

MONTHLY MONITORING REPORT

November 2017

Central Subway Project

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

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Work Order Number: 002

OPs Referenced: 01 and 25

CLIN 0002B

David Evans and Associates, Inc.

Bill Byrne, Task Order Manager

Voice – (303) 828-8626; Email – bbyrne@deainc.com

Time on project: 3.5 years

EXECUTIVE SUMMARY

Project Description

The Central Subway Project (CSP) involves construction of 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 LRT 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, 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 October 2017, the project was 72.2% complete based on expenditures.* There is one active construction contract: 1300 Stations and Systems/Trackwork, *which was 62.3% complete based on incurred cost.* Substantial completion of this contract was originally scheduled for February 2018, but the latest master program schedule update forecasts substantial completion on June 26, 2019, a delay of 502 days. Because the contractor has failed to provide acceptable schedule updates, 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 December 10, 2019. This is 349 days later than the required RSD of December 26, 2018 in the Full Funding Grant Agreement (FFGA) and unchanged for the past six reporting periods.

SFMTA and the contractor collaborated to start work on the CTS crossover cavern, which was on the critical path, prior to completion of the platform cavern and several months earlier than originally planned. The substantial completion date remained unchanged due to the early start of this work. **CTS is the only station where mass excavation and the primary structural support system are incomplete. *When this work is complete at CTS, the required cost and schedule contingencies for the project should be reevaluated.*** *The last portion of the Sequential Excavation Method (SEM) mining at CTS for the crossover cavern has been progressing well.* In the opinion of the Resident Engineer (RE) for CTS, the SEM work is likely to be completed on or near January 31, 2018 as forecast in the latest SFMTA schedule update.

SFMTA has been using a Dispute Review Board (DRB) to address claims by the contractor for additional costs and delays. The DRB returned an opinion on the contractor's claim of 86 days of compensable time for delays to the start of building demolition at CTS. The DRB opinion stated

that 22 days were compensable, 29 days were non-compensable, and 35 days were avoidable. **In the opinion of the PMOC, the issuance of the DRB opinion should help facilitate resolution of this and other outstanding claims by the contractor. SFMTA and the contractor should continue to use the DRB process as a tool to resolve contract disputes.**

Table 1 - Core Accountability Items

Project Status: (as of October 31, 2017)		Original at FFGA:	Current Estimate:
Cost	Cost Estimate	\$1,578,300,000	\$1,578,300,000
Contingency	Unallocated Contingency	\$74,722,000	\$9,005,903
	Total Contingency (Including Approved Contract Changes)	\$185,500,000	\$75,236,637
Schedule	Revenue Service Date	12/26/2018	12/10/2019 (SFMTA forecast)
Total Project Percent Complete	Based on Expenditures	72.20%	
	Based on Earned Value	72.80%	
Major Issues	Status	Comments/Planned Action	
Schedule Contingency	<i>Delays have not increased in the past six months.</i>	SFMTA to identify range of potential RSDs based on remaining schedule risks. <i>Required contingency should be reevaluated when CTS excavation is complete.</i>	
Cost Contingency	The current Total Contingency is \$75.2 million. The Federal Transit Administration (FTA) recommends a minimum contingency level of \$60 million.	Delays will likely lead to an increase in project soft costs, and the contractor has issued many claims. However, the contingency appears adequate for the current level of project completion. <i>Required contingency should be reevaluated when CTS excavation is complete.</i>	
Technical Capacity and Capability	<i>A few positions on the management team remain open.</i>	Recruitment for a start-up manager, Mechanical, Electrical, and Plumbing (M/E/P) inspectors and an assistant RE is underway.	
Date of Next Quarterly Meeting:		February 7, 2018	

Earned Value (EV): \$1,149,029,073, an increase of \$14.95 million from September.

Planned Value (PV): \$1,462,873,076, a planned increase of \$7.64 million from September.

Actual Cost (AC): \$1,139,525,690, an increase of \$6.07 million from September.

Cost Performance Index (CPI): 1.00, indicating that the value of completed work is consistent with the incurred cost.

Schedule Performance Index (SPI): 0.79, indicating that the amount of work completed is far less than planned and the project is well behind schedule.

Contingency

Cost Contingency

The total available contingency (approved contingency less approved contract changes) as of October 31, 2017 was \$75,236,637, which is above the minimum required contingency of \$60 million and down slightly from September. SFMTA's latest trend summary report estimates a total potential cost increase of \$51.59 million (not including executed contract modifications), which is \$23.65 million less than the available contingency. Pending changes decreased about \$29,000 from November to December.

Schedule Contingency

All contingency in the schedule has been consumed, and there is nearly 12 months of negative float. SFMTA has completed an initial assessment of schedule risk associated with the SEM work at CTS. The worst case scenario would result in an RSD of April 29, 2020, four months later than the current forecast. After further evaluation of schedule risks for station finishing work, SFMTA will establish a new RSD including appropriate schedule float.

PMOC Observations, Opinions, and Concerns

The PMOC supports SFMTA's plans to establish a range of potential RSD achievement dates based on a refined project master schedule and recognizing the remaining schedule risks. The PMOC recommends that SFMTA further define the requirements for a possible "Revenue Service Demonstration," which could involve opening a portion of the line early. The definition of requirements will help to confirm the feasibility and timing of the proposed demonstration.

Significant risks will be retired with the impending completion of excavation at CTS in early 2018. A reevaluation of required cost and schedule contingencies should be undertaken following completion of excavation and the primary structural support systems at CTS.

The PMOC notes that the REs and contract management staff continue to be challenged to address the high volume of claims, Proposed Contract Changes, and contractor Change Order Requests. *The PMOC notes the most recent SFMTA Monthly Progress Report identifies an issue with disruption of quality-related work priorities for the REs and design staff caused by efforts to accelerate the schedule to recover delays. The PMOC recommends that the CSP Management Team assess the impacts that schedule acceleration may be having on the quality program for the project and make any necessary adjustments needed to assure that quality is not compromised.*

The PMOC notes that the potential cost increases for the project in SFMTA's trend summary report remained relatively stable from November 2017 to December 2017. However, the PMOC notes that project management costs will likely increase due to the extended duration of the project and these costs are not included in SFMTA's current forecast. Nonetheless, the forecasts for total potential cost increases remain well below the available cost contingency.

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A. PROJECT STATUS

The Project Management Oversight Consultant (PMOC) did not conduct on-site monitoring for Central Subway Project (CSP) in early December 2017 due to the Quarterly Progress Review Meeting being held in late November. The information presented in this report is drawn from SFMTA's October 2017 Monthly Progress Report (MPR) and other project documentation provided by SFMTA.

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.

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.

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, retrieval shaft, and five cross-passages. Final completion has been achieved, and financial close out is underway. San Francisco Municipal Transportation Agency (SFMTA) is still working to reach resolution on the amounts that are due to the stations contractor to cover extra costs related to non-conforming work by the tunnel contractor. Credits to SFMTA from the contractor totaling about \$132,000 have been negotiated, and SFMTA is currently planning to hold an additional \$848,000 in retainage for possible charges by the 1300 contractor. Repairs for leaks at the portal were completed, but were not completely effective. Coordination of access to the tunnel for further leak repair work with ongoing station construction is underway.

