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Transmittal

CS Transmittal No. 2237

To:	Jeff Davis FTA 201 Mission Street, Suite 1650 San Francisco, CA 94105	**From:**	John Funghi
		Project No./Contract No.:	M544.1, CS-149
		Task No./Title:	1-4.02 Contingency Management
		Project Phase:	
Date:	May 21, 2013	**Subject:**	Contingency Management – Schedule 2012 Update
Reference:			

Sent via:	☐ *mail*	☐ *overnight*	☐ *messenger*	☐ *hand-delivered*
	☐ *fax – **No:***		☒ *email – **Address:***	jeffrey.s.davis@dot.gov

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☐ *copy of letter/memo*	☐ *estimate*	☒ *information/use*	N/A
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☐ *other* _____		_____	

Item No.	***Copies***	***Description***	***Rev. No.***	***Date***
1	1	Contingency Management – Schedule 2012 Update (DRAFT)		May 2013

If enclosures are not as noted, kindly notify us at once.

Remarks: Attached please find revised draft of Contingency Management – Schedule 2012 Update.

John Funghi
Program Director

JF:smk

cc: David Kuehn, STV (w/attachments) david.kuehn@stvinc.com
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CS File No. M544.1.5.0810

Contingency Management – 2012 Update

To date, Contingency Management has been structured on baseline documents developed from the FTA Risk Assessment performed in March 2009 prior to entry into Final Design. A FTA Risk Refresh was performed in May 2011 in preparation for entering into a FFGA. At the time, several significant changes had occurred on the Program; however, no changes were made to the Contingency Drawdown Curves for both cost and schedule. Minimum schedule contingency levels established by the baseline documents in early 2009 require updating at this phase of the project to reflect current project status. The Program is advocating the need for changes to the baseline documents' milestones, hold points and minimum contingency levels for reasons stated within.

Contributing factors necessitating the need for reexamining the original milestones hold points and drawdown curves are: Changes to project configurations, delays to final design submittals, changes is construction contracts packaging strategy, delay to FFGA, improved risk profiles for tunnel and station contracts as well as interfaces with station to tunnel and stations to systems contracts.

SCHEDULE ASSESSMENT AND RISK MODELING

A review of schedule risk was performed as part of the May 2011 Risk Refresh prior to the FFGA. The review included basic schedule logic, durations, and critical paths. The proposed changes to the schedule contingency that follow are based on elements of the 2011 Schedule Review to assess and compare current project schedule risk and sensitivity to project delivery to those schedule risks.

As part of the 2011 Schedule Review, an independent assessment of the most optimistic activity durations was utilized to develop a stripped project schedule. These minimal activity durations resulted in a shortest project path, which provided input to a program used to simulate the magnitude of project schedule risk, and may be used to establish the potential responses to manage the risk. The project risk simulation program stochastically modeled sufficient iterations of random activity durations to adequately represent the risk associated with the project's schedule outcomes.

FTA has established parameters for schedule contingency based upon TCRP Report 31. The time between "Entry into Final Design" and Revenue Service Date (RSD), stripped of all contingency, has nationally and historically averaged a 20 percent overrun in time. It is, therefore, prudent to allow for this time in the schedule and is recommended by FTA. The result is referred to as the "Federal Date" and is calculated below. For ease of calculation, all data is converted to calendar days (CD).

A. Entry into Final Design	01/07/2010	
B. SFMTA Revenue Date	12/26/2018	
C. Duration	3325 CD	B – A
D. Latent Contingency	0	
E. Buffer Float (259 workdays)	360 CD	
F. Stripped Schedule Duration	2965 CD	C – E
G. Stripped Schedule RSD	12/31/2017	A + F
H. FTA Float (20%)	593 CD	F x 20%

I. Recommended Duration	3558 CD	F + H
J. Federal Date	8/16/2019	A + I
K. Difference	233 CD	J - B

The Federal Date is a point of anticipated completion taking into consideration industry experienced delays and difficulties. **It is not a binding date on the project but provides a comparison point so that judgments can be made.** The modeling of the project schedule is compared to the Federal Date for the purpose of determining extra costs for extended performance times. Any indication that the project completion will go beyond the Federal Date requires an adjustment to cost contingency to cover the extra performance time. **The 2011 analysis for the CSP did not indicate that additional costs would be needed.**

SFMTA continues to produce a Critical Path Method Schedule that consolidates the work of design, Real Estate, administrative, construction, and other elements into a work plan that indicates an RSD of December 26, 2018. That Schedule also includes strategically placed quantities of "reserve time" referred to as buffer float. The intent of the buffer float is to isolate risk events and provide for a mitigating contingency so that subsequent work activities are minimally affected. This is a useful strategy in development of the risk models **but has the inherent difficulty in that it affects the inter-contract relationships and timing.** In addition, **embedding buffer float can affect the determination of the critical path of the project,** which in fact happened on the SFMTA Schedule. It is, therefore, important to be cautious in how the schedule is structured.

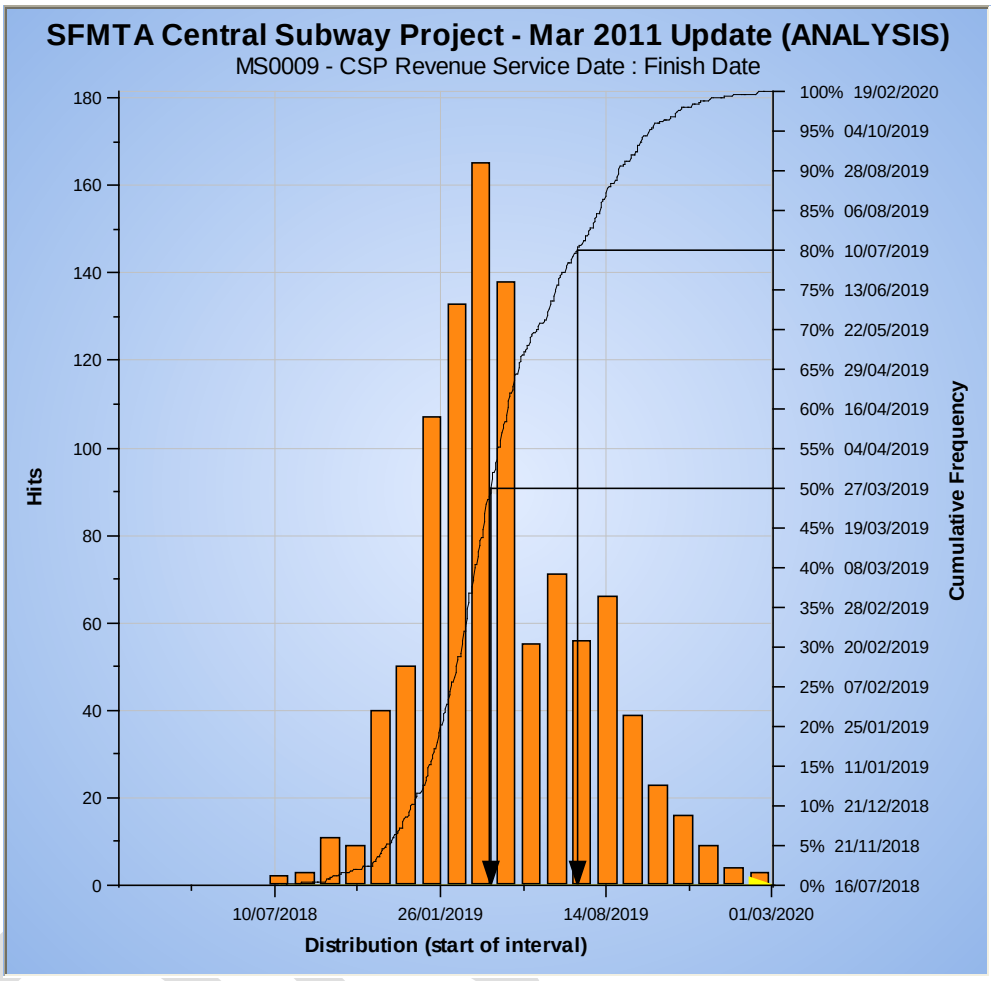
The RA process requires that all contingency time be eliminated from the schedule. In 2011 Schedule Review, investigations by the PMOC and by the Grantee did not identify any latent contingency time beyond the buffer float explicitly shown in the schedule. **The amount of buffer float embedded on the critical path totaled 12 months, and there was other buffer float attached to portions of the schedule.** The elimination of the buffer float throughout the schedule revealed that the project could be shortened by a year to late December 2017. This was the basis for the start of the 2011 schedule RA process.

