# MONTHLY REPORT
## *September 2015*

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

Draft Report delivered to FTA on *October 21, 2015*
Final Report delivered to FTA on *October 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*

**David Evans and Associates, Inc.**
Bill Byrne, Task Order Manager
Voice – (303) 828-8626; Email – bbyrne@deainc.com
Time on project: *16 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 August 2015, the project was 52.6% 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. SFMTA is no longer including the 1252 Contract in its monthly progress reports for the CSP.

*The 1300 Contract was 33.5% complete on the basis of cost at the end of August. Substantial completion is scheduled for February 2018, but the SFMTA August Monthly Progress Report states that the most current accepted contractor schedule update (reflecting the status of the construction at the end of August 2015) indicates that the station construction work is ten months behind schedule, with completion forecast in December 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), since the schedule forecast is based on the progress of the construction through August 2015, it is likely that the forecast substantial completion date will now be better assessed from a schedule recovery perspective. SFMTA has not yet received the recovery schedule from TPC, but is pursuing discussions to recover some slippage through logic changes in the schedule. The PMOC has the current Master Project Schedule (MPS) under review in preparation for a schedule recovery workshop planned to occur in November 2015. SFMTA should make every effort to accept the remaining schedule updates and obtain the***

***contractor's recovery schedule as quickly as possible so that the true status of the station construction work can be understood.***

*As a result of the delayed completion of station construction, the current program master schedule, which incorporates the contractor's schedule updates through August 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 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 will facilitate Schedule Containment Workshops to identify options for overcoming the delays and meeting the required RSD. These workshops are scheduled to occur in November presuming that the program master schedule is fully updated to reflect the current status of the station construction.*

**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 | *$84,513,346* |
| **Schedule** | Revenue Service Date | 12/26/2018 | *05/2019 (forecast)* |
| | | | |
| **Total Project Percent Complete** | Based on Expenditures | *52.64%* | |
| | Based on Earned Value | *Not available, earned value calculations are being revised* | |

| Major Issues | Status | Comments/Planned Action |
|---|---|---|
| Schedule Contingency | *Based on the status of construction reflected in the updated station construction schedule through August 2015, the projected RSD is five months later than the FFGA date. 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 will be conducting schedule containment workshops after the program schedule is fully updated to reflect the current status of the project. These workshops are tentatively scheduled for November 2015.* |
| Cost Contingency | The current Total Contingency is $*84.5* million. The FTA recommends a minimum contingency level of $60 million. | |
| 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:** | | November 4, 2015 |

- Earned Value (EV): *Not available. The PMOC notes that the basis for calculating earned value is under review by SFMTA. Earned value reporting should resume with the September SFMTA Monthly Status Report.*
- Planned Value: *Not available. The PMOC notes that the basis for calculating planned value is under review by SFMTA. Planned value reporting should resume with the September SFMTA Monthly Status Report.*
- Actual Cost: *$830,847,736 – an increase of $12.07 million from July.*
- Cost Performance Index (CPI): *Not available. A value* greater than 1 means that value of the work completed is more than the cost of the work (under budget) and less than 1 means that the value of the work is less than the cost of the work (over budget).
- Schedule Performance Index (SPI): *Not available.* SPI greater than 1 is ahead of schedule and less than 1 is behind schedule.

### Contingency

*Cost Contingency*

The total available contingency (approved contingency plus approved contract changes) is $*84,513,346*, which is above the minimum required contingency of $60 million. No contract modifications have been executed in the last *three months.* It still appears that the tunnel contract will not consume its entire allocated contingency, thereby freeing additional contingency for other aspects of the project. **In the opinion of the PMOC, the available cost contingency is sufficient to provide reasonable assurance of on-budget completion of the project.**

