Minto Mine Phase V/VI
Biotic Ligand Modelling (BLM) in Support of
Effects Assessment

Contents:

Table 1: Minto Creek Water Quality Monitoring Station W2 Data Used to Calculate Inout Values for the Biotic Ligand Model

Date	pH (field)	pH (lab)	Temperature (field)	Alkalinity, total	Dissolved Organic Carbon
	pH units	pH units	C	mg/L	mg/L
5/27/2005		8.06			
5/27/2005		8.03		67.1	
6/30/2005		8.17		140	
7/28/2005		8.01			
8/30/2005		8.26		143	
9/28/2005		7.90		115	
10/15/2005		8.11			
4/8/2006	8.10	8.25		261	
4/9/2006	8.30	8.34		273	
4/10/2006	8.50	8.34		245	
4/11/2006	8.50	8.34		224	
4/12/2006	8.40	8.23		210	
4/13/2006	8.40	8.33		218	
4/14/2006	8.40	8.37		218	
4/15/2006	8.60	8.38		222	
4/16/2006	8.40	8.37		235	
4/17/2006	8.50	8.39		286	11.1
4/18/2006	8.40	8.20		246	
4/19/2006	8.50	8.34		222	
4/20/2006	8.50	8.35		235	
4/21/2006	8.45	8.33		203	
4/22/2006	8.45	8.31		165	
4/23/2006	8.45	8.24		135	
4/24/2006	8.55	8.15		103	14.0
4/25/2006	8.50	7.75		77	
4/26/2006	8.60	7.82		78	
4/27/2006	8.10	7.89		75.2	
4/28/2006	8.10	7.88		71.2	
4/29/2006	8.30	7.93		76.7	
4/30/2006	8.50	7.97		74.5	
5/1/2006	8.30	7.99		79.8	
5/2/2006	8.30	7.95			
5/3/2006	8.20	7.86			
5/5/2006		7.63			
5/6/2006		7.60			
5/8/2006		7.65			25.0
5/10/2006		7.65		34.5	
5/14/2006		7.61		32.1	21.6
5/17/2006		7.69		63.1	
5/20/2006		7.81		70.6	
5/23/2006		7.93		72.2	18.5
5/26/2006		7.71		94.3	
5/29/2006		7.66		82	
6/2/2006		7.19		91.8	18.4
6/7/2006		7.92		83.4	20.9
6/15/2006		8.11		117	12.6
6/23/2006		7.92		132	7.7
6/28/2006		8.05		133	10.7
7/7/2006		7.91		135	9.6
7/12/2006		7.93		132	9.6
7/31/2006		7.82		142	8.8
8/2/2006		7.86		152	9.0
8/23/2006		8.03		148	7.7
8/30/2006		7.87		150	7.9
9/6/2006		7.93		149	8.5
9/13/2006		7.99		156	8.1
9/20/2006		7.87		150	7.8
9/28/2006		7.64		151	7.7
10/4/2006		8.32		152	8.2
10/12/2006		7.54		146	8.1
10/18/2006		8.20		194	8.2
10/28/2006		7.77		151	7.7
4/17/2007		8.34		197	21.0
4/26/2007		7.44		44	27.0
5/19/2007		8.03		104	13.6
5/30/2007		8.10		116	10.2
6/20/2007		7.95		137	10.4
7/18/2007		7.96		154	10.4

Date	pH (field)	pH (lab)	Temperature (field)	Alkalinity, total	Dissolved Organic Carbon
	pH units	pH units	C	mg/L	mg/L
8/15/2007		8.18		166	10.0
9/18/2007		8.18		144	13.4