The PMOC analyzed activity durations and determined the optimistic, pessimistic, and realistic durations that may be expected. The risk ranging of activity durations were combined with discrete risks surviving on the Risk Register to form a comprehensive look at the risk profile and schedule performance.

The histogram in Figure 1 compares the total retained risks identified (168) in the Risk Register to the discrete high level risks (36) modeled in the analysis.

The analysis of the stripped schedule determined that 15 months of risk are present in the schedule, and the RSD could be March 27, 2019 at the 50th percentile (recommended as the appropriate evaluative hold point at FFGA). This is a full three months beyond the planned RSD of December 26, 2018, but less than the SFMTA CSP completion date of August 2019. The following histogram illustrates the results of the analysis.

Figure 1 Histogram



Contingency Management – 2012 Update

Table 1 exhibits the existing agreed to Milestones and Hold points that are an integral part of the Program's Risk and Contingency Management Plan (RCMP), the timing of the milestone (QTR) reflects the 2012 update of the RCMP. Proposed changes are shown by in italicized Red Text and new column for proposed minimum levels.

Table 1: Minimum Schedule Contingency

	Hold Points	QTR	Minimum Contingency Level (Months)	Proposed Contingency Levels (months)
1	Tunnels 100% Designed	1Q11	14	14
2	~~UMS~~ CTS100% Designed June 2011	4Q11	13	13
3	~~FFGA Award and~~ NTP Tunnels	4Q11	12	12
3a	FFGA Award	4Q12	12	10
4	CTS/UMS ~~Commence~~ *Bid* October 2012	4Q12	10	6
5	Demobilize Tunnels October 2014	4Q14	8	5
6	Complete Station to Platform Levels October January 2017 (CTS/YBM)	1Q17	6	4
7	Complete CTS/Tunnels Systems Installation July 2018	3Q18	4	2
	Revenue Service	4Q18	0	0

Close examination of Contingency levels and rational utilized for minimum levels reveals that the original plan has a minimum of 12 month at the time of FFGA. Expectations would have been that the tunnel was bid and physical work would be completed or in progress on the Advance Utility Relocations contracts. The importance of these expectations put in context with the schedule is that the major risk is associated with the inter dependencies of the station contract and tunnel completion. The Program maintained a schedule contingency balance of 14 months up until August of 2012.

In August 2012, although the station designs were complete and two stations (UMS and CTS) had been bid but not yet awarded, the original relationship between tunneling and commencement of the station construction had significantly been altered to the point that the risk to the Program regarding the inherent interdependency had been reduced but not completely eliminated. Reexamining the recommendation to combine all the station contracts and systems contract for cost and schedule benefits, the Program would also transfer the risks of the interdependency of the station to track work

to the Contractor, who would be in the best position to control the successful outcome of these risks. Not only would the Program be relieved of the administrative burden and risk of coordinating four individual contracts, the risk of not completing dependent activities within the specified timeframes would be transferred completely under the control of one Contractor.

Attachments 1 thru 5 illustrate graphically the effect of combining the contracts. Listed below are explanations of the graphical depictions.

Attachment 1 – Illustrates how combining the contracts further delays the NTP dates of the station contracts providing more time for tunneling to complete prior to the required station tunnel interdependency. The 5 month delay to NTP does not impact the planned Revenue Service Date.

Attachment 2 – Illustrates the August 2012 Program critical path and the buffer float on the critical path totaling 14.4 months.

Attachment 3 – Illustrates the September 2012 Program critical path after combining the four remaining contracts into one and the buffer float on the critical path. Note buffer float previously on the critical path no longer exists and new buffer float has been added.

Attachment 4 – Illustrates the November 2012 Program critical path, adjusted by making changes to the CTS tunnel break-in activity buffer float; providing more overall buffer float on critical path.

Attachment 5 – Illustrates in one graphic, the effect of buffer float changes and how what is on the critical path has changed. The buffer float still exists in the schedule.

The importance of attachment 4 is to demonstrate the effect of computing minimum schedule contingency, it only accounts for buffer float that is on the critical path.

The Program advocates that the risk profile has changed with the delay in commencement of the stations contracts and with the combining of the four remaining contracts into one. This significant change in the Program risk profile justifies the adjustments to the minimum contingencies and the Hold Points definitions.

Contributing factor to adjust milestones	Resulting justification for use of contingency
Delays to stations NTPs	Extends time to complete tunnel and reduce risk of delay to station break-in activity
Combining of contract package into one procurement	Transfers high risk cost items to contractor
Delay to FFGA	Allows use of contingency for intended purpose
Improved risk profiles for tunnel and station contracts	Allows use of contingency for intended purpose

Implementation of the recommended changes to milestones and hold points, **the Program still has embedded float in the schedule to account for the identified risks, but will not be credited for it against the minimum contingency because of the shift in the critical activities.** Commencement of the underground stations is important, however, UMS becomes the critical path for the majority of the

remaining time. The program sees the need to adjust the hold points and minimum levels in approaching this strategic point in time due to contributing factors noted above. Specifically, the delay in station construction relative to tunnel construction, and combining the remaining four contracts into one procurement; has not only changed the order in which previously identified key strategic events occur, but has necessitated the reevaluation and heightened importance of hold points as they relate specifically to contingency draw down. Examining these against the backdrop of rational utilized to establish the minimum levels as outlined above provides the necessary justification to rationalize the change in contingency draw down, milestones and hold points.

