Santa Ana River Wasteload Allocation Model Update

BASIN MONITORING PROGRAM TASK FORCE

January 18, 2018

SAWPA

GEOSCIENCE

Overview

- Peer Review Workshop Results
- SAR WLAM Change Order No. 1
- Updated Project Schedule

Overview

- **Peer Review Workshop Results**
- **SAR WLAM Change Order No. 1**
- **Updated Project Schedule**

Summary of Comments for TM-1: Data Collection

Source		No Action Necessary	Minor Edit	Additional Explanation or Table/ Figure	Additional Work/ Model Calibration	Total No. of Comments
		Corresponding Comment Number				
Prior to Workshop	IEUA/ CBWM	G-1	2, 11	1, 3, 4, 5, 6, **7**, **8**, 9, 10	-	12
	OCWD	-	1	-	-	1
	RWQCB	-	-	-	-	0
	SAWPA	-	1	2, 3	-	3
Risk Sciences		-	-	-	-	0
					Total	16

Note: Bolded blue numbers indicate out-of-scope work

Summary of Comments for TM-2: WLAM Update and Recalibration

Source		No Action Necessary	Minor Edit	Additional Explanation or Table/ Figure	Additional Work/ Model Calibration	Total No. of Comments
		Corresponding Comment Number				
Prior to Workshop	IEUA/ CBWM	G-2, 11	5, 6, 7, 8, 9, 13, 17, 19, 20, 21	1,2, 4, 10, 12, 14, 15, 16, 18, 22	**3, 23**	24
	OCWD	13	2, 4, 8, 12, 15	1, 3, **5**, 6, 10, 11, 14	**7, 9**	15
	RWQCB	-	1, 2, 3	5	**4, 6, 7**	7
	SAWPA	-	2, 3	1, 5, 6	**4, 7**	7
Risk Sciences		-	4, 14, 15, 16, 17, 18, 32, 34, 35, 36, 37, 38, 39, 40	1, 2, 8, **9**, 10, 11, 13, 19, 20, 21, 22, 24, 25, 26, **27**, **29**, **30**, **31**, 33, 41	**3**, **5**, **6**, **7**, **12**, **23**, **28**	41
					Total	94

Note: Bolded black numbers indicate work has already been completed.
Bolded blue numbers indicate out-of-scope work

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Subtask 1h: Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM

No.	Section	Pg.	Comment	Source
3	2.3.8	9	There are significant discharges from the San Bernardino's geothermal plant to Warm Creek. These do not appear to be accounted for in the model calibration and may explain some of the discrepancy at this station.	Risk Sciences
5	2.3.8	9	On occasion, under certain extreme wet weather conditions, the Cities of San Bernardino and Colton may discharge directly to the river rather than sending secondary effluent to RIX for filtration. Although rare, these discharges may be confounding the calibration. Please check with POTWs for more details regarding these events.	Risk Sciences

Subtask 1h: Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM (Cont.)

No.	Section	Pg.	Comment	Source
6	2.3.8	9	Historically, SBVMWD has operated a dewatering discharge of approximately 6.3 cfs. This does not appear to be accounted for in the calibration. Please check with Valley District to determine if the discharge is still occurring.	Risk Sciences
7	2.3.8	9	Historically, there was up to 7.9 cfs of discharge from the Arlington Desalter. This does not appear to be accounted for in the calibration and may explain some of the discrepancy at Temescal Creek. Please check with SAWPA to better characterize these flows.	Risk Sciences

Cost Estimate for Subtask 1h
Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	**$285**	**$200**	**$125**	**$110**	**$95**			
1.0	**Update the Data Used in the Waste Load Allocation Model (WLAM)**									
	1h	**Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM**		2	16			$2,400		$2,400

Subtask 1i: Augment TIN Water Quality

No.	Section	Pg.	Comment	Source
23	2.3.10	10	It appears that there are very little TIN data available at most gaging stations. It may be possible to augment this dataset by computing a synthetic TIN value by summing the value of Ammonia + Nitrate + Nitrite. Nitrite is not critical to this computation as the concentration is usually very small.	Risk Sciences

Cost Estimate for Subtask 1i
Augment TIN Water Quality

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95			
1.0		Update the Data Used in the Waste Load Allocation Model (WLAM)								
	1i	Augment TIN Water Quality Data		1	12			$1,700		$1,700

