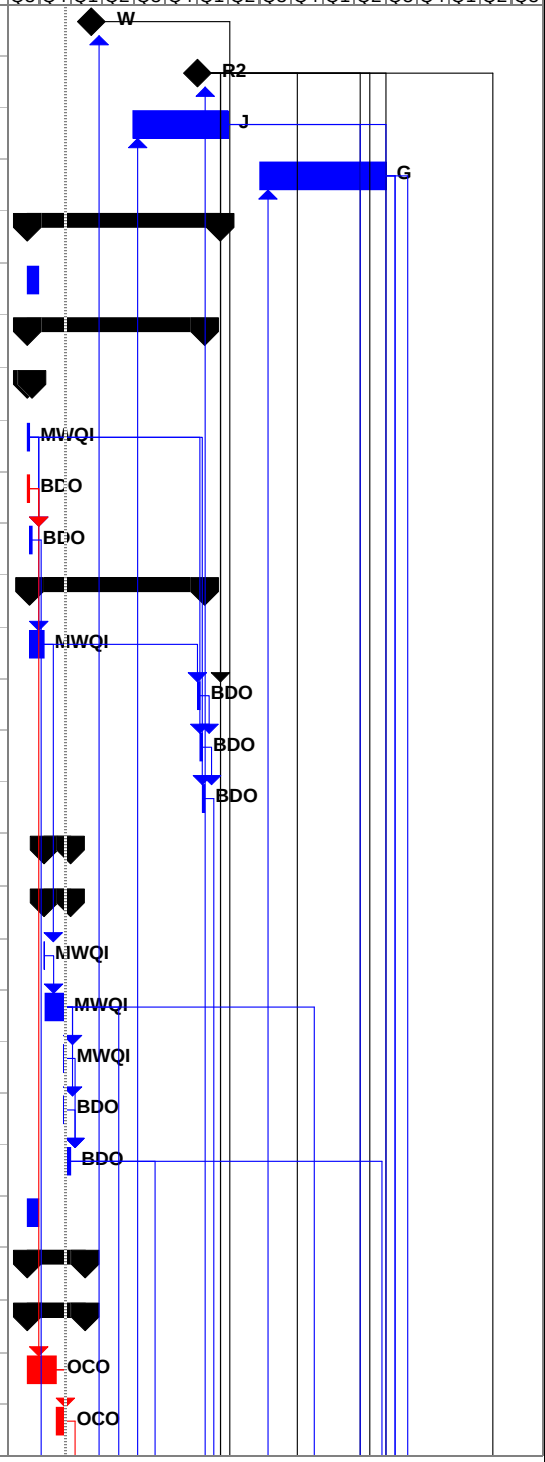
Appendix 2 Gantt Chart

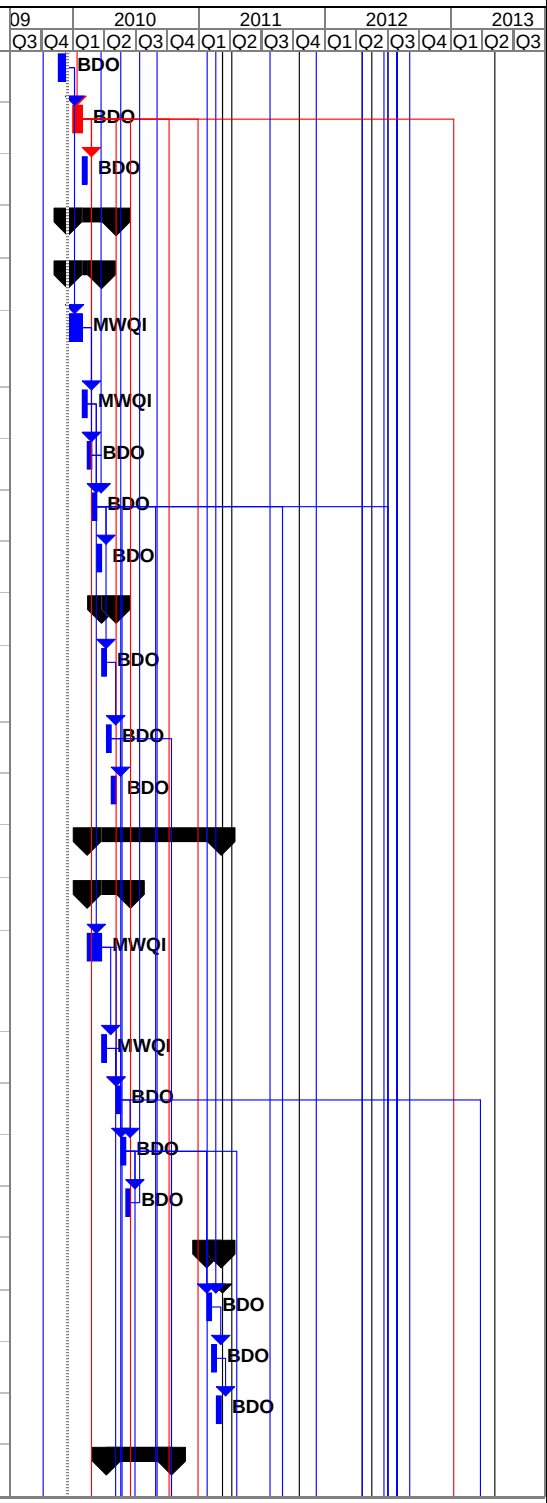
Municipal Water Quality Investigations
Program 2011-2012 Workplan
4/27/11
Final

Appendix 2—Gantt Chart

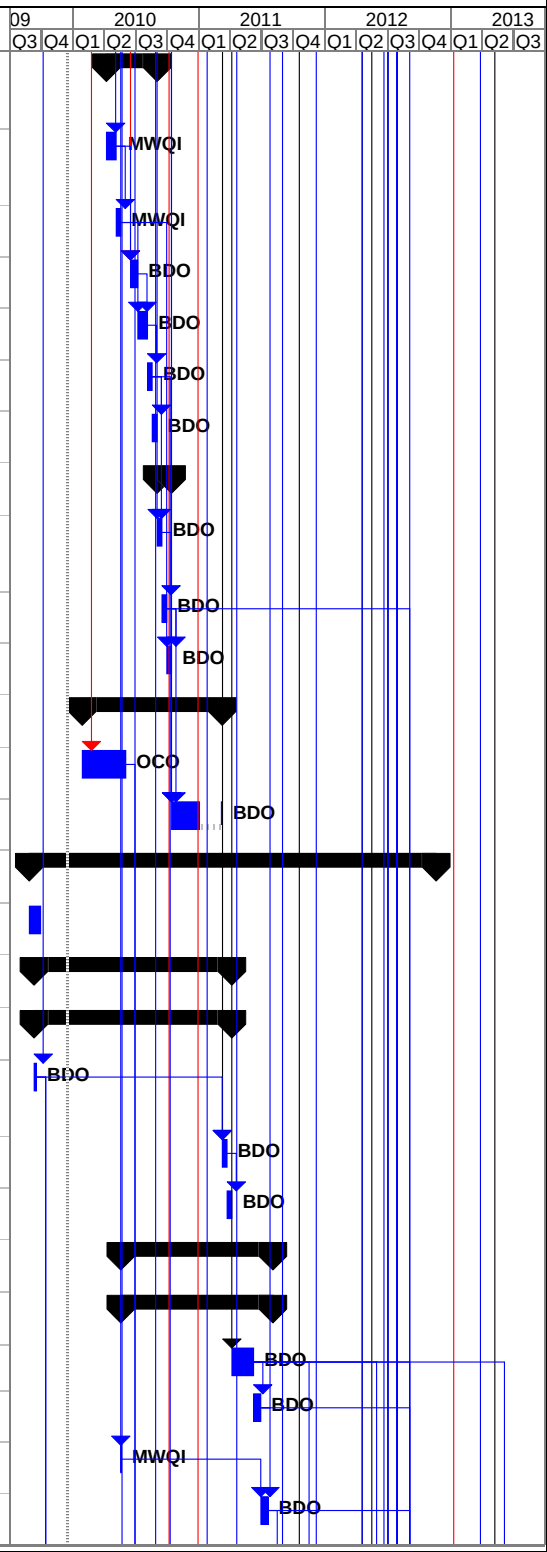
ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
1	WARMF (w)	0 days	Mon 3/1/10	Mon 3/1/10	No	W	36FS+2 days
2	Recalibration DSM2 to conservative constituent (r2)	0 days	Mon 1/3/11	Mon 1/3/11	No	R2	87FS+2 days
3	Installation of Anion Analyzer at Jones PP	197 days	Thu 7/1/10	Fri 4/1/11	No	J	49FS+9 days
4	Installation of Gianelli Water Quality Station	262 days	Mon 7/4/11	Tue 7/3/12	No	G	79FS+1 day
5	**Simulation of Historical Conditions, 1990 - present**				**Yes**		
6	A. Delta Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
7	**Bromide**	**367 days**	**Fri 8/28/09**	**Mon 1/24/11**	**Yes**		
8	**Phase 1**	**10 days**	**Fri 8/28/09**	**Thu 9/10/09**	**Yes**		
9	Assemble measured data at diversions and in-Delta locations	5 days	Fri 8/28/09	Thu 9/3/09	No	MWQI	
10	Calculate historical bromide based on EC simulation	5 days	Fri 8/28/09	Thu 9/3/09	Yes	BDO	
11	Document validation of estimating bromide using simulated EC	5 days	Fri 9/4/09	Thu 9/10/09	No	BDO	10,9
12	**Phase 2**	**362 days**	**Fri 9/4/09**	**Mon 1/24/11**	**No**		
13	Assemble and synthesize bromide data as necessary to define boundary conditions	30 days	Fri 9/4/09	Thu 10/15/09	No	MWQI	9
14	Produce first direct DSM2 Delta bromide simulation for period 1990 to present	5 days	Tue 1/4/11	Mon 1/10/11	No	BDO	2,13
15	Finalize historical simulation	5 days	Tue 1/11/11	Mon 1/17/11	No	BDO	14,9
16	Document simulation of historical conditions, including a validation	5 days	Tue 1/18/11	Mon 1/24/11	No	BDO	9,15
17	**DOC**	**55 days**	**Fri 10/16/09**	**Thu 12/31/09**	**No**		
18	**Phase 1**	**55 days**	**Fri 10/16/09**	**Thu 12/31/09**	**No**		
19	Assemble DOC data to define boundary condition	1 day	Fri 10/16/09	Fri 10/16/09	No	MWQI	13
20	Synthesize DOC data as needed to define boundary condition	39 days	Mon 10/19/09	Thu 12/10/09	No	MWQI	19
21	Assemble measured data at diversions and in-Delta locations for model validation	5 days	Fri 12/11/09	Thu 12/17/09	No	MWQI	20
22	Produce first DSM2 Delta DOC simulation for period 1990 to present	5 days	Fri 12/11/09	Thu 12/17/09	No	BDO	20