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

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 October 2017, the construction of the Stations and Surface, Track, and Systems Contract was 62.31% complete based on cost and 64.19% complete based on the value of completed construction.*

The contractor and SFMTA have been establishing “Big Hairy Audacious Goals” (BHAGs) as a means of encouraging focus and collaboration between the contractor and agency project team members to maintain and enhance schedule performance. The BHAGs are established for critical path and other important activities in the schedule and are defined so as to be difficult to achieve. Thus far, few of the identified BHAGs have been achieved and there is little evidence that the BHAGs have been effective in arresting schedule delays. *See Table 5 on Page 14 for the current status of BHAGs. The following paragraphs describe ongoing work for each construction package.*

Union Square/Market Street Station (UMS): Permanent struts under the Union Square plaza have been placed, and work on the walls is underway at the fan level. Waterproofing and utilities are being installed for the planters at the surface in Union Square. Encasement of permanent walers and struts is underway in the north concourse and in the station box. Scallop walls are being poured on either side of the station box. At the surface on Stockton Street, the Winter Walk has been set up and no work on the surface is ongoing except at night and in the limited areas noted below. Work on the emergency exit stairs at O’Farrell Street is continuing at night. Final street and sidewalk finishing at Ellis Street is continuing through the holiday moratorium, with work forecast to be completed on December 15.

Chinatown Station (CTS): At CTS, cleanup and smoothing is underway in the platform cavern north and south. Excavation of the side drifts of the crossover cavern is complete, with the last remaining excavation being the center drift, which will continue through December. In the headhouse, temporary struts and walers are being placed at level 6.

Yerba Buena/Moscone Station (YBM): Utility work is continuing at the 4th and Howard and 4th and Folsom street intersections. Streetlight poles are being installed along Clementina Street. Construction of emergency exit stair 4 at 4th and Folsom streets is forecast to be complete at the end of December. Finishing work continues in the station box at all three levels. Preparations to place the mezzanine level deck are underway, with the deck pour scheduled for December 18. Placement of interior walls and various utilities continues at the lower level of the headhouse.

Surface, Track, and Systems (STS): Final street and sidewalk paving and trackway construction is complete along 4th Street between King Street and Bluxome Street, except for a short section of track to be tied in at King Street. Road construction on either side of the trackway is complete from Bluxome Street to the tunnel portal except for the intersections of Brannan and Bryant streets, where a few utility relocations remain to be completed. The double crossover south of Bluxome Street will be installed in December. Electric utilities need to be relocated for trackbed construction to continue north of Bluxome Street. Demolition of the old roadway in the center of the street in preparation for track construction is underway from Bluxome Street to Bryant Street. Work on the surface station at 4th and Brannan streets has started.

In the tunnel section of the project, work continues in both tunnels to install the track between YBM and UMS. The look ahead schedule indicates that rail will be installed through UMS starting in mid-December. Installation of the tunnel walkway continues between YBM and UMS.

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

Bay Area Rapid Transit (BART)

SFMTA is coordinating with BART for the completion and acceptance by BART of shared facilities at the south end of the UMS station. There have been challenges because the CSP is not installing equipment that meets BART's standards. Executives of the two agencies have met and directed staff to resolve the issues and implement the required permits.

California Department of Transportation (Caltrans)

SFMTA needs an Encroachment Permit to install electrical and traffic signal equipment at the I-280 off ramp. SFMTA delivered the permit application materials to Caltrans and is working to address Caltrans' comments on the application. SFMTA is providing additional information requested by Caltrans.

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 (QPRM), although CPUC was not represented at the November 16 QPRM. The FLSC is working to approve items on 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)

SFPDW also inspects completed street and sidewalk facilities that the contractor has proposed to release to the City. SFPDW develops punch lists of required repairs that must be completed by the contractor prior to acceptance of the streets and sidewalks.

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

All real estate acquisitions are complete. 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. The builder's insurance policies maintained by the contractor cover the costs associated with these claims 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 four Light Rail Vehicles (LRVs) for the Central Subway, 24 LRVs for near-term fleet expansion (4 for service to the new Warriors arena), and 151 LRVs for fleet replacement. Options for up to 85 additional vehicles are available for fleet expansion. SFMTA had received seven cars as of November 16. SFMTA announced that the first vehicle has been certified by CPUC and *that vehicle was placed into revenue service as a one-car consist on November 18*. SFMTA has been requested to identify which of the new cars will be assigned as being funded by the CSP and will provide information on the vehicles for ongoing tracking of these assets in which the federal government has a financial interest.

Real Estate

SFMTA has acquired all project right-of-way, 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 June 30, 2017. SFMTA contract goals range from 6% to 30% on each of the contracts. The majority of the contracts have met these goals to date.

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

The 1300 contractor had previously raised the possibility of Buy America compliance issues with cooling equipment 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.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

SFMTA delivered an update of the PMP in April 2017.

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the Second Quarter 2017 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on October 26, 2017. The PMOC will review this document in the coming weeks.

Real Estate Acquisition Management Plan (RAMP)

SFMTA submitted RAMP Revision 5, dated September 26, 2013, to FTA on November 19, 2013. SFMTA has acquired all required real estate for the project in accordance with the RAMP.

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

Agency Staff

SFMTA has been recruiting for several open positions and reported that a new cost estimator and a new claims manager would be joining the project in November. **The PMOC has been reporting for several months that the Resident Engineers (REs) have been challenged to address the high volume of open contractor change requests requiring merit determination, completion of negotiations for merited changes, and completion of the necessary paperwork to execute changes that have been negotiated. No contract modifications were issued in October or November, despite the fact that 631 trend items have been determined to have merit and should be advancing to the contract modification stage. The new staff members should help to expedite the administration of contract changes.** SFMTA also noted that it is planning to hold interviews for an assistant RE position that is open and for the start-up and testing manager position. The PMOC will continue to monitor the SFMTA's progress in clearing the backlog of pending change orders.

The 1300 Contract includes a Dispute Review Board (DRB) as a resource for helping to achieve resolution of contract disputes. SFMTA and the contractor have been presenting unresolved issues to the DRB as a means to help achieve resolution. The DRB has begun to issue opinions regarding the merit and quantum of contractor requested changes that are under dispute and/or the subject of claims.

Contractor Staff

There were no changes in the contractor's management staff.

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continued to maintain the Trend Log and logs of Change Order Requests (COR), Proposed Contract Changes (PCC), Notices of Potential Claims (NOPC) and Certified Claims 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 contract change management log includes CORs that have been determined to have merit as well as agency-initiated PCCs that are progressing through negotiations toward a contract modification (CMod). The NOPC log and the Claim Log include CORs rejected by SFMTA for which the contractor expects to submit or has submitted a claim. **The PMOC, recommends that the trend log tracking should include the amount of time that has passed from the initial identification of the trend.**

The most recent versions of the Trend Log and Trend Summary documents are dated December 6, 2017. The Trend Summary indicates that 75 contract modifications had been executed for the 1300 Contract. The total value of executed CMods was \$8,121,714 (no change from November). The NOPC log, also dated December 6, 2017, indicates that there are now 80 potential claims (unchanged from November). The Claim log shows that 57 of these potential claims have been certified and submitted by the contractor and two have been resolved and will be addressed through contract modifications. The submitted claims total \$24.40 million in extra costs, which is unchanged from November.