Schedule Contingency

*The Program Master Schedule for the Central Subway Project now shows no buffer float and a forecast RSD five months later than planned. 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 August 2015. SFMTA reports that the contractor's latest approved schedule update indicates ten months of delay to the 1300 Contract. SFMTA has also stated that they are pursuing further discussions regarding schedule logic in the latest schedule update from TPC that may reduce the amount of delay currently being shown. 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.
- *PMOC Concern: The latest program master schedule forecasts that the RSD will be five months later than planned. In the opinion of the PMOC, since the schedule forecast is based on the progress of the construction through August 2015 and construction production rates remained lower than planned after February, it is likely that the forecast substantial completion date is now more closely reflecting the current set of circumstances than previously reported during recent months. SFMTA should make every effort to complete its current schedule logic analysis and make any further schedule updates as quickly as possible so that the upcoming schedule containment workshops can focus on possibilities for schedule recovery with the best possible information available.* In the opinion of the PMOC, the accuracy of the cost and schedule performance indicators can only be assured with the incorporation of the fully updated 1300 Contract baseline schedule reflecting progress through the current reporting period into the performance measurement process.
- 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 PMOC is concerned that although the contractor and CSP staff have been working cooperatively to advance progress on construction of the three CSP subway stations through the identification and tracking of short-term performance targets, there is no indication that the overall progress of construction is improving. 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. *The planned double shifting of station roof construction is a good first step in the process of implementing schedule recovery strategies. More schedule recovery strategies will be necessary to fully recover the accumulated delays and achieve the planned RSD. SFMTA also should be exploring strategies to reduce the time between substantial completion of the stations and the RSD. The PMOC will facilitate schedule containment workshops to identify options for overcoming the delays and meeting the required RSD.*

- In the opinion of the PMOC, the total cost contingency, including unallocated contingency and less identified trends, of *11.3%* 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.
- The PMOC remains concerned that the recent quality problems with the station construction may indicate a lack of sufficient quality commitment by the contractor and a potential for future problems and associated delays and increased costs (borne by the contractor) for the repair or replacement of defective work. *The PMOC conducted a Quality Review of the project in early September, and the results were documented in a draft Spot Report that was forwarded to FTA for review in late September.*

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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, and 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).**
- Approximately $16 million in allocated contingency for this contract will not be spent.

***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 August 2015, the construction of the Stations and Surface, Track and Systems contract was 34.5% complete on the basis of cost.*
- Union Square/Market Street Station (UMS): *Jet grouting to prevent water intrusion into the excavation in the areas supported by tangent piles was previously being given priority for completion before the construction moratorium. During August, this priority shifted to the completion of roof decking, and jet grouting work was halted after 200 of the planned 398 jet grout columns had been placed in the north and south concourse areas.* The master schedule indicates that the jet grout operation should have been completed in May 2015. *However, the jet grouting operation was demobilized in September and will not resume until after the holiday construction moratorium.*
- At the north concourse, work on the existing Union Square parking garage continued. *Roof deck construction for the north concourse was being advanced using double shifts through August and September with Geary Phase 3 work progressing at the end of this*

*period.* At the south concourse, excavation to the compensation grouting level is complete, and grout tubes have been installed. Pre-conditioning for grout injection continued through mid-July, when the grout subcontractor demobilized and shifted its operations to CTS. *The Ellis roof deck sections were underway at the end of September. Placement of the invert slab in the Ellis Annex was advanced, but not completed as planned in September.*

- Chinatown Station (CTS): *A repair plan for the cold joint in the roof slab of the headhouse was still in preparation as of the end of August. The structural capacity of the roof slab will not be a problem, but treatment of the slab to prevent water intrusion and corrosion of the reinforcing steel will be required. Welding of the level 1 struts and walers was completed at the end of August. Installation of compensation grout tubes was progressing throughout the headhouse in August and continued through September. Installation of dewatering wells in the station area was underway and is now expected to extend into October.* Utility work at the north concourse is ongoing in advance of the placement of dewatering wells and construction of the north access shaft. Preparations for the installation of a temporary power station at CTS started in July and will extend until the scheduled energizing of the station by PG&E *in late October*.

- Yerba Buena/Moscone Station (YBM): *Utilities are now being placed above the final roof section, and work to restore the street to its final configuration occurred in August. The restoration of the full cross section of 4th Street to traffic by Labor Day was established as a milestone by SFMTA and TPC. Two traffic lanes on the East Side of 4th Street were completed for use by September 13, 2015. At the headhouse, excavation to the second strut level was completed and placement of the temporary level 2 struts was underway. An opening in the slurry wall between the station box and headhouse was completed in late August and excavation to the first strut level within the station box started, with material being moved through this opening and removed for disposal through the headhouse. The installation of the temporary first level of struts in the station box was underway in late September.*

- Surface, Track, and Systems (STS): Muni Traction Power duct bank (MRY), water line, alternative water supply system (AWSS) and sewer work continued. *The first stage of the cutover of service at the 4th and King intersection was executed in early September during an extended shutdown over the Labor Day weekend. Planning continued for the second stage closure for completion of the track installation work at this intersection scheduled to occur with a shutdown in mid-November. Planning in advance of the closure continues to be detailed through twice weekly meetings among the contractor, SFMTA Construction Management (CM) staff, and SFMTA Operations staff. The first phase of the cutover work was completed* during an extended shutdown over the Labor Day weekend.