23	Finalize historical simulation and document validation of simulation of DOC	10 days	Fri 12/18/09	Thu 12/31/09	No	BDO	21,22
24	B. Aqueduct Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
25	**Hydraulics**	**120 days**	**Fri 8/28/09**	**Thu 2/11/10**	**Yes**		
26	**Phase 1**	**120 days**	**Fri 8/28/09**	**Thu 2/11/10**	**Yes**		
27	Assemble and synthesize data including system operations needed to conduct simulation of	60 days	Fri 8/28/09	Thu 11/19/09	Yes	OCO	10FS-5 days
28	Assemble historical hydraulic data within Aqueduct system for validation	20 days	Fri 11/20/09	Thu 12/17/09	Yes	OCO	27



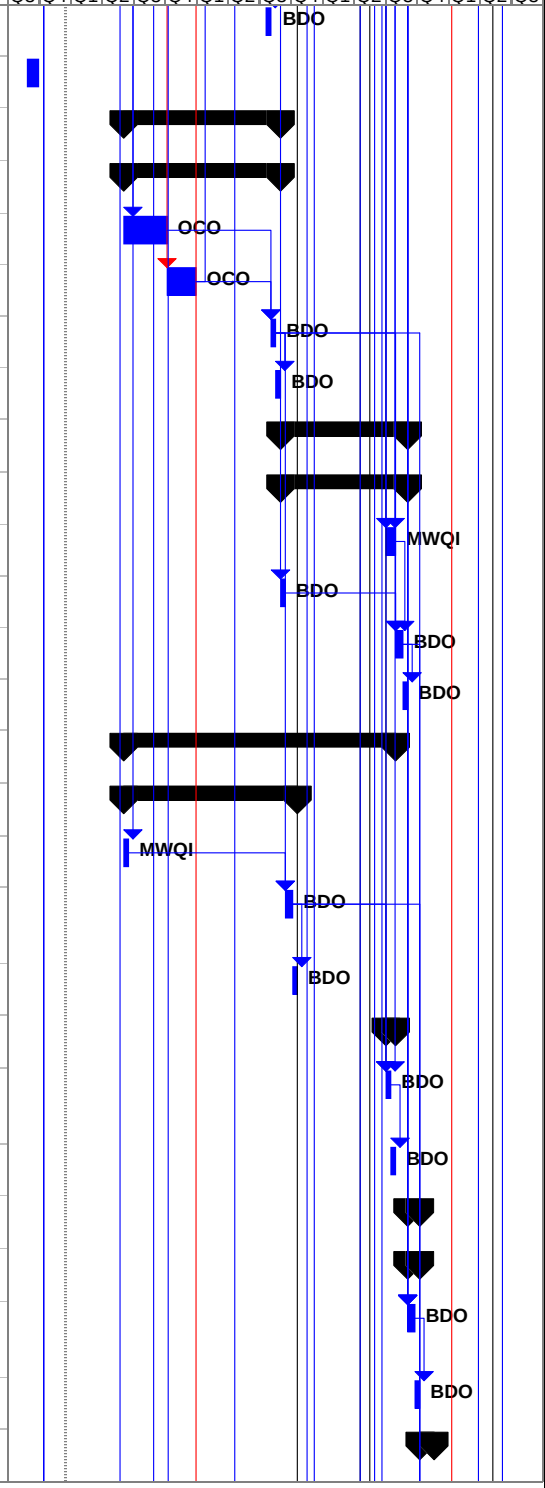
ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
29	Conduct hydraulic simulation of historical Aqueduct hydraulics	15 days	Fri 11/20/09	Thu 12/10/09	No	BDO	27
30	Finalize simulation of historical Aqueduct hydraulics	20 days	Fri 1/1/10	Thu 1/28/10	Yes	BDO	28,29
31	Document simulation of historical Aqueduct hydraulics, including validation	10 days	Fri 1/29/10	Thu 2/11/10	No	BDO	30
32	**EC**	**100 days**	**Fri 12/18/09**	**Thu 5/6/10**	**No**		
33	**Phase 1**	**70 days**	**Fri 12/18/09**	**Thu 3/25/10**	**No**		
34	Assemble and synthesize EC data as needed to define boundary condition using field EC at Banks and Jones PP	30 days	Fri 12/18/09	Thu 1/28/10	No	MWQI	29
35	Assemble measured data within the Aqueduct system for model validation	10 days	Fri 1/29/10	Thu 2/11/10	No	MWQI	34
36	Produce DSM2 Aqueduct EC simulation for period 1990 to present using field EC at Banks and Jones	10 days	Fri 2/12/10	Thu 2/25/10	No	BDO	30,34
37	Finalize historical simulation	10 days	Fri 2/26/10	Thu 3/11/10	No	BDO	35,36
38	Document simulation of historical EC, including validation	10 days	Fri 3/12/10	Thu 3/25/10	No	BDO	37
39	**Phase 2**	**30 days**	**Fri 3/26/10**	**Thu 5/6/10**	**No**		
40	Simulate Aqueduct EC using DSM2-simulated EC at Jones and Banks PP based on measured Delta boundary conditions	10 days	Fri 3/26/10	Thu 4/8/10	No	BDO	37
41	Finalize historical simulation	10 days	Fri 4/9/10	Thu 4/22/10	No	BDO	40
42	Document simulation of historical EC, including validation of model	10 days	Fri 4/23/10	Thu 5/6/10	No	BDO	41
43	**Bromide**	**277 days**	**Fri 2/12/10**	**Mon 3/7/11**	**No**		
44	**Phase 1**	**90 days**	**Fri 2/12/10**	**Thu 6/17/10**	**No**		