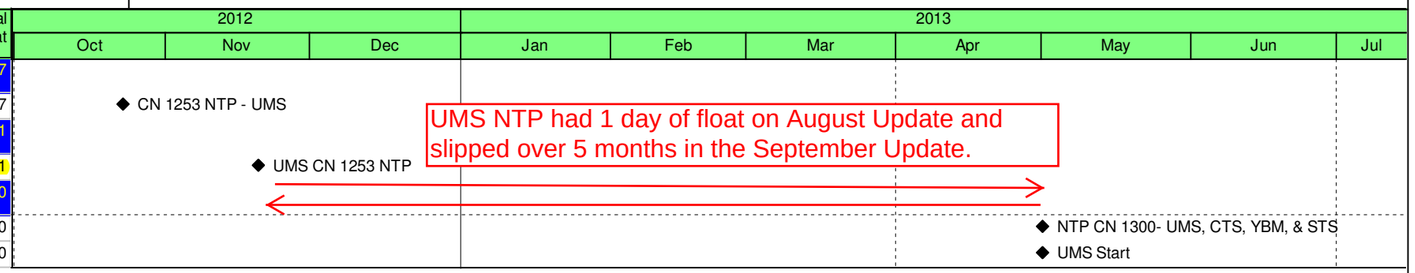
The justification for these changes can be augmented by examining the rational for the establishment of the original milestones and hold points and then addressing the contributing factors above and how they preserve the integrity of the original contingency management objects for addressing those risks, but justifiably can be refined to better address the current project circumstances and status.

In addition to these adjustments, the single contract for combining the four remaining contracts is including a schedule component in the bid package. The bid evaluation allows the bidder to insert number of bid days, not to exceed 1700 days, as part of the competitive bidding process. The Program has added this component as an additional mitigation measure to preserve schedule contingency.

The Program will develop a revised histogram to validate the proposed changes to ensure that the new risk profile falls within acceptable limits of time and cost. The Program will analyze activity durations and determined the optimistic, pessimistic, and realistic durations that may be expected, based on real data from tunnel contractor experiences. The risk ranging of activity durations will be combined with discrete risks surviving on the Risk Register to form a comprehensive look at the risk profile and schedule performance.

Attachment 1

Activity ID	Activity Name	Org Dur	Start	Total Float
SMTA Central Subway Project - March 2012 Update		0	23-Oct-12	17
FDS1700	CN 1253 NTP - UMS	0	23-Oct-12	17
SFMTA Central Subway Project - August 2012 Update		0	20-Nov-12	1
FDS1700	UMS CN 1253 NTP	0	20-Nov-12	1
SFMTA Central Subway Project - September 2012 Update		0	01-May-13	0
FDS2320	NTP CN 1300- UMS, CTS, YBM, & STS	0	01-May-13	0
FDS1700	UMS Start	0	01-May-13	0

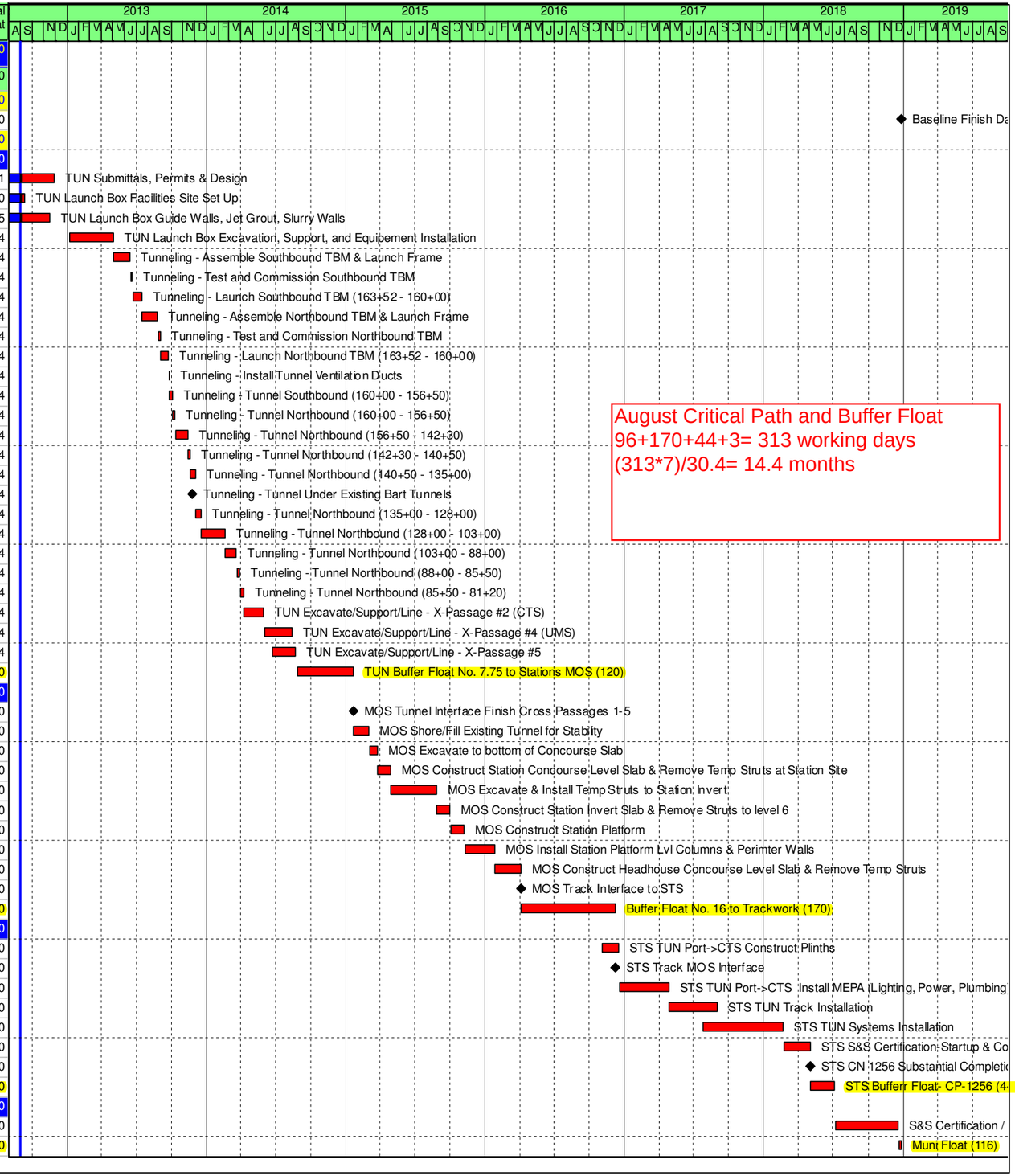


UMS NTP had 1 day of float on August Update and slipped over 5 months in the September Update.