10/17/2007		8.17		132	11.9
4/22/2008		8.30		169	
5/13/2008		7.94		77	
5/20/2008		7.98		89	
6/3/2008		8.04		116	
7/8/2008		8.15		138	9.8
7/23/2008		8.03		92	
8/7/2008					9.4
8/28/2008		8.04		113	22.8
8/31/2008		8.10		118	
9/7/2008		8.14		139	
9/11/2008		8.07		129	
9/19/2008		8.12		147	19.8
10/8/2008		8.03		113	15.6
10/29/2008					11.3
11/18/2008	8.23	7.88	0.8	150	
4/22/2009	8.20	7.92	0.3	134	
4/30/2009	7.40	7.07	0.5	23	20.8
5/5/2009		7.03		24	
5/27/2009	7.98	7.98	13.7	110	
6/17/2009	8.17	7.98	6.7	122	10.7
6/26/2009		8.20			10.1
6/27/2009	8.21		7.9		
6/28/2009	8.29		10.2		
6/29/2009	7.90	8.20	8.0	130	12.5
6/30/2009	8.26		8.0		
7/1/2009	8.32	8.30	8.4		
7/2/2009	8.20	8.20	9.2		
7/3/2009	8.18	8.30	9.9		
7/4/2009	8.20		9.2		
7/5/2009	8.17	8.20	9.8	150	
7/6/2009	8.11		11.9		
7/7/2009	8.20		8.7		
7/8/2009	8.17		12.0		
7/9/2009	8.46		13.0		
7/10/2009	8.40		11.8		
7/11/2009	8.38		12.0		
7/12/2009	8.39		11.1		
7/12/2009		8.30		160	12.2
7/13/2009	8.40		9.7		
7/14/2009	8.42		9.8		
7/15/2009	8.36	8.30	10.3		
7/16/2009	8.41	8.20	7.9	160	
7/17/2009	8.30	8.20	7.6	160	
7/18/2009	8.61	8.00	7.8	84	
7/19/2009	8.34	8.20	7.9		
7/20/2009	8.19		8.9		
7/21/2009	8.34		8.4		
7/22/2009	8.43	8.10	9.1		
7/22/2009		8.00			
7/23/2009	8.32		9.4		
7/24/2009	8.37		10.5		
7/24/2009		8.20			
7/25/2009	8.39		8.4		
7/25/2009		8.20		140	
7/26/2009		8.10			
7/26/2009	8.43	8.20	10.2		
7/27/2009	8.40	8.20	12.0		
7/28/2009	7.94	8.05	10.7	107	
7/29/2009	7.90	8.10	9.2		
7/30/2009	7.79	8.10	8.8		
7/31/2009	8.36	8.10	9.5		
8/1/2009		8.20		140	
8/1/2009	8.10		11.1		
8/2/2009		8.20			
8/2/2009	7.87		13.7		

Table 1: Minto Creek Water Quality Monitoring Station W2 Data Used to Calculate Inout Values for the Biotic Ligand Model

Date	pH (field)	pH (lab)	Temperature (field)	Alkalinity, total	Dissolved Organic Carbon
	pH units	pH units	C	mg/L	mg/L
8/3/2009		8.10			
8/3/2009	8.13		8.0		
8/4/2009	8.00	8.30	8.0		
8/5/2009	8.34	8.30	8.4		
8/8/2009		8.20			
8/9/2009	7.85		7.2		
8/10/2009	7.80		9.6		
8/11/2009		8.05		140	
8/12/2009		8.10		140	
8/14/2009	7.87	8.10	7.5		
8/15/2009	7.83	8.20	8.6	120	
8/16/2009	7.79	8.20	9.4		
8/17/2009	7.87	8.20	9.8		
8/18/2009	7.84	8.20	9.1		
8/19/2009	7.96	8.00	8.3	120	
8/20/2009	8.10	8.10	8.2	120	