- **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 no 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. Some of these milestones are only slightly behind schedule, but the restoration of traffic on Ellis Street by Labor Day and the completion of all jet-grouting by the November construction moratorium are not going to be achieved. *In addition, the milestones are being adjusted to focus on alternative priorities like the roof deck completion at UMS.* **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).

### *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.

### 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

The tunneling contractor did not achieve the planned level of participation in its contract by women and apprentices. SFMTA is requesting documentation from Barnard Impregilo Healy (BIH) of its good faith efforts in regard to hiring women and apprentices for its work.

## 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 Second Quarter 2015 Mitigation Monitoring Reporting Program (MMRP) update from SFMTA on August 27, 2015. The PMOC will document its review of this report in the October Monthly Monitoring Report. Archaeological monitoring is ongoing at YBM through spot checks of the excavated materials.*

### 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 and no positions in the organization are open. *SFMTA reported that they are assessing their need for the addition of a Systems Integration staff person as the project progresses to the stage where systems needs become a greater focus.*

### Contractor Staff

The contractor still has not filled the number of safety oversight positions required by the contract. TPC is continuing to advertise for candidates.

SFMTA initiated an audit of the contractor's Quality Management staffing and procedures. This audit was completed in June. *The PMOC reviewed the report as part of a comprehensive quality review conducted in early September.*

## 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 incudes 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, when completed, the trend and change management summary reports will 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.**

## Project Cost

Cost estimate: $1.5783 billion

Total contingency: *$84.51 million* (minimum contingency is $60 million)

Total net incurred costs: *$830,847,736, an increase of $12.07 million from July (52.6% of the total project budget)*

Current funding level: $1,029,794, 000 (65.3% of the total project budget)

Earned Value (EV): *Not available. The PMOC notes that SFMTA is modifying its basis for calculation of planned value and earned value and the metrics are not available for August.*

CPI*: Not reported.*

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 |

| | 1252 - Tunnel | 1300 Stations, STS |
|---|---|---|
| **Extra Budget for Non-Project Costs** | 6,173,508 | |
| **Approved Budget** | 251,068,968 | 859,676,396 |
| **Approved Changes** | 1,421,807 | *(1,207,535)* |
| **Current Contract (1252 does not include non-project costs)** | 235,005,822 | *838,468,865* |
| **Remaining Contingency** | 1,063,145 | *21,207,535* |
| **Potential Changes (Trends)** | (77,798) | *14,153,480* |
| **Potential Contract** | 234,928,024 | *852,622,345* |
| **Contingency Less Trends** | 1,140,944 | *7,054,055* |
| **Spent to Date** | 234,616,308 | *288,317,594* |
| **Potential Left to Spend** | 311,716 | *564,304,751* |
| **Contingency Less Trends as % of Potential Cost to Complete** | 366.0% | *1.25%* |

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

*During this period, SFMTA transferred $15 million of remaining contingency that had been allocated to the 1252 Contract back to unallocated contingency.* The remaining contingency, less identified trends, represents *366.0%* of the potential left to spend for Contract 1252 *and 1.25% of the potential left to spend for Contract 1300.* The combined allocated contingency for all construction work less identified trends represents about *1.5%* 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.**

