Risk Register

PROJECT RISK REGISTER

Central Subway Project San Francisco

REV : 21

DATE ISSUED: 05/10/13

Risk Profile

Likelihood Score	Severity Score 1	2	3	4	5
5				HIGH	
4					
3		MEDIUM			
2	LOW				
1					

	Low (1)	Medium (2)	High (3)	Very High (4)	Significant (5)	Legend
Probability	< 10%	<> 10% - 50%	> 50%	<> 75% - 90%	> 90%	<3 Low
Cost Impact	< $250K	<> $250K - $1M	<> $1M - $3M	<> $3M - $10M	> $10M	3 - 9 Medium
Schedule Impact	< 1 Month	<> 1 - 3 Months	<> 3 - 6 Months	<> 6 - 12 Months	> 12 Months	>10 High

RISK RATING = PROBABILITY X (COST IMPACT + SCHEDULE IMPACT)

2

SCORE = PROBABILITY X (COST IMPACT + SCHEDULE IMPACT)

Final Risk ID	Risk Description	Mitigation Description	Risk Category	Probability %	Cost Impact	Schedule Impact	Calc Impact	Calc %	Risk Rating	Score	Status	Must Complete by Date
Underground Tunnel												
1	Additional night shift work required at portal launch box due to bus storage facility relocation delay	Work with TJPA to coordinate construction schedules and GGB to coordinate Traffic Routing.	C	2	1	-	1	35%	1	2	No longer considered a risk. GGB not scheduled to be utilizing site until 2014	3/20/15 TUN1160
2a	42"/48" sewer line relocated as part Utility 1 package is damaged by subsequent construction of the launch box.	1. Make follow-on contractor responsible for repairs to any existing utility lines. 2. Properly as built actual location as part of Utility 1 package and provide to Contract 3 Contractor	C	1	1	2	2	10%	2	3	Sewer Installation complete, awaiting as built drawing. Sewer installed according to contract drawings. Contract 1252 provisions for protection of existing utilities puts all cost and schedule risk on Contractor.	10/24/12 TUN1080
5	Possibility that lowest level of tie-backs extending out from Moscone Center could be within the tunnel alignment.	1. Lower tunnel alignment 5' below the lowest expected tieback. 2. Include obstruction clause and allowance in contract documents.	C	1	1	1	1	10%	1	2	Contract Documents issued for bid, contain location of tiebacks from as built drawings, do not intersect tunnel alignment.	7/2/13 TUN1118
7	Potential for excessive settlement of BART tunnels - SIGNIFICANT COMPENSATION GROUT REQUIRED OVER ESTIMATE ALLOWANCES	1. Early and extensive co-ordination with BART. 2. Survey BART tunnels to determine exact locations. 3. Checking effect of maximum expected settlement on tunnels. 4. Require EPBM TBM, Contractor to demonstrate effective control of ground settlements and correction of settlements by compensation grouting, and pre-installation of compensation grout piping under BART tunnels prior to tunneling reaching Market St. Require repair/adjustment plan. 5. Develop contingency plan to provide bus bridge, if needed. 6. Require non-stop weekend excavation beneath BART tunnels. 7. Monitor movement of BART tunnels in real-time. 8. Repair/adjust as needed. 9. Include probable cost in estimate.	C	2	4	1	3	35%	5	10	Risk is considered active, with mitigation measures fully developed with the exception of Bus Bridge. Adjusted cost impact lower resulting in Risk rating increasing to 2 but still remains a low risk.	8/28/13 TUN1120
8	Flowing groundwater in vicinity of UMS Station could make adequate annulus grouting difficult.	1. Use appropriate additives such as accelerators in primary annulus backfill grouting, if needed. 2. Use secondary grouting as needed.	C	1	1	1	1	10%	1	2	Plans issued for bid contain mitigation measures	8/28/13 TUN1120