Subtask 1j: Create Plots and Database Files of Model Input Data (to be included as appendices)

No.	Section	Pg.	Comment	Source
7	2.6	3	Page 3, Section 2.6. How was the streamflow data determined to be reliable? Can you provide a table that summarizes the stations, including the names, data provider/source, the data type (USGS gage vs. wastewater discharge point), the period of record available from the station, and if any data gaps exist for the calibration period of record? For the POTW discharges, can you please provide time-history charts for the agencies to review and QA/QC?	IEUA/CBWM
8	2.7	4	Page 4, Section 2.7. Please expand this section to clearly describe the information collected. At a minimum, a table of stations for which data was collected, including the names, data provider/source, the data type available (TIN, TDS, or both), the period of record available from the station, and the number of TIN and/or TDS observations available in the calibration period. For the POTW discharges, can you please provide time-history charts for the agencies to review and QA/QC?	IEUA/CBWM

Cost Estimate for Subtask 1j
Create Plots and Database Files of Model Input Data (to be included as appendices)

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95			
1.0		Update the Data Used in the Waste Load Allocation Model (WLAM)								
	1j	Create Plots and Database Files of Model Input Data (to be included as appendices)		1	16			$2,200		$2,200

Subtask 2h: Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality

No.	Section	Pg.	Comment	Source
12	2.3.10.2	11	The WLAM should probably be revised to treat the Prado Wetlands as a discrete impoundment so that the model can better account for the minor evapotranspiration losses that occur for river flows diverted through those ponds. This will probably improve the TDS and flow calibration at Prado Dam.	Risk Sciences

Cost Estimate for Subtask 2h
Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95			
2.0		Update and Recalibrate the WLAM								
	2h	Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality	1	16	24			$6,485		$6,485

Scope and Cost for Subtasks 2i, 2j, and 2k

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95			
2.0	Update and Recalibrate the WLAM									
	2i	Re-Estimate Stream Flow in Major Stream Segments after Incorporating Additional Discharge Data		2	24			$3,400		$3,400
	2j	Re-Estimate Concentration of TDS in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands		2	24			$3,400		$3,400
	2k	Re-Estimate Concentration of TIN in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands		2	24			$3,400		$3,400

Subtask 2l: Tabulate the Differences between WLAM Versions

No.	Section	Pg.	Comment	Source
9	2.0	-	Please prepare a table summarizing key similarities and differences between the 2002 WLAM, the 2015 WLAM (Scenario 8) and the 2017 WLAM including, but not limited to, the following categories: land use data, precipitation data, gauge data, number of sub-areas, POTW data, soil data, evaporation stations, nitrogen reaction coefficients, calibration period, calibration endpoints (R2, RMSE, other), etc.	Risk Sciences

Subtask 2l: Tabulate the Differences between WLAM Versions (Cont.)

No.	Section	Pg.	Comment	Source
27	3.3	13	Please provide a more detailed description of the precise methods used to account for the amount of flow, and related water quality of those flows, for rising groundwater at the Riverside Narrows and at Prado Dam. Compare and contrast the method(s) used by Geosciences to that used in the previous WLAM. Discuss Pros and Cons of both methods and, in particular, how the different methods may affect subsequent calculations required by the RFP-SOW for this project (e.g. Task 3b: volume and quality of water recharging to each individual aquifer through streambed percolation from each surface segment of the river).	Risk Sciences

Subtask 2l: Tabulate the Differences between WLAM Versions (Cont.)

No.	Section	Pg.	Comment	Source
29	3.3	13	Please provide a detailed forensic analysis of how the prior WLAM was able to achieve an acceptable R2 value at San Timoteo when the new WLAM did not.	Risk Sciences
30	3.3	13	Please provide a detailed forensic analysis of how the prior WLAM was able to achieve an acceptable R2 value at Chino Creek (Schaefer Ave.) when the new WLAM did not. Figure 20 appears to indicate that the old WLAM established a minimum flow and truncated all model estimates below that threshold.	Risk Sciences
31	3.3	13	Please provide a detailed forensic analysis of how the prior WLAM was able to achieve an acceptable R2 value at Temescal Creek when the new WLAM did not. Figure 15 appears to indicate that the old WLAM established a minimum flow value and truncated all model estimates below that threshold.	Risk Sciences

Cost Estimate for Subtask 2l
Tabulate the Differences between WLAM Versions

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95			
2.0		Update and Recalibrate the WLAM								
	2l	Tabulate the Differences between WLAM Versions	2	24	16			$7,370		$7,370