Note that Tables 2 and 3 reflect the project status as of the end of October 2017 as reported in SFMTA's latest MPR, and show substantially different values for potential contract changes because of the differing time period and because pending contract changes in Tables 2 and 3 include only SFMTA-initiated PCCs and contractor CORs that have been determined to have merit. Claims and denied CORs are not included in the cost forecast in Tables 2 and 3.

Project Cost (as of September 30, 2017)

Cost estimate: \$1.5783 billion.

Total contingency: \$75.23 million (minimum contingency is \$60 million), *reduced slightly from September.*

Actual Cost (AC): \$1,139,525,690, *an increase of \$6.07 million from September (72.20% of the total project budget).*

Current funding level: \$1,479,780,000 (93.6% of the total project budget).

Earned Value (EV): \$1,149,029,073, *an increase of \$14.95 million from September (72.80% of project value earned).*

Cost Performance Index (CPI): 1.00.

CPI is a measure of cost efficiency on a project. It is the ratio of EV to AC. A CPI equal to or greater than 1.0 indicates a cost underrun, and a value of less than 1.0 indicates a trend towards 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. ***The PMOC noted that the earned value reported in October 2017 appears to recognize the value of completed work on LRVs, the cost for which was recognized in September.***

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 a lower value than the contractor’s estimate of extra costs, with the value reflecting SFMTA’s assessment of the likelihood that the change would ultimately be approved through the contract dispute resolution process.

Table 2 summarizes the trends for the two construction contracts that have not attained financial close out. The remaining contingency, less identified trends, represents about 54% of the potential left to spend for Contract 1252. SFMTA’s latest forecast for close out of Contract 1252 indicates that additional credits will be extended by the contractor leading to a reduction in final contract value. **It appears likely that additional contingency from Contract 1252 will be available for reallocation to unallocated contingency.**

SFMTA decreased its forecast of the potential cost impact of trends for the 1300 Contract by about \$10 million between its August and September MPRs. However, in the October MPR, SFMTA estimates the total cost impact of potential contract changes at \$24.17 million, compared with \$18.9 million in September, an increase of \$5.69 million.

*After potential changes were accounted for, \$7.71 million in allocated contingency remained for Contract 1300 at the end of October. **The resulting contingency of 2.4% of potential remaining spending after potential changes are accounted for is likely insufficient, and additional contingency will probably need to be allocated to this contract prior to completion. The available unallocated contingency and excess contingency for other elements of the program are likely sufficient to allow on-budget completion of the CSP.***

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. *The Budget Forecast Variance, which reflects the total remaining contingency after the cost of trends is accounted for, is 13.2% of the potential remaining spending. In the opinion of the PMOC, this contingency should be sufficient to provide reasonable confidence in an on-budget completion of the project.*

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	8,121,713
Current Contract (1252 does not include non-project costs)	235,078,785	847,798,113
Remaining Contingency	834,715	31,878,287
Potential Changes (PCCs and merited CORs)	20,000	24,166,038
Estimate at Completion	235,098,785	871,964,151
Contingency Less Trends	814,715	7,712,249
Spent to Date	233,589,322	548,088,736
Potential Left to Spend	1,509,463	323,875,415
Contingency Less Trends as % of Potential Cost to Complete	54.0%	2.4%

¹ As reported in the October 2017 Central Subway Project Monthly Progress Report – SFMTA (reformatted by the PMOC).

Table 3 - Budget and Contingency Status for Central Subway Project

SFMTA Central Subway Project, Budget, Costs and EAC by SCC October 31, 2017		FFGA Budget	Budget Transfers	Current Budget	Change	Base Budget	Contingency	Expenditures to Date		Remaining Budget	Cost to Complete	Estimate at Completion	Budget Forecast Variance
		\$	\$	= Committed				%	\$				
10	Guideway and Track Elements	315,926,081	(30,698,202)	285,227,879	-10%			250,281,346	88%	34,946,533			
10.02	Guideway: At Grade, Semi-exclusive	2,395,143	464,857	2,860,000	19%			1,020,000	36%	1,840,000			
10.06	Guideway: Underground cut and cover	74,407,195	(4,590,788)	69,816,407	-6%			63,199,677	91%	6,616,730			
10.07	Guideway: Underground tunnel	224,933,257	(23,592,511)	201,340,746	-10%			177,995,153	88%	23,345,593			
10.09	Track: Direct fixation	7,293,157	(532,068)	6,761,089	-7%			5,447,916	81%	1,313,173			
10.10	Track: Embedded	1,601,763	(1,601,763)	-	-100%			-	0%	-			
10.12	Track: Special	5,295,566	(845,929)	4,449,637	-16%			2,618,600	59%	1,831,037			
20	Stations, Stops, Terminals, Intermodal	432,698,735	153,963,624	586,662,359	36%			361,753,097	62%	224,909,262			
20.01	At-grade station	774,913	6,827,944	7,602,857	881%			1,608,488	21%	5,994,369			
20.02	Aerial station, stop, shelter, mall, terminal, platform		2,901,013	2,901,013	NA			-	0%	2,901,013			
20.03	Underground station	412,084,888	142,371,764	554,456,652	35%			355,628,278	64%	198,828,374			
20.07	Elevators, escalators	19,838,934	1,862,903	21,701,837	9%			4,516,331	21%	17,185,506			
40	Sitework and Special Conditions	232,551,627	(17,860,689)	214,690,938	-8%			202,621,938	94%	12,069,000			
40.01	Demolition, clearing, earthwork	8,887,028	3,468,587	12,355,615	39%			12,078,515	98%	277,100			
40.02	Site utilities, utility relocation	29,562,587	31,257,647	60,820,234	106%			66,422,072	109%	(5,601,838)			
40.03	Haz. Material, contam'd soil removal, ground water treatment	2,957,442	4,576,686	7,534,128	155%			5,469,151	73%	2,064,977			
40.04	Environmental mitigation	3,146,216	(2,023,317)	1,122,899	-64%			687,590	61%	435,309			
40.05	Site structures, including retaining walls, sound walls	2,894,074	(187,643)	2,706,431	-6%			2,706,431	100%	-			
40.06	Pedestrian and bike access and accommodation, landscaping	14,393,910	(4,602,915)	9,790,995	-32%			3,017,407	31%	6,773,588			
40.07	Automobile, van, bus accessways, including roads and parking lots	11,919,550	(5,340,451)	6,579,099	-45%			4,640,843	71%	1,938,256			
40.08	Temporary facilities and other construction indirect costs	158,790,820	(45,009,283)	113,781,537	-28%			107,599,929	95%	6,181,608			
50	Systems	108,429,774	(13,087,948)	95,341,826	-12%			29,831,990	31%	65,509,836			
50.01	Train control and signals	37,447,116	(9,319,177)	28,127,939	-25%			7,459,819	27%	20,668,120			
50.02	Traffic signals and crossing protection	3,013,232	9,549,297	12,562,529	317%			10,838,063	86%	1,724,466			
50.03	Traction power supply	20,379,634	1,085,439	21,465,073	5%			9,493,250	44%	11,971,823			
50.04	Traction power distribution	16,239,951	(3,798,838)	12,441,113	-23%			1,681,354	14%	10,759,759			
50.05	Communications	28,545,305	(16,514,719)	12,030,586	-58%			359,503	3%	11,671,083			
50.06	Fare collection system and equipment	2,804,536	3,295,464	6,100,000	118%			-	0%	6,100,000			
50.07	Central Control		2,614,586	2,614,586	NA			1	0%	2,614,585			
Subtotal (10 - 50)		1,089,606,217	92,316,785	1,181,923,002	8%	1,146,990,000	34,933,002	844,488,371	71%	337,434,631	326,687,668	1,171,176,039	10,746,963
60	ROW, Land, Existing Improvements	37,398,029	(5,151,708)	32,246,321	-14%	32,246,321	-	30,732,020	95%	1,514,301	1,514,301	32,246,321	-
60.01	Purchase or lease of real estate	33,798,029	(3,732,219)	30,065,810	-11%	30,065,810	-	28,322,590	94%	1,743,220	1,514,301	29,836,891	228,919
60.02	Relocation of existing households and businesses	3,600,000	(1,419,489)	2,180,511	-39%	2,180,511	-	2,409,430	110%	(228,919)	-	2,409,430	(228,919)
70	Vehicles	26,385,653	-	26,385,653	0%	13,309,000	13,076,653	10,598,347	40%	15,787,306	2,710,653	13,309,000	13,076,653
70.01	Light Rail Vehicles	26,385,653	-	26,385,653	0%	13,309,000	13,076,653	10,598,347	40%	15,787,306	2,710,653	13,309,000	13,076,653
80	Professional Services	361,568,360	(32,829,239)	328,739,121	-9%	310,518,042	18,221,079	253,706,953	77%	75,032,168	56,811,089	310,518,042	18,221,079
80.01	Preliminary Engineering	46,317,094	(114,420)	46,202,674	0%	46,202,674	-	46,202,675	100%	(1)	-	46,202,675	(1)
80.02	Final Design	86,053,240	(24,734,909)	61,318,331	-29%	61,318,331	-	61,199,308	100%	119,023	-	61,318,331	-
80.03	Project Management for Design and Construction	191,025,800	(88,107,410)	102,918,390	-46%	89,012,545	13,905,845	68,835,412	67%	34,082,978	25,272,198	94,107,610	8,810,780
80.04	Construction Administration and Management	15,495,521	78,558,172	94,053,693	507%	91,096,881	2,956,812	65,780,781	70%	28,272,912	20,221,034	86,001,815	8,051,878
80.05	Professional Liability and Other Non-Construction Insurance	6,800,000	-	6,800,000	0%	6,800,000	-	6,340,196	93%	459,804	78,823	6,419,019	380,981
80.06	Legal, Permits, Review Fees by Other Agencies	7,242,340	970,264	8,212,604	13%	8,212,604	-	4,497,714	55%	3,714,890	3,254,766	7,752,480	460,124
80.07	Surveys, Testing, Investigation, Inspection	234,036	699,064	933,100	299%	933,100	-	850,867	91%	82,233	29,955	880,822	52,278
80.08	Start up	8,400,329	(100,000)	8,300,329	-1%	6,941,907	1,358,422	-	0%	8,300,329	7,835,290	7,835,290	465,039
Subtotal (10 - 80)		1,514,958,258	54,335,839	1,569,294,097	4%	1,503,063,363	66,230,734	1,139,525,691	73%	429,768,406	387,723,711	1,527,249,402	42,044,695
90	Unallocated Contingency	63,341,742	(54,335,839)	9,005,903	-86%		9,005,903		0%	9,005,903			9,005,903
Total Project Costs (10 - 100)		1,578,300,000	-	1,578,300,000	0%	1,503,063,363	75,236,637	1,139,525,691	72%	438,774,309	387,723,711	1,527,249,402	51,050,598