45	Assemble and synthesize bromide data as needed to define boundary condition, including measured or calculated bromide at Jones and Banks Pumping Plants	30 days	Fri 2/12/10	Thu 3/25/10	No	MWQI	35
46	Assemble measured bromide data within Aqueduct system for validation	10 days	Fri 3/26/10	Thu 4/8/10	No	MWQI	45
47	Produce DSM2 Aqueduct Bromide simulation for period 1990 to present	10 days	Fri 5/7/10	Thu 5/20/10	No	BDO	30,45
48	Finalize historical simulation	10 days	Fri 5/21/10	Thu 6/3/10	No	BDO	46,47
49	Document simulation of historical Bromide, including validation	10 days	Fri 6/4/10	Thu 6/17/10	No	BDO	48
50	**Phase 2**	**30 days**	**Tue 1/25/11**	**Mon 3/7/11**	**No**		
51	Simulate Aqueduct Bromide using DSM2-simulated bromide at Jones and Banks PP based upon	10 days	Tue 1/25/11	Mon 2/7/11	No	BDO	2,48,16
52	Finalize historical simulation	10 days	Tue 2/8/11	Mon 2/21/11	No	BDO	51
53	Document simulation of historical Bromide, including validation	10 days	Tue 2/22/11	Mon 3/7/11	No	BDO	52
54	**DOC**	**135 days**	**Fri 4/9/10**	**Thu 10/14/10**	**No**		



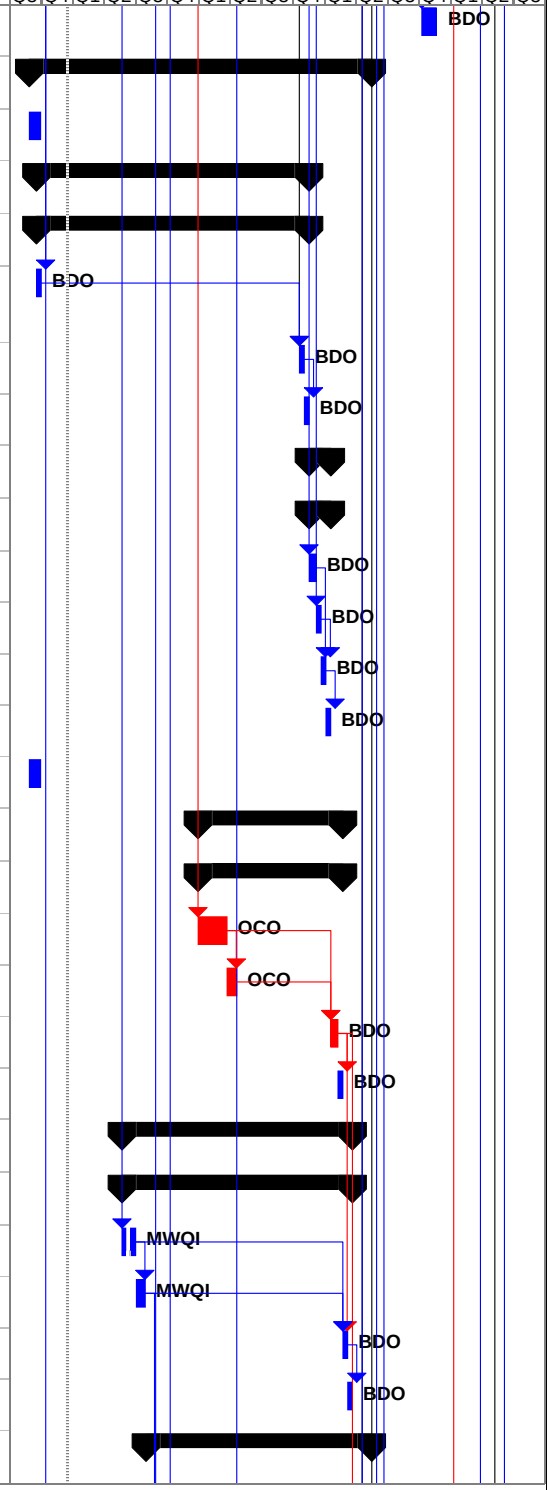
ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
55	**Phase 1**	**105 days**	**Fri 4/9/10**	**Thu 9/2/10**	**No**		
56	Assemble and synthesize DOC data as needed to define boundary conditions, Including DOC at Jones and Banks Pumping Plants	20 days	Fri 4/9/10	Thu 5/6/10	No	MWQI	46
57	Assemble historical DOC data within Aqueduct system for validation	10 days	Fri 5/7/10	Thu 5/20/10	No	MWQI	56
58	Produce first DSM2 Aqueduct DOC simulation for period 1990 to present	15 days	Fri 6/18/10	Thu 7/8/10	No	BDO	30,56
59	Calibrate model DOC kinetic parameters along the Aqueduct and in reservoirs	20 days	Fri 7/9/10	Thu 8/5/10	No	BDO	57,58
60	Finalize historical simulation	10 days	Fri 8/6/10	Thu 8/19/10	No	BDO	59
61	Document simulation of historical DOC, including validation	10 days	Fri 8/20/10	Thu 9/2/10	No	BDO	60
62	**Phase 2**	**30 days**	**Fri 9/3/10**	**Thu 10/14/10**	**No**		
63	Simulate Aqueduct DOC using DSM2-simulated DOC at Jones and Banks PP based upon measured Delta boundary DOC	10 days	Fri 9/3/10	Thu 9/16/10	No	BDO	23,60
64	Finalize historical simulation	10 days	Fri 9/17/10	Thu 9/30/10	No	BDO	63
65	Document simulation of historical DOC, including validation	10 days	Fri 10/1/10	Thu 10/14/10	No	BDO	57,64