E	Underground obstructions tunnel and retrieval shaft	Include differing site conditions in GPs as well as DRB to adjudicate conflicts and minimize costs	C	2	2	3	3	35%	5	10	Mitigation measures have been implemented. Maintain adequate contingency throughout tunnel construction	2/5/14 TUN1124
PR1	Actual TBM production rate may be slower than forecasted.	Assign significant liquidated damages for not meeting specific schedule dates.	C	1	1	3	2	10%	2	4	Considered Risk inherent in the work and reflected in the Current Cost Estimate. Risk will be reflected in Contractor's Bid. LDs included in contract.	2/5/14 TUN1124
13	Damage / settlement 3x 5' to old brick sewer running parallel to tunnel alignment	Slip Line 3'x5' brick sewer before TBM reaches CTS.	C	1	1	-	1	10%	1	1	Tunnel profile has been lowered 25 ft. and plans developed for replacement of at risk utilities in advance of tunnel drive.	12/16/13 TUN1121
15	Major TBM machine failure	Closely monitor condition and maintenance of the machines.	C	1	2	2	2	10%	2	4	Contractor has indicated that they plan to use a newly manufactured TBM for this project.	2/5/14 TUN1124
16	TBM loss and / or damaged in Transit	Provide provisions for insurance for TBM in transit to jobsite	C	1	5	4	5	10%	5	9	Costs covered by Contractor's insurance.	5/20/13 TUN1095
115	Jet grouted station end walls are installed by Tunnel contractor. Station Contractor assumes risk of possibly leakage problems due to insufficiently qualify of end walls.	1. In the 1252 contract, have tunnel contractor set aside a pre-determined amount of money in escrow that can be used to repair any leaks encountered by the station contractors after the in the jet grout end walls are excavated. 2. Alternatively, place an allowance in the station contracts for end wall leakage repair.	C	3	1	1	1	50%	3	6	Project configuration changes include headwall designs with multiple levels of redundancy. Warranty provisions added to contact language.	5/26/15 UMS1295
116	TBM procurement, delivery and assembly takes longer than assumed in schedule.	Accommodate delay to TBM procurement and delivery, on the order of 2 or 3 months, with current float shown on the construction schedule.	C	2	2	2	2	35%	4	8	Mitigation measures are being implemented	5/20/13 TUN1095
B	Storage and testing of excavated soils from tunnel limits advance rate of tunneling.	1. Provide adequate storage and handling facility to accommodate testing activity. 2. Work with SAR to develop acceptance criteria, to minimize or eliminate testing requirements. 3. Require the contractor to provide a detailed workplan for testing, sorting and stockpile prior to hauling.	C	2	3	3	3	35%	6	9	Contractor is attempting to obtain the use of additional Caltrans parcel between Fourth & Fifth and Harrison & Bryant to help facilitate this work and provide additional storage area. .	2/5/14 TUN1124
MOS Station												
21	Incomplete cutoff of groundwater at MOS	1. Require additional grouting to limit leakage to permissible level. 2. Include probable grouting work in cost & schedule estimates.	C	1	1	-	1	10%	1	1	Mitigation measure to be made part of the contract documents	4/28/15 MOS1150