TASK filter: UMS NTPs.

Attachment 2

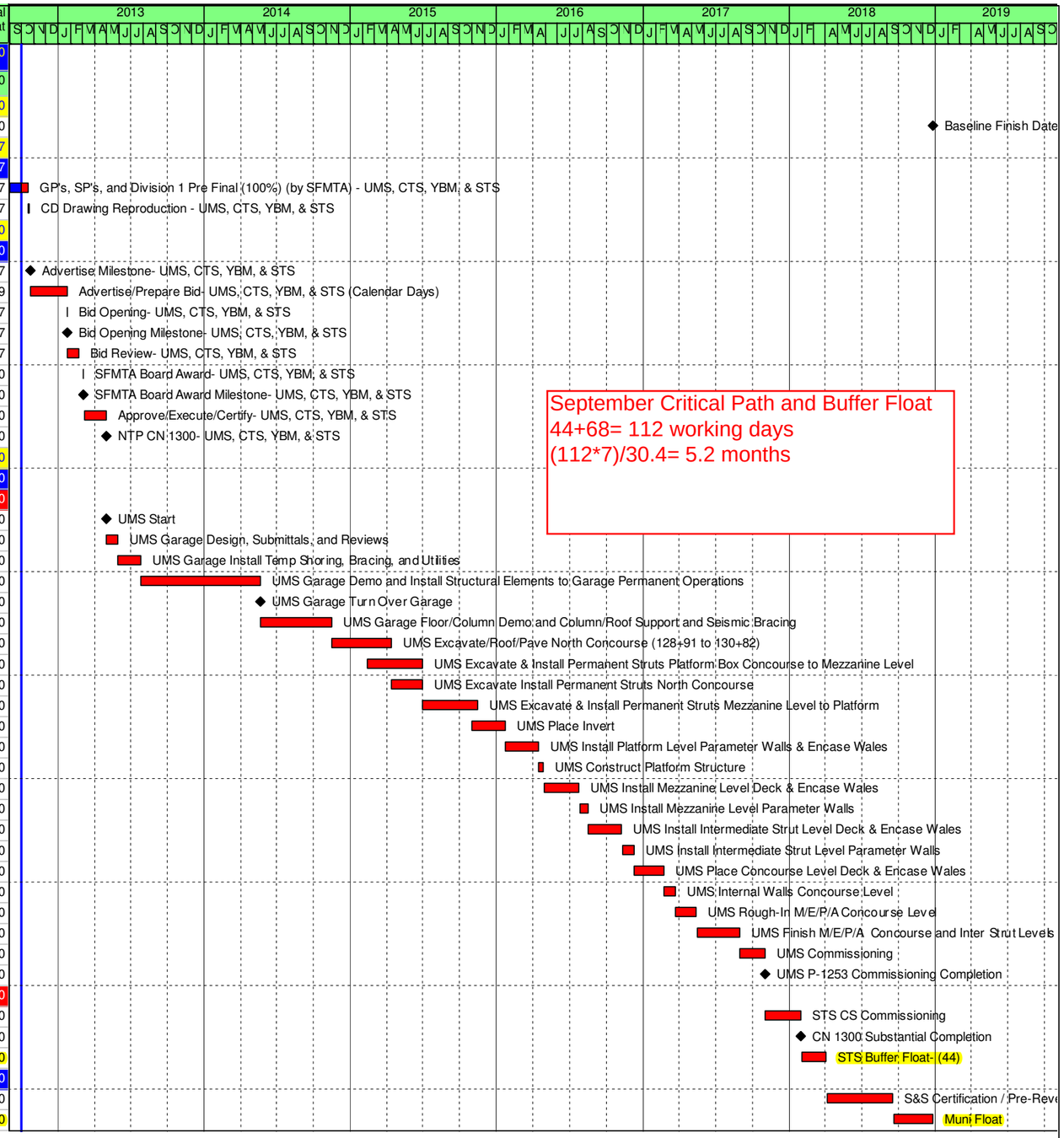
Activity ID	Activity Name	Org Dur	Start	Finish	Total Float
SFMTA Central Subway Project - August 2012 Update		2404	30-Jan-12 A	26-Dec-18	0
CENTRAL SUBWAY PROJECT		2404	30-Jan-12 A	26-Dec-18	0
Program Level Milestones		0	26-Dec-18	26-Dec-18	0
MS0019	Baseline Finish Date: 12-26-2018	0		26-Dec-18*	0
CONSTRUCTION PHASE		2404	30-Jan-12 A	26-Dec-18	0
Construction Tunnels CN-1252		969	30-Jan-12 A	21-Jan-15	0
TUN9860	TUN Submittals, Permits & Design	13	30-Jan-12 A	27-Nov-12	-31
TUN9870	TUN Launch Box Facilities Site Set Up	40	01-Apr-12 A	10-Sep-12	-30
TUN1080	TUN Launch Box Guide Walls, Jet Grout, Slurry Walls	130	11-Apr-12 A	17-Nov-12	-35
TUN9710	TUN Launch Box Excavation, Support, and Equipement Installation	83	07-Jan-13	02-May-13	-24
TUN-07-1000	Tunneling - Assemble Southbound TBM & Launch Frame	30	03-May-13	14-Jun-13	-24
TUN-07-1010	Tunneling - Test and Commission Southbound TBM	5	17-Jun-13	21-Jun-13	-24
TUN-07-1020	Tunneling - Launch Southbound TBM (163+52 - 160+00)	15	24-Jun-13	15-Jul-13	-24
TUN-06-1000	Tunneling - Assemble Northbound TBM & Launch Frame	30	16-Jul-13	26-Aug-13	-24
TUN-06-1010	Tunneling - Test and Commission Northbound TBM	5	27-Aug-13	03-Sep-13	-24
TUN-06-1020	Tunneling - Launch Northbound TBM (163+52 - 160+00)	15	04-Sep-13	24-Sep-13	-24
TUN-07-1030	Tunneling - Install Tunnel Ventilation Ducts	1	25-Sep-13	25-Sep-13	-24
TUN-07-1050	Tunneling - Tunnel Southbound (160+00 - 156+50)	6	26-Sep-13	03-Oct-13	-24
TUN-06-1040	Tunneling - Tunnel Northbound (160+00 - 156+50)	6	04-Oct-13	11-Oct-13	-24
TUN-06-1050	Tunneling - Tunnel Northbound (156+50 - 142+30)	23	14-Oct-13	13-Nov-13	-24
TUN-06-1060	Tunneling - Tunnel Northbound (142+30 - 140+50)	3	14-Nov-13	18-Nov-13	-24
TUN-06-1070	Tunneling - Tunnel Northbound (140+50 - 135+00)	9	19-Nov-13	03-Dec-13	-24
TUN-06-1080	Tunneling - Tunnel Under Existing Bart Tunnels	0	25-Nov-13		-24
TUN-06-1130	Tunneling - Tunnel Northbound (135+00 - 128+00)	11	04-Dec-13	18-Dec-13	-24
TUN-06-1150	Tunneling - Tunnel Northbound (128+00 - 103+00)	39	19-Dec-13	18-Feb-14	-24
TUN-06-1140	Tunneling - Tunnel Northbound (103+00 - 88+00)	23	19-Feb-14	21-Mar-14	-24