SCC Breakdown of Forecast Construction Costs Not Available

²Data reported in the *October 2017* Central Subway Project Monthly Progress Report – SFMTA (reformatted by the PMOC).

Change Order Control

SFMTA continues to estimate that CMods with a net increase in contract value of only \$20,000 will be executed as part of contract close out for the 1252 Contract. Based on the expected final contract value, change orders for the base work are forecast to represent less than 1% of the original contract amount. **This represents exceptionally good change order control compared to typical infrastructure projects.**

SFMTA is maintaining its management tools for tracking potential contract changes for the 1300 Contract. *The latest CN1300 Trend Summary is dated December 6, 2017. This report shows that 75 contract modifications have been approved for a net increase in the contract value of \$8,121,714, which is unchanged from November. CORs (generated by the contractor) that have been determined to have merit and PCCs (generated by SFMTA) have a combined potential cost impact of \$24.38 million in increased contract value, a decrease of \$670,000 since November 15. SFMTA expects to settle the outstanding CORs for less than the overall cost currently claimed by the contractor. SFMTA also expects to receive \$6.02 million in non-project funds to cover the cost of these pending contract changes. The net impact of the CORs and PCCs on the potential project cost is \$18.36 million.*

An additional 720 items are being tracked in the Trend Log. Of these, SFMTA judged 347 items to be without merit and denied them. A further 285 items have been voided and are carried at no cost. There are 73 items covered by certified claims and NOPCs by the contractor (\$25.35 million total exposure, a slight decrease from last month), and 15 items are “open” or “new” and awaiting a determination of merit.

*The potential exposure of the project to additional costs from the denied items, NOPCs, claims, and open items is \$33.24 million, which, when added to the \$18.36 million in increased project costs from merited contract changes, yields a possible exposure of the project to additional costs for the 1300 Contract of \$51.60 million. This compares to the remaining contingency for the project of \$75.23 million. **In the opinion of the PMOC, the available cost contingency for the CSP remains sufficient to address potential cost increases. The PMOC notes that the forecast of overall project costs is now more accurate since SFMTA is recognizing that some extra costs will be reimbursed by non-project funds.***

The Trend Log shows the following trend items with potential cost increases in excess of \$250,000:

1. # 24 - Change to grade 50 steel from specified grade 70 steel (due to availability issues) - \$572,884
2. # 36 - Extra trucking costs for contaminated soil at CTS - \$2,274,225
3. # 39 - Harder rock than anticipated for CTS slurry wall excavation - \$1,880,379
4. # 61 - Delays to installation of tangent piles at UMS - \$1,082,380
5. # 160 - Conflicting duct bank at UMS - \$581,837
6. # 176 - UMS Garage underpinning requirements - \$732,157