66	**Tools**	**290 days**	**Fri 1/29/10**	**Thu 3/10/11**	**No**		
67	Develop ability to gather data for near immediate update of aqueduct conditions	90 days	Fri 1/29/10	Thu 6/3/10	No	OCO	30
68	Develop tool to enable near immediate update of historical simulation of EC, Bromide, and DOC	60 days	Fri 10/15/10	Thu 3/10/11	No	BDO	48,41,64
69	**Short-Term Forecast of Water Quality Conditions**				**No**		
70	A. Delta Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
71	**Bromide**	**410 days**	**Fri 9/11/09**	**Thu 4/7/11**	**No**		
72	**Phase 2**	**410 days**	**Fri 9/11/09**	**Thu 4/7/11**	**No**		
73	Develop methods to generate Delta bromide boundary conditions based on EC generated by existing methods	5 days	Fri 9/11/09	Thu 9/17/09	No	BDO	11
74	Test conducting short-term forecast using EC-derived boundary bromide	10 days	Fri 3/11/11	Thu 3/24/11	No	BDO	2,73
75	Document methodology	10 days	Fri 3/25/11	Thu 4/7/11	No	BDO	74
76	**DOC**	**315 days**	**Fri 5/21/10**	**Thu 8/4/11**	**No**		
77	**Phase 3**	**315 days**	**Fri 5/21/10**	**Thu 8/4/11**	**No**		
78	Staff develop working knowledge of WARMF model	45 days	Fri 4/8/11	Thu 6/9/11	No	BDO	1
79	Use WARMF model to develop methods to generate Delta DOC for Sac and SJR	15 days	Fri 6/10/11	Thu 6/30/11	No	BDO	78
80	Develop methods to generate DOC conditions at other Delta boundaries	1 day	Fri 5/21/10	Fri 5/21/10	No	MWQI	20
81	Test conducting short-term forecast using WARMF-derived boundary DOC	15 days	Fri 7/1/11	Thu 7/21/11	No	BDO	79,80



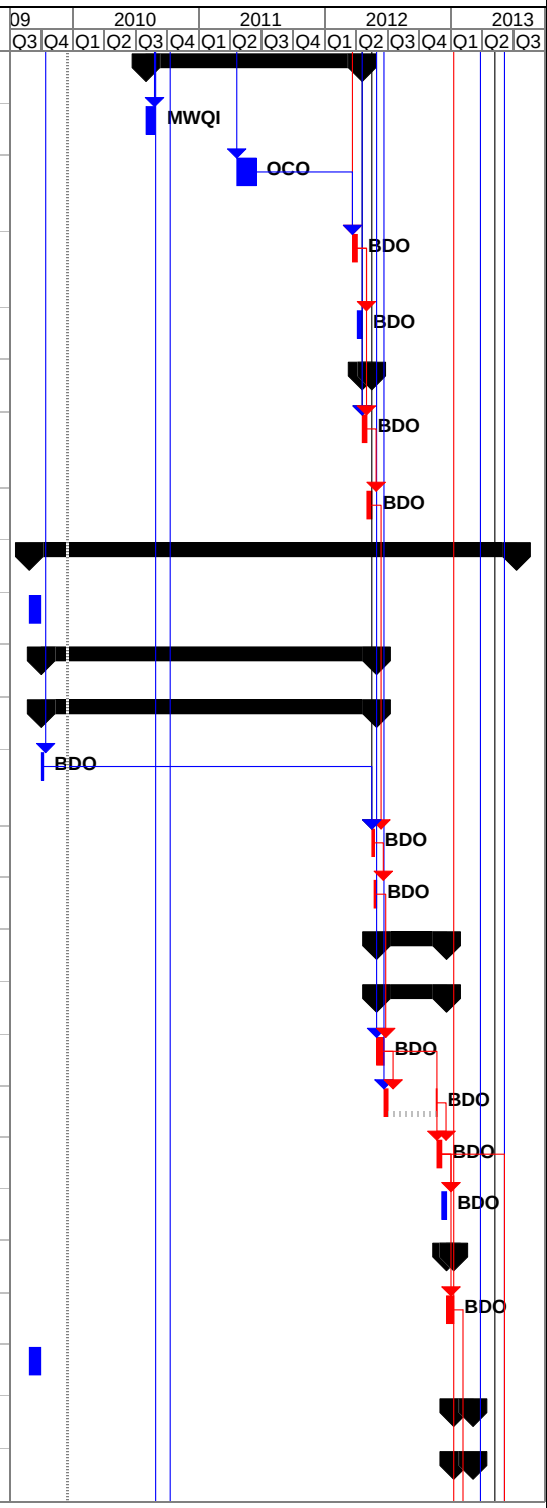
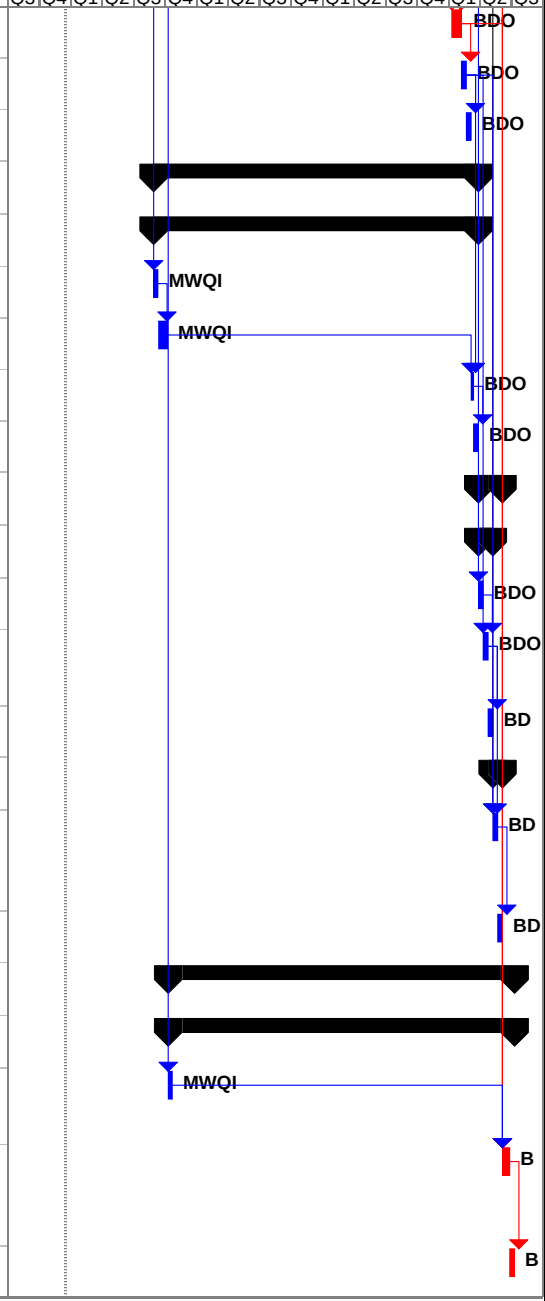
ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
82	Document methodology	10 days	Fri 7/22/11	Thu 8/4/11	No	BDO	81
83	B. Aqueduct Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
84	**Hydraulics**	**325 days**	**Fri 6/4/10**	**Thu 9/1/11**	**No**		
85	**Phase 3**	**325 days**	**Fri 6/4/10**	**Thu 9/1/11**	**No**		
86	Develop method of short-term forecast of operations from O&M, USBR sources	90 days	Fri 6/4/10	Thu 10/7/10	No	OCO	67
87	Use study of historical SWP operations to refine assumptions of operations	60 days	Fri 10/8/10	Thu 12/30/10	No	OCO	30
88	Conduct short-term forecast hydraulics simulation using refined operation assumptions	10 days	Fri 8/5/11	Thu 8/18/11	No	BDO	86,87