Plot : 5/14/2013 4:44 PM

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22	Public complaints result in unanticipated restrictions on construction at MOS.	1. Public outreach. 2. Maintain regular and open communications so Public knows construction plans and progress at all times. 3. Require Contractor to assist Public Outreach efforts, maintain access to businesses and assist with deliveries and pick-ups, control noise and vibration, continuously cleanup site, and provide pedestrian and vehicle traffic and protection plans, informational signage, ADA ramps and minimum sidewalk widths. 4. Work with MOED to increase cleanup of the area and assist pedestrians across streets, as needed. 5. Monitor and enforce noise, vibration, ADA, traffic, and cleanup requirements. 6. Quickly process and resolve damage and accident claims from the Public. 7. Assumed this work in cost & schedule estimates.	C	1	1	-	1	10%	1	1	Implementation of mitigation measures part of Communication/Outreach plan and certain aspects to be included in the contract documents.	9/16/16 MOS1230
F	Underground obstructions Stations (MOS)	1. Provide adequate allowance for differing site conditions to address unknown underground obstructions. 2. Show field verified obstructions discovered during previous contracts on contract drawings. 3. Make as-built drawings of structures adjacent to the work available to the contractor as reference drawings.	C	4	2	2	2	80%	8	16	Mitigation measures have been implemented.	4/28/15 MOS1150
27	Loss of business results in unanticipated restrictions on construction at MOS.	1. Public outreach. 2. Maintain regular and open communications so Merchants know construction plans and progress at all times. 3. Require Contractor to coordinate with merchants, maintain access to businesses and assist with deliveries and pick-ups, continuously cleanup site, and provide pedestrian and vehicle traffic and protection plans, informational signage, and minimum sidewalk widths. 4. Require barriers to protect pedestrians and shield them from noise and dirt from construction. 5. Work with MOEWD to increase cleanup of the area and assist pedestrians across streets. 6. Include this work in cost & schedule estimates.	C	1	2	1	2	10%	2	3	Mitigation measures to be implemented and to the extent possible requirements will be written into contract documents to minimize disruptions to businesses.	4/28/15 MOS1150
UMS Station												
F	Underground obstructions Stations (UMS)	1. Provide adequate allowance for differing site conditions to address unknown underground obstructions. 2. Show field verified obstructions discovered during previous contracts on contract drawings. 3. Make as-built drawings of structures adjacent to the work available to the contractor as reference drawings.	C	4	2	2	2	80%	8		Mitigation measures have been implemented.	8/12/15 UMS 1320
28	Incomplete cutoff of groundwater at UMS	1. If needed, perform grouting to mitigate the intrusion of groundwater. 2. Include in cost & schedule estimates.	C	1	2	1	2	10%	2	3	Mitigation measures in the form of consolidation grouting to be included in contract documents	8/12/15 UMS1320
32	Delay in advanced utility relocation delays ground treatment and start of construction. (Uty 2)	1. Intensive coordination with and commitment from utility owners. 2. Early completion incentive for utility relocation contract. 3. Enforce franchise agreements.	R	1	1	1	1	10%	1	2	Advance utility relocation contract (1251) is underway with a projected completion date in advance of advertising UMS construction contract, reducing this risk of cost and schedule impacts	7/31/12 N-ATT00100
33	Damage to utilities at UMS causes delay to construction and/or consequential cost. (very close to walls adjacent to relocated utility trenches)	1. Intensive utility coordination and investigation. 2. Relocate utilities out of the way of construction wherever possible. 3. Show utilities on reference plans. 4. Have utility contact information and procedure on plans. 5. Have contingency repair/restoration plans. 6. Include probable impacts to schedule & cost in estimates.	C	2	1	1	1	35%	2	4	Although mitigation measure have been fully implemented, Increased probability due to proximity of new pile design to existing relocated utilities.	7/19/16 UMS1410