8/21/2009	8.08	8.10	8.2	120	
8/22/2009	7.93	8.10	9.5	120	
8/23/2009	8.08	8.10	9.4	120	
8/24/2009	8.07	8.20	8.6	110	
8/25/2009	7.97	8.20	8.8		
8/26/2009	8.01	8.20	8.7		
8/27/2009	8.02	8.00	7.8		
8/28/2009	7.97	8.10	9.7		
8/29/2009	8.04	8.00	9.1		
8/30/2009	7.87	8.00	9.5	110	
8/31/2009	7.95	8.00	8.6		9.7
9/1/2009	7.94	8.10	8.0		
9/2/2009	7.97	8.10	7.7		
9/3/2009	7.95	8.10	7.2		
9/4/2009	7.91	8.10	7.8		
9/5/2009	8.00	8.10	8.1		
9/6/2009	8.07	8.00	7.4	100	
9/7/2009	8.13	8.10	6.9		
9/8/2009	8.24	8.10	7.1		
9/9/2009	8.20	8.10	7.0		
9/10/2009	8.14	8.10	6.3		
9/11/2009	8.20	8.10	7.7		
9/12/2009	8.39	7.90	7.1		
9/13/2009	8.19	8.10	7.5	110	
9/14/2009	8.22	8.00	6.4		
9/15/2009	8.12	8.10	5.5		
9/16/2009	8.25	7.90	6.8		
9/17/2009	8.02	8.10	7.1		
9/18/2009	8.45	7.60	5.2		
9/19/2009	8.21	8.10	5.8		
9/20/2009	8.24	8.10	5.9		
9/21/2009	7.93	8.00	5.9		
9/22/2009	8.08	8.00	4.4		
9/23/2009	8.28	8.00	6.0		
9/24/2009	8.09	8.10	5.5		
9/25/2009	8.12	8.00	5.7		
9/26/2009	8.24	8.10	6.0		
9/27/2009	8.13	8.10	4.1		
9/28/2009	8.11	8.10	2.8		
9/29/2009	8.33	8.10	1.5		
9/30/2009	8.02	8.10	2.2		
10/1/2009	7.82	8.20	3.5		
10/2/2009	7.79	8.10	2.4		
10/3/2009	7.65	8.10	2.2		
10/4/2009	7.70	8.10	2.8		
10/5/2009	7.80	8.10	2.6		
10/6/2009	8.03	8.10	3.1		
10/7/2009	8.10	8.10	2.0		
10/8/2009	8.03	8.10	2.2		
10/9/2009	8.00	8.10	2.3		
10/10/2009	8.05	8.00	2.3		
10/11/2009	8.11	8.10	1.8		
10/12/2009	8.16	8.10	1.0		
10/13/2009	8.13	8.10	-0.1		
10/14/2009	8.43	8.10	-0.1		
10/15/2009	8.40	8.10	-0.1		
10/16/2009	7.70	8.10	-0.1		
10/17/2009	8.20	8.10	0.0		
10/18/2009	8.30	8.10	1.1		
10/19/2009	8.30	8.10	1.4		
10/20/2009	8.25	8.10	0.1	130	
10/21/2009	8.21	8.20	0.7		
10/22/2009	8.25	8.10	0.8		
10/23/2009	8.13	8.10	1.3		
10/24/2009	8.09	8.10	0.6		
10/25/2009	8.11	8.10	0.5	130	8.2
10/25/2009	8.11		0.5		
10/26/2009	8.16	8.10	1.2		
10/27/2009	8.05	8.10	0.8	130	
10/28/2009	8.12	8.20	0.7		
10/29/2009	7.79	8.20	0.2		
10/30/2009	7.81	8.10	-0.1		
11/5/2009	7.65		1.3		
11/6/2009		7.88		134	
4/7/2010	7.81	8.26	1.0	250	
4/19/2010	7.69	7.83	1.1	92	
4/20/2010	7.76	7.72	1.0	64	
4/21/2010	6.88	7.20	1.0	38	
4/22/2010	6.93	7.47	1.0	43	
4/23/2010	7.64	7.48	0.0	45	27.2
4/24/2010	7.53	7.44		45	27.5
4/25/2010	7.78	7.50	0.0	41	21.3