Subtask 2m: Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment

No.	Section	Pg.	Comment	Source
5	General	-	A water budget summary table should be included – among other items, the table should list total runoff, total wastewater discharge, total unmanaged streambed infiltration, total managed infiltration (such as OCWD managed infiltration, and other agencies if it can be accounted for), total evapotranspiration, rising groundwater at Riverside Narrows, rising groundwater in Prado Basin, and total outflow at the downstream model boundary; the table should list the above terms by year; the table should be used to demonstrate that all the water in the system is accounted for from a mass balance perspective on an annual basis.	OCWD

Subtask 2m: Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment (Cont.)

No.	Section	Pg.	Comment	Source
-	-	-	Using the calibrated WLAM, the consultant shall prepare a tabular summary describing the average mass balance (by source) for flow, TDS and TIN in each major stream segment (see examples below):	RWQCB, SAWPA, and Risk Sciences

Example Mass Balance (by Source) for Reach 3 & 4 of the Santa Ana River overlying the Riverside-A GMZ

SOURCE	FLOW *(ac-ft./yr. & % of total)*	TDS *(tons/yr. & % of total)*	TIN *(tons/yr. & % of total)*
Rialto POTW			
RIX POTW			
Surface Runoff			
Rising Groundwater			
Water Transfers			
Other (specify)			
TOTAL	**xxx (100%)**	**yyy (100%)**	**zzz (100%)**

Cost Estimate for Subtask 2m

Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	**$285**	**$200**	**$125**	**$110**	**$95**			
2.0	**Update and Recalibrate the WLAM**									
	2m	**Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment**		4	24			$3,800		$3,800

Subtask 2n: Conduct Formal Outlier Analysis for Areas of High Model Over/Underestimation (i.e., greater than two orders of magnitude)

No.	Section	Pg.	Comment	Source
28	3.3	13	It may be appropriate to do some formal outlier analysis for those data points where the model estimates and the observed values differ by more than two orders of magnitude (see, for example, Figures 32, 35, 36 & 41). Such discrepancies seem quite large even if the overall average relative percent difference is small. Large differences in both directions tend to cancel each other out and give the illusion that the overall error is small when it is not. This analysis should focus on only the most extreme deviations which would have the greatest adverse effect on R2 values. For example, in Figure 37, there seem to be several instances where the model predicts flows in the 0.1 to 1.0 cfs range but the measured flows range from 10 to 100 cfs. This may be an example of where the model cannot account for excess irrigation runoff in the Arlington orchard area that ultimately drains to Temescal Creek.	Risk Sciences

Cost Estimate for Subtask 2n
Conduct Formal Outlier Analysis for Areas of High Model Over/Underestimation (i.e., > two orders of magnitude)

Task		Description	ADDITIONAL COST							
			Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
		Hourly Rate:	$285	$200	$125	$110	$95	2n		
2.0		Update and Recalibrate the WLAM								
	2n	Conduct Formal Outlier Analyses for Areas of High Model Over/Underestimation (i.e., greater than two orders of magnitude)		2	16			$2,400		$2,400

Cost Estimate for Task 9
Prepare Second Draft Task Report for Task 2

Task	Description	ADDITIONAL COST							
		Principal Hydrologist	Senior Geo-Hydrologist	Staff Geo-Hydrologist	Graphics	Clerical	Labor Cost	Reimbursable Expenses	Additional Cost
	Hourly Rate:	**$285**	**$200**	**$125**	**$110**	**$95**			
9.0	**Draft Task Reports, Draft and Final Report**								
	Prepare Second Draft Task Report for Task 2 Documenting the Results of Task 2	2	8	32	8	1	$7,145	$100	$7,245

Proposed Budget for Out-of-Scope Work

TASK		Total Additional Hours	Total Additional Cost
1h	Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM	18	$2,400
1i	Augment TIN Water Quality Data	13	$1,700
1j	Create Plots and Database Files of Model Input Data (to be included as appendices)	17	$2,200
2h	Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality	41	$6,485
2i	Re-Estimate Stream Flow in Major Stream Segments after Incorporating Additional Discharge Data	26	$3,400
2j	Re-Estimate Concentration of TDS in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands	26	$3,400
2k	Re-Estimate Concentration of TIN in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands	26	$3,400
2l	Tabulate the Differences between WLAM Versions	42	$7,370
2m	Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment	28	$3,800
2n	Conduct Formal Outlier Analyses for Areas of High Model Over/Underestimation (i.e., greater than two orders of magnitude)	18	$2,400
9.0	Prepare Second Draft Task Report for Task 2 Documenting the Results of Task 2	51	$7,245
	TOTAL	**306**	**$43,800**