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34	Loss of business results in unanticipated restrictions on construction at UMS.	1. Public outreach. 2. Work closely with Merchant's Association. 3. Maintain regular and open communications so Merchants know construction plans and progress at all times. 4. Advertise that Stockton Street Merchants are Open for Business. 5. Require Contractor to coordinate with merchants, maintain access to businesses and assist with deliveries and pick-ups, continuously cleanup site, and provide pedestrian and vehicle traffic and protection plans, informational signage, and minimum sidewalk widths. 6. Require barriers to protect pedestrians and shield them from noise and dirt from construction. 7. Work with the Union Square BID or MOED to increase cleanup of the area and assist pedestrians across streets. 8. Include this work in cost & schedule estimates.	C	2	3	2	3	35%	5	10	Mitigation measures to be implemented and to the extent possible requirements will be written into contract documents to minimize disruptions to businesses.	9/7/16 UMS1430
35	Ground support structure causes groundwater table to rise which results in leakage into adjacent structures.(new structure might create a dam that results into leaks into new and existing structures)	1. Perform detailed hydrogeologic modeling and analysis. 2. Monitor groundwater table at multiple locations and passive measures as necessary to mitigate. 3. Reference the Tech memo in contract documents. 4. Include probable costs in estimate.	C	1	2	-	1	10%	1	2	Mitigation measures incorporated in design based on updated Hydrogeologic analysis and report	9/7/16 UMS1430
36	Damage to buildings or utilities as a result of heave from jet grouting at UMS.	Utilize tangent piles combined with surface jet grouting.	C	1	1	-	1	10%	1	1	Mitigation measures implemented in contract documents to reduce risk	4/14/15 UMS1310
37	Damage to adjacent buildings at UMS due to surface construction activities.	1. Require protective barriers. 2. Have an emergency and rapid response customer focused task force to fix damaged facilities. 3. Quickly repair and reimburse resulting costs. 4. Include probable cost in estimate.	C	1	2	-	1	10%	1	2	Mitigation measures implemented in contract documents to reduce risk	9/7/16 UMS1430
38	Tiebacks in Stockton Street misallocated (in path of walls and would have to be dug out within 20ft of surface level)'	1. Direct contractor to dig out the tiebacks on the plans. 2. Include allowance and differing site conditions clause in contract. 3. Include this work in the cost and schedule estimates.	C	2	2	1	2	35%	3		Mitigation measures fully implemented, Advance utility relocation contract (1251) confirmed location of tiebacks. Risk rating has been reduced due to a lowering of the probability of event occurring	5/6/14 UMS1170
J	Macy's entrance conflict with new piles	1. Show known obstructions shown on as-built drawings on contract drawings. 2. Make as-built drawings available to contractor as reference drawings. 3. Have contractor field verify obstruction shown on as-built drawings and contract drawings	C	3	1	1	1	50%	3	6	Known obstructions are shown on the ES drawings. Allowance for differing site conditions added to UMS Station contract.	1/23/14 UMS1060
Q	As-built drawings and UMS construction drawings do not contain enough information to produce shop drawings without significant surveying effort delaying construction north entrance.	1. Investigate if electronic files of design can be given to the contractor. 2. Clearly define shop drawing criteria in the technical specifications. 3. Make as-built drawings available as reference drawings to the contractor	C	3	1	1	1	50%	3	6	Specifications require contractor to survey USG in order to develop shop drawings for structural steel.	3/24/12 UMS1280
CTS Station												
46	Public complaints result in unanticipated restrictions on construction at CTS. (schedule and estimate for underground work assumes 6 day work week and 2 shifts per day)	1. Public outreach. 2. Maintain regular and open communications so Public knows construction plans and progress at all times. 3. Require Contractor to assist Public Outreach efforts, maintain access to businesses and assist with deliveries and pick-ups, control noise and vibration, continuously cleanup site, and provide pedestrian and vehicle traffic and protection plans, informational signage, ADA ramps and minimum sidewalk widths. 4. Require barriers to protect pedestrians and shield them from noise and dirt from construction. 5. Work with MOED to increase cleanup of the area and assist pedestrians across streets, as needed. 6. Monitor and enforce noise, vibration, ADA, traffic, and cleanup requirements. 7. Quickly process and resolve damage and accident claims from the Public. 8. Include this work in cost & schedule estimates.	C	2	5	1	3	35%	6	12	Implementation of mitigation measures part of Communication/Outreach plan and certain aspects to be included in the contract documents.	10/9/17 CTS1500