89	Document refined assumptions	10 days	Fri 8/19/11	Thu 9/1/11	No	BDO	88
90	**EC**	**263 days**	**Fri 9/2/11**	**Tue 9/4/12**	**No**		
91	**Phase 1**	**263 days**	**Fri 9/2/11**	**Tue 9/4/12**	**No**		
92	Develop method to estimate Aqueduct EC boundary conditions including pump-in	20 days	Wed 7/4/12	Tue 7/31/12	No	MWQI	37,4
93	Develop method to initialize Aqueduct EC	10 days	Fri 9/2/11	Thu 9/15/11	No	BDO	37
94	Test conducting short-term forecast of EC	15 days	Wed 8/1/12	Tue 8/21/12	No	BDO	88,92,93
95	Document methodology	10 days	Wed 8/22/12	Tue 9/4/12	No	BDO	94
96	**Bromide**	**563 days**	**Fri 6/4/10**	**Tue 7/31/12**	**No**		
97	**Phase 1**	**360 days**	**Fri 6/4/10**	**Thu 10/20/11**	**No**		
98	Develop and test methods to generate Aqueduct boundary bromide conditions other than Banks and	10 days	Fri 6/4/10	Thu 6/17/10	No	MWQI	48
99	Make test short-term forecast of bromide with bromide at Banks and Jones PP converted from EC generated by DSM2	15 days	Fri 9/16/11	Thu 10/6/11	No	BDO	88,98
100	Document methodology	10 days	Fri 10/7/11	Thu 10/20/11	No	BDO	99
101	**Phase 2**	**20 days**	**Wed 7/4/12**	**Tue 7/31/12**	**No**		
102	Make test short-term forecast of bromide with bromide at Banks and Jones PP directly simulated by DSM2 based on current Delta EC boundary	10 days	Wed 7/4/12	Tue 7/17/12	No	BDO	99,2,3,4
103	Document methodology	10 days	Wed 7/18/12	Tue 7/31/12	No	BDO	102
104	**DOC**	**25 days**	**Wed 9/5/12**	**Tue 10/9/12**	**No**		
105	**Phase 3**	**25 days**	**Wed 9/5/12**	**Tue 10/9/12**	**No**		
106	Test conducting short-term forecast of DOC with DOC at Banks and Jones PP directly simulated by DSM2 based on WARMF simulation	15 days	Wed 9/5/12	Tue 9/25/12	No	BDO	79,64,81,78,4
107	Document methodolgy	10 days	Wed 9/26/12	Tue 10/9/12	No	BDO	106
108	**Tools**	**30 days**	**Wed 10/10/12**	**Tue 11/20/12**	**No**		



ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
109	Develop tools to acquire and synthesize Aqueduct operations forecast data in a timely manner	30 days	Wed 10/10/12	Tue 11/20/12	No	BDO	88,94,99
110	**Seasonal Forecast of Water Quality Conditions based on Calsim Simulations**				**No**		
111	A. Delta Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
112	**Bromide**	**565 days**	**Fri 9/18/09**	**Thu 11/17/11**	**No**		
113	**Phase 2**	**565 days**	**Fri 9/18/09**	**Thu 11/17/11**	**No**		