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Original Project Schedule

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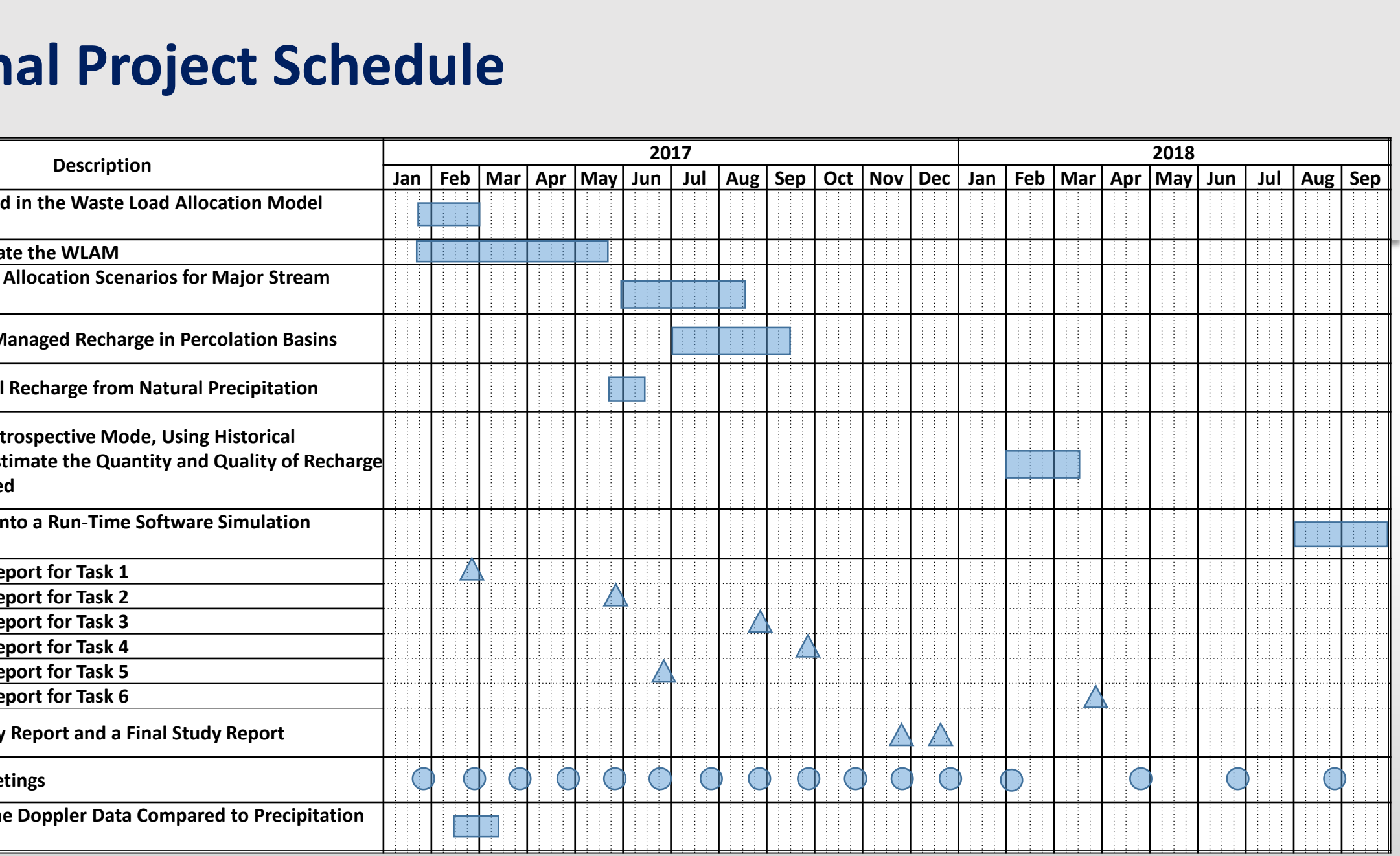
3	Evaluate Waste Load Allocation Scenarios for Major Stream Segments
4	Develop WLAM for Managed Recharge in Percolation Basins
5	Estimate Off-Channel Recharge from Natural Precipitation
6	Run the WLAM in Retrospective Mode, Using Historical Discharge Data, to Estimate the Quantity and Quality of Recharge that Actually Occurred
7	Compile the WLAM into a Run-Time Software Simulation Package
9	Prepare Draft Task Report for Task 1
	Prepare Draft Task Report for Task 2
	Prepare Draft Task Report for Task 3
	Prepare Draft Task Report for Task 4
	Prepare Draft Task Report for Task 5
	Prepare Draft Task Report for Task 6
	Prepare a Draft Study Report and a Final Study Report
10	Monthly Project Meetings
11	Pilot evaluation of the Doppler Data Compared to Precipitation Gauge Data