4/26/2010	7.23	7.70	0.0	42	21.8
4/27/2010	7.63	7.70	0.0	38	20.2
4/28/2010	7.87	7.70	0.0	36	18.3
4/29/2010	7.87	7.50	0.0	39	22.5
4/30/2010	7.90	7.50	0.2	39	23.1
5/1/2010	7.11	7.90	0.0	48	22.0
5/2/2010	7.88	7.80	0.0	58	18.1
5/3/2010	7.98	7.80	0.4	58	16.2
5/4/2010	7.89	7.90	0.0	64	16.3
5/5/2010	7.95	7.60	0.0	69	14.2
5/6/2010	8.09	8.00	0.0	74	13.7
5/7/2010	8.13	8.10	0.0	78	13.0
5/8/2010	8.04	8.10	0.0	81	10.2
5/9/2010	8.01	8.00	0.1	81	11.0
5/10/2010	8.18	7.90	0.0	89	10.6
5/11/2010		8.00		93	10.5
5/12/2010		8.10		98	9.5
5/13/2010		8.00		98	9.9
5/14/2010	7.80	8.10	1.4	110	8.7
5/15/2010	7.93	8.20	1.5	110	9.7
5/16/2010	7.97	8.10	2.8	110	9.5
5/17/2010	7.87	7.80	1.2	100	9.2
5/18/2010	7.86	8.20	4.5	110	8.9
5/19/2010	7.76	8.20	2.4	110	8.2
5/20/2010	7.26	8.10	4.4	110	7.2
5/21/2010	7.67	8.10	2.6	110	7.9
5/22/2010	7.85	8.20	2.7	110	7.8
5/23/2010	7.91	8.10	3.0	110	10.2
5/24/2010	7.84	8.10	2.5	110	8.1
5/25/2010	7.62	8.30	5.6	120	7.2
5/26/2010	7.87	7.90	2.6	120	7.3
5/27/2010	7.98	8.20	2.7	120	6.2
5/28/2010	7.97	8.30	3.4	120	6.0
5/29/2010	7.97	8.20	3.7	130	6.4
5/30/2010	7.95	8.40	2.7	130	6.7
5/31/2010	7.95	8.30	3.8	130	6.4
6/1/2010	7.67	8.30	5.8	130	5.2
6/2/2010	7.68	8.30	4.1	130	6.4

Table 1: Minto Creek Water Quality Monitoring Station W2 Data Used to Calculate Inout Values for the Biotic Ligand Model

Date	pH (field)	pH (lab)	Temperature (field)	Alkalinity, total	Dissolved Organic Carbon
	pH units	pH units	C	mg/L	mg/L
6/3/2010	7.52	8.30	4.4	140	6.4
6/4/2010	7.40	8.30	6.2	140	
6/5/2010	7.85	8.30	4.7	140	
6/6/2010	7.92	8.30	5.2	150	6.9
6/10/2010	7.82	8.20	6.8	130	7.1
6/11/2010	7.88	8.10	7.9	140	7.2
6/12/2010	7.89	8.40	5.5	140	7.2
6/13/2010	7.92	8.20	6.0	140	6.6
6/14/2010	6.63	8.30	6.5	140	6.9
6/15/2010	7.42	8.46	7.2	150	6.9
6/16/2010	7.32	8.20	6.5	150	7.4
6/17/2010	7.10	8.20	4.6	150	6.9
6/18/2010	7.13	8.13	6.1	160	9.7
6/19/2010	7.31	8.30	5.3	170	8.6
6/20/2010	7.19	8.20	5.7	140	8.0
6/21/2010	7.19	8.40	6.4	140	9.1
6/22/2010	8.00	8.24	4.5	130	9.2
6/23/2010	7.90	8.24	4.8	130	9.2
6/24/2010	7.95	8.21	5.0	130	9.1
6/25/2010	7.76	8.32	5.0	130	8.4
6/26/2010		8.39		140	
6/26/2010	7.78		5.5		7.7
6/27/2010	7.53	8.03	5.3	140	8.3
6/28/2010	7.49	7.94	5.5	140	8.1
6/29/2010	7.89	7.96	7.1	140	8.2