TUN-06-1090	Tunneling - Tunnel Northbound (88+00 - 85+50)	5	24-Mar-14	28-Mar-14	-24
TUN-06-1100	Tunneling - Tunnel Northbound (85+50 - 81+20)	7	31-Mar-14	08-Apr-14	-24
TUN1205	TUN Excavate/Support/Line - X-Passage #2 (CTS)	37	09-Apr-14	30-May-14	-24
TUN1215	TUN Excavate/Support/Line - X-Passage #4 (UMS)	52	02-Jun-14	13-Aug-14	-24
TUN1125	TUN Excavate/Support/Line - X-Passage #5	43	23-Jun-14	21-Aug-14	-24
BUF1047	TUN Buffer Float No. 7.75 to Stations MOS (120)	96	29-Aug-14	21-Jan-15	0
Construction MOS Station CN-1255		685	21-Jan-15	06-Dec-16	0
N-MOS9910	MOS Tunnel Interface Finish Cross Passages 1-5	0		21-Jan-15	0
N-MOS9740	MOS Shore/Fill Existing Tunnel for Stability	28	22-Jan-15	03-Mar-15	0
N-MOS10150	MOS Excavate to bottom of Concourse Slab	15	04-Mar-15	24-Mar-15	0
MOS1140	MOS Construct Station Concourse Level Slab & Remove Temp Struts at Station Site	25	25-Mar-15	28-Apr-15	0
MOS1110	MOS Excavate & Install Temp Struts to Station Invert	85	29-Apr-15	27-Aug-15	0
MOS1160	MOS Construct Station Invert Slab & Remove Struts to level 6	25	28-Aug-15	02-Oct-15	0
MOS1180	MOS Construct Station Platform	25	05-Oct-15	06-Nov-15	0
N-MOS1180	MOS Install Station Platform Lvl Columns & Perimter Walls	50	09-Nov-15	25-Jan-16	0
N-MOS9745	MOS Construct Headhouse Concourse Level Slab & Remove Temp Struts	50	26-Jan-16	05-Apr-16	0
N-MOS10120	MOS Track Interface to STS	0		05-Apr-16	0
BUF0016	Buffer Float No. 16 to Trackwork (170)	170	06-Apr-16	06-Dec-16	0
Construction STS CN-1256		611	03-Nov-16	06-Jul-18	0
STS3030	STS TUN Port->CTS Construct Plinths	30	03-Nov-16	16-Dec-16	0
STS9720	STS Track MOS Interface	0		06-Dec-16	0
STS3040	STS TUN Port->CTS Install MEPA (Lighting, Power, Plumbing)	90	19-Dec-16	26-Apr-17	0
STS3070	STS TUN Track Installation	90	27-Apr-17	01-Sep-17	0
STS3080	STS TUN Systems Installation	147	24-Jul-17	21-Feb-18	0
STS3090	STS S&S Certification-Startup & Commissioning	50	22-Feb-18	02-May-18	0
STS1500	STS CN 1256 Substantial Completion	0		02-May-18	0
BUF1017	STS Bufferr Float- CP-1256 (44)	44	03-May-18	06-Jul-18	0
Project Startup		118	09-Jul-18	26-Dec-18	0
STU1010	S&S Certification / Pre-Revenue Activities	115	09-Jul-18	19-Dec-18	0
BUF0018	Muni Float (116)	3	20-Dec-18	26-Dec-18	0



