MONTHLY REPORT
November 2015

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

Draft Report delivered to FTA on December 18, 2015
Final Report delivered to December 29, 2015

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

Work Order Number: 001
OPs Referenced: 01 and 25
CLIN 0002B

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Time on project: *18 months*

EXECUTIVE SUMMARY

Project Description

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

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

Project Status

The Full Funding Grant Agreement (FFGA) was signed on October 11, 2012. Design is complete, and the project has been under construction since February 2010. *At the end of October 2015, the project was 54.65% complete based on expenditures.* There was one active construction contract: 1300 Stations and Systems/Trackwork. The 1252 Contract for construction of the twin subway tunnels achieved final completion on May 15, 2015. Financial close out of the 1252 Contract will occur in the coming months.

The 1300 Contract was 36.8% complete on the basis of incurred cost at the end of October 2015. Substantial completion is scheduled for February 2018, but the SFMTA October Monthly Progress Report states that the most current accepted contractor schedule update still indicates that the station construction work is nine months behind schedule, with completion forecast in November 2018. Tutor Perini Corporation (TPC) has been directed to prepare a recovery schedule to show how the accumulated delays to the construction work can be recovered. **In the opinion of the Project Management Oversight Contractor (PMOC), significant improvements in work productivity *and/or extended work shifts and added crews* will be needed in order for the accumulated delays to be sufficiently recovered to meet the required RSD of December 2018.** SFMTA has not yet received the recovery schedule from TPC, but is pursuing discussions to recover some slippage through changes in the sequence of work and through focused management attention on the factors that are impacting the progress of the work**.** As a result of the delayed completion of station construction, the current program master schedule, which incorporates the contractor's schedule updates through October 2015, indicates that Revenue Service Date (RSD) will be achieved in May 2019, five months later than the date required in the FFGA. The entire schedule contingency in the program master schedule

has now been consumed by the delays to the station construction, and the project schedule now has negative float. Further delays to the station construction may push the forecast RSD even later.

In the opinion of the PMOC, measures implemented to recover the accumulated delays to the station construction work are not yet showing results. The opportunities to recover the schedule delays will be more limited as time passes, so it is very important for SFMTA and the contractor to work collaboratively to identify and implement schedule containment strategies soon. SFMTA also should be exploring strategies to reduce the time between substantial completion of the 1300 Contract and the RSD. *The PMOC facilitated a schedule recovery workshop for the CSP on November 18 and 19, 2015. The findings of the workshop are documented in a draft report that is currently under review by FTA and SFMTA.*

Table 1 - Core Accountability Items

Project Status:		**Original at FFGA:**	**Current Estimate:**
Cost	Cost Estimate	$1,578,300,000	$1,578,300,000
Contingency	Unallocated Contingency	$74,722,000	$*24,519,456*
	Total Contingency (Allocated Plus Unallocated, Including Approved Contract Changes)	$185,500,000	*$84,322,397*
Schedule	Revenue Service Date	12/26/2018	*05/2019 (forecast)*
Total Project Percent Complete	Based on Expenditures	*54.65%*	
	Based on Earned Value	*57.93%*	

Major Issues	**Status**	**Comments/Planned Action**
Schedule Contingency	*Based on the status of construction reflected in the updated station construction schedule, there is negative schedule float of 5.0 months based on the available schedule data.*	The minimum schedule contingency agreed to at this stage of the project is *6.0* months. *The PMOC conducted schedule containment workshops on November 18 and 19, 2015. The results of the workshop are documented in a draft report that is currently under review.*

Major Issues	Status	Comments/Planned Action
Cost Contingency	The current Total Contingency is $*84.3* million. The FTA recommends a minimum contingency level of $60 million.	The availability of excess cost contingency may make it possible to implement strategies to accelerate the construction work that could increase project cost.
Technical Capacity and Capability	All management positions in the organization are filled.	The PMOC is assessing the effectiveness of the SFMTA CSP team in managing the project through routine on-site monitoring.
Date of Next Quarterly Meeting:		*February 3, 2015*

- Earned Value (EV): $*914,311,093*, *an increase of $8.04 million from September*
- Planned Value: *$1,129,829,298, an increase of $9.24 million from September*.
- Actual Cost: *$862,556,970, an increase of $15.44 million from September*.
- Cost Performance Index (CPI): *1.06.* A value greater than 1 means that value of the work completed is more than the cost of the work (under budget) and less than 1 means that the value of the work is less than the cost of the work (over budget). *SFMTA believes that TPC is under-reporting actual costs, thereby resulting in an overstated CPI.*

Schedule Performance Index (SPI): 0.81. SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90; the current SPI indicates unacceptable schedule performance. *The SPI is unchanged from the September reporting period.*

Contingency

Cost Contingency

The total available contingency (approved contingency plus approved contract changes) is $84,322,397, which is above the minimum required contingency of $60 million. Over $21,000,000 in allocated contingency was previously transferred out of the Tunnel project as a result of the successful, under-budget completion of this major element of work. Unallocated contingency is now $24.5 million. **In the opinion of the PMOC, the available cost contingency is likely to be sufficient to provide reasonable assurance of on-budget completion of the project.** ***However, the accumulated delays to the construction raise the potential for contractor time impact claims and, if the delays are determined to be SFMTA's responsibility, associated extra costs. To date the contractor has not demonstrated that SFMTA has any responsibility for the delays.***

Schedule Contingency

The Program Master Schedule for the Central Subway Project now shows no buffer float and a forecast RSD five months later than required. An approved, updated 1300 Contract schedule is now available and has been incorporated into the master schedule, with the latest master schedule incorporating progress through September 2015. SFMTA reports that the contractor's latest approved schedule update continues to indicate nine months of delay to the 1300 Contract. The agreed level of schedule contingency after demobilization of the tunnel work is 6.0 months. **In the opinion of the PMOC, SFMTA needs to identify at least 11 months of time savings for the remaining work in the CSP in order to have sufficient schedule float to provide reasonable assurance of on-time completion of the project.**

PMOC Observations, Opinions, and Concerns

- In the opinion of the PMOC, the tunnel contractor should prepare an analysis of the cause of the failure at Cross Passage 5. The contractor is contesting SFMTA's assertion that this analysis is required by contract. The PMOC understands that SFMTA is considering withholding the estimated cost of this analysis from the final payment to the tunnel contractor.
- PMOC Concern: The latest program master schedule forecasts that the RSD will be five months later than planned. In the opinion of the PMOC, significant improvements in work productivity *and or extended work shifts and additional crews* will need to occur in order for the accumulated delays to be sufficiently recovered to meet the required RSD of December 2018.
- *In the opinion of the PMOC, the first round of short-term schedule achievement milestones had mixed results and there appears to have been little impact on the forecast completion date for construction. Now that an adopted baseline schedule and accepted updates to the schedule are available, SFMTA is encouraged to work with the contractor to make further improvements to the schedule tool and to identify schedule recovery strategies. SFMTA is further encouraged to continue to improve the collaboration between the agency construction staff and the contractor so as to advance the construction work. SFMTA is also encouraged to work with the contractor to define additional short-term and longer-term key performance targets that will help to advance critical path work based on the approved, fully-updated construction schedule.*
- In accordance with FTA guidelines, a minimum of 6.0 months of schedule contingency is recommended at this phase of the project. At present there is negative float in the schedule, resulting in a late date for project completion. In the opinion of the PMOC, SFMTA needs to identify at least 11 months of time savings for the remaining work in the CSP in order to have sufficient schedule float to provide reasonable assurance of on-time completion of the project. The opportunities to recover the schedule delays will be more

limited as time passes, so it is very important for SFMTA and the contractor to work collaboratively to identify and implement schedule containment strategies soon.