114	Develop methods to generate Delta bromide boundary conditions based on EC generated by existing methods	10 days	Fri 9/18/09	Thu 10/1/09	No	BDO	73
115	Test conducting seasonal forecast using EC-derived boundary bromide	10 days	Fri 10/21/11	Thu 11/3/11	No	BDO	2,114
116	Document methodology	10 days	Fri 11/4/11	Thu 11/17/11	No	BDO	115
117	**DOC**	**45 days**	**Fri 11/18/11**	**Thu 1/19/12**	**No**		
118	**Phase 3**	**45 days**	**Fri 11/18/11**	**Thu 1/19/12**	**No**		
119	Use WARMF model to develop methods to generate Delta DOC for Sac and SJR	15 days	Fri 11/18/11	Thu 12/8/11	No	BDO	78
120	Develop methods to generate DOC conditions at other Delta boundaries	10 days	Fri 12/9/11	Thu 12/22/11	No	BDO	20
121	Test conducting seasonal forecast using WARMF-derived boundary DOC	10 days	Fri 12/23/11	Thu 1/5/12	No	BDO	119,120
122	Document methodology	10 days	Fri 1/6/12	Thu 1/19/12	No	BDO	121
123	B. Aqueduct Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
124	**Hydraulics**	**300 days**	**Fri 12/31/10**	**Thu 2/23/12**	**Yes**		
125	**Phase 3**	**300 days**	**Fri 12/31/10**	**Thu 2/23/12**	**Yes**		
126	Use study of historical SWP operations to refine assumptions of operations	60 days	Fri 12/31/10	Thu 3/24/11	Yes	OCO	30
127	Develop method for assuming pump-in amounts	20 days	Fri 3/25/11	Thu 4/21/11	Yes	OCO	126
128	Conduct seasonal forecast hydraulics simulation using refined operation assumptions	15 days	Fri 1/20/12	Thu 2/9/12	Yes	BDO	126,127
129	Document methodology	10 days	Fri 2/10/12	Thu 2/23/12	No	BDO	128
130	**EC**	**479 days**	**Mon 5/24/10**	**Thu 3/22/12**	**No**		
131	**Phase 2**	**479 days**	**Mon 5/24/10**	**Thu 3/22/12**	**No**		
132	Develop method for estimating Aqueduct EC boundary conditions	20 days	Mon 5/24/10	Fri 7/2/10	No	MWQI	37
133	Develop method for assuming pump-in EC	20 days	Mon 7/5/10	Fri 7/30/10	No	MWQI	132
134	Conduct seasonal forecast of EC	10 days	Fri 2/24/12	Thu 3/8/12	No	BDO	128,132,133
135	Document methodology	10 days	Fri 3/9/12	Thu 3/22/12	No	BDO	134
136	**Bromide**	**469 days**	**Mon 8/2/10**	**Thu 5/17/12**	**No**		



ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
137	**Phase 1**	**449 days**	**Mon 8/2/10**	**Thu 4/19/12**	**No**		
138	Develop method for assuming pump-in bromide	20 days	Mon 8/2/10	Fri 8/27/10	No	MWQI	133