Original Project Schedule

Progress to Date

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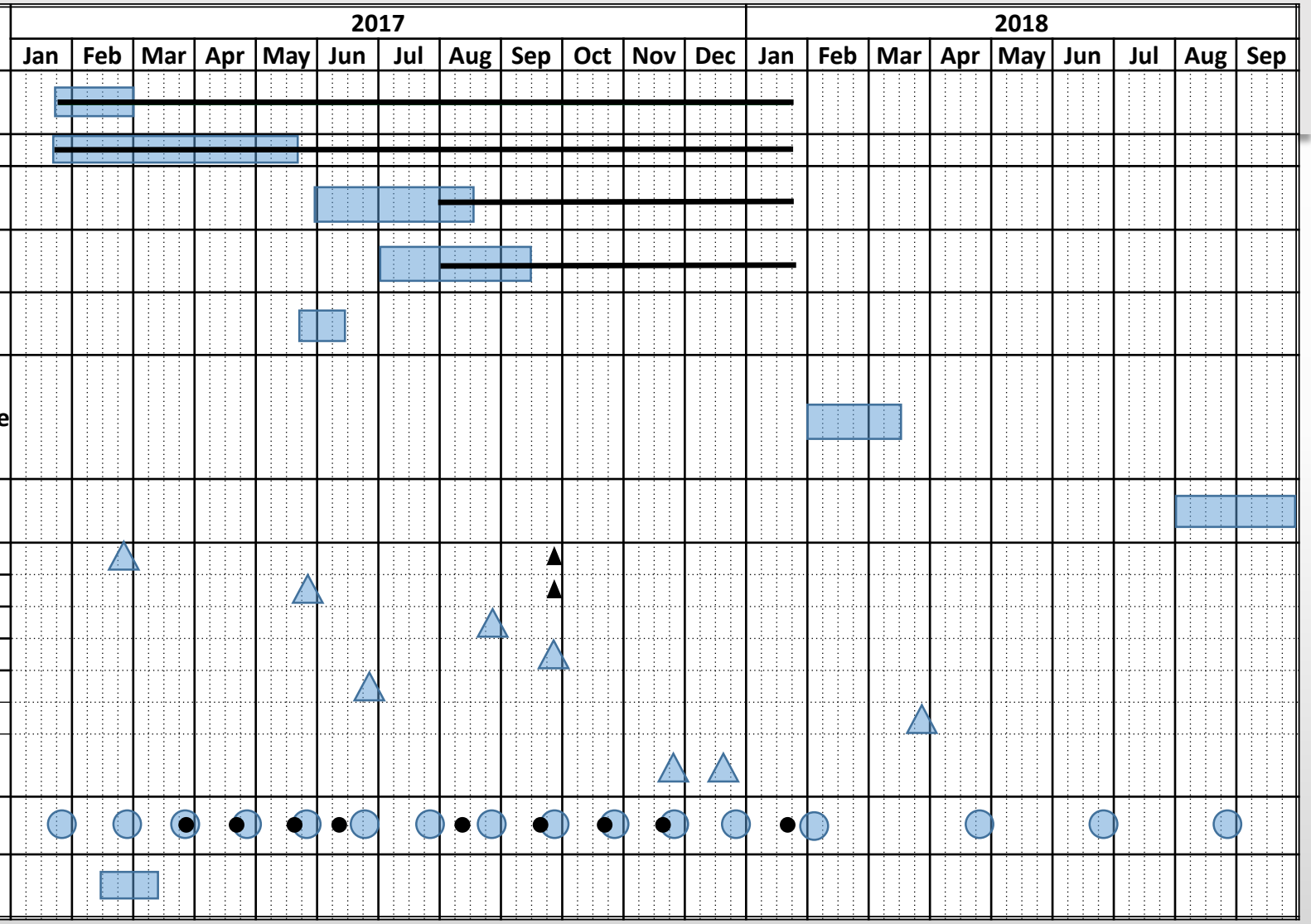