- In the opinion of the PMOC, the total cost contingency, including unallocated contingency and less identified trends, of *10.4%* of the potential remaining spending is sufficient to provide reasonable assurance of on-budget completion of the project. The available contingency is well above the recommended minimum of $60 million. *However, if efforts to recover the accumulated schedule delays are unsuccessful and SFMTA is shown to be responsible for portions of the delay, there is a potential for increased project cost. To date the contractor has not demonstrated that SFMTA is responsible for any of the accumulated delays.*
- Based on its review of the Second Quarter 2015 Mitigation Monitoring Reporting Program (MMRP), the PMOC concludes that SFMTA is conducting monitoring in accordance with the established plan and that SFMTA is implementing appropriate mitigation actions when conditions that could lead to significant impacts are encountered.
- In the opinion of the PMOC, there are a large number of potential contract changes in process that could lead to significant increases in the cost of the 1300 Contract. The allocated contingency, adjusted for potential changes to the Contract, is only 1% of the remaining work. Unallocated contingency will likely need to be transferred to the 1300 Contract before work is complete.
- In the opinion of the PMOC, the trend and change management summary reports now being published by SFMTA improve the accuracy of forecasts of cost at completion and should help to expedite the completion of the contract modification process for justified contract changes. *However, the PMOC notes that no change orders have been executed for the 1300 Contract in many months and the backlog of pending change orders is quite large.*
- *The PMOC's Quality Review of the project concluded that the SFMTA staff is implementing the SFMTA Quality Assurance (QA) Program as described in the SFMTA Quality Management Plan (QMP). While the PMOC review included recommendations to clarify organizational reporting relationships and to document SFMTA and contractor senior management's support for the QA program, the fundamental implementation of the SFMTA quality program and SFMTA management's support of the program were readily apparent during the PMOC's QA program review.*

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A. PROJECT STATUS

Full Funding Grant Agreement (FFGA)

The FFGA was signed on October 11, 2012.

Design

All designs are complete.

Construction

Contract 1250 (UR #1). This contract relocated utilities within the footprint of the proposed YBM Station, and work is complete.

Contract 1251 (UR #2). This contract relocated utility lines within the footprint of the proposed UMS Station and temporarily rerouted existing trolley coach lines around the construction zone. The work is complete.

Contract 1252 Tunnel. This contract completed the construction of 1.5 miles of twin tunnels by tunnel boring machines and the tunnel portal and retrieval shaft.

- Final completion has been achieved and final close out will occur over the coming months.
- **In the opinion of the PMOC, the contractor should prepare an analysis of the cause of the subsidence at Cross Passage 5 (4th and Jessie streets).** The contractor is contesting SFMTA's assertion that the analysis is required under the contract. SFMTA is considering withholding the estimated cost of preparing the analysis from the final payment for the tunnel work.
- More than $21 million in allocated contingency for this contract was previously transferred to unallocated project contingency.

Contract 1300 (Combination of UMS, CTS, YBM, and STS). This contract is constructing three underground stations, one surface station, all surface works required for the installation of LRT between 4th and King streets and the tunnel portal, and all LRT track and systems components.

- *As of the end of October 2015, the construction of the Stations and Surface, Track, and Systems contract was 36.8% complete on the basis of cost and 43.2% complete on the basis of completed construction. SFMTA believes that the reported cost to date is understated due to issues with the cost-loading of the contractor's schedule for completed tasks.*
- Union Square/Market Street Station (UMS): *A portion of the roof deck of the Ellis Street Annex was completed and one lane of traffic was opened for public access on the north side of the street. The triangle formed by Market Street, the westbound lane of Ellis Street, and the western end of the Ellis Street Annex remained uncovered until waterproofing of*

the joint between the new CSP structure and the existing Powell Street Station could be completed and tested. That work and subsequent backfilling and paving was expected to be completed in mid-December. Modifications to the Union Square Garage progressed and the garage was readied for turnover to the garage operator for the holiday shopping season. Minor interior structural work on the areas of the garage that remain closed to the public was expected to continue in December. At the main station box, double shifts were being used to advance work on the structural support for the roof deck, with a target of completing all sections of the station box roof deck by the holiday work moratorium. When construction was halted to complete preparations for the holiday construction moratorium, the contractor had completed approximately two-thirds of the roof deck above the main station box, with two large segments and one short segment yet to be completed. At the north concourse, the roof deck was completed and backfilling was started. Backfilling will be completed after final utility connections are made in the area, with temporary paving scheduled to be completed in mid-December.

- Chinatown Station (CTS): *Installation of compensation grout tubes in the station headhouse was completed. Excavation inside the headhouse progressed to the third level of struts, and strut and waler installation at the second level was completed in early November. Level 3 struts are scheduled to be installed in December, with excavation toward level 4 starting late in December. Installation of dewatering wells in Stockton Street above the station area was completed in early November. Construction work on the composite walls that will help to support the cross cut cavern from the headhouse to the station platforms started in November and will extend into the first week of December. Utility work at the north concourse in advance of the placement of dewatering wells and construction of the north access shaft was completed. Two of the support piles for the north access shaft will need to be replaced, which will delay the start of excavation of the shaft.* Preparations for energizing the temporary power station for construction power continued, and the temporary power is expected to be operational in December.
- Yerba Buena/Moscone Station (YBM): *Traffic continues to flow on the two traffic lanes on the east Side of 4th Street while construction staging is occurring on the western two lanes of 4th Street. The unoccupied building just to the north of the headhouse across Clementina Street was demolished and construction of a new building is now underway by another contractor. Thus far, the construction of this building has been effectively coordinated with the ongoing station construction and has not caused any impacts to progress on the station work. The third level of strut and waler installation was completed in the headhouse, and excavation progressed below these supports to level four. Installation of the level 4 temporary supports is scheduled to occur in December. In the station box, the mud slab that will act as the bottom of the form system for the mezzanine level floor slab has been placed. The mezzanine slab is planned to be placed in six separate pours that will stretch through November and December. Two of the sections had been completed as of the end of November. Backfilling of the portion of the headhouse*

roof slab under Clementina Street was completed and this portion of Clementina Street is being used as an access route for construction of the station and the adjacent private building.