7. # 192 - 12-inch waterline at UMS, added scope - \$336,236
8. # 239 - Changes in construction sequence for UMS Garage - \$500,000
9. # 246 - UMS art glass installation requirements - \$690,017 (*increased from \$382,978*)
10. # 272 - Obstructions to jet grout placement at UMS - \$2,060,001
11. # 341 - Change in track switch machine manufacturer at STS - \$347,670 (*decreased from \$391,909*)
12. # 399 - Additional monitoring instruments at CTS - \$429,777
13. # 466 - Extra work to prepare existing tunnel - \$431,423
14. # 498 - Additional traffic control requirements at 4th and King - \$500,001 (*decreased from \$675,001*)
15. # 524 - Changed requirements for pre-loading of UMS concourse level struts - \$1,319,593
16. # 526 - Incomplete interface design at STS - \$300,001
17. # 528 - Additional traffic control requirements for STS work package - \$1,032,302
18. # 537 - Cost of changes to the design of CTS to accommodate the plaza requested by the community - \$4,500,001 (*decreased from \$4,618,428; paid from non-project funds*)
19. # 543 - Change in construction sequence at CTS - \$250,001
20. # 580 – Missing conduit between manholes at UMS - \$250,001
21. # 636 – Changes in emergency vent design (all stations) - \$500,001
22. # 644 - Contractor-claimed change in contract requirements for pre-loading permanent struts at UMS - \$1,853,352
23. #695 – Change in scope for slip-lining of 78-inch sewer on 4th Street – \$793,433 (*decreased from \$828,956*)
24. #715 - Soil nail and shotcrete wall changes in Union Square Garage - \$1,365,378
25. # 840 - Change in drain piping details at UMS - \$332,252
26. # 942 - Change in automatic train control system for reverse running - \$400,000
27. # 968 - Design changes for UMS vertical drainage slots - \$603,910
28. # 1022 - Claim for extra costs and time due to extremely hard ground claimed by Tutor Perini Corporation (TPC) during the coring for the Sequential Excavation Method (SEM) mining work - \$862,720
29. # 1032 - Escalator raceways at UMS - \$492,065
30. # 1099 - Extra costs for SEM excavation at CTS due to tunnel segments being 5 feet long - \$4,404,329

31. # 1117 - Extra costs due to concrete obstruction at CTS south platform cavern - \$583,623
32. # 1175 - Time impacts due to power pole conflict during demolition at CTS - \$3,516,164
33. # 1211 - Time impacts from extended submittal reviews and substitution request procedures - \$3,021,262
34. # 1217 - Claimed delays to SEM work at the platform invert due to compensation grout exclusion zone requirements in the contract specifications - \$900,889
35. # 1276 - Estimated extra costs of proposed scope increase to provide sidewalk bulb-outs at 4th and Bryant and 4th and Harrison - \$1,500,000 (*increased from \$1,402,706; paid from non-project funds*)
36. # 1299 - Claimed extra costs for a schedule delay to the train control subcontract - \$2,000,001
37. # 1311 - Claimed extra costs for delays to the CTS south platform center drift excavation due to restrictions caused by compensation grouting - \$675,952
38. # 1373 - Extra costs for jet grouting complications at Macy's basement at UMS - \$500,000 (*decreased from \$599,421*)
39. #1374 – Extra costs to provide painted sheet metal enclosure for YBM light fixtures - \$443,720 (*decreased from \$548,821*)
40. # 1378 - General claimed extra costs for SEM work at CTS - \$5,457,322
41. # 1424 - Extra work due to changes in form-savers and couplers at roof to wall connection at YBM - \$250,001 (*decreased from \$305,906*)
42. #1479 – Large volume of water inflow at end of probe - \$300,000

The PMOC notes that there were no new trends with costs in excess of \$250,000 in the current month.

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)
3. Replace specified Closed Circuit Television (CCTV) equipment with alternate for all stations - (\$1,600,000)

Funding

Federal, state, and local project funding and expenditures are shown in Table 4. The awarded funding now represents 93.8% of the project budget.

Table 4 - Project Funding

Source	Committed (\$1,000)	Awarded (\$1,000)
<u>Federal</u>		
New Starts	942,200	919,182
Congestion Mitigation	41,025	41,025
<i>Federal Subtotal</i>	983,225	960,207
<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	1,479,780

E. PROJECT SCHEDULE STATUS

SFMTA prepared an update of the master program schedule in October representing progress on the project through September 2017. SFMTA continues to reject schedule updates from the contractor. SFMTA has directed the contractor to make corrections to the schedule logic, but the contractor has not complied with this direction.

As of the end of October 2017, the project was 349 days late, based on the projected Revenue Service Date (RSD) of December 10, 2019. The projected substantial completion date for the 1300 Contract remained June 26, 2019, which is 502 days later than the original date (February 9, 2018). There have been no changes to these milestone dates over the past six schedule updates. Excavation work at CTS has been progressing in accordance with the updated schedule forecast and it appears that the work may be completed at or near the end of January 2018, as currently forecast.

Major delay claims and NOPCs by TPC for CTS and the other work packages are pending resolution. SFMTA and TPC have been addressing the claims through the DRB process. The schedule for installation and testing of the train control system is the subject of major delay claims that may impact the project critical path. SFMTA has requested an updated schedule from the train control supplier, which has not been received.

SFMTA reported that the DRB issued its opinion regarding the contractor's claim for compensable time at the start of demolition at the CTS headhouse site. The contractor claimed 86 days of unavoidable delay and additional compensation of \$40,000 per day, as provided for in the contract for unavoidable delay. The DRB opinion recommends 22 days of compensable delay, 29 days of non-compensable delay, and 35 days of avoidable delay. The avoidable delay could be subject to liquidated damages per the terms and conditions of the contract. SFMTA's claim log includes \$3.5 million of potential cost exposure for this claim. The DRB opinion indicates that the actual

exposure could be much less. *The contractor's claims have been covered in the San Francisco press recently*¹.

The critical path for the construction work continues to flow through the construction of CTS, but analysis by the PMOC indicates that there are other lines of work that are influencing the RSD for the project. Schedule risks related to CTS work and the other near-critical lines of work may further extend the project completion date. SFMTA is conducting a risk assessment of the schedule to establish a range of possible construction completion dates and start dates for revenue service. SFMTA will also identify mitigation measures to reduce the potential effects of the major risks.

SFMTA and TPC have been establishing BHAGs as a way to focus the project team's attention on advancing project work and to encourage teamwork among SFMTA and TPC staff to removing barriers to completion of the work.

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

Table 5 - Interim BHAGs for CTS Construction Progress

Milestone	Target Date	Actual Date	Status
CTS Complete crossover cavern	January 31, 2018	TBD	Favorable progress is being made
UMS Complete utilities and street restoration in Ellis Street	October 1, 2017	TBD	Late, work scheduled to be completed in December
Complete utilities in Geary Street and O'Farrell Street	November 21, 2017	11/21/2017	Utility work complete, some surface work for emergency access remains to be completed
BART Powell Street elevator ready to install	September 1, 2017	TBD	Late, no work scheduled in December
YBM Escalators ready to install	December 1, 2017	11/28/2017	Escalators delivered. Installation not scheduled
Complete utilities at Folsom Street	December 15, 2017	TBD	Work is in progress
Complete utilities at Howard Street	Delayed to April 1, 2018	TBD	Construction progressing slowly
Complete headhouse roof slab	February 1, 2018	TBD	Work is in progress
STS Complete all utility work along 4th Street	Delayed to December 31 from November 30	TBD	In progress, utility conflicts are being resolved
Complete track installation on 4th Street	December 31, 2017	TBD	Utility conflicts delaying portions of the work

TBD: To Be Determined

¹ <http://www.sfchronicle.com/bayarea/article/SF-s-Central-Subway-falling-further-behind-12408123.php>

In the opinion of the PMOC, setting of BHAGs has limited effectiveness, in part due to the inconsistent treatment of BHAG by the RE teams for the work packages. BHAGs are actively discussed at some work package status meetings and not at others. *The PMOC recommends that the status of BHAGs should be discussed at each work package status meeting in order to improve the effectiveness of the goals in advancing critical project work.*