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48	Incomplete drawdown of groundwater. (inside of box and inside of caverns)	1. Require additional grouting to limit leakage to permissible level. 2. Include probable grouting work in cost & schedule estimates. 3. Include allowance for dewatering within cavern during construction.	C	2	2	1	2	35%	3	6	Mitigation measures have been included in contract documents	5/1/16 CTS1140
50	CTS station contractor delayed by tunnel contractor since station platform construction cannot start until tunnels have been finished.	1. Include provisions in CTS contract identifying the potential waiting period for tunnel contractor. 2. Actively monitor progress towards schedule milestones	C	2	1	2	2	35%	3	6	Constraints on CTS contractor added to specification "Work Sequence and Constraints"	12/16/13 TUN1122
52	Unacceptable settlement and impact on major utilities at CTS. (OLD SEWERS AND OTHERS WITHIN 20FT SPACE BETWEEN TOP OF CAVERN AND STREET LEVEL)	1. Evaluate effect of potential settlement on utilities. 2. Slip-line sewer by TBM contractor. 3. Reinforce other utilities as needed, monitored during construction, and repair / replace, as needed. 4. Have contingency repair/restoration plan. 5. Utility contact information and procedure will be on plans. 6. Develop an allowance for utility repair. 7. Include probable cost in estimate.	C	3	3	1	2	50%	6	12	Project configuration change, lowered station 25 ft. reducing the probability of this risk. Risk rating lowered.	4/22/16 N-CTS9730
F	Underground obstructions stations (CTS)	1. Provide adequate allowance for differing site conditions to address unknown underground obstructions. 2. Make as-built drawings of structures adjacent to the work available to the contractor as reference drawings	C	4	2	2	2	80%	8		Mitigation measures have been implemented.	10/9/17 CTS1500
U	Proximity at junction of head house boundary wall and school yard may result in relocation of school yard during wall construction		C	1	1	1	1	10%	1	2	Project configuration changed to eliminate encroachment. Risk converted to Construction risk from Risk 55.	8/16/13 CTS1010
General												
56	Escalation more / less than expected (Increase in bid prices to hedge possible increases in cost of volatile commodities.)	1. In the current economic environment, escalation is just as likely to be less as more than anticipated. 2. For volatile materials and equipment, provide substantial payment for stored materials and equipment to encourage early procurement and an escalation clause for volatile commodities in contracts.	M	2	3	-	2	35%	3	6	Current projected escalation rates remain below those reflected in Program budget.	1/10/18 STS1042
Demolition, Clearing , Earthwork												
Site Utilities, Utility relocations												
A	Timely resolution of Sewer lines south of portal.	1. Develop alternatives that do not require creation of a new sewer line. 2. Work together with SFPUC to find mutually beneficial solutions. . 3. Provide evidence of solutions developed for similar situations from existing SFMTA and /or other transit agencies. 4. Develop detailed schedule of activities required for resolution including milestones for go - no go actions which will not impact the overall MPS.	R	1	2	1	2	10%	2	3	$ 2.1 million in budget. Could be as high as $8 million. Continuing to work with SFPUC to find solution.	5/13/12 PDS 1870
Environmental Mitigations												
65	Archeological/Cultural findings during construction increases schedule and/or cost. (Portal) AROUND 10%	1. Provide on-call Archeologist. 2. Provide allowance and procedure in contract for Archeological/Cultural discoveries.	C	1	2	1	2	10%	2	3	Additional boring taken in vicinity of portal indicated no evidence of Archeological/Cultural resources.	10/24/12 TUN1080
66	Archeological/Cultural findings during construction increases schedule and/or cost.(Moscone) AROUND 10%	1. Provide on-call Archeologist. 2. Provide allowance and procedure in contract for Archeological/Cultural discoveries.	C	3	1	1	1	50%	3	6	Mitigated - Current exposure only to those amount above those currently identified	4/28/15 TUN1150
67	Archeological/Cultural findings during construction increases schedule and/or cost. (UMS)…LESS THAN 1%	1. Provide on-call Archeologist. 2. Provide allowance and procedure in contract for Archeological/Cultural discoveries.	C	3	1	2	2	50%	5	9	Mitigation measures to be implemented in contract documents	8/12/15 UMS1320
68	Archeological/Cultural findings during construction increases schedule and/or cost. (CHINA TOWN) …AROUND 10%	1. Provide on-call Archeologist. 2. Provide allowance and procedure in contract for Archeological/Cultural discoveries.	C	3	1	2	2	50%	5	9	Mitigation measures to be implemented in contract documents	10/9/17 CTS1500
Auto/bus/van access ways, roads												
70	Change in traffic control requirements after bid.	1. Provide unit bid items to reimburse contractor for traffic management costs outside their control. 2. Include allowance in construction contracts for PCOs.	C	3	4	1	3	50%	8	15	Mitigation measures implemented.	5/22/17 STS1020
71	Power supply interruptions to TBM's (no dual power feed currently planned)	Obtain TBM power directly from PG&E substation.	C	1	2	-	1	10%	1	2		2/5/14 TUN1124
Train Control and Signals												