- Surface, Track, and Systems (STS): Muni Traction Power duct bank (MRY), water line, alternative water supply system (AWSS)*, street lighting, traffic signal,* and sewer work continued. *The second stage of the cutover of service at the 4th and King intersection was successfully executed during an extended shutdown over the Veteran's Day weekend and adjacent weekdays. This stage completed the installation of all new trackwork for the connection of the T Third line to the new CSP alignment along 4th Street. The complex trackwork for the crossing was assembled in advance at a SFMTA maintenance facility. The resulting completed track assembly was surveyed to check dimensions with the dimensions of the existing track components to which it would be attached. Required adjustments in geometry were made and the construction crew identified an assembly approach that reduced the time required to make the final installation. The detailed advance planning and off-site assembly for the work resulted in a smooth installation that was completed in less time than planned. This effective approach to the installation of special trackwork within an operating transit line has been identified as a lesson learned. Brief traffic shutdowns will be implemented in the future for installation of signaling and traction power systems at this location. The PMOC was informed that minor problems with the geometry of the curves connecting the T line to the Embarcadero line have surfaced. The LRV wheels appear to be contacting the concrete pavement adjacent to the rails and the edges of the pavement have been ground down to allow the wheels to pass through the curve. The designer and contractor are researching the issue. The contractor began preparations for work in the tunnel. The temporary ventilation and other equipment left by the tunnel contractor were removed and cleaning of the tunnel was started. The contractor also began staging reinforcing steel inside the tunnel in preparation for placement of the track slab.*

- **In the opinion of the PMOC, the contractor and CSP staff members are now working cooperatively to advance progress on construction of the three CSP subway stations.** *However, there has been only minor recovery of the construction schedule from accumulated delays.* SFMTA and the contractor established short-term performance milestones as a way to focus the combined efforts of the contractor and SFMTA project staff on advancing the work. *The results for the first set of milestones were mixed, with several of the target dates being missed. New milestones will need to be identified for upcoming work.* **The PMOC supports the establishment of interim performance milestones as a way to encourage effective team collaboration and encourages SFMTA and the contractor to assess and set additional targets based on the critical path of the updated and approved construction schedule.**

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

Bay Area Rapid Transit (BART)

No updates to report.

Caltrans

No updates to report.

CPUC Communications

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/FTA Quarterly Progress Review Meetings (QPRMs). *Two items related to the tunnel construction remain to be certified. These items are currently under review by SFMTA's Safety department and are expected to be forwarded to CPUC for concurrence in the near future.*

San Francisco Public Utilities Commission (SFPUC)

No updates to report.

San Francisco Department of Public Works (SFDPW)

No updates to report.

San Francisco Parks and Recreation Department

No updates to report.

Private Property Owners

For 19 Stockton Street (Armani Exchange Building), condemnation was filed in February 2013. Pre-judgment possession was granted October 3, 2013, allowing the City access to install monitoring equipment and compensation grout tubes at the property. A settlement conference was held in November 2014 in advance of the compensation trial, which was held as scheduled in December. The judgment regarding the value of the license for the property is pending.

The project has installed settlement monitoring equipment at sensitive buildings adjacent to the project. There are now 370 total licenses for monitoring equipment (ten were added to address the potential Pagoda retrieval shaft) and property agreements. The monitoring equipment is in the process of being removed or transferred to the station contractor, as the need for ongoing monitoring during station construction dictates.

Vehicle Status of Design, Procurement, Testing, and Integration

Vehicle design is underway by Siemens Corporation for 4 LRVs for the Central Subway, 20 LRVs for near-term fleet expansion, and 151 LRVs for fleet replacement. Options for up to 85

additional vehicles are available for fleet expansion. The vehicle design and assembly process is reported to be on schedule, with the first cars due to be delivered to SFMTA in 2016, well ahead of the CSP opening date.

Real Estate

All project right-of-way has been acquired, and all commercial and residential relocations are complete. Value judgments for a few of the acquisitions are not yet finalized.

Labor Relations and Policies

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

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

No updates to report.

B. PROJECT MANAGEMENT PLAN AND SUB-PLAN IMPLEMENTATION

Project Management Plan (PMP)

The latest update of the PMP was received by the PMOC in early May 2015. This plan includes the initial draft of the Rail Activation Plan.

Environmental Assessment/Mitigation Plan/Archaeological Plans

The PMOC received the Third Quarter 2015 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on November 19, 2015. ***The PMOC will review this document in December.*** **Based on its previous review of the Second Quarter MMRP, the PMOC concludes that SFMTA is conducting monitoring in accordance with the established plan and that SFMTA is implementing appropriate mitigation actions when conditions that could lead to significant impacts are encountered.**

Real Estate Acquisition Management Plan (RAMP)

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

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

See section F.

Safety and Security Management Plan (SSMP)

See section G.

Risk and Contingency Management Plan (RCMP)

See section H.

C. PROJECT MANAGEMENT CAPABILITY AND CAPACITY

The PMOC received the latest update of the PMP in early May 2015. This plan included the updated organization chart provided to the PMOC in March.

Agency Staff

Total project staff levels are close to the planned values. SFMTA reported that they plan to hire a specialist for system start-up in the near future and that an additional office engineer and one or more field inspectors will be hired in the coming months.

Contractor Staff

The contractor has hired a new system integration specialist. *This staff member played a key role in the recently completed second phase of trackwork and systems installation at 4th and King Streets. The system integration specialist will be engaged in preparation of submittals and managing the installation of track and systems elements in the tunnels.*

D. PROJECT COST STATUS

Project Cost Control Systems

SFMTA continues its efforts to create a useful Trend Log 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. A companion contract change management log includes items that have been determined to have merit and are progressing through negotiations toward a contract modification (CMod). SFMTA is attempting to improve the timeliness of processing determinations of merit as well as the progression of pending contract changes and completion of CMods by creating summary tables of the numbers of items that are in the various stages of processing. **In the opinion of the PMOC, the trend and change management summary reports now being published by SFMTA improve the accuracy of forecasts of cost at completion and should help to expedite the completion of the contract modification process for justified contract changes.** ***However, no contract modifications have been executed for several months, although there are many pending modifications that have been in process for an extended time.***

Project Cost

Cost estimate: $1.5783 billion.

Total contingency: *$84.32 million* (minimum contingency is $60 million), *unchanged from September.*

Total net incurred costs: *$862,556,970, an increase of $15.44 million from September (54.65% of the total project budget).*

Current funding level: $1,179,794,000 (74.8% of the total project budget).

Earned Value (EV): *$914,311,093, an increase of $8.04 million from September.*

Planned Value: *$1,129,829,298, an increase of $9.24 million from September.*

Cost Performance Index (CPI): *1.06.* SFMTA believes that TPC is under-reporting actual costs, thereby resulting in an overstated CPI.

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

A settlement conference for the Total Cost Claim made by the utility relocation contractor for the 1250 Contract resulted in a settlement amount of $787,000. This additional project cost will be taken from the unallocated contingency. An additional outstanding claim by the 1251 contractor of $3.8 million is still pending resolution. SFMTA is of the opinion that the claim on the 1251 Contract has less merit than the settled claim on the 1250 Contract. Potential costs for the 1251 Contract claim are not being carried in the project Trend Log.

Project Cost Trends

SFMTA tracks potential changes in project cost, calling these potential changes "trends." Trends include all potential changes in the contract value. As the status of an identified trend changes, it may become a contract modification, it may become an item that is paid on a force account basis, or it may be denied/closed with no impact to the project cost. Extra cost items identified by the 1300 contractor that CSP management concludes have no merit are carried in the total trend amount at 50% of the contractor's estimate of extra costs. Table 2 summarizes the trends for the two construction contracts that have not attained financial close out.