6/30/2010	7.94	8.02	6.6	140	20.3
7/1/2010	8.13	7.86	5.6	100	19.7
7/2/2010	7.13	7.85	6.3	110	19.3
7/3/2010	8.11	8.05	6.1	110	17.0
7/4/2010	8.16	7.98	6.6	120	15.8
7/5/2010	8.14	7.98	5.8	120	14.0
7/6/2010	8.07	8.03	5.6	130	12.2
7/7/2010	8.11	8.07	8.8	140	11.8
7/8/2010	8.15	8.11	8.0	140	11.0
7/9/2010	8.02	8.03	6.1	130	10.7
7/10/2010	8.15	8.11	6.8	150	9.6
7/11/2010	8.03	8.22	6.4	150	10.0
7/12/2010	8.11	8.06	7.7	150	9.7
7/13/2010	7.82	8.06	6.1	160	9.8
7/14/2010	8.31	7.90	6.9	150	
7/15/2010	8.26	8.13	7.6	110	17.2
7/16/2010	7.90	8.14	8.4	120	15.5
7/17/2010	7.85	8.13	7.2	120	15.4
7/18/2010	7.75	8.09	7.3	130	13.5
7/19/2010	8.25	8.15	8.2	130	12.5
7/20/2010	7.98	8.15	8.8	130	12.4
7/21/2010	7.47	8.17	9.2	130	12.6
7/22/2010	8.19	8.17	9.3	120	14.3
7/23/2010	7.82	8.10	8.1	120	13.5
7/24/2010	7.68	7.96	7.1	120	14.9
7/25/2010	8.03	8.05	7.0	120	14.1
7/27/2010	8.11	8.13	9.1	130	12.2
7/28/2010	8.10	8.16	7.7	130	12.4
7/29/2010	8.02	8.11	8.5	130	10.1
7/30/2010	7.95	8.09	7.9	130	11.3
7/31/2010	8.00	8.20	8.5	130	10.1
8/1/2010	8.02	8.17	8.3	130	11.3
8/2/2010	7.99	8.19	9.6	140	9.5
8/3/2010	8.03	8.14	9.1	130	11.0
8/4/2010	8.14	8.10	11.2	130	11.5
8/5/2010	8.09	8.15	9.6	140	11.0
8/6/2010	8.10	8.19	10.1	130	10.0
8/7/2010	8.08	8.13	8.4	140	10.5
8/8/2010	8.11	8.17	8.5	130	11.0
8/9/2010	8.08	8.21	8.8	130	11.5
8/10/2010	8.09	8.25	8.1	140	11.6
8/11/2010	8.43	7.97	9.0	130	11.9
8/12/2010	8.54	8.10	7.2	130	12.3
8/13/2010	7.83	8.07	9.0	130	13.1
8/14/2010	8.09	8.07	8.5	130	10.9
8/15/2010	7.76	8.23	8.9	130	13.4
8/16/2010	8.50	8.23	9.3	140	10.9
8/17/2010	8.43	8.23	10.2	140	11.6
8/18/2010	8.53	8.23	10.1	130	14.3
8/19/2010	8.35	8.14	8.3	110	18.9
8/20/2010	7.31	8.04	7.6	110	7.1
8/21/2010	7.87	8.24	6.9	120	8.8
8/22/2010	8.46	8.28	7.3	120	13.6
8/23/2010	8.15	8.23	8.6	120	14.2
8/24/2010	8.22	8.20	5.8	130	15.3
8/25/2010	8.17	8.13	7.3	120	13.4
8/26/2010	8.21	8.17	6.7	120	12.7
8/27/2010	8.12	8.20	6.0	120	12.0
8/28/2010	8.22	8.21	5.5	120	11.6
8/29/2010	8.23	8.01	6.2	120	12.5
8/30/2010	8.26	8.17	5.8	130	13.0
8/31/2010	8.28	8.07	7.3	130	11.8
9/1/2010	8.28	8.09	6.7	130	11.5
9/2/2010	8.20	8.17	6.8	130	11.9
9/3/2010	8.13	8.12	7.7	130	12.3
9/4/2010	8.12	8.16	7.0	130	12.4
9/5/2010	8.15	8.11	5.6	130	12.1