August Critical Path and Buffer Float
96+170+44+3= 313 working days
(313*7)/30.4= 14.4 months

Attachment 3

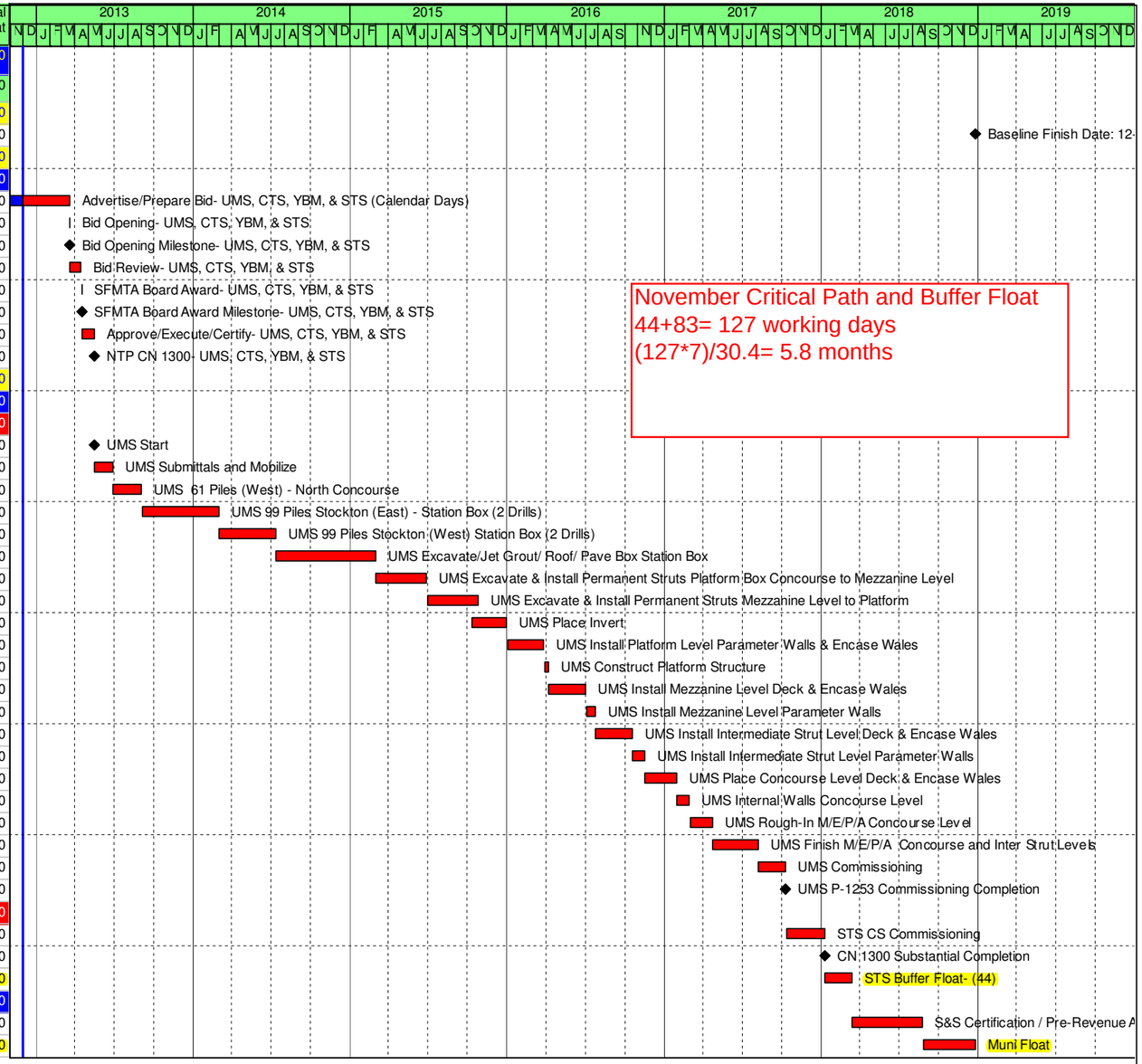
Activity ID	Activity Name	Org Dur	Start	Finish	Total Float
SFMTA Central Subway Project - September 2012 Update		2278	03-Sep-12 A	26-Dec-18	0
CENTRAL SUBWAY PROJECT		2278	03-Sep-12 A	26-Dec-18	0
Program Level Milestones		0	26-Dec-18	26-Dec-18	0
MS0019	Baseline Finish Date: 12-26-2018	0		26-Dec-18*	0
FINAL DESIGN PHASE		35	03-Sep-12 A	19-Oct-12	7
Final Construction Docs CN-1300		35	03-Sep-12 A	19-Oct-12	7
FDS1540	GP's, SP's, and Division 1 Pre Final (100%) (by SFMTA) - UMS, CTS, YBM, & STS	35	03-Sep-12 A	17-Oct-12	7
FDS2340	CD Drawing Reproduction - UMS, CTS, YBM, & STS	2	18-Oct-12	19-Oct-12	7
PROCUREMENT PHASE		191	22-Oct-12	01-May-13	0
Bid/Award CP-1300		191	22-Oct-12	01-May-13	0
FDS2290	Advertise Milestone- UMS, CTS, YBM, & STS	0	22-Oct-12		7
FDS2270	Advertise/Prepare Bid- UMS, CTS, YBM, & STS (Calendar Days)	93	22-Oct-12	22-Jan-13	9
FDS2250	Bid Opening- UMS, CTS, YBM, & STS	1	23-Jan-13	23-Jan-13	7
FDS2300	Bid Opening Milestone- UMS, CTS, YBM, & STS	0		23-Jan-13	7
FDS2280	Bid Review- UMS, CTS, YBM, & STS	20	24-Jan-13	21-Feb-13	7
FDS2240	SFMTA Board Award- UMS, CTS, YBM, & STS	1	05-Mar-13	05-Mar-13	0
FDS2310	SFMTA Board Award Milestone- UMS, CTS, YBM, & STS	0		05-Mar-13	0
FDS2260	Approve/Execute/Certify- UMS, CTS, YBM, & STS	40	06-Mar-13	30-Apr-13	0
FDS2320	NTP CN 1300- UMS, CTS, YBM, & STS	0	01-May-13		0
CONSTRUCTION PHASE		2066	01-May-13	26-Dec-18	0
Construction CN-1300		1799	01-May-13	03-Apr-18	0
Construction UMS Station P-1253		1646	01-May-13	01-Nov-17	0
FDS1700	UMS Start	0	01-May-13		0
N-UMS1067	UMS Garage Design, Submittals, and Reviews	20	01-May-13	29-May-13	0
N-UMS10000	UMS Garage Install Temp Shoring, Bracing, and Utilities	40	30-May-13	25-Jul-13	0
N-UMS10010	UMS Garage Demo and Install Structural Elements to Garage Permanent Operations	175	26-Jul-13	19-May-14	0
N-UMS9990	UMS Garage Turn Over Garage	0		19-May-14	0
N-UMS10060	UMS Garage Floor/Column Demo and Column/Roof Support and Seismic Bracing	125	20-May-14	13-Nov-14	0
N-UMS1013	UMS Excavate/Roof/Pave North Concourse (128+91 to 130+82)	85	14-Nov-14	13-Apr-15	0
N-UMS1160	UMS Excavate & Install Permanent Struts Platform Box Concourse to Mezzanine Level	115	13-Feb-15	29-Jun-15	0
UMS1170	UMS Excavate Install Permanent Struts North Concourse	65	14-Apr-15	29-Jun-15	0
N-UMS1295	UMS Excavate & Install Permanent Struts Mezzanine Level to Platform	115	30-Jun-15	13-Nov-15	0
UMS1330	UMS Place Invert	62	31-Oct-15	21-Jan-16	0
UMS1315	UMS Install Platform Level Parameter Walls & Encase Wales	71	22-Jan-16	14-Apr-16	0
UMS1340	UMS Construct Platform Structure	11	15-Apr-16	27-Apr-16	0
N-UMS1222	UMS Install Mezzanine Level Deck & Encase Wales	61	28-Apr-16	25-Jul-16	0
N-UMS10030	UMS Install Mezzanine Level Parameter Walls	15	26-Jul-16	15-Aug-16	0
UMS1200	UMS Install Intermediate Strut Level Deck & Encase Wales	60	16-Aug-16	08-Nov-16	0
N-UMS1040	UMS Install Intermediate Strut Level Parameter Walls	20	09-Nov-16	08-Dec-16	0
UMS1180	UMS Place Concourse Level Deck & Encase Wales	50	09-Dec-16	21-Feb-17	0
UMS1210	UMS Internal Walls Concourse Level	25	22-Feb-17	22-Mar-17	0
UMS1230	UMS Rough-In M/E/P/A Concourse Level	45	23-Mar-17	13-May-17	0
UMS1440	UMS Finish M/E/P/A Concourse and Inter Strut Levels	90	15-May-17	29-Aug-17	0
UMS1450	UMS Commissioning	45	30-Aug-17	01-Nov-17	0
UMS1500	UMS P-1253 Commissioning Completion	0		01-Nov-17	0
Construction STS P-1256		153	02-Nov-17	03-Apr-18	0
STS9990	STS CS Commissioning	60	02-Nov-17	30-Jan-18	0
STS1500	CN 1300 Substantial Completion	0		30-Jan-18	0
BUF1017	STS Buffer Float- (44)	44	31-Jan-18	03-Apr-18	0
Project Startup		183	04-Apr-18	26-Dec-18	0
STU1010	S&S Certification / Pre-Revenue Activities	115	04-Apr-18	17-Sep-18	0
BUF0018	Muni Float	68	18-Sep-18	26-Dec-18	0