The PMOC and SFMTA convened a schedule workshop on July 26 and 27, 2017 with the objective of agreeing on an approach to establishing a reliable forecast of the project RSD. The PMOC issued a report documenting the results of the workshop and identifying action items relative to the schedule. SFMTA and the PMOC reviewed the status of the action items on October 17. The remaining open action items include:

1. Review and confirm schedule for procurement of Advanced Train Control System (ATCS) hardware, software, and testing. The ATCS supplier is preparing an update of its schedule, which is pending. The master schedule will be updated when the revised ATCS schedule is received.
2. Evaluate the benefits, feasibility, and cost of advancing the completion of traction power and station power supplies at YBM. If effective and feasible, work with contractor to implement required contract modifications. SFMTA found that the completion date for traction power at YBM could be moved up 3.5 months. This would not impact the overall project completion date but it could support the early start of testing, which could help to reduce the duration of later testing activities. It also could support the Revenue Service Demonstration. This strategy appears to be achievable and SFMTA will work with the contractor to implement it as the affected work comes up in the sequence of construction at YBM.
3. Define the scope and confirm the schedule for Building Systems Start-up and Testing at each station. Determine if some of the work can start sooner than indicated in the current schedule. SFMTA is working with TPC to justify the durations of this work at each station. TPC is resisting changing the durations. In the PMOC's opinion, much of the work that would be in this activity will be completed under other activities in the schedule. If this is the case, when the work packages reach these tasks, there will be little to do and the durations will be much shorter than indicated in the schedule. SFMTA has requested that TPC provide more detail for the building start-up and testing activities.
4. Conduct a risk assessment to identify a reasonable range for the RSD recognizing the schedule risks. SFMTA has developed the summary level schedule and has initiated the Monte Carlo schedule analysis.
5. If SFMTA intends to pursue a Revenue Service Demonstration, prepare a plan that identifies the work that must be complete in order to start such a demonstration. Identify a range of dates by which the required work is likely to be complete. SFMTA does intend to pursue a Revenue Service Demonstration and is identifying what work will need to be complete, including staff training, to implement such a demonstration. SFMTA has initiated discussion with Muni operations on the requirements for the potential

demonstration. *SFMTA recently stated that the demonstration may present unwarranted operational challenges and is still under evaluation.*

The PMOC supports SFMTA’s planned approach to identifying a range for the RSD for the project. The PMOC encourages SFMTA to complete its assessment according to the dates shown in Table 8.

Project Schedule Data

Earned Value (EV): *\$1,149,029,073, an increase of \$14.95 million from September.*

Planned Value (PV): *\$1,462,873,076, a planned increase of \$7.64 million from September.*

Schedule Performance Index (SPI): *0.79*. 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 1.0 indicates more work was completed than planned and a value of less than 1.0 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 *0.79* indicates that the project is significantly behind schedule.

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

Table 6 - Schedule Milestones

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

Schedule Contingency Management criteria were developed from the FTA Risk Assessment prior to entry into Final Design (FD). Minimum schedule contingency levels at various project milestones or “Hold Points” were agreed to with SFMTA at Risk Workshop #4, held on February 24 through 27, 2009. The FTA recommended schedule contingency for the current stage of the project is 6.0 months. As noted above, the current schedule reflects nearly 12 months of negative buffer float.

Critical Path Summary (*Baseline Schedule*)

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

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract***UMS***

- Complete utility placement, backfill, and paving of Ellis Street, Geary Street, and O'Farrell Street
- Complete emergency exit stairs at O'Farrell Street
- Continue exterior finishing work at the plaza level of the Union Square Garage and the north entrance
- Continue below-grade construction in the north concourse fan plant
- Complete encasement of permanent walers and scalloped walls in the main station box
- Install elevator in the BART annex
- Construct the mezzanine level floor slab in the station box
- Continue construction of interior walls in the south concourse
- *Decommission the Winter Walk after the holiday construction moratorium*

CTS

- *Complete excavation of the crossover cavern*
- *Clean up platform and crossover caverns and prepare for installation of final lining*
- *Continue excavation and placement of temporary supports in the headhouse*

YBM

- Complete interior walls at the concourse level of the headhouse
- Complete construction of the mezzanine floor slab in the headhouse

- Continue construction of stairs within the station box and emergency egress stairs
- Continue M/E/P rough-in and interior work mezzanine and concourse levels
- Continue interior wall construction and M/E/P rough-in at the platform level
- *Continue utility work in 4th Street above the station box*
- Complete street work on Clementina Street
- Install escalators and elevators
- Start construction of the surface level deck

STS

- Complete utility work and street restoration along 4th Street
- Complete construction of the trackway and installation of track along 4th Street
- Install track from YBM through UMS and on toward CTS
- Construction tunnel walkways
- Start construction of surface level station

The PMOC expects to attend the following meetings:

- Weekly Management (January 2, February 5, and March 8, 2018)
- Weekly Contract 1300 Construction Progress Meetings (January 2/3, February 6/7, and March 9/10, 2018)
- Weekly Configuration Management Board (CMB) (January 3, February 7, and March 10, 2018)
- CSP PMOC Status Meetings (January 3 or 4, February 6, and March 9, 2018)
- CSP Risk Management Meeting (January 4, 2018)
- FTA/QPRM (February 7, 2018)

F. QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC Plan Implementation

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.

The quality concerns for the 1300 Stations Contract identified in the SFMTA October monthly report included issues identified in the previous month and one new issue including:

- As is typical to similar projects, work performed prior to receipt of approval status of required submittals/Requests for Information (RFI) remains a potential area of concern.
- Also as is typical, timely identification and response to construction problems such as too little concrete cover for reinforcing steel due to close proximity of adjacent objects remains a challenge.
- Schedule compression demands are disrupting RE and design staff priorities. ***The PMOC intends to follow up with the QCM to identify how the challenges associated with schedule acceleration are impacting the quality program for the project. The PMOC recommends that the CSP management team assess the impact that schedule acceleration may be having on the quality program and make necessary adjustments to assure the effectiveness of the quality program.***

As of November 27, 2017, TPC's Quality Manager had filed 327 CNCRs (five new since the last report). Eight new items were under review, 11 other items had responses identified but not yet approved, the proposed responses to 13 items were disapproved, and 17 items had approved responses that were not yet implemented. In addition, 240 items were closed (two more than in late October) and 38 items had been voided.

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 Rail Activation Plan (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 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 started to address the

station construction items in 2016. *As of December 11, 2017, 125 of the 1660 items on the Safety and Security Conformance Checklist were approved, with no new approvals in the past month. Twenty-two items were under review by the committee, and 18 items required follow-up responses from the SFMTA construction team. SFMTA planned to submit 55 new items for review at the December committee meeting and was awaiting sign-off by the REs for the work packages.* 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 recordable incidents occurred in the month of October 2017.* 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 October 2017</i>	No. of Incidents	Incident Rate ¹	Goal
1300 Contract			
OSHA Recordable Accidents	6	0.44	<3.4
Job Transfer/Restricted Duty Incidents	0	0	NA
Lost Time Incidents	1	0.07	<1.6
Total Incidents	7	0.51	NA
Hours Worked	2,748,831		

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

I. PROJECT RISK, RISK MANAGEMENT, AND RISK MITIGATION

The PMOC received RCMP Revision 3 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 status of the construction work and the accumulated construction delays.

