occurred in November.* 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

<i>Through September 2016</i>	No. of Incidents	Incident Rate ¹	Goal
1300 Contract			
OSHA Recordable Accidents	6	0.82	<3.4
Job Transfer/Restricted Duty Incidents	0	0	NA
Lost Time Incidents	1	0.14	<1.6
Total Incidents	7	0.96	NA
Hours Worked	1,458,277		

¹OSHA 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 January 2017 Risk Mitigation Meeting for the CSP, which included a review of the status of the top construction risks *and a full review of the complete risk register*. The following significant updates were provided during the meeting:

- *The risk of community complaints leading to restricted working hours and accompanying delays at CTS was reduced in probability and potential cost impact. After sound mitigation measures were implemented, there have been no complaints regarding construction impacts at CTS. In the opinion of the PMOC, the implementation of noise mitigations is a good example of effective collaboration between SFMTA and the contractor that has supported advancement of the construction work at CTS.*
- *The risk of the project falling further behind schedule and being unable to recover was increased. The potential cost impacts of the delays were increased, along with the probability of occurrence. The risk rating increased from 12 to 20, with the risk remaining as the top risk. In the opinion of the PMOC, SFMTA is now accepting that the project completion date will be extended and is beginning to focus on determining a reasonable forecast date for construction substantial completion and the RSD. In the opinion of the PMOC, a realistic schedule for the remaining work is vital to the effective planning and scheduling of the startup activities, including testing, acceptance, training, and pre-revenue operation.*
- *The risk of contractor complacency in responding to third party damage claims leading to higher project costs was reduced. The contractor has been much more proactive in acknowledging and responding to claims from adjacent businesses and property owners, recognizing that ignoring the claims was leading to increased City of San Francisco legal costs that are assigned to the contractor.*
- *The risk of non-conforming work not being identified by the contractor's Quality Control program was reduced. The potential impacts on cost and schedule of failure by the contractor to identify non-conforming work was reduced. The contractor's Project Manager (PM) is no longer interfering with the QC team's work to assure quality requirements are met. In the opinion of the PMOC, the improved performance of the QM program is evidenced by the recent lack of major CNCRs that pose risks to the project schedule. Reasonable numbers of CNCRs are being logged, but the issues are minor and the disposition of required responses is being determined quickly.*
- *The risk of delays to UMS work from potential archeological or other finds was retired. Excavation has reached a level lower than the area where finds are likely.*

- *The risk that as-built drawings of the existing Union Square Garage are inadequate to support preparation of shop drawing for the required structural support was retired. Although this risk occurred and had a significant impact on the cost of the garage modifications, all demolition work in the garage is complete and all necessary modifications have been fully defined and are under construction.*
- *The risk that impacts to adjacent businesses would cause a restriction on working hours and accompanying increased costs and schedule delays was retired. Impacts to businesses should be declining as the support of excavation work is complete, all station roof sections are installed, and the construction footprint should be reduced in the coming months.*
- *The risk that sewer relocation work along Stockton Street at CTS would be delayed or increased in cost was retired as this work is now complete.*
- *The risk of additional costs and schedule delays due to difficulty in obtaining permits was reduced. The likely cost impact was reduced substantially.*
- *The risk of damage to adjacent buildings due to surface construction work at UMS was retired. The only remaining work at the surface is restoration of the street, which can occur within the public right of way.*

In the opinion of the PMOC, this was an effective meeting, although SFMTA should seek better attendance at subsequent meetings. All risks were considered and reasonable updates to the risk register were implemented. It is apparent that most of the major risks to project cost and schedule have been reduced to low levels or eliminated. The primary determinant of the time required to complete the project (and any delay-related costs) will now be the contractor's ability to effectively advance the work. Third party and differing site condition issues should involve minimal impacts to the progress of most of the work, despite the utility issues that remain to be resolved in the surface section of the alignment.