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

	1252 - Tunnel	1300 Stations, STS
Original Contract	233,584,015	839,676,396
Approved Contingency	2,484,953	20,000,000
Extra Budget for Non-Project Costs	6,173,508	
Approved Budget	236,068,968	859,676,396
Approved Changes	1,421,807	(1,016,585)
Current Contract (1252 does not include non-project costs)	235,005,822	838,659,811
Remaining Contingency	1,063,146	21,016,585
Potential Changes (Trends)	(77,798)	*16,213,565*
Potential Contract	234,928,024	*854,873,380*
Contingency Less Trends	1,140,944	*4,803,020*

	1252 - Tunnel	1300 Stations, STS
Spent to Date	234,616,104	*316,241,970*
Potential Left to Spend	311,920	*538,631,410*
Contingency Less Trends as % of Potential Cost to Complete	365.8%	*0.9%*

[1] As reported in the *October* 2015 Central Subway Project Monthly Progress Report – SFMTA.

SFMTA previously transferred more than $21 million of remaining contingency that had been allocated to the 1252 Contract to unallocated contingency. The remaining contingency, less identified trends, represents 366% of the potential left to spend for Contract 1252 and *0.9%* of the potential left to spend for Contract 1300. The combined allocated contingency for all construction work less identified trends represents about *1.3%* of the potential remaining construction expenditure. **In the opinion of the PMOC, the allocated contingency for the 1252 Contract is greater than the amount required to assure completion of the contract within the budget. The allocated contingency for the 1300 Contract is likely not sufficient to complete the contract, and the overall allocated contingency is inadequate for the percentage completion level of construction. However, there appears to be sufficient unallocated contingency and excess allocated contingency from other program components for successful completion of the program. However, increased cost claims from the 1300 contractor due to delays could consume some of the available contingency.**

Table 3 shows the overall budget, trends, and contingency status for the entire Central Subway program. **As shown, the total contingency, including unallocated contingency and less identified trends, represents 10.4% of the potential remaining spending, which, in the opinion of the PMOC, is sufficient to provide reasonable assurance of on-budget completion of the project.**

Table 3 - Budget and Contingency Status for Central Subway Project[2]

	Total Construction	Right of Way	Vehicles	Professional Services	Unallocated Contingency	Total Program
Original Contract	1,130,842,772	36,511,799	24,108,712	310,518,041		1,501,981,324
Approved Contingency	30,301,196	1,000,000	2,276,941	18,221,079	10,019,456	61,818,672
Extra Budget for Non – Project Costs	6,173,508					
Approved Budget (w/o Extra Launch Shaft Cost)	1,161,143,968	37,511,799	26,385,653	328,739,120	10,019,456	1,563,799,996
Approved Changes	7,061,465	(4,265,478)	(10,799,712)			(8,003,725)
Current Contract	1,137,904,237	32,246,321	13,309,000	310,518,041	10,019,456	1,493,977,599
Remaining Contingency	23,239,731	5,265,478	13,076,653	18,221,079	24,519,456	84,322,397

	Total Construction	Right of Way	Vehicles	Professional Services	Unallocated Contingency	Total Program
Potential Changes (Trends)	*16,135,767*	-	-	-		*16,135,767*
Potential Contract	*1,154,040,008*	*32,246,321*	*13,309,000*	*310,518,041*		*1,510,113,370*
Contingency Less Trends	*7,103,964*	*5,265,478*	*13,076,653*	*18,221,079*	*24,519,456*	*68,186,630*
Spent to Date	*609,836,339*	*30,467,005*	*2,147,204*	*220,106,422*		*862,556,970*
Potential Left to Spend	*544,203,669*	*1,779,316*	*11,161,796*	*90,411,619*		*647,556,400*
Contingency Less Trends/Potential Left to Spend	*1.3%*	*295.9%*	*117.2%*	*20.2%*		*10.5%*

[2] As reported in the *October* 2015 Central Subway Project Monthly Progress Report – SFMTA.

Change Order Control

SFMTA is estimating that additional CMods with a net reduction in contract value of $77,798 will be executed as part of contract close out for the 1252 Contract. Based on discussions between the PMOC and SFMTA, there are a number of potential modifications, including cost increases and cost reductions that are likely to balance out. *SFMTA will hold a negotiating session with the 1252 contractor on December 16, 2015 in an effort to reach final agreement on the contract final cost.*

SFMTA continues to refine its management tools for tracking potential contract changes for the 1300 Contract. The latest summary report is titled, "CN1300 Trend Statistics" and is dated *December 9, 2015. This report continues to show that 10 contract modifications have been executed for a net reduction in the contract value of $1,016,585. One contract modification for $32,302 is ready for execution, which represents no change from the November status.* ***In the opinion of the PMOC, contract modifications are taking an inordinate amount of time to be executed.*** *Change Order Requests (generated by the contractor) that have been determined to have merit and Proposed Contract Changes (generated by SFMTA) have an expected value of $9,529,919 in increased contract value, which is $1.84 million higher than in November. An additional 136 items are being tracked in the Trend Log with a net value of $8.91 million in possible contract value increases.* Of these, 119 have been judged by SFMTA to be without merit, but are being carried at a reduced value in the trend to address potential future claims.

The most recent version of the complete Trend Statistics Summary for the 1300 Contract dated December 9, 2015 shows a total potential increase in contract cost of $17,452,205, including the $1.02 million in contract decreases executed thus far. Adjusting the total to reflect its estimate of those trends that would not result in contract changes, *SFMTA estimated the total potential cost increase for the 1300 Contract at $16.135 million as of the end of October, an increase of*

$530,900 from the end of September. The following trend items with potential cost increases in excess of $250,000 are identified in the Trend Log:

1. Changes to traffic signals and street lights - $298,307
2. Change to grade 50 steel from specified grade 70 steel (due to availability and Buy America issues) - $595,197
3. Extra trucking costs for contaminated soil at CTS - $1,714,205
4. Harder rock than anticipated for CTS slurry wall excavation - $2,820,600
5. Delays to installation of tangent piles at UMS - $1,074,229 (reduced from previous estimate)
6. Changes to underpinning requirements for support of UMS Garage - $474,470
7. Changes in construction sequence for UMS Garage - $500,000
8. Obstructions to jet grout placement at UMS - $965,550
9. Additional instrumentation for detection of ground movement - $429,777
10. 12" water line conflict at UMS - $293, 538
11. Changes in installation requirements for art glass at UMS - $681,978
12. Additional instrumentation for station construction - $429,777
13. New emergency stop switch for CSP operations - $315,001
14. Removal of temporary facilities from 1252 Contract in tunnel - $345,001
15. Hydrocarbons in excavated soil at CTS headhouse - $500,000
16. *12" water line conflict at YBM - $355,711*
17. *Additional traffic control requirements at 4th and King - $675,001*
18. *Changes to AWSS layout at 4th and King - $295,269*
19. Changes in requirements for pre-stressing temporary struts at UMS - $250,001

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. Building cost savings from deletion of ARS - ($600,000)

In the opinion of the PMOC, the large number of pending contract changes could lead to significant increases in the cost of the 1300 Contract. The allocated contingency, adjusted for potential changes to the Contract, is only 1% of the remaining work. Unallocated contingency will likely need to be transferred to the 1300 Contract before work is complete.