SFMTA conducts monthly meetings to review the status of identified risks, monitor the implementation of mitigation measures, identify new risks, and evaluate the probability and potential impacts of existing and newly identified risks. The current major risk to the project is the potential for further delays to the construction of the stations, which cannot be mitigated or recovered, resulting in further delays to the RSD. SFMTA has recently subdivided this general schedule risk into several more specific risks. At the Risk Mitigation meeting on October 5, 2017, these new risks were evaluated. The risk mitigation report from that meeting includes the following information regarding these newly-identified risks:

- Risk 248 – Mining production rate at CTS is less than assumed in the construction schedule (rating 25 – very high). The contractor has been maintaining the planned production rate for the past several weeks.
- Risk 253 – Inadequate contractor resources to complete scheduled work (rating 6 – medium). Resources for M/E/P work are the current primary concern. The M/E/P work will be staggered in time, with YBM first, UMS next, and CTS last. The staggering of work will help to limit the need for M/E/P resources.
- Risk 249 – Inability to recover time through parallel, rather than sequential, work activities (rating 7 – medium). SFMTA’s scheduling staff are evaluating the potential for parallel work.
- Risk 251 – The current construction schedule does not include all activities required for completion of the work. Inclusion of all activities may cause further schedule delays (rating 8 – medium). TPC’s scheduler has recently identified activities required to complete upcoming work are missing. SFMTA is researching the schedule to determine if activities that appear to be missing are actually imbedded in other activities.
- Risk 252 – The risk that the time allocated to certain activities is inadequate to complete them (rating 5 – low). SFMTA will be monitoring progress on activities in an attempt to identify shortfalls in production early.

SFMTA has started the process of applying these newly-identified risks to the program schedule in order to establish a range of likely construction completion dates and revenue service dates. SFMTA has developed a simplified, high level schedule with a reduced number of activities. SFMTA will apply the identified risks to this schedule through Monte Carlo simulation over the next few weeks.

In the opinion of the PMOC, SFMTA is taking an appropriate approach to identifying and quantifying the potential impacts of the remaining schedule risks to the project. The outcome of the SFMTA risk assessment is expected to be a range of likely RSDs for the project.

J. ACTION ITEMS AND RECOMMENDATIONS

Table 8 on the following page shows the current action items for SFMTA. Table 9 provides a summary of the currently active PMOC recommendations.

Table 9 - PMOC Recommendations

Number	Date Identified	Recommendation
1	12/27/2017	<i>SFMTA and the contractor should continue to use the DRB process as a tool to resolve contract disputes.</i>
2	12/27/2017	<i>Required cost and schedule contingencies should be reevaluated when CTS excavation is complete</i>
3	12/27/2017	<i>SFMTA should further define the requirements for a possible “Revenue Service Demonstration,” which could involve opening a portion of the line early. The definition of requirements will help to confirm the feasibility and timing of the proposed demonstration.</i>
4	12/27/2017	<i>The CSP Management Team should assess the impacts that schedule acceleration may be having on the quality program for the project and make any necessary adjustments needed to assure that quality is not compromised.</i>
5	12/27/2017	<i>The status of BHAGs should be discussed at each work package status meeting in order to improve the effectiveness of the goals in advancing critical project work.</i>
6	12/27/2017	<i>The trend log tracking should include the amount of time that has passed from the initial identification of the trend.</i>

APPENDIX A. LIST OF ACRONYMS

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

M/E/P	Mechanical, Electrical, and Plumbing
MMRP	Mitigation Monitoring Reporting Program
MOU	Memorandum of Understanding
MPS	Master Project Schedule
MRP	Monthly Progress Report
Muni	Common Public Reference to SFMTA
NCN	Non-conformance Notice
NCR	Non-conformance Report
NEPA	National Environmental Policy Act
NOPC	Notice of Potential Claim
NTP	Notice to Proceed
O&M	Operations & Maintenance
OHA	Operational Hazard Analysis
OP	Oversight Procedure
PCC	Proposed Contract Changes
PE	Preliminary Engineering
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
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
SFWD	San Francisco Water Department
SIT	Systems Integration Test
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. CPUC attends monthly certification review meetings conducted by SFMTA.
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.

Central Subway Project Overview			
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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
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.	
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		

Central Subway Project Overview			
Project mode (Rail, Bus, BRT, Multimode)	Light Rail Transit		
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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 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.
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 for the current construction contract (1300) work package status meetings. The status of safety and security certifications is reviewed at weekly project management meetings.
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 have been developed. Certification is achieved through monthly meetings. Design is complete and construction is underway.

Central Subway Project Overview			
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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 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. Certification reviews are underway for the stations contract.
Has the grantee verified construction specification conformance?	Y		This is on-going as construction progresses and verified through the Safety and Security Certification process
Has the grantee identified safety and security critical tests to be performed prior to passenger operations?	N		Currently being developed.
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 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		Currently no work-arounds have been identified.

Central Subway Project Overview		
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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>
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>	Second draft of Rail Activation Plan has been completed. An Integration Matrix has been implemented for all disciplines including safety and security concerns.
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.
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 follows 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.

Central Subway Project Overview		
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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>
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 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	
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>December 8, 2017</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
12/10/2019			Revenue Operations Date at date of this report

72.8% *Percent Complete Based on Progress (October 2017 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>\$1,139.5 million</i>	Amount of Expenditures at date of this report from Total Project Budget of \$1,578 million
72.2%	Percent Complete based on Expenditures at date of this report
\$9.00 million	Unallocated Contingency remaining
<i>\$75.24 million</i>	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	4Q19		
CURRENT TOTAL CONTINGENCY \$75.24 Million				



APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in 2016. Top risks and selected risks that had not been reviewed in several months were discussed at the August 2017 meeting as noted below. Due to scheduling issues, the PMOC has not attended a project risk mitigation meeting since August 2017.

Top Risks Discussed in the Previous Month:

#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. Some settlement of subsurface utilities has been detected. Gate valves have now been installed on the water lines above the excavation. These allow immediate shut-off of water in the event of a failure in one of the lines or ground settlement that could damage the lines and cause a leak. SFMTA is negotiating the cost of these valves with SFWD.

#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. The largest sources of delay are extra time required to establish merit by SFMTA REs and delays in receipt of formal price proposals from the contractor for merited changes.

#229 – Risk that acceptance testing takes longer than planned, resulting in delays to the RSD. A more detailed schedule for testing is included in the updated RAP. Some testing may be advanced at YBM, as that station will be completed earlier than the other subway stations.

#230 – Insufficient time for Muni Operations involvement in commissioning results in delays and an impact to the RSD. Muni Operations and Management are reviewing the RAP. CSP staff has started more intensive coordination with Muni staff to plan and schedule the necessary tasks.

#232 – Unable to recover accumulated delays, resulting in late RSD. This risk has occurred and the RSD is very likely to be delayed. A schedule containment workshop was held in July 2017. More specific schedule risks will be identified and evaluated in order to establish a range of likely project completion dates.