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 10.7% 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** | 1,130,842,777 | 36,511,799 | 24,108,712 | 310,518,041 | | 1,501,481,329 |
| **Approved Contingency** | 23,430,680 | 5,265,478 | 13,076,653 | 18,221,079 | 24,519,456 | 8,4513,346 |
| **Extra Budget** | 6,173,508 | | | | | |

| | Total Construction | Right of Way | Vehicles | Professional Services | Unallocated Contingency | Total Program |
|---|---|---|---|---|---|---|
| **for Non – Project Costs** | | | | | | |
| **Approved Budget (w/o Extra Launch Shaft Cost)** | 1,161,143,972 | 37,511,799 | 26,385,653 | 328,739,120 | 24,519,456 | 1,578,300,001 |
| **Approved Changes** | 6,870,515 | (4,265,478) | (10,799,712) | - | | (8,194,675) |
| **Current Contract** | 1,137,713,291 | 32,246,321 | 13,309,000 | 310,518,041 | 9,519,456 | 1,493,786,653 |
| **Remaining Contingency** | 23,430,680 | 5,265,478 | 13,076,653 | 18,221,079 | 24,519,456 | 84,513,346 |
| **Potential Changes (Trends)** | *14,075,682* | - | - | - | | 14,075,682 |
| **Potential Contract** | *1,161,143,971* | 32,246,321 | 13,309,000 | 310,518,041 | | 1,505,056,799 |
| **Contingency Less Trends** | *9,354,998* | 5,265,478 | 13,076,653 | 18,221,079 | 24,519,456 | 70,437,664 |
| **Spent to Date** | *581,638,024* | 30,004,567 | 2,146,905 | 217,058,240 | | 830,847,736 |
| **Potential Left to Spend** | *579,505,947* | 2,241,754 | 11,162,095 | 93,459,801 | | 674,209,063 |
| **Contingency Less Trends/Potential Left to Spend** | *1.6%* | 234.9% | 117.2% | 19.5% | | 10.4% |

[2] As reported in the August 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's worst-case estimate is a net increase of contract value of less than $300,000 when all of these items are settled.

*The Contract 1300 Proposed Contract Change (PCC)/Change Order Request (COR) Progress Log dated October 7, 2015 shows the following:*

- *23 items ready for negotiation*
- *13 items requiring reconciliation of Force Account charges*
- *100 items that require price proposals from the contractor*
- *24 items that require SFMTA engineer's estimates*
- *63 items that are awaiting a determination of merit by SFMTA*
- *17 items were forwarded for execution of contract modifications*

*The most recent version of the complete Trend Statistics Summary for the 1300 Contract dated September 30, 2015 shows a total potential increase in contract cost of $14,767,377.* The Contract Modification/Trend Log in the CSP monthly report indicates that approximately 50% of the estimated value of trend items are judged by the CSP team not to have merit. SFMTA estimated the total potential cost increase for the 1300 Contract at $11.573 million as of the end of August, an increase of $1.579 million from the end of July. 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 - $3,743,672
4. Harder rock than anticipated for CTS slurry wall excavation - $2,820,600 (reduced from previous estimate)
5. Delays to installation of tangent piles at UMS - $1,074,229 (reduced from previous estimate)
6. Unstable rock caving into slurry wall excavation at CTS - $600,000
7. Extra concrete from tunnel construction affecting slurry wall installation at YBM - two occurrences of $335,809
8. Changes to tie-back requirements for support of UMS Garage - $300,000
9. Changes in construction sequence for UMS Garage - $500,000
10. Obstructions to jet grout placement at UMS - $830,750 (increased from previous estimate)
11. Addition of a 24" water main above the YBM roof slab (note that the cost of this scope change would likely be paid by third parties) - $224,438
12. Additional instrumentation for detection of ground movement - $429,777

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)

## 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 | 469,198 |
| Congestion Mitigation | 41,025 | 41,025 |
| *Federal Subtotal* | 983,225 | 510,223 |
| **State** | | |
| TCRP | 14,000 | 14,000 |
| State RIP | 88,000 | 12,498 |
| Prop. 1B / PTMISEA | 307,792 | 225,912 |
| 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** | **1,029,794** |

## E. PROJECT SCHEDULE STATUS

*As of the end of August, the project had received eight monthly updates to the Contract 1300 baseline schedule from the contractor and SFMTA has accepted seven of these updates. The latest accepted schedule update reflecting progress on construction through August 2015 indicated that the station construction was ten months behind schedule as of the schedule date. After SFMTA incorporated the August 2015 contractor schedule into the master program schedule, the projected RSD was forecast for May 2019, five months later than planned. The most recent schedule update has confirmed the indications 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. SFMTA has indicated that they will request a revision to the September schedule update to correct logic issues in the schedule that they believe will reduce the amount of delay currently indicated. In addition, a recovery schedule has been requested from the contractor.* ***In the opinion of the PMOC, it is likely that the current characterization of the project schedule is better now that the contractor's schedule updates have been incorporated. The contractor's recovery schedule and any other corrections based on logic changes anticipated by SFMTA should be helpful getting the project to a point that the schedule is being reported consistent with the status of work.***