September Critical Path and Buffer Float
44+68= 112 working days
(112*7)/30.4= 5.2 months

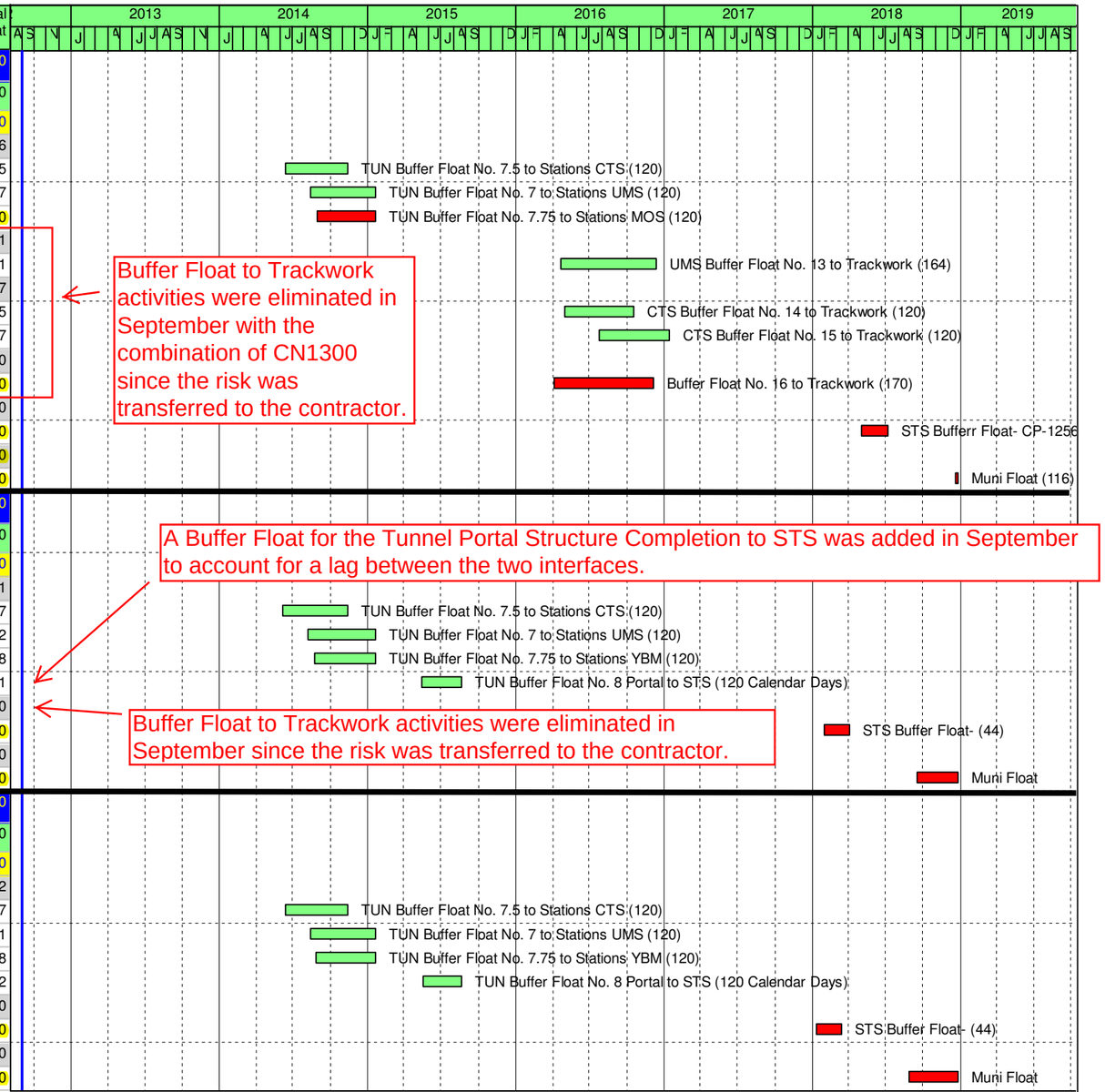
Attachment 4

Activity ID	Activity Name	Org Dur	Start	Finish	Total Float
SFMTA Central Subway Project - November 2012 Update		2257	22-Oct-12 A	26-Dec-18	0
CENTRAL SUBWAY PROJECT		2257	22-Oct-12 A	26-Dec-18	0
Program Level Milestones		0	26-Dec-18	26-Dec-18	0
MS0019	Baseline Finish Date: 12-26-2018	0		26-Dec-18*	0
PROCUREMENT PHASE		206	22-Oct-12 A	15-May-13	0
Bid/Award CP-1300		206	22-Oct-12 A	15-May-13	0
FDS2270	Advertise/Prepare Bid- UMS, CTS, YBM, & STS (Calendar Days)	148	22-Oct-12 A	18-Mar-13	0
FDS2250	Bid Opening- UMS, CTS, YBM, & STS	1	19-Mar-13	19-Mar-13	0
FDS2300	Bid Opening Milestone- UMS, CTS, YBM, & STS	0		19-Mar-13	0
FDS2280	Bid Review- UMS, CTS, YBM, & STS	19	20-Mar-13	15-Apr-13	0
FDS2240	SFMTA Board Award- UMS, CTS, YBM, & STS	1	16-Apr-13	16-Apr-13	0
FDS2310	SFMTA Board Award Milestone- UMS, CTS, YBM, & STS	0		16-Apr-13	0
FDS2260	Approve/Execute/Certify- UMS, CTS, YBM, & STS	21	17-Apr-13	15-May-13	0
FDS2320	NTP CN 1300- UMS, CTS, YBM, & STS	0		15-May-13	0
CONSTRUCTION PHASE		2051	16-May-13	26-Dec-18	0
Construction CN-1300		1763	16-May-13	13-Mar-18	0
Construction UMS Station P-1253		1610	16-May-13	11-Oct-17	0
FDS1700	UMS Start	0	16-May-13		0
N-UMS1000	UMS Submittals and Mobilize	30	16-May-13	27-Jun-13	0
N-UMS1001	UMS 61 Piles (West) - North Concourse	46	28-Jun-13	03-Sep-13	0
N-UMS9900	UMS 99 Piles Stockton (East) - Station Box (2 Drills)	110	04-Sep-13	01-Mar-14	0
N-UMS1003	UMS 99 Piles Stockton (West) Station Box (2 Drills)	110	03-Mar-14	11-Jul-14	0
N-UMS1016	UMS Excavate/Jet Grout/ Roof/ Pave Box Station Box	155	12-Jul-14	02-Mar-15	0
N-UMS1160	UMS Excavate & Install Permanent Struts Platform Box Concourse to Mezzanine Level	100	03-Mar-15	27-Jun-15	0
N-UMS1295	UMS Excavate & Install Permanent Struts Mezzanine Level to Platform	100	29-Jun-15	26-Oct-15	0
UMS1330	UMS Place Invert	62	13-Oct-15	30-Dec-15	0
UMS1315	UMS Install Platform Level Parameter Walls & Encase Wales	71	04-Jan-16	26-Mar-16	0
UMS1340	UMS Construct Platform Structure	10	28-Mar-16	07-Apr-16	0
N-UMS1222	UMS Install Mezzanine Level Deck & Encase Wales	60	08-Apr-16	01-Jul-16	0
N-UMS10030	UMS Install Mezzanine Level Parameter Walls	15	05-Jul-16	25-Jul-16	0
UMS1200	UMS Install Intermediate Strut Level Deck & Encase Wales	60	26-Jul-16	18-Oct-16	0
N-UMS1040	UMS Install Intermediate Strut Level Parameter Walls	20	19-Oct-16	15-Nov-16	0
UMS1180	UMS Place Concourse Level Deck & Encase Wales	50	16-Nov-16	30-Jan-17	0
UMS1210	UMS Internal Walls Concourse Level	25	31-Jan-17	01-Mar-17	0
UMS1230	UMS Rough-In M/E/P/A Concourse Level	45	02-Mar-17	22-Apr-17	0
UMS1440	UMS Finish M/E/P/A Concourse and Inter Strut Levels	90	24-Apr-17	08-Aug-17	0
UMS1450	UMS Commissioning	45	09-Aug-17	11-Oct-17	0
UMS1500	UMS P-1253 Commissioning Completion	0		11-Oct-17	0
Construction STS P-1256		153	12-Oct-17	13-Mar-18	0
STS9990	STS CS Commissioning	60	12-Oct-17	09-Jan-18	0
STS1500	CN 1300 Substantial Completion	0		09-Jan-18	0
BUF1017	STS Buffer Float- (44)	44	10-Jan-18	13-Mar-18	0
Project Startup		198	14-Mar-18	26-Dec-18	0
STU1010	S&S Certification / Pre-Revenue Activities	115	14-Mar-18	24-Aug-18	0
BUF0018	Muni Float	83	27-Aug-18	26-Dec-18	0