Funding and Expenditures

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

Table 4 - Project Funding

Source	Committed ($1,000)	Awarded ($1,000)
Federal		
New Starts	942,200	619,196
Congestion Mitigation	41,025	41,025
Federal Subtotal	983,225	660,221
State		
TCRP	14,000	14,000
State RIP	88,000	12,498
Prop. 1B / PTMISEA	307,792	307,792
Prop. 1A / HSR	61,308	61,308
State Subtotal	471,100	395,598
Local		
Prop. K Sales Tax	123,975	123,975
Local Subtotal	123,975	123,975
Project Total:	**1,578,300**	**1,179,794**

E. PROJECT SCHEDULE STATUS

The Contractor's October 2015 schedule update indicated that the construction work continued to be nine months behind schedule. The critical path for the construction work continues to flow through the construction of CTS. The projected RSD is still forecast for May 2019, five months later than planned. The most recent schedule update still shows that there is no float on the project critical path and that time savings must be identified for the remaining work if the project is to be completed on time.

As a means of encouraging better collaboration among the project participants, SFMTA and TPC identified several short-term performance targets that were considered to be crucial to the overall progress of the work. The parties believed that successful completion of the identified work according to the adopted schedule would reinforce the working relationships on the team and provide confidence that the team members could work cooperatively toward important schedule objectives. SFMTA had hoped that longer-term plans for schedule recovery could be developed based on the working relationships established through the focus on short-term performance targets. *The results of the focus on the short-term performance targets was mixed, with some milestones being achieved and others missed. Table 5 shows the final status of the initial set of identified milestones.*

Table 5 - Status of Central Subway Station Construction Milestones[3]

Milestone	*Target Date*	*Status*
Complete submittal for Union Square Garage (UMS)	July 13, 2015	Completed on time
Complete station roof slab and related work at Geary intersection (UMS)	14 weeks	*Completed later than planned*
Complete station roof deck	November 26, 2015	*Approximately 2/3 of the deck was completed prior to the start of the holiday construction moratorium*
Restore traffic on Ellis Street by Labor Day (UMS)	Revised to Late October 2015	*Partially achieved in late November 2015*
Open all lanes on 4th and start excavation of station box (YBM)	September 7, 2015	Two lanes opened on east side, completed 9/13/15. *Traffic remains restricted to two lanes*
Open north side of 4th and King intersection to traffic ASAP	August 14, 2015	*Completed all trackwork in the intersection well ahead of the original schedule for this work*

[3] *SFMTA Management Meeting, 12/7/2015*

Project Schedule Data

- *Earned Value (EV): $914,311,093, an increase of $8.04 million from September.*
- *Planned Value: $1,129,829,298, an increase of $9.24 million from September.*
- *Schedule Performance Index (SPI):* 0.81. SPI greater than 1 is ahead of schedule and less than 1 is behind schedule. SFMTA has identified the minimum acceptable SPI to be 0.90; the current SPI indicates unacceptable schedule performance. *The SPI is unchanged from the September reporting period.*

SPI is a measure of schedule efficiency on a project. It is the ratio of earned value to planned value. An SPI equal to or greater than 1 indicates more work was completed than planned and a value of less than 1 indicates less work was completed than planned. A value of equal to or greater than 0.9 reflects satisfactory performance, considering the margin of error in estimating both earned value and planned value. The current value of 0.81 indicates that the project is significantly behind schedule

In the opinion of the PMOC, the incorporation of the updated TPC schedule into the calculation of earned value results in more reliable measures of schedule performance of the project. Based on the low value of the SPI, SFMTA should be working with the 1300 contractor to identify schedule containment strategies and it should be exploring ways to reduce the time between completion of the construction contract and the RSD.

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), November 2018 (F)
RSD:	December 26, 2018 (P), May 2019 (F)

The current master schedule (incorporating the approved 1300 Contract baseline schedule and updated actual progress through October 2015) reflects negative buffer float and late completion of the project.

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 at this time of the project is 6.0 months. As noted above, the current schedule reflects five months of negative buffer float. **In the opinion of the PMOC, time savings of approximately 11 months for the remaining work should be identified in order to offset the accumulated construction delays and establish an appropriate amount of schedule float.**

SFMTA reported that the project partnering session held in early July concentrated on the project schedule and ways to advance the construction work. The group's opinion was that if the project team could work together to meet mutually agreed short-term targets it would increase the overall confidence of the team in its ability to advance the project. *SFMTA reported to the Dispute Review Board for the CSP in December that the team was still not working together as effectively as needed to recover the accumulated delays. SFMTA also reported to the PMOC that it continues to hold executive level partnering meetings with TPC and that the contractor is starting to engage in efforts to recover the schedule.* ***In the opinion of the PMOC, the first round of short-term milestones had mixed results and there appears to have been little impact on the forecast completion date for construction. Now that an adopted baseline schedule and accepted updates to the schedule are available, SFMTA is encouraged to work with the***

contractor to make further improvements to the schedule tool and to identify schedule recovery strategies. SFMTA is further encouraged to continue to improve the collaboration between the agency construction staff and the contractor so as to advance the construction work. SFMTA is also encouraged to work with the contractor to define additional short-term and longer-term performance targets that will help to advance critical path work based on the approved, fully-updated construction schedule.

Critical Path Summary *(Baseline Schedule)*

- CTS Install Guidewalls, Slurry Walls, and Install Surface Deck
- CTS Excavate Headhouse and Bracing
- CTS Sequential Excavation Method and Install Supports
- 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 Complete
- Safety and Security Certification / Pre-Revenue Activities
- RSD on December 26, 2018 (currently forecast in *May 2019*)

The PMOC notes that the critical path was reported to have changed from CTS to UMS construction activities based on the schedule updates through February 2015. However, the sequence of work was revised for UMS, resulting in time savings that caused the critical path to revert to the CTS construction.

Three Month Look-ahead

The following activities are planned over the next three months:

1300 Contract

UMS

- *Complete utility connections and backfill the roof deck at the north concourse, allowing for Stockton Street to be re-opened north of Geary Street*
- *Complete waterproofing the interface between the Powell Station and the Ellis Street Annex, finalize utility connections and complete the paving of Ellis Street*
- *Continue Union Square Garage (USG) shear wall installation for permanent structural support for north concourse entrance*
- Install shoring in the tunnel and prepare the tunnel for break-in
- *Maintain the Winter Walk, suspend most construction for the holiday moratorium and remobilize construction in January 2015*

- *Complete the remaining sections of the station box roof deck and start excavation to platform level*
- *Address utility conflicts for the jet grout program and finish the placement of jet grout columns around the main station box*

CTS

- *Initiate dewatering*
- *Completed installation of level 3 struts and walers*
- Build composite wall over cross cut cavern opening
- *Drill and install barrel vault pipe canopy to form top of cross cut cavern*
- Slip line brick sewer on Stockton Street
- Excavate inside headhouse, and install temporary struts to level 4
- *Repair piles, excavate the north access shaft, and install excavation support*
- *Energize the temporary construction power station*

YBM

- *Continue headhouse excavation, install level 4 temporary bracing*
- *Complete placement of the mezzanine level floor slab within the station box*
- *Start excavation under the mezzanine to concourse level in the station box*