*SFMTA expects that the remaining contractor's schedule updates up to the current date will have been accepted and incorporated into the master program schedule by the end of October 2015.* ***In the opinion of the PMOC, the long overdue updated Program Master Schedule will be a vital tool for development of schedule recovery strategies.*** *The PMOC will be leading*

*schedule containment workshops after the master program schedule has been fully updated and is available for use in assessing the potential effectiveness of schedule acceleration strategies.*

*As a means of encouraging better collaboration among the project participants,* SFMTA and TPC have agreed to focus on several short-term performance targets that are crucial to the overall progress of the work. The parties are hopeful that successful completion of the identified work according to the adopted schedule will reinforce the working relationships on the team and provide confidence that the team members can work cooperatively toward important schedule objectives. SFMTA hopes that longer-term plans for schedule recovery can be developed based on the working relationships established through the focus on short-term performance targets. Table 5 shows the current status of the 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 | Slightly behind schedule |
| ~~Complete all jet grout columns (UMS)~~/Replaced with complete station roof deck | November 26, 2015 | Behind schedule |
| Restore traffic on Ellis Street by Labor Day (UMS) | ~~September 7, 2015~~/*Late October* | Behind schedule |
| 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* |
| Open north side of 4th and King intersection to traffic ASAP | August 14, 2015 | *Completed* |

[3] *TPC three-week look-ahead schedule – 10/06/15*

## Project Schedule Data

- *Earned Value (EV): Not available. SFMTA is revising the basis for estimation of planned and earned value.*
- *Planned Value: Not available. SFMTA is revising the basis for estimation of planned and earned value.*
- *SPI: Not available.*

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.

**In the opinion of the PMOC, the accuracy of the cost and schedule performance indicators can only be assured with the incorporation of the fully updated 1300 Contract baseline**

**schedule reflecting progress through the current reporting period into the performance measurement process.**

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:<br>(Utility Relocation Contract) | February 9, 2010 (A) |
| Tunnel excavation complete<br>(hole through): | June 2, 2014 (SB); June 11, 2014 (NB) (A) |
| Cross passages complete: | December 20, 2014; 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), *December 2019 (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 August 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. **In the opinion of the PMOC, CSP and TPC working together on mutually-agreed short-term performance targets may result in an improved working relationship that will pay dividends in advancing the project and recovering the accumulated delays. The PMOC is concerned that the selected targets**

**were defined without the benefit of a mutually agreed upon updated project schedule. SFMTA is encouraged to work with the contractor to define additional longer-term key 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. Production rates on jet grout to prevent water intrusion have been much lower than expected. The critical path description will be updated after SFMTA produces a fully updated master program schedule.*

## Three Month Look-ahead

The following activities are planned over the next three months:

### *1300 Contract*

*UMS*

- Progress I-beam, roof deck, and waterproofing installation for roof deck construction
- Continue demolition operations at Ellis Street on remaining BART structure to be removed
- Install new roof on Ellis for BART station entrance to UMS station and reopen Ellis Street to traffic
- Continue Union Square Garage (USG) temporary support and demolition for north concourse entrance, including demolition of the garage roof deck
- *Suspended* jet grouting operations on Stockton Street between Geary and O'Farrell streets
- *Install new roof on station between Maiden Lane and Geary Street*

*CTS*

- *Finish installation of compensation grout tubes and pre-grouting*

- *Build composite wall over cross cut cavern opening*
- *Slip line brick sewer on Stockton Street*
- Finish dewatering wells on Stockton Street
- *Excavate inside headhouse, install temporary level 3 bracing.*

*YBM*

- *East side road restoration*
- *Utility installation at intersections of 4th Street with Howard and Folsom streets*
- Restore all traffic lanes on 4th Street
- Continue headhouse excavation, install excavation temporary bracing
- *Archaeological Monitoring*

*STS*

- Sewer installation and repair
- Waterline installation
- Alternative Water Supply System (AWSS) installation
- Muni ductbank installation
- Installation of fiber optic cable by AT&T
- *Second stage of cutover from T line to new CSP alignment at 4th and King intersection*