9/6/2010	8.19	8.15	8.1	130	11.6
9/7/2010	8.11	8.15	7.0	120	12.2
9/8/2010	8.20		7.3	130	13.5
9/9/2010	8.33	8.11	7.6	130	12.8
9/10/2010	7.53	8.16	6.3	120	13.8
9/11/2010	8.07	8.13	5.9	120	12.2
9/12/2010	8.15	8.11	6.8	120	12.8
9/13/2010	8.12	8.26	5.8	120	12.4
9/14/2010	7.20	8.22	5.0	120	12.9
9/15/2010	8.01	8.22	4.3	130	13.2
9/16/2010	8.02	8.22	5.0	130	12.2
9/17/2010	8.05	8.23	3.7	130	13.2
9/18/2010	8.14	8.08	4.8	130	12.7
9/19/2010	8.18	8.09	2.8	130	11.9
9/20/2010	8.19	8.13	2.2	130	12.4
9/21/2010	8.19	8.09	1.8	130	12.9
9/22/2010	8.19	8.11	1.9	130	11.3
9/23/2010	8.06	8.04	0.8	130	12.5
9/24/2010	7.99	8.08	1.3	130	11.2
9/25/2010	8.10	8.04	2.3	130	11.4
9/26/2010	8.11	8.10	2.1	130	10.3
9/27/2010	8.11	8.10	2.4	130	10.9
9/28/2010	8.11	8.14	2.4	130	10.8
9/29/2010	8.17	8.15	2.5	130	11.7
10/1/2010		8.12		130	12.6
10/2/2010		8.12		120	13.3
10/3/2010		8.04		120	13.7
10/4/2010		8.09		120	13.5
10/5/2010	8.09	8.10	1.4	130	12.0
10/6/2010	8.15	8.10	2.1	130	13.2
10/7/2010	8.11	8.21	0.4	130	11.4
10/8/2010	8.15	8.17	-0.2	140	12.1
10/9/2010	8.16	8.23	-0.1	140	10.1
10/10/2010	7.85	8.20	1.5	140	12.1
10/11/2010		8.09		140	12.3
10/12/2010	8.11	8.10	1.2	140	11.1
10/13/2010	8.31	8.11	1.5	140	11.2
10/14/2010	8.27	8.12	0.7	140	10.9
10/15/2010	8.18	8.14	0.5	140	10.6
10/16/2010	8.20	8.15	0.3	140	11.0
10/17/2010		8.21		140	10.0
10/18/2010	8.28	8.24	2.0	140	10.2
10/19/2010	8.33	8.22	1.2	140	9.8
10/20/2010	8.25	8.22	1.3	140	

Table 1: Minto Creek Water Quality Monitoring Station W2 Data Used to Calculate Inout Values for the Biotic Ligand Model

Date	pH (field)	pH (lab)	Temperature (field)	Alkalinity, total	Dissolved Organic Carbon
	pH units	pH units	C	mg/L	mg/L
10/21/2010	7.87	8.24	-0.2	150	9.7
10/22/2010		8.28		150	9.7
10/23/2010	8.17	8.26	-0.2	150	9.3
10/24/2010				140	8.9
10/25/2010	8.28	8.29	-0.1	150	8.8
10/26/2010	8.23		2.8		
10/27/2010	8.39	8.14	0.5	150	9.0
10/28/2010	8.27	8.14	-0.2	150	9.1
10/29/2010	8.26	8.33	0.1	150	10.6
10/30/2010	8.26	8.29	0.1	150	10.6
10/31/2010	8.03	8.23	-0.2	150	11.5
11/1/2010	7.41	8.25	0.1	150	9.4
11/2/2010	7.64	8.29	0.5	150	9.0
11/7/2010	7.06	8.11	-0.2	160	8.8
11/16/2010	7.28	8.07	-0.2	150	7.9
11/29/2010	8.05	8.06	-0.2	150	10.1
12/6/2010		8.06	1.1	190	9.1
12/10/2010	7.25	7.99	0.2	170	9.2