STS

- Sewer installation and repair
- Water line installation
- Alternative Water Supply System (AWSS) installation
- Muni ductbank installation
- Installation of fiber optic cable by AT&T
- *Start installation tunnel invert slab*

The PMOC expects to attend the following meetings:

- Weekly Management (first Monday of each month)
- Weekly Contract 1300 Construction Progress (*now conducted in separate meetings for each of the four work packages; first Tuesday and first Wednesday of the month)*
- Weekly Configuration Management Board (CMB) (first Wednesday of each month)
- Monthly CSP Risk Management Meetings (first Thursday of each month)

- CSP month-end meetings on January 5, 2016*;* February 2, 2016; and March 1, 2016
- FTA/QPRM scheduled for February 3, 2016

F. QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC Plan Implementation

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

For each of the construction contracts, the 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. For the stations contract, the CQM is provided by a subcontractor. The reporting structure is to provide the CQM with direct access to the contractor's Principal Officers. For each of the construction contracts, a Contractor Non-Conformance Report (CNCR) Log for identifying, correcting, documenting, and controlling non-conformances is maintained by the contractor. Subsequent work may not progress for work that is the subject of a Corrective Action Request (CAR) until conditions adverse to quality are corrected.

According to contract requirements, the 1252 contractor must complete a root cause analysis in order to close the CNCR related to the subsidence at Cross Passage 5. *The contractor is refusing to conduct this analysis and SFMTA is working to close the related CNCR. There will likely be a deduction in the contract value for the estimated cost of the root cause analysis that was not conducted.*

The contractor's commitment to quality and the execution of the contractor's Quality Management Plan have been concerns of SFMTA for the 1300 Contract. SFMTA completed an audit of the TPC Quality Control system, including staff and procedures in May. That audit was completed in early June, identifying six corrective actions to be taken by the contractor.

Construction crew attention to quality remains an issue. The following quality issues and concerns for the 1300 Stations Contract were identified in the SFMTA *October* monthly report:

- *Assurance that all RFIs, submittals, and USE-AS-IS and REPAIR dispositioned CNCRs related to a particular concrete placement, have been approved by the SFMTA Resident Engineers (REs). Practically, SFMTA REs have imposed a concrete placement hold point for all concrete placements to collectively ensure that the contractor has performed all work to the requirements of the Contract Documents, i.e., all RFIs, CNCRs, and submittals have been approved and acceptably executed.*
- *The possible impacts on quality of compressing the schedule for UMS work to accommodate the annual holiday construction moratorium.*

- *SFMTA's provision of advance notification to TPC/TPC QC, of in-process work that appears to be deficient or of questionable nature, is not mitigated/reconciled in a timely manner, if at all.*

- Necessity of using both Reinforcing Steel Design Drawings and approved Reinforcing Steel Shop Drawings to inspect/accept rebar placement. The requirement to use approved shop drawings was identified as a preventative measure for improper/incomplete placement of reinforcing steel. It is common practice to assure that the latest approved submittals and shop drawings are available in the field, for use by both the construction crews and the QC inspectors, to assure proper installation of all constructed elements.

- Incomplete/confusing shop drawing submittals for UMS structural steel resulting in QC and or QA stopping TPC from making welded connections upon discovery that approved details are missing.

- *Maintenance of the procedure to facilitate the verification that welds to be embedded in concrete have been inspected and accepted or CNCRs generated and closed, prior to final sign-offs on each concrete placement. Smith Emery (TPC's QC representative) continues to update and refine their spreadsheet "tool" that is used by TPC QC to account for the acceptability and associated documentation by Certified Welding Inspectors (CWIs) for all welded joints that are to be embedded in concrete.*

- Document control issues within the CM13 software system.

- *The large number of Field Notifications issued by SFMTA to TPC for work at UMS (notice that work does not conform with contract requirements and should have been identified through the CNCR process).*

As of December 8, 2015, 144 CNCRs had been filed by TPC's Quality Manager, and 24 items remained open. The PMOC conducted a Quality Review of the CSP in September, and a draft report was delivered to FTA for review in late September. That report was finalized in early November 2015. *The report identified recommended refinements to the organization charts and descriptions of certain staff positions' quality-related responsibilities to clarify the quality assurance organization. The report also recommended that executive management support for the quality program be demonstrated through approval signatures on quality plans by TPC and SFMTA executive management. The PMOC's Quality Review of the project concluded that the SFMTA staff is implementing the SFMTA Quality Assurance (QA) Program as described in the SFMTA QMP. The fundamental implementation of the SFMTA quality program and SFMTA management's support of the program were readily apparent during the PMOC's QA program review.*

G. SAFETY AND SECURITY

Safety and Security Management Plan (SSMP)

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 have not been completed and are expected to be provided with the next PMP update.

Fire and Life Safety/Safety and Security Issues

The Construction Specification Conformance Checklists have been completed and approved for all construction packages. In September 2013, the CPUC staff began attending monthly as-built meetings to review the completed items. *As of early December 2015, all but two items related to the tunnel construction had been certified. Information required for certification was issued for the two remaining items, which are under review by SFMTA's safety staff. Final certification of the tunnel items is expected in December or January. The certification work will begin to address the station construction items in 2016.* The San Francisco Fire Department (SFFD) regularly attends the now combined Fire and Life Safety Committee (FLSC) and Safety and Security Certification Review Committee (SSCRC) meetings. The SFFD will continue to coordinate with the Stations Construction Project to identify issues of importance during construction.

Construction Safety

The project is maintaining an excellent safety record, with *only two recordable* and no lost time incidents. The performance metrics relating to accidents per working hour are well below the OSHA goals for similar construction. One incident occurred on the active construction contract in July. The current accident records for the 1300 Contract are shown in Table 7.

Table 7 - Construction Safety Data – Start of Contract Through October 2015

	No. of Incidents	Incident Rate	Goal
1300 Contract			
OSHA Recordable Accidents	*2*	*0.25*	<3.4
Job Transfer/Restricted Duty Incidents	*2*	*0*	NA
Lost Time Incidents	0	0	<1.6
Total Incidents	*4*	*0.50*	NA
Hours Worked	*791,473*		

H. PROJECT RISK, RISK MANAGEMENT, AND RISK MITIGATION

RCMP Revision 3 was received by the PMOC on April 30, 2013. The outgoing PMOC provided its final Spot Report to FTA on July 19, 2013. SFMTA submitted a CSP "Contingency Management – Schedule 2012 Update" on May 22, 2013. On October 11, 2013, the CSP provided an updated report with new schedule modeling and a recommendation to reduce the current FTA minimum schedule contingency of 8.0 months. The PMOC provided a review of this document to FTA on November 21, 2013 and could not recommend at that time that FTA accept any modification to schedule contingency minimum levels based on the current documentation provided. 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 from 8.0 months to 4.0 months. The updated risk assessment was conducted on the approved baseline schedule for the 1300 Contract without updates to reflect the current status of the construction work and the accumulated construction delays.