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72	Interface new Signaling and Train Control system to existing at Fourth and King	Connect new system in parallel with existing system until the new system has been tested and safety certified for operation.	C	2	2	3	3	35%	5	10	Awaiting approval of contract plans by Muni Operations.	3/4/16 STS1045
PR73	Delays or complications of design & construction by others – SF Dept. Of Technology, 3rd party utilities	Early engagement and coordination for agreements and plan development to avoid construction delays.	D	2	1	1	1	35%	2	4		5/30/12 DP3C530
PR78	Delays or complication by other SFMTA projects delays CSP: radio, fare collection, C3/TMC	1. Monitor other projects' developments. 2. Develop contingency plans as needed to avoid 1256 delay of revenue service.	C	2	1	1	1	35%	2	4		7/27/12 FDS 1940
Traffic signals & Crossing Protn.												
Purchase or lease of Real Estate												
79	Delay in obtaining tunnel easements (3 #) (goes to condemnation) - Costs of ROW may cost more than expected	1. Engage Owners in negotiations as soon as possible. 2. PM/CM to provide real estate specialists to facilitate.	R	1	1	-	1	10%	1	1	Right of possession obtained on all three parcels. Cost agreement reached with 1455 Stockton & 801 Market.	9/7/2012
PR80	ROW costs higher than anticipated.	Provide adequate contingency for potential higher costs	M	1	3	-	2	10%	2	3	Similar to Risk 81.	7/1/12 FDS 1240
Vehicles												
83	Cost of vehicles may be more than estimated due to sole source and small order	Time the procurement of the vehicles to be part of the procurement of the existing Breda LRVs.	R	4	4	4	4	80%	16	32	CSP vehicles to be included in overall SFMTA vehicle procurement contract.	11/17/17 STS 1500
												4
89	3rd Party reviews of Design documents delays completion of Final Design.	Provide assistance to 3rd Parties to facilitate their reviews and obtain concurrent partial approval for underground work.	D	1	2	2	2	10%	2	4	3rd Party coordination meeting ongoing.	5/23/12 FDS 1930
Project Management for Design and Construction												
94	Bid protests delay award and NTP for construction contracts	Strictly adhere to Procurement Best Practices and Protest Procedures.	M	1	2	2	2	10%	2	4	Mitigation measures being implemented	2/19/13 FDS 1900
95	Contractor default during construction impacts schedule. (key sub-contractor)	Assist Bonding company in transition and to maintain schedule.	C	1	2	2	2	10%	2	4		11/17/17 STS 1500
PR82	Confined work spaces along alignment can impact productivity and result in significant cost and schedule impacts.	Account for cost and schedule impacts in estimate and schedule for contract packages	C	1	1	1	1	10%	1	2		11/17/17 STS 1500
99	Breakdown in relationships between SFMTA and Contractors during construction results in increased claims and delays to the overall construction schedule.	1. Executive partnering and alternate dispute resolution. 2. Provide incentives in construction contracts in addition to penalties	C	2	5	3	4	35%	8	16	Mitigation measures being implemented	7/27/12 FDS 1940
100	Procurement of long lead items delays work. (fans, rails and special track work, TPSS, Escalators, elevators, TBM)	1. Include schedule milestones for procurement of and substantial payment for stored long lead items in contract to encourage early procurement. 2. Monitor procurement of critical items.	M	1	2	2	2	10%	2	4	Not considered a project risk.	11/17/17 STS 1500
102	Late finish of early contract delays later contracts and extends PM / CM and incurs additional costs	1. Actively manage contracts and include incentive provisions for early completion in critical contracts. 2. Add buffer float to critical path to actively manage schedule contingency	C	2	1	2	2	35%	3	6	LONP 1 & 2 initiated to reduce this risk. See Risk 86. The mitigation of risks associated with early contracts will address this risk. Risk rating reduced due to mitigation measures implemented	12/30/20 MS 0010
107	Market risk in achieving 100% bonding capacity (cost and reduction in contractors able to get bonding)	Structure construction contracts not to exceed $250 million	M	2	5	-	3	35%	5	10	All contracts expected not to exceed $250 million	7/27/12 FDS 1940
T	Delay on station emergency ventilation approval	1. Work with SFFD to develop a plan acceptable to each party. 2. Incorporate SFFD requirements into construction documents.	R	2	5	-	2	35%	4	10	SFFD agreed to the proposed plan by SFMTA	7/27/12 FDS 1940
V	Incorporation of revised Planning Zoning/ development criteria for Moscone Station TOD impact MOS and CTS construction contract.	1. Participate and provide input of CSP constraints to SFMTA Real Estate during process of initial task to define best use. 2. Integrate work with SFMTA Real Estate into CSP.	D	3	2	2	2	50%	6			12/13/16 N-CTS1225
PR37	Temporary construction power and ability to provide permanent power feed - PGE ability to provide power requirements to the program together with their other commitment	1. Identify temporary power requirements for station construction. 2. Investigate the timing of the permanent feed.	C	2	1	2	2	35%	3	6	Cost for First and Redundant electrical services need to be included in Cost Estimate.	5/3/18 STS1080
Insurance, permits etc.												