The PMOC expects to attend the following meetings:

- Weekly Management (first Monday of each month)
- Weekly Contract 1300 Construction Progress (first Tuesday of each 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 October 6, November 3*, and December 1*
- FTA/QPRM scheduled for November 4, 2015
- Meetings for Schedule Review to be scheduled in November

## 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'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 *August* monthly report:

- *SFMTA's Quality Audit identified six findings that require response by the contractor. A response to the six findings was submitted by TPC's QC and is currently under review. One of the findings related to the Stop Work Notice that was ignored by the contractor during a roof slab pour at CTS.*
- 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.
- A procedure is needed 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.

*As of October 6, 2015, 107 CNCRs had been filed by TPC's Quality Manager, and 26 items remained open.*

**The PMOC remains concerned that the quality issues revealed on past construction work could result in further delays to the project and increased costs for the repair or replacement of defective work by the station contractor.** Extra time is now being taken to assure that all quality-related actions are completed and the necessary documentation is in place prior to follow-on construction work. This process impacted the progress of structural welding at UMS. **SFMTA is encouraged to assure that the SFMTA Quality staff members are addressing QA actions to close out CNCRs in an expeditious manner.** *The PMOC conducted a Quality Review of the CSP in September, and a draft report was delivered to FTA for review in late September*.

## 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 California Public Utilities Commission (CPUC) staff began attending monthly as-built meetings to review the completed items. *As of the end of September, 61 items related to the tunnel facilities were certified, four items were under review by CPUC and SFMTA's safety department, and two items required additional response from the tunnel CM team. SFMTA expects to complete certification of the tunnel construction items on the checklist in October. At that time the certification work will begin to address the station construction items.* 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 one 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 August 2015**

| | No. of Incidents | Incident Rate | Goal |
|---|---|---|---|
| **1300 Contract** | | | |
| OSHA Recordable Accidents | 1 | 0.32 | <3.4 |
| Job Transfer/Restricted Duty Incidents | 0 | 0 | NA |
| Lost Time Incidents | 0 | 0 | <1.6 |
| Total Incidents | 1 | 0.32 | NA |
| Hours Worked | *661,579* | | |

## 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 PMOC recommends that the CSP incorporate the updated Contract 1300 baseline schedule into an updated risk assessment as soon as it is approved. The PMOC recommends that the CSP incorporate the remaining high level schedule risks on the Project Risk Register into the updated risk assessment.** The Contract 1300 baseline schedule was adopted in early December 2014. Eight schedule updates have been completed by the contractor and the first three have been approved by SFMTA and incorporated into the Master Program Schedule. The schedule risk assessment update is now expected from the CSP after an updated Master Program Schedule is produced in September 2015 and schedule containment workshops are conducted in November 2015.

At the October CSP Risk Management Meeting, the committee reviewed the status of the highest ranked risks in the risk register. *No risks were closed, but risk 222 (monitoring software for ground movement) was identified for possible closure next month. Three new risks were discussed, characterized, and rated by the committee: #240 – the risk that unresolved assignment of schedule delay responsibility may lead to increased costs to SFMTA, #241 – the risk that the*

*forecast "El Nino" weather pattern will cause excessive weather delays, and #242 – the risk that requests received to accommodate the upcoming Super Bowl event will have impacts to the construction.*

Risk 232 was discussed at some length. This risk covers the possible inability of SFMTA and the contractor to identify and implement time-saving actions that would allow the accumulated delays to the station construction to be recovered. Based on the results of an executive partnering session between SFMTA and TPC, the contractor has committed to implementing double shifts for the construction of the UMS roof in an effort to recover the delays associated with slow progress on jet grouting around the station perimeter. **In the opinion of the PMOC, the double shifting of station roof construction is a good first step in the process of implementing schedule recovery strategies. More schedule recovery strategies will be necessary to fully recover the accumulated delays and achieve the planned RSD.**

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 | TBD | | July 2015 Monthly Progress Report (MPR) indicates negative float for RSD. Risk update urgently needed. |
| **C, S** | **162** | Documentation of changes in Earned Value and Planned Value estimation | 1/14/15 | 10/15/15 | | Document new basis for calculation. |
| **S** | **163** | Hold Schedule Containment Workshop for Stations Construction and Follow-on Work to RSD | 5/6/15 | Mid November | | Requested by FTA at May QPRM. Dates to be set after schedule updates are complete. |
| **QA** | **164** | Support PMOC Quality Review | 7/30/15 | 8/1/15 | 9/3/15 | Review completed, draft under review. CLOSE |