Original Project Schedule

Progress to Date

Updated Project Schedule With Out-of-Scope Work

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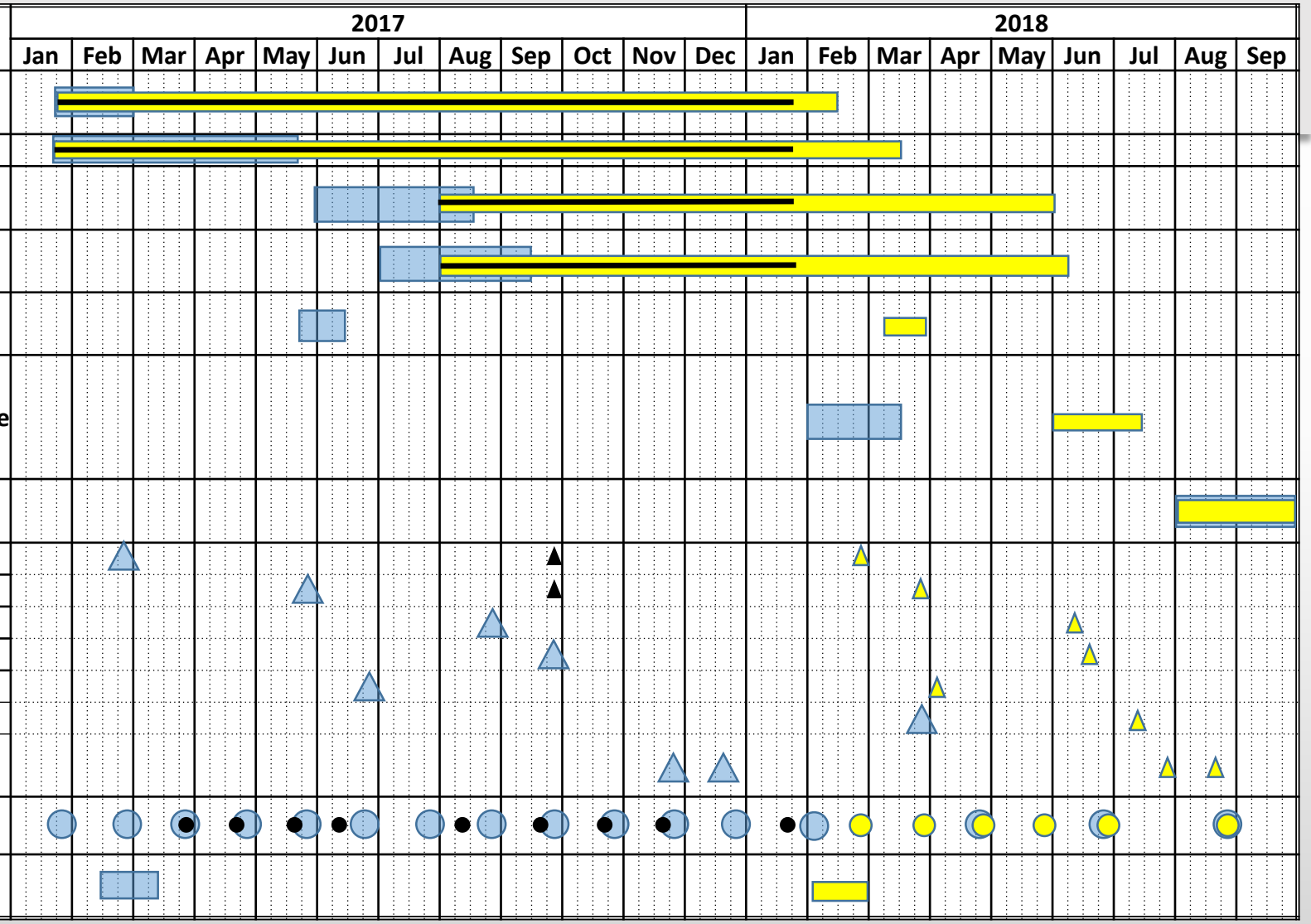