A list of the top risks discussed at the December 2016 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	<i>1/23/17</i>		P6 schedule completed, narrative being developed
S	173	Integrate testing and commissioning tasks into master program schedule	12/6/2016	<i>TBD</i>		

(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

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
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
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
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
QMP	Quality Management Plan
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	<i>Version</i>	<i>Review by FTA/FRA</i>	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	<i>Y/N</i>		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	<i>Version</i>	<i>Review by FTA/FRA</i>	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	<i>Version</i>	<i>Review by FTA/FRA</i>	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	<i>Version</i>	<i>Review by FTA/FRA</i>	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	<i>Version</i>	<i>Review by FTA/FRA</i>	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: <input type="checkbox"/> Activation Plan and Procedures <input type="checkbox"/> Integrated Test Plan and Procedures <input type="checkbox"/> Operations and Maintenance Plan <input type="checkbox"/> Emergency Operations Plan	<i>In Process</i>		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	<i>Version</i>	<i>Review by FTA/FRA</i> 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	<i>Version</i>	<i>Review by FTA/FRA</i>	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:	<i>January 10, 2016</i>
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

63.7% *Percent Complete Based on Progress (November 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
<i>\$1,006.0 million</i>	Amount of Expenditures at date of this report from Total Project Budget of \$1,578 million
63.7%	Percent Complete based on Expenditures at date of this report
<i>\$4.67 million</i>	Unallocated Contingency remaining
\$79.21 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 \$79.21 Million				



APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in early 2015. All remaining project risks were discussed at the September 2016 risk mitigation meeting.

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. *Thus far, no ground movement has been detected and the cross-cut cavern is complete.* This risk will remain, although it appears to be at a reduced level, until the excavation is completed.

#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. The risk was re-rated, with higher potential cost impacts and a higher probability of occurrence. The overall rating increased from 12 to 20.*

#233 – Related to the quality of the shotcrete lining substitution proposed by TPC being inferior. This risk continues, and while SFMTA has seen good results from the permanent installation work at YBM, the contractor recently ran out of shotcrete during a large placement. SFMTA has directed the contractor to proceed with formed and poured linings for the CTS caverns. *Contractor has requested an executive meeting on the subject. SFMTA will require execution of the issue resolution ladder to proceed with the requested meeting.*

#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.

#243 – Risk that contractor will be complacent in addressing damage claims from third parties, resulting in additional costs to the program. *The contractor has been more responsive in addressing issues with third parties. The probability of occurrence was reduced.*

#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.

#104 – CPUC approval at grade crossing takes longer to negotiate/obtain than schedule allows. This risk is increased by the CPUC's stated desire to revise SFMTA's standard operating procedures regarding the traffic control used at grade crossings.

#72 – Risk that interfaces with train control at 4th and King streets fail. Ongoing issues with the track circuit at 4th and King will need to be resolved in order to retire this risk.

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. The likely impacts of the risk were reduced.

95 – Risk of default by contractor or major subcontractor leading to delays. There has been one occurrence of this risk already. The probability and impacts were adjusted upwards.

#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.

#67 – Risk that archeological findings delays construction progress. Excavation has reached levels below the areas likely to contain artifacts. This risk can be retired.

#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.

#229 – Risk of delayed completion of TPC acceptance tests. A schedule for start-up activities is being prepared and long-lead items are being identified. The major contributor to the risk is Train Control testing, *and the time required for testing is still uncertain.*

#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.
<i>Third Party and Agency Agreements</i>				
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
<i>Revenue Service</i>				
Target Revenue Service Date	-	8/15/2019		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 percent of project cost at Entry into FD and 3 percent 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 percent 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.	<p>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.</p>

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:	<i>Support of excavation work is complete. Placement of roof slabs is underway. Preparations underway for mass excavation.</i>	
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 <i>forecast March 2019.</i>	
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:	<i>Contract is significantly over budget.</i>	

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:		