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 |
| BIH | Barnard Impregilo Healy |
| 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 |
| COR | Change Order Request |
| CP5 | Cross Passage 5 |
| CPI | Cost Performance Index |
| CPUC | California Public Utilities Commission |
| CQM | Contractor's Quality Manager |
| CSP | Central Subway Project |
| CTS | Chinatown Station |
| DF | Designated Function |
| EV | Earned Value |
| FD | Final Design |
| 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 |
| MPR | Monthly Progress Report |

| | |
|---|---|
| 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 |
| PCC | Proposed Contract Change |
| 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 |
| 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.<br>Not submitted to FRA. |
| System Security Plan (SSP) or Security and Emergency Preparedness Plan (SEPP) | **2009** | | Not submitted to FTA.<br>Not submitted to FRA. |
| Construction Safety and Security Plan | **2012** | | Health and Safety.<br>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)<br>Consumer Protection & Safety Division<br>505 Van Ness Avenue<br>San Francisco, CA 94102<br>(415) 703-1017 phone<br>(415) 703-1758 fax<br>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:<br>- Activation Plan and Procedures<br>- Integrated Test Plan and Procedures<br>- Operations and Maintenance Plan<br>- 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<br>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.<br>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:** | *October 16, 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 | | |

*52.6%* *Percent Complete Based on Expenditure* (*August 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 |
| *$830.85 million* | Amount of Expenditures at date of this report from Total Project Budget of $1,578 million |
| *52.6%* | Percent Complete based on Expenditures at date of this report |
| *$24.52 million* | Unallocated Contingency remaining |
| *$84.51 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 $84.51 Million** | | | | |


central T subway
Lombard St.
COIT TOWER
Columbus Ave.
Washington Square Park
Union St.
TUNNEL ONLY - NO SERVICE
Broadway
Broadway Tunnel
The Embarcadero
Washington St.
Ferry Building
T CHINATOWN
Stockton St.
Kearny St.
Montgomery St.
Battery St.
EMBARCADERO
California St.
Leavenworth St.
Bush St.
FOLSOM
FUTURE TRANSBAY TERMINAL
Post St.
MONTGOMERY
UNION SQUARE/ MARKET STREET
J K L M N T
Market St.
1st St.
N
Mission St.
2nd St.
Howard St.
POWELL
Harrison St.
BRANNAN
Folsom St.
I-80
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.
Caltrain
Townsend St.
MISSION ROCK
UCSF
UCSF MISSION BAY
LEGEND
T Third Phase 2
T Third Phase 1
Muni Metro
Caltrain
BART

# APPENDIX D. TOP PROJECT RISKS

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

**Top Risks discussed in the previous month:**

- Risks of delays or quality issues due to problems in transfer of settlement monitoring data, equipment, and software from 1252 to 1300 Contract. *All data transmitted. Risk is recommended for closure.*
- Risks associated with the cutover work at 4th and King streets. Detailed planning of construction and SFMTA operations during the cutover is underway. Work was on target to begin over the Labor Day weekend.
- Risk of TPC-proposed use of shotcrete for final station wall surfaces may result in quality shortfall. *TPC has delivered the submittal for use of shotcrete, which is under review by the engineer of record.*
- Risks associated with TPC-proposed sequential excavation method (SEM) mining at CTS using two headings. *TPC has delivered its submittal in response to SFMTA comments on the initial submittal. The new submittal is under review by the engineer.*
- Risk of damage to adjacent buildings from construction work at the surface. Several damage claims have been made by adjacent property owners and tenants. Risk of additional damage still exists.
- Risks that signaling and train control will not work properly during cutover and intermediate operating stages at 4th and King. This risk has been partially mitigated by the replacement of the H&K switches proposed by the contractor with Irwin switches, which match the existing equipment. The risk has been further reduced by decreasing the number of stages in which interim operations would need to be safety certified.
- Risk of a breakdown in relations between SFMTA and the contractor. *An executive partnering session was held.* Routine partnering is ongoing. Mini-milestones for schedule achievement have been established to demonstrate cooperative work approach. *Contractor has committed to implementing schedule recovery actions. SFMTA has committed to timely processing of contractor change order requests.*
- Risk that station licenses will cost more than budgeted. A court judgment was finalized. This risk was realized and the cost is known - $355,000.
- Delays in AT&T completion of cable installation in the surface section of the project. The ductbanks are ready for AT&T to start work and the cables are on hand. A 12 month window for AT&T to complete the work started in April 2015. *AT&T reported to expect completion of its work by the end of 2015.*