139	Develop and test methods to generate Aqueduct boundary (Kern River and San Luis) bromide conditions other than Banks and Jones PP bromide	40 days	Fri 4/22/11	Thu 6/16/11	No	OCO	48
140	Make test seasonal forecast of bromide with bromide at Banks and Jones PP converted from EC generated by DSM2	10 days	Fri 3/23/12	Thu 4/5/12	Yes	BDO	128,139
141	Document methodology	10 days	Fri 4/6/12	Thu 4/19/12	No	BDO	140
142	**Phase 2**	**20 days**	**Fri 4/20/12**	**Thu 5/17/12**	**Yes**		
143	Make test seasonal forecast of bromide with bromide at Banks and Jones PP directly simulated by DSM2 based on current Delta EC boundary methods	10 days	Fri 4/20/12	Thu 5/3/12	Yes	BDO	2,140,3
144	Document methodology	10 days	Fri 5/4/12	Thu 5/17/12	Yes	BDO	143
145	**Planning Studies of Water Quality Conditions based on Calsim Simulations**				**Yes**		
146	A. Delta Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
147	**Bromide**	**695 days**	**Fri 10/2/09**	**Thu 5/31/12**	**Yes**		
148	**Phase 2**	**695 days**	**Fri 10/2/09**	**Thu 5/31/12**	**Yes**		
149	Develop methods to generate Delta bromide boundary conditions based on EC generated by existing methods	5 days	Fri 10/2/09	Thu 10/8/09	No	BDO	73FS+10 days
150	Test conducting planning study using EC-derived boundary bromide	5 days	Fri 5/18/12	Thu 5/24/12	Yes	BDO	2,149,144
151	Document methodology	5 days	Fri 5/25/12	Thu 5/31/12	Yes	BDO	150
152	**DOC**	**145 days**	**Fri 6/1/12**	**Thu 12/20/12**	**Yes**		
153	**Phase 3**	**145 days**	**Fri 6/1/12**	**Thu 12/20/12**	**Yes**		
154	Using the WARMF model, develop methods to generate Delta DOC for Sac and SJR	15 days	Fri 6/1/12	Thu 6/21/12	Yes	BDO	78,151
155	Develop methods to generate DOC conditions at other Delta boundaries	10 days	Fri 6/22/12	Thu 11/22/12	Yes	BDO	23,154
156	Test conducting planning study using WARMF-derived boundary DOC	10 days	Fri 11/23/12	Thu 12/6/12	Yes	BDO	154,155
157	Document methodology	10 days	Fri 12/7/12	Thu 12/20/12	No	BDO	156
158	**Tools**	**15 days**	**Fri 12/21/12**	**Thu 1/10/13**	**Yes**		
159	Devlop tools to enable rapid generation of DOC boundary conditions for given planning study	15 days	Fri 12/21/12	Thu 1/10/13	Yes	BDO	156
160	B. Aqueduct Conditions	23 days	Fri 8/28/09	Tue 9/29/09	No		
161	**Hydraulics**	**40 days**	**Fri 1/11/13**	**Thu 3/7/13**	**Yes**		