The PMOC cannot recommend any reduction in the minimum schedule contingency because the SFMTA's risk assessment update was not based on the actual current status of the 1300 Contract construction work. The Contract 1300 baseline schedule was adopted in early December 2014. Ten schedule updates have been completed by the contractor and accepted by SFMTA and incorporated into the Master Program Schedule. *The schedule risk assessment update is now expected from the CSP after the schedule tool in P6 is further enhanced and a recovery schedule is produced. The risk assessment would be conducted to assess the probability that the recovery schedule will result in the project meeting the required RSD. The timing of the risk assessment will be determined in the coming months.*

At the December CSP Risk Management Meeting, the committee reviewed the status of the highest ranked risks in the risk register. Risk 222 (monitoring software for ground movement) was closed. Risk 234, which is related to the alternative Sequential Excavation Method construction of the cavern connecting the CTS headhouse to the tunnel, will likely be cancelled as the engineer has rejected TPC's submittal and the construction will now most likely follow the methods specified in the 1300 Contract.

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

In the opinion of the PMOC, the risk meetings are an effective forum for the evaluation of risks and the identification of mitigation measures. The PMOC will continue to monitor the Risk Mitigation meetings to assess the SFMTA's risk mitigation activities.

I. ACTION ITEMS

Table 7 on the following page shows the current action items for SFMTA.

Table 7
The PMOC's Central Subway Points of Action for SFMTA
(Note: All closed items are removed a month after being closed. Changes to open items since last update are indicated in BLUE.)

Category	NO.	ACTION	DATE OPENED	DUE DATE	DATE CLOSED	COMMENTS
S, RA	**159**	Once the Contract 1300 Baseline Schedule has been approved, incorporate remaining high level schedule risks into a new risk assessment	4/21/14	NA	12/10	Superseded by 164, 165, 166
C, S	**162**	Documentation of changes in Earned Value and Planned Value estimation	1/14/15	12/04/15	12/10	Voided
S	**164**	Develop technically acceptable schedule tool in P6	12/10/15	TBD		SFMTA working with contractor to make schedule improvements
S	**165**	Develop recovery schedule	12/10/15	TBD		SFMTA to work with contractor on recovery strategies
S, RA	**166**	Update schedule risks based on recovery schedule	12/10/15	TBD		Once the schedule tool and recovery schedule are complete

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

APPENDIX A. LIST OF ACRONYMS

APTA	American Public Transportation Association
ARS	Air Replenishment System
AWSS	Alternative Water Supply System
BART	Bay Area Rapid Transit
BCE	Baseline Cost Estimate
Caltrans	California Department of Transportation
CAR	Corrective Action Request
CFR	Code of Federal Regulations
CLIN	Contract Line Item Number
CM	Construction Management
CM13	Contract Management 13
CMB	Configuration Management Board
CMod	Contract Modification
CNCR	Contractor Non-Conformance Report
CPI	Cost Performance Index
CPUC	California Public Utilities Commission
CQM	Contractor's Quality Manager
CSP	Central Subway Project
CTS	Chinatown Station
CWI	Certified Welding Inspector
DF	Designated Function
EV	Earned Value
FD	Final Design
FEIS	Final Environmental Impact Statement
FEIR	Final Environmental Impact Report
FFGA	Full Funding Grant Agreement
FLSC	Fire and Life Safety Committee
FMP	Fleet Management Plan
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
MRY	Muni Traction Power System
Muni	Common Public Reference to SFMTA

NEPA	National Environmental Policy Act
NTP	Notice to Proceed
OHA	Operational Hazard Analysis
O&M	Operations & Maintenance
OP	Oversight Procedure
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
QA/QC	Quality Assurance/Quality Control
QMP	Quality Management Plan
QPRM	Quarterly Progress Review Meeting
QTR	Quarter
RAMP	Real Estate Acquisition Management Plan
RAP	Rail Activation Plan
RCMP	Risk and Contingency Management Plan
ROD	Record of Decision
RSD	Revenue Service Date
SBE	Small Business Enterprise
SCIL	Safety Certifiable Item List
SCP	Safety Certification Plan
SEIS	Supplemental Environmental Impact Statement
SEM	Sequential Excavation Method
SEPP	Security and Emergency Preparedness Plan
SFDPW	San Francisco Department of Public Works
SFFD	San Francisco Fire Department
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission
SIT	Systems Integration Test
SoMa	South of Market (Street)
SOP	Standard Operating Procedure
SPI	Schedule Performance Index
SSCP	Safety and Security Certification Plan
SSCRC	Safety and Security Certification Review Committee
SSCVR	Safety and Security Certification Verification Report
SSMP	Safety and Security Management Plan
SSO	State Safety Oversight
SSP	System Security Plan

SSPP	System Safety Program Plan
STS	Surface, Track, and Systems
TBD	To Be Determined
TBM	Tunnel Boring Machine
TPC	Tutor Perini Corporation
TSA	Transportation Security Administration
TVA	Threat and Vulnerability Analysis
UMS	Union Square/Market Street Station
UR	Utility Relocation
U.S.C.	United States Code
USG	Union Square Garage
YBM	Yerba Buena/Moscone Center Station
YOE	Year of Expenditure

APPENDIX B. SAFETY AND SECURITY CHECKLIST

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

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

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

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

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

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

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

N/A = Not applicable.

APPENDIX C. PROJECT MAP AND OVERVIEW

CENTRAL SUBWAY PROJECT: Project Overview and Map

Date:	*December 18, 2015*
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
05/2019	Revenue Operations Date at date of this report		

54.65% *Percent Complete Based on Expenditure* (*October 2015 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
$862.55 million	Amount of Expenditures at date of this report from Total Project Budget of $1,578 million
54.65%	Percent Complete based on Expenditures at date of this report
$24.52 million	Unallocated Contingency remaining
$84.32 million	Total Project Contingency (allocated and unallocated contingency as reported by CSP)
$60 million	Minimum Total Project Contingency revised on September 5, 2012 PMOC review of Contingency Management Plan

	AT HOLD POINTS	QTR	Minimum Contingency Levels	Revised Levels
1A	Hold Point 1a – Tunnels 100% designed February 2011 (Actual)	1Q11	280	280
1B	Hold Point 1b – CTS 100% designed June 2012 (Actual)	4Q11	250	240
1C	Hold Point 1c – 40% Bid (Tunnel and CTS)	2Q12	225	200
1D	Hold Point 1d – FFGA Award October 2012 (Actual)	3Q12	-	180
2	Hold Point 2 – Commence CTS / UMS construction (Actual June 17, 2013)	2Q13	160	160
3	Hold Point 3 – Demobilize Tunnels *(Actual April 15, 2015)*	*2Q15*	140	140
4	Hold Point 4 – Stations to platform levels (CTS/MOS) November 2016	4Q16	60	60
5	Hold Point 5 – Complete CTS / Tunnels systems inst. April 2018	2Q18	25	25
RSD	PMOC / FTA RSD	4Q18		
CURRENT TOTAL CONTINGENCY $84.32 Million				


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

APPENDIX D. TOP PROJECT RISKS

The Project Risk Register was updated in early 2015. The following risks were discussed at the August Risk Management Meeting.