- Risk of extra costs due to differing site condition claim by BIH at the site of the Cross Passage 5 (CP5) subsidence. BIH has not submitted a Change Order Request for any additional cost. Risk is minor.
- Delays from construction/demolition work at the Olivet Building site. *The developer has stated that demolition will begin soon.* SFMTA is coordinating to develop a plan to support the demolition work while allowing YBM construction to proceed. Demolition is not likely to begin until 4th Street is fully restored to traffic at which time interference between the station construction and site demolition will be minimal.
- Risk that non-conforming work is not identified by the contractor's QC program. SFMTA has been conducting audits and surveillances of TPC's QC program. *CNCRs continue to be generated and work is ongoing to resolve them – current total is 94 CNCRs. TPC has reorganized and added quality control staff. SFMTA states that TPC has been inappropriately using the quality control process to raise issues regarding the contract scope of work.*
- Risk that ineffective processing of CNCRs by the CSP QA Team results in delays to construction. This risk is evident by the extended time that has been required to assemble complete documentation of repairs or other corrective actions. *The QA Team has been working to update the CNCR log and to prioritize timely closure of CNCRs related to upcoming construction work.*
- Risk of delay to the Revenue Service Date. *The current forecast is for construction to be completed six to eight months later than planned, which would result in a delay of the RSD.* General mitigation strategies have been identified. More specific mitigation plans need to be prepared and adopted by the contractor.
- *New risk: Unresolved responsibility for schedule delays results in extra costs to the owner (SFMTA).*
- *New risk: Possible construction delays caused by heavy precipitation in the upcoming winter season.*

# APPENDIX E. ROADMAP TO REVENUE OPERATIONS

| Description | Estimated Start Date | Estimated Completion Date | Actual Completion Date | Notes |
|---|---|---|---|---|
| ***Testing*** | | | | |
| Finalize/update Systems Integration Test (SIT) Plan | TBD | TBD | *TBD* | Project is in construction, with RSD more than 3 years in the future |
| Conduct System Integrated Testing with trains, including procedures and reports | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Certificates of Occupancy / Substantial Completion | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| ***Operating Plan, Rules and Training*** | | | | |
| Finalize Operating Plan | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Finalize / revise SOPs, manuals and rulebook as applicable | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Staffing and Operations Plan | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Training of O&M personnel | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Emergency response plan, training and drills | TBD | TBD | TBD | *Project* is in construction, with RSD more than 3 years in the future |
| ***Pre-Revenue Operations*** | | | | |
| Finalize and/or update Rail Activation Plan (RAP) and/or Pre-Revenue Operations Plan | *4/2/2015* | TBD | | *Initial draft, including task identification complete. Schedule for updating and completing task descriptions TBD* |
| Implement Rail Activation Committee | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Shadow operations | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| Develop / revise SSPP & Security Plan (approved by SSO) | TBD | TBD | TBD | Project is in construction, with RSD more than 3 years in the future |
| FTA Office of Safety & Security Readiness Review | 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. |

# 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 | $238.75 million; $6.2 million is paid from non-project funds |
| | % Expended | 98.9% |
| | 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 | $242.37 million |
| | % Expended | 28.9% |
| | SBE Participation | 11.1% |
| **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 | $7,719,958 |
| | % Expended | 103% |
| | SBE Participation | 29.8% |
| **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 | $28,847,529 |
| | % Expended | 79.0% |
| | SBE Participation | 43.0% |
| **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 | $12,203,626 |
| | % Expended | 70.8% |
| | SBE Participation | 28.6% |
| **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 | $49,735,730 |
| | % Expended | 58.4% |
| | SBE Participation | 35.8% |
| **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 | $8,105,506 |
| | % Expended | 47.4% |
| | SBE Participation | 28.9% |
| **Schedule:** | | |
| **Issues or Concerns:** | | |