162	**Phase 3**	**40 days**	**Fri 1/11/13**	**Thu 3/7/13**	**Yes**		



ID	Task Name	Duration	Start	Finish	Critical	Resource Names	Predecessors
163	Use study of historical SWP operations to refine assumptions of operations	20 days	Fri 1/11/13	Thu 2/7/13	Yes	BDO	30,159
164	Conduct planning study using refined operation assumptions	10 days	Fri 2/8/13	Thu 2/21/13	No	BDO	163
165	Document refined assumptions	10 days	Fri 2/22/13	Thu 3/7/13	No	BDO	164
166	**EC**	**674 days**	**Mon 8/30/10**	**Thu 3/28/13**	**No**		
167	**Phase 2**	**674 days**	**Mon 8/30/10**	**Thu 3/28/13**	**No**		
168	Develop method for estimating Aqueduct EC boundary conditions	10 days	Mon 8/30/10	Fri 9/10/10	No	MWQI	37
169	Develop method for assuming pump-in EC	20 days	Mon 9/13/10	Fri 10/8/10	No	MWQI	168
170	Conduct planning study with EC	5 days	Fri 3/8/13	Thu 3/14/13	No	BDO	164,169
171	Document methodology	10 days	Fri 3/15/13	Thu 3/28/13	No	BDO	170
172	**Bromide**	**50 days**	**Fri 3/29/13**	**Thu 6/6/13**	**No**		
173	**Phase 1**	**30 days**	**Fri 3/29/13**	**Thu 5/9/13**	**No**		
174	Develop and test methods to generate Aqueduct boundary bromide conditions other than Banks and	10 days	Fri 3/29/13	Thu 4/11/13	No	BDO	47
175	Make test planning study simulation of bromide with bromide at Banks and Jones PP converted from EC generated by DSM2	10 days	Fri 4/12/13	Thu 4/25/13	No	BDO	164,174
176	Document methodology	10 days	Fri 4/26/13	Thu 5/9/13	No	BDO	175
177	**Phase 2**	**20 days**	**Fri 5/10/13**	**Thu 6/6/13**	**No**		
178	Make test planning study simulation of bromide with bromide at Banks and Jones PP directly simulated by DSM2 based on current Delta EC boundary methods	10 days	Fri 5/10/13	Thu 5/23/13	No	BDO	2,164,175
179	Document methodology	10 days	Fri 5/24/13	Thu 6/6/13	No	BDO	178
180	**DOC**	**719 days**	**Mon 10/11/10**	**Thu 7/11/13**	**Yes**		
181	**Phase 3**	**719 days**	**Mon 10/11/10**	**Thu 7/11/13**	**Yes**		
182	Develop and test methods to generate Aqueduct boundary DOC conditions other than Banks and Jones PP DOC	10 days	Mon 10/11/10	Fri 10/22/10	No	MWQI	60
183	Make test planning study simulation of DOC with DOC at Banks and Jones PP directly simulated by DSM2 based on WARMF simulation for Delta bound.	15 days	Fri 6/7/13	Thu 6/27/13	Yes	BDO	156,163,182,78
184	Document methodolgy	10 days	Fri 6/28/13	Thu 7/11/13	Yes	BDO	183