Attachment 5

Activity ID	Activity Name	Org Dur	Start	Finish	Total Float
SFMTA Central Subway Project - August 2012 Update		1141	12-Jun-14	26-Dec-18	0
CENTRAL SUBWAY PROJECT		1141	12-Jun-14	26-Dec-18	0
CONSTRUCTION PHASE		1141	12-Jun-14	26-Dec-18	0
Construction Tunnels CN-1252		151	12-Jun-14	21-Jan-15	46
BUF1027	TUN Buffer Float No. 7.5 to Stations CTS (120)	108	12-Jun-14	12-Nov-14	45
BUF0007	TUN Buffer Float No. 7 to Stations UMS (120)	106	14-Aug-14	20-Jan-15	47
BUF1047	TUN Buffer Float No. 7.75 to Stations MOS (120)	96	29-Aug-14	21-Jan-15	0
Construction UMS Station CN-1253		164	21-Apr-16	13-Dec-16	1
BUF1037	UMS Buffer Float No. 13 to Trackwork (164)	164	21-Apr-16	13-Dec-16	1
Construction CTS Station CN-1254		178	02-May-16	13-Jan-17	47
BUF0014	CTS Buffer Float No. 14 to Trackwork (120)	120	02-May-16	19-Oct-16	105
BUF0015	CTS Buffer Float No. 15 to Trackwork (120)	120	25-Jul-16	13-Jan-17	47
Construction MOS Station CN-1255		170	06-Apr-16	06-Dec-16	0
BUF0016	MOS Buffer Float No. 16 to Trackwork (170)	170	06-Apr-16	06-Dec-16	0
Construction STS CN-1256		44	03-May-18	06-Jul-18	0
BUF1017	STS Bufferr Float- CP-1256 (44)	44	03-May-18	06-Jul-18	0
Project Startup		3	20-Dec-18	26-Dec-18	0
BUF0018	Muni Float (116)	3	20-Dec-18	26-Dec-18	0
SFMTA Central Subway Project - September 2012 Update		1665	06-Jun-14	26-Dec-18	0
CENTRAL SUBWAY PROJECT		1665	06-Jun-14	26-Dec-18	0
CONSTRUCTION PHASE		1665	06-Jun-14	26-Dec-18	0
Construction Tunnels CN-1252		440	06-Jun-14	19-Aug-15	21
BUF1027	TUN Buffer Float No. 7.5 to Stations CTS (120)	112	06-Jun-14	12-Nov-14	47
BUF0007	TUN Buffer Float No. 7 to Stations UMS (120)	110	08-Aug-14	20-Jan-15	112
BUF1047	TUN Buffer Float No. 7.75 to Stations YBM (120)	100	25-Aug-14	21-Jan-15	38
BUF008	TUN Buffer Float No. 8 Portal to STS (120 Calendar Days)	96	16-May-15	19-Aug-15	21
Construction CN-1300		44	31-Jan-18	03-Apr-18	0
BUF1017	STS Buffer Float- (44)	44	31-Jan-18	03-Apr-18	0
Project Startup		68	18-Sep-18	26-Dec-18	0
BUF0018	Muni Float	68	18-Sep-18	26-Dec-18	0
SFMTA Central Subway Project - November 2012 Update		1659	12-Jun-14	26-Dec-18	0
CENTRAL SUBWAY PROJECT		1659	12-Jun-14	26-Dec-18	0
CONSTRUCTION PHASE		1659	12-Jun-14	26-Dec-18	0
Construction Tunnels CN-1252		434	12-Jun-14	19-Aug-15	162
BUF1027	TUN Buffer Float No. 7.5 to Stations CTS (120)	108	12-Jun-14	12-Nov-14	57
BUF0007	TUN Buffer Float No. 7 to Stations UMS (120)	106	14-Aug-14	20-Jan-15	111
BUF1047	TUN Buffer Float No. 7.75 to Stations YBM (120)	99	26-Aug-14	21-Jan-15	38
BUF008	TUN Buffer Float No. 8 Portal to STS (120 Calendar Days)	93	19-May-15	19-Aug-15	162
Construction CN-1300		44	10-Jan-18	13-Mar-18	0
BUF1017	STS Buffer Float- (44)	44	10-Jan-18	13-Mar-18	0
Project Startup		83	27-Aug-18	26-Dec-18	0
BUF0018	Muni Float	83	27-Aug-18	26-Dec-18	0



Buffer Float to Trackwork activities were eliminated in September with the combination of CN1300 since the risk was transferred to the contractor.

A Buffer Float for the Tunnel Portal Structure Completion to STS was added in September to account for a lag between the two interfaces.

Buffer Float to Trackwork activities were eliminated in September since the risk was transferred to the contractor.