#234 – This risk that the contractor's proposed alternative SEM excavation method would cause subsidence will continue to be monitored until all SEM operations are completed. Settlement that is occurring is within the expected range and compensation grouting has been completed to arrest the settlement.

#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 NCR through improved tracking logs is continuing. The CNCR log is being updated as appropriate. CNCRs are being identified timely and processed appropriately. The rating of this risk has been reduced.

#36 – Risk of damage to adjacent buildings from compensation grouting at UMS. This very low risk can be retired once the invert slab is placed in the UMS station box and the temporary struts are removed.

#103 – Risk that obtaining required permits will take longer than planned. SFMTA still needs an encroachment permit from Caltrans for work at the I-80 off-ramp on 4th Street. The application has been submitted and SFMTA is answering questions from Caltrans regarding the application

#115 – Risk of water intrusion at the station headwalls due to non-conforming work by the tunnel contractor that has been accepted by the stations contractor. This risk is low but remains until dewatering equipment is decommissioned at all of the stations.

#100 – Risk that late delivery of long-lead items results in delayed completion of the project. This risk will remain until escalators and elevators are delivered.

Discussion to begin identifying more specific schedule risks followed the review of existing risks. More detail will be developed at the next risk mitigation meeting.

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	1/1/2017	3/1/2017	3/21/2017	Initial testing, commissioning, and start-up schedule has been completed.
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	4/2017	4/27/2017	The second draft with additional detail and a schedule for testing and pre-revenue activities was submitted with the 2017 update of the PMP.
Implement Rail Activation Committee	TBD	TBD	TBD	Project is in construction, with RSD 2+ years in the future.
Shadow operations	NA	NA	NA	Project will be operated by the established MUNI operations division.

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 State Safety Oversight (SSO))	<i>Ongoing</i>	10/31/2015	10/31/2015	CPUC triennial review conducted in October 2015 concluded that SFMTA “has a comprehensive System Safety Program Plan (SSPP) and has made significant progress in executing that plan.”
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	09/24/2019	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	09/24/2019	TBD	Punch list completion expected at final completion of 1300 Contract.
Certificates of Occupancy/Substantial Completion	TBD	06/26/2019	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
<i>Safety, Security, and Fire-life Safety Certifications</i>				
Update/Finalize SSMP			2/18/2014	Revision 2 completed.
Finalize and/or update SCIL and SSCP			10/10/2008	Revision 0.
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	NA	NA	NA	Design is complete and construction is underway.
Review status of quality non-conformances	Ongoing	09/24/2019	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	10/11/2019		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	
SSO final certification/signature	TBD	11/19/2019		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	-	12/10/2019		Current forecast RSD. Recovery schedule to be prepared.
FFGA Revenue Service Date	-	12/23/2018		

APPENDIX F. LESSONS LEARNED

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

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

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

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

LL#	Date	Phase	Category	Subject	Lesson Learned
19	5-11-15	Const.	Quality Control	Use of Latest Design Information for Field Inspection	After two roof pours were completed, it was discovered that required reinforcing steel was missing. Changes to the arrangement of the reinforcing steels were made as part of the submittal review and response process. Notes from the designer were included on the approved shop drawings but not in the contract design drawings. Field inspectors were using only the design drawings to confirm the proper installation of reinforcing steel prior to concrete placement. In the future, the latest design information, including submittals and related designer notes, will be used to inspect reinforcing steel prior to concrete placement.
20	9-28-15	Const.	Schedule	Maintenance of Updated Construction Schedule and Master Program Schedule	SFMTA was unable to obtain an acceptable baseline schedule from the station construction contractor for over a year. Then, SFMTA could not obtain acceptable updated status schedules from the contractor for another 8 months. As a result, the construction status and completion date could not be accurately determined for the first 20 months of the contract. This made schedule control impossible. SFMTA finally created its own schedule updates for the first 12 months of the construction contract using the pay applications and 4-week look-ahead schedules from the contractor. Lesson learned – owners should aggressively assert the need for accurate schedule updates from contractors and should withhold payment if such updates are included in the contract terms or specifications and are not forthcoming. If schedule updates are not received within the first few months of the project, the owner should create its own updates for the purpose of progress monitoring and schedule control.

LL#	Date	Phase	Category	Subject	Lesson Learned
21	11-30-15	Const.	Construction Planning	Installation of Special Trackwork in Operating Systems	SFMTA needed to install special trackwork to provide the connection to the new alignment for Central Subway portion the T Third LRT line. The original plan was to install the special trackwork at the intersection in eight extended weekend shutdowns. Working with the contractor, the plan was revised to accomplish the necessary trackwork installations in two shutdowns. After considering the outcome of the first shutdown, where a portion of the special trackwork did not fit properly and needed adjustment during the shutdown, SFMTA decided to pre-assemble the second, more complex, special trackwork assembly at an off-site facility. The assembly was completed and the resulting track was surveyed to confirm the geometry and to assure that the assembly would fit into the existing field conditions. While conducting the assembly and disassembly of the track components, the contractor identified an approach that would reduce the time required to reassemble the trackwork in the field. As a result of the pre-planning and assembly of the complex trackwork, the final assembly was completed without the need for field adjustments and in less time than planned. This was an effective approach to mitigate the risks associated with the installation of complex custom track components in an operating transit line.
22	3-1-17	Const.	Legal/Claims	Preparation for Mediation	A contractor for advance utility relocation issued a multi-million-dollar claim for extra costs due to delays and unforeseen conditions. SFMTA believed the claim had no justification. After several years, the claim was referred for mediation prior to going to trial. The contractor made a very compelling presentation regarding the extra costs. However, due to careful preparation by SFMTA management, the agency was able to provide specific and detailed rebuttals to the contractor's major arguments. The mediation resulted in a settlement for less than 15% of the original claim amount. SFMTA chose to accept the settlement amount, recognizing that the costs to pursue the claim in court would likely exceed the settlement value.

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 30, 2017*.

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 been settled.	

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	\$233.59 million; \$6.2 million is paid from non-project funds
	% Expended	96.6%
	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:	Mass excavation complete at one station and well underway at two other stations.	
Cost:	Original Contract Value	\$839.68 million
	Approved Change Orders	\$7.73 million
	Current Contract Value	\$847.40 million
	Expended to Date	\$535.92 million
	% Expended	63.2%
	SBE Participation	19.2%
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 2018 and forecast June 2019.	
Issues or Concerns:	The work on this contract is behind schedule.	

Contract No.	CS-155-1	
Contract Description:	Design Package 1 for Contracts 1250, 1251, and 1252. PB/Telemon	
Status:	Design is complete. Construction support is nearly complete 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	\$7,937,601
	% Expended	100.0%
	SBE Participation	30.2%
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	\$35,428,038
	Approved Change Orders	\$1,626,722
	Current Contract Value	\$37,054,760
	Expended to Date	\$36,629,789
	% Expended	98.9%
	SBE Participation	35.5%
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	\$14,570,305
	% Expended	84.6%
	SBE Participation	26.4%
Schedule:		
Issues or Concerns:		

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	\$62,684,498
	% Expended	73.6%
	SBE Participation	32.6%
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	\$9,846,888
	% Expended	57.5%
	SBE Participation	29.2%
Schedule:		
Issues or Concerns:		