Top Risks discussed in the previous month:

- #222 – Transfer of the ARGUS Monitoring Software that documents monitoring instrumentation. This is nearly complete and it was anticipated that the risk would be retired next month.
- #226 – The risk that TPC would be unable to complete the work for the 4th and King shutdown as planned. It was reported that "all systems are go" for the shutdown work starting on Friday, November 6, 2015 and that this risk would likely pass following next week's shutdown, presuming success.
- #232 – This is the top rated risk and is related to TPC being behind schedule and potentially unable to recover. It was reported that a key component of the current schedule effort, being the roof deck completion at UMS, was continuing and that most of the intended deck sections would be completed before the moratorium except for one. This risk continues, and the upcoming schedule workshop is intended to provide further insight on getting to the recovery schedule.
- #233 – Related to the quality of the shotcrete lining substitution proposed by TPC being inferior. SFMTA reported that continued pressure to resolve this issue is being applied through the submittals process.
- #234 – This risk that the contractor's proposed alternative Sequential Excavation Method (SEM) excavation method would cause subsidence, was discussed and it was concluded that, as defined, the risk would largely disappear at this point, but it was left open for now. After analysis by the engineer the contractor's proposal was rejected, and the current specified design will be implemented.
- #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 NCRs through improved tracking logs is helping, but timeliness continues to be an issue, even with mitigation strategies having been implemented.
- #240 – This risk that unresolved assignment of schedule delay responsibility may lead to increased cost continues, but the upcoming schedule workshop should help clarify it and start the development of a recovery schedule.
- *#243 (new) – Risk that the contractor becomes complacent in addressing third-party insurance claims, which could result in increased costs to the program.*

ADMAP TO REVENUE OPERATIONS

	Estimated Start Date	Estimated Completion Date	Actual Completion Date	Notes
ration Test	TBD	TBD	*TBD*	Project is in construction, with RSD more than 3 years in the future
sting with d reports	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
bstantial	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
aining				
	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
ls and	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
ning and	TBD	TBD	TBD	*Project* is in construction, with RSD more than 3 years in the future
tivation ue	*4/2/2015*	TBD		*Initial draft, including task identification complete. Schedule for updating and completing task descriptions TBD*
mmittee	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
rity Plan	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
ity	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future

Description	Estimated Start Date	Estimated Completion Date	Actual Completion Date	Notes
PMOC OP-54 Readiness for Revenue Operations Review Report, Phase I	*TBD*	*TBD*	TBD	*Project* is in construction, with RSD more than 3 years in the future
Conduct Operational Hazard Analysis (OHA) and resolve other hazards / vulnerabilities	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
Pre-Revenue Operations	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
Public Outreach				
Develop Safety Outreach Plan	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
Provide Community Outreach	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
Grand Opening Plan	TBD	TBD	TBD	Project is in construction, with RSD more than 3 years in the future
Safety, Security and Fire-life Safety Certifications				
Update/Finalize SSMP			2/18/2014	Revision 2 completed
Finalize and/or update Safety Certifiable Item List (SCIL) and SSCP			10/10/2008	Revision 0
Implement Safety and Security Certification Committee			8/1/2010	
Implement Fire Life Safety Committee				
Verify design criteria, Preliminary Hazard Analysis (PHA), TVA, change orders are implemented within the project	10/10/2008	Ongoing		
Review status of quality non-conformances	TBD	TBD	TBD	
Close-out of non-safety critical items / non-conformances	TBD	TBD	TBD	
Close-out of safety critical items / non-conformances	TBD	TBD	TBD	
Complete Safety & Security Certification Verification Report (SSCVR)	TBD	11/1/2018		60 days before RSD

Description	Estimated Start Date	Estimated Completion Date	Actual Completion Date	Notes
Document Workarounds / Open Items List	TBD	TBD	TBD	
Verify emergency drills, tabletops, training, etc. are completed	TBD	TBD	TBD	
State Safety Oversight (SSO) final certification / signature	TBD	12/10/2018		21 days before RSD
Revenue Service				
Target Revenue Service Date	-			
FFGA Revenue Service Date	-	12/31/2018		

APPENDIX F. LESSONS LEARNED

LL#	Date	Phase	Category	Subject	Lesson Learned
1	09-30-10	FD	Management	Consultant Contracts	The project must have a full understanding of the agency and other approving governmental authorities to avoid delay of contract approval and consequential delay of the Master Project Schedule (MPS).
2	09-30-10	FD	Cost	Staffing Plan	The project staffing plan needs to be formulated during PE and updated at least quarterly during FD to manage Standard Cost Category 80 costs and monitor design production.
3	09-30-10	FD	Scope	Letter of No Prejudice (LONPs)	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 five percent of project cost at Entry into FD and three percent at execution of an FFGA.

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

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

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

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

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

APPENDIX G. CONTRACT STATUS

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

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	87%
Schedule:	NTP issued January 2010. Substantial completion in June 2011.	
Issues or Concerns:	Final total cost claim by contractor has not been resolved.	

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	97%
Schedule:	NTP issued January 2011. Substantial completion in August 2012.	
Issues or Concerns:	Final total cost claim by contractor has not been resolved.	

Contract No.	**1252**	
Contract Description:	**Tunnels**	
Status:	*Final completion achieved. Financial close out underway.*	
Cost:	Original Contract Value	$233.58 million
	Approved Change Orders	$7.71 million
	Current Contract Value	$241.29 million
	Expended to Date	$234.62 million; $6.2 million is paid from non-project funds
	% Expended	97.2%
	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	$179,139
	Current Contract Value	$678,134
	Expended to Date	$638,278
	% Expended	94.1%
	SBE Participation	100%
Schedule:		
Issues or Concerns:	None.	

Contract No.	**1300**	
Contract Description:	**Three subway stations (YBM, UMS, and CTS) and STS**	
Status:	*Support of excavation work is complete. Placement of roof slabs is underway. Preparations underway for mass excavation.*	
Cost:	Original Contract Value	$839.68 million
	Approved Change Orders	-$1.42 million
	Current Contract Value	$838.24 million
	Expended to Date	$302.39 million
	% Expended	36.1%
	SBE Participation	15.1%
Schedule:	NTP issued June 17, 2013. Substantial Completion planned February 10, 2018 and forecast August 2018.	
Issues or Concerns:	The work on this contract is behind schedule.	

Contract No.	**CS-155-1**	
Contract Description:	**Design Package 1 for Contracts 1250, 1251, and 1252. PB/Telemon**	
Status:	Design is complete. Construction support is ongoing for Contract 1252.	
Cost:	Original Contract Value	$5,795,000 (includes exercised options)
	Approved Change Orders	$1,697,245
	Current Contract Value	$7,492,245
	Expended to Date	$7,730,484
	% Expended	103.2%
	SBE Participation	29.7%
Schedule:		
Issues or Concerns:		

Contract No.	**CS-155-2**	
Contract Description:	**Design Package 2 for UMS, CTS, and YBM. CSDG prime**	
Status:	Designs are complete for all of the station contracts. Construction support of Contract 1300 is underway.	
Cost:	Original Contract Value	$35,059,252
	Approved Change Orders	$1,460,360
	Current Contract Value	$36,519,612
	Expended to Date	$30,104,946
	% Expended	82.4%
	SBE Participation	42.7%
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	$12,553,146
	% Expended	72.8%
	SBE Participation	28.3%
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	$51,964,952
	% Expended	61.0%
	SBE Participation	35.5%
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	$8,575,771
	% Expended	50.1%
	SBE Participation	28.9%
Schedule:		
Issues or Concerns:		