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Risk Profile

Likelihood Score	Severity Score 1	2	3	4	5
5				HIGH	
4					
3		MEDIUM			
2	LOW				
1					

	Low (1)	Medium (2)	High (3)	Very High (4)	Significant (5)	Legend
Probability	< 10%	<> 10% - 50%	> 50%	<> 75% - 90%	> 90%	<3 Low
Cost Impact	< $250K	<> $250K - $1M	<> $1M - $3M	<> $3M - $10M	> $10M	3 - 9 Medium
Schedule Impact	< 1 Month	<> 1 - 3 Months	<> 3 - 6 Months	<> 6 - 12 Months	> 12 Months	>10 High

RISK RATING = PROBABILITY X (COST IMPACT + SCHEDULE IMPACT)

2

SCORE = PROBABILITY X (COST IMPACT + SCHEDULE IMPACT)

Final Risk ID	Risk Description	Mitigation Description	Risk Category	Probability %	Cost Impact	Schedule Impact	Calc Impact	Calc %	Risk Rating	Score	Status	Must Complete by Date
103	Difficulty in getting required permits.	1. Coordinate with permit officials and request permits as early as possible. 2. Obtain assistance obtaining permits from PM/CM & FD Consultants.	C	1	2	1	2	10%	2	3		12/18/12 FDS 1275
104	CPUC approval at Grade Crossing for G0164d takes longer to negotiate / obtain than schedule allows	1. Obtain Grade Crossing approvals at final CPUC inspection at the completion of construction. 2. Coordinate closely with CPUC until approval is received.	R	2	3	2	3	35%	5	10	Providing preview of 90% submittal to CPUC and will resolve comments/issues from PE before finalizing design documents	7/27/12 FDS 1940
105	Electrical service delays startup and testing.	1. Submit applications for new service as early as possible. 2. Coordinate closely with PG&E to ensure timely delivery of electrical service.	C	1	2	1	2	10%	2	3	Applications for new service have been submitted to PG&E.	11/17/17 STS 1500
106	Risk of Labor dispute delaying the work.	Enforce designated gate for employees of the contract in dispute so that the rest of the work is not delayed.	C	2	1	1	1	35%	2	4		11/17/17 STS 1500
Unallocated Contingency												
110	Unanticipated poor weather delays work. Delay could be extended by Holiday Moratorium period.	1. Schedule open excavations during dry season. 2. Durations to assume normal weather delay and moratoriums. 3. Include acceleration clauses in contracts. 4. Work cooperatively with Contractor to mitigate delays.	C	-	-	-	-	0%	-	-	Acceleration of work will be done as necessary to maintain program schedule. Acceleration costs will be covered by project contingency.	12/30/20 MS 0010
111	Major Earthquake stops work	Include Force Majeure clause in contracts.	C	1	5	3	4	10%	4	8	Force Majeure clause included in contracts.	12/30/20 MS 0010
112	Major safety event halts work	1. Require contractor Safety plan to address this risk. 2. CM inspections to ensure that safety plan and procedures are implemented.	C	1	5	3	4	10%	4	8	Health and Safety provisions included in contracts. CS Program provides full-time Safety Manager.	12/30/20 MS 0010
196	The process of acquiring station licenses: acquisition/condemnation could significantly delay schedule and cost more than that presently planned.	1. Continue to negotiate with building owners 2. Required Notices and Appraisals to be completed 3. Commence condemnation process with City Attorneys	C		1	1	1	0%	4	-		
201	Bid Protest - (SSTS) 1300 Contract	1. Establish and enforce appropriate qualifications requirement for contractors to be deemed a responsible bidder.	M	1	1	1	1	10%	1	2		
202	Cargo Preference (Ship America) must solicit U.S.- flag carriers. Civilian Agencies Cargo = at least 50% (governed by Cargo Preference Act of 1954	1. Require Ship America compliance agreement first tier contractors and subcontractors	C	1	1	1	1	10%	1	2		
203	Headwalls interface delay 1300 Contractor (SSTS)	1. Meet and develop recovery schedule 2. Review possible Adjustment to 1300 interface	C	3	3	2	3	50%	8	15		
204	AT&T Vault - New Sewer Work south of Bryant	1. Continue negotiations/coordination with utility owners. 2. Schedule analysis to confirm coordination	C	2	2	4	3	35%	6	12		
205	Prolong period of CMod's creates additional cost/causes bad blood between Resident Engineer and Contractor	1. CMod Task Force - 5 Areas of Improvement 2. Implement 3. Delegation of Authority	C	3	1	1	1	50%	3	6		
207	Implementing Pagoda Option for Retrieval Shaft - Delay in Obtaining Property	1. Obtain clear undstanding of current status of property 2. Meet with Owner and determine best options for SFMTA needs. 3.Establish Special Use District to retain existing development rights, in addition to new land use entitlements. 4. Obtain Appraisal 5. Identify Funding 6, Confirm hazardous abatement	C	3	4	2	3	50%	9	18		
208	Additional cost if we change direction going to the Pagoda	1. Develop Scope with designers currently under contract 2. Agree to alignment and details of new shaft location 3. Issue PCC to Contractor 4. Initial site works and borings if necessary 5. Obtain appropriate permits	C	3	3	2	3	50%	8	15		
209	Implementing Pagoda Option - Obtaining Environmental Clearance	1. Engage Planning Dept to outline required actions 2. Develop necessary CEQA documents in concert with Planning Dept. 3. Meet with FTA and determine NEPA and SHPO requirements	C	3	1	1	1	50%	3	6		