Original Project Schedule

Updated Project Schedule with Out-of-Scope Work

Progress to Date

Original and Updated Project Schedule Without Out-of-Scope Work

Task	Description
1	Update the Data Used in the Waste Load Allocation Model (WLAM)
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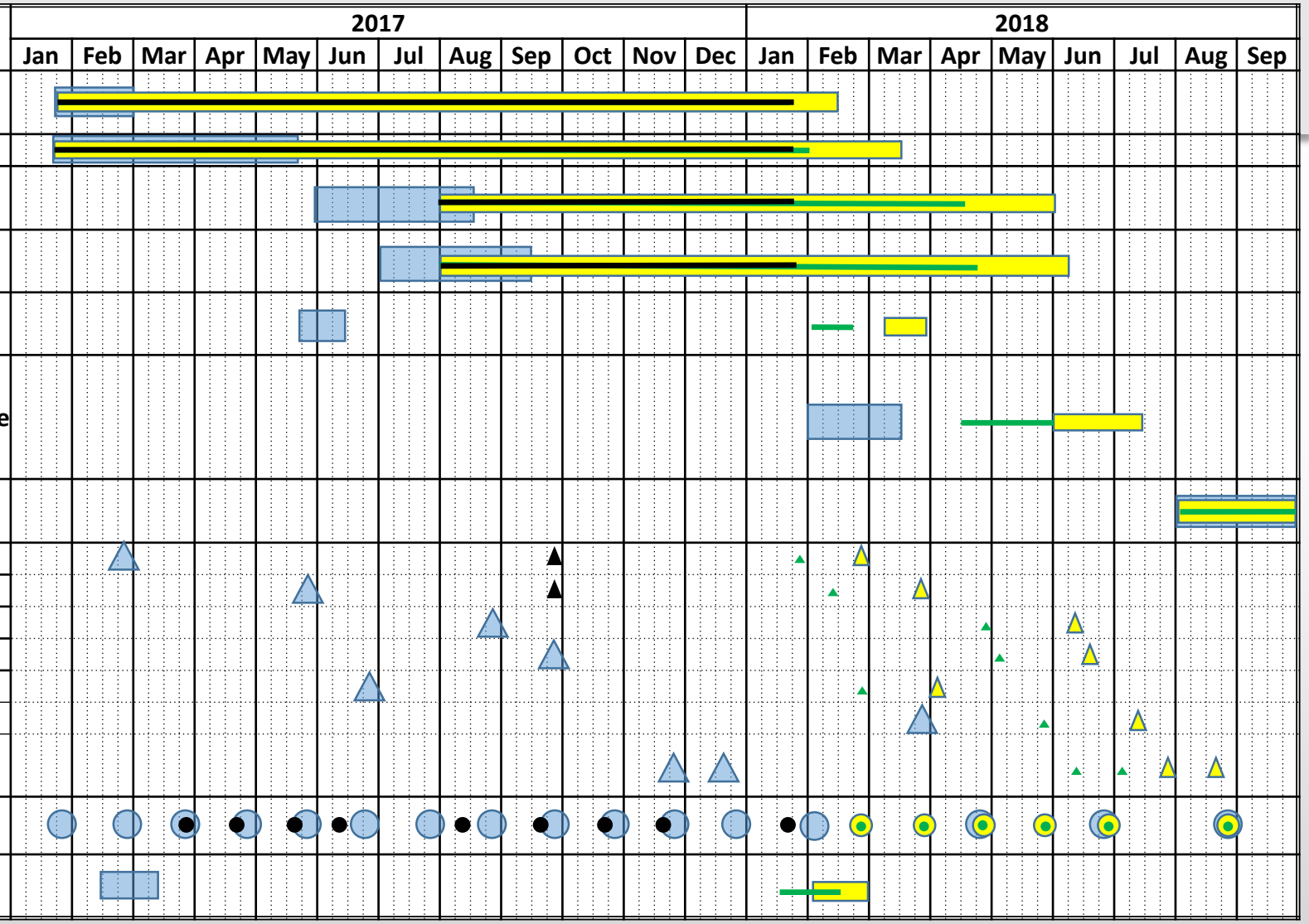

Original Project Schedule

Updated Project Schedule with Out-of-Scope Work

Progress to Date

Updated Project Schedule without Out-of-Scope Work