PROJECT RISK REGISTER

Central Subway Project San Francisco

REV : 21

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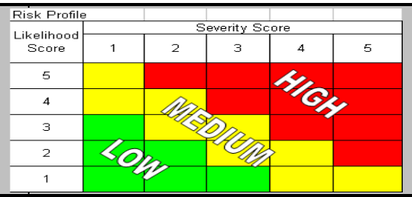

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210	Mission Bay Loop Grant – Needs to be built to allow for train turnarounds (June 2013)	1. Identify timeline for grant funding	C	4	1	1	1	80%	4	8		
211	Differing site conditions encountered during ground freezing of Cross Passage 5 results in increased costs.		C	1	2	2	2	10%	2	4		
212	UMS Inclined piles – 8" clearance between piles and tunnel results in damage or safety issues within the tunnel	1. Establish 1252 and 1300 contract requirements to construct within acceptable tolerances 2. Workshop to be held with BIH to discuss	C	1	5	3	4	10%	4	8		
213	Micro Piles exist within tunnel path at UMS	1. Re-profile and realign tunnel to clear micropiles	C	2	3	1	2	35%	4	8		
214	Micro Piles at UMS interfere with Tube-a-manchette installation (60' deep micropiles)	1. Provide micro-pile as-built information to contractor 2. Realign tube-a-manchettes clear of micro-piles	C	3	1	1	1	50%	3	6		
215	DPW Excavation permit reviews delay contract works	1. Obtain a blanket excavation permits from DPW covering the area of work for 1253, 1254, 1255, 1256	C	2	1	1	1	35%	2	4		
216	Olivet building potential construction impact	1. Reach out to building owner and keep him abreast of CS construction activities.	C	1	1	2	2	10%	2	3		
PNR 130314-1	Contract 1300 language requires the contractor to coordinate with 1252 for tunnel access. The tunnel contractor is not required to coordinate with the 1300 contractor. Bracing in the tunnel at UMS is required during construction of CP-5. Construction of CP-5 may limit access for installation of this bracing	1	C					0%	-			