12/14/2010		8.14		230	10.5
4/4/2011		8.39		230	10.1
4/11/2011		8.28		190	7.3
4/21/2011		8.24		140	15.0
4/27/2011		7.62		51	19.0
5/5/2011		7.32		36	
5/10/2011		7.60		46	22.5
5/15/2011		7.84		65	20.0
5/23/2011		8.03		88	14.9
5/30/2011		8.07		110	10.9
6/7/2011		7.74		80	17.6
6/13/2011		8.08		110	14.3
6/16/2011		8.01		110	<0.5
6/20/2011		7.90		110	15.9
6/27/2011		7.97		120	16.0
7/3/2011		8.17		110	20.3
7/9/2011		8.03		110	16.0
7/19/2011		8.02		110	20.1
7/26/2011		8.12		130	17.0
8/2/2011		7.86		72	22.4
8/16/2011		7.97		110	<0.5
8/29/2011		8.06		120	17.7
9/8/2011	8.03	8.23	2.9	120	15.4
9/12/2011	8.04	8.11	2.2	120	13.9
9/19/2011	8.06	8.17	2.0	120	12.9
9/27/2011	8.07	8.17	1.6	120	12.8
10/6/2011	7.92	8.08	0.0	140	13.3
10/11/2011	7.79	8.01	0.5	130	12.7
10/19/2011	7.81	8.13	0.0	140	10.8
10/26/2011	8.01	8.14	0.0	140	10.2
10/30/2011	7.80	8.18	0.0	150	10.3
11/3/2011	7.70	8.17	0.0	150	
11/8/2011	7.61	8.20	0.0	150	10.6
11/13/2011	8.00	8.32	0.0	158	9.7
11/22/2011		7.98		169	8.1
11/28/2011		8.14		171	9.7
4/6/2012	7.99	8.23	0.0	199	10.0
4/12/2012	7.78	8.23	0.2	185	9.3
4/14/2012	7.95	8.19	0.0	156	12.9
4/15/2012	8.13	8.14	0.0	131	12.2
4/16/2012	8.23	8.08	0.0	110	13.4
4/17/2012	8.07		0.0		
4/18/2012	8.11		0.0		
4/19/2012	8.00		0.0		
4/20/2012	7.48		0.0		
4/21/2012	7.44		0.0		
4/22/2012	7.54	7.68	0.0	49.5	32.4
4/23/2012	7.61		0.2		
4/24/2012	8.04	7.80	0.0	54.9	20.8
4/25/2012	7.81		0.4		
4/26/2012	7.63	7.74	0.5	56.9	23.1
4/27/2012	7.70		0.6		
4/28/2012	7.59		0.8		
4/29/2012	7.49	7.80	0.8	52.1	19.1
4/30/2012	7.65	7.81	0.7	57.8	18.3
5/1/2012	7.23		0.5		
5/2/2012	7.23		2.4		
5/3/2012	7.44		0.2		
5/7/2012	7.68	7.81	1.8	65.6	14.3
5/10/2012	8.07		1.5		
5/12/2012	7.90	7.74	2.2	70.3	14.1
5/18/2012	8.11	8.04	2.8	95.8	14.1
5/20/2012	7.84	7.98	2.3	88.7	12.5
5/25/2012	7.76	7.91	2.9	95.8	11.7
6/2/2012	8.04	8.10	3.2	123	9.7
6/6/2012	7.74	8.09	5.3	123	13.2
6/9/2012	7.77	8.00	5.3	115	11.2
6/13/2012	7.78	8.02	4.3	108	14.2
6/15/2012	7.89	8.02	4.6	96	16.4
6/19/2012	7.75	8.15	5.6	110	15.2
6/22/2012	8.10	8.12	9.2	118	15.2
6/29/2012	7.93	8.22	7.2	137	12.3
7/8/2012	8.03	8.19	6.0	134	15.6
7/11/2012	8.02	8.04	5.8	134	13.9
7/17/2012	8.17	8.13	9.4	142	15.9
7/24/2012	8.04	8.20	8.1	141	14.0
7/31/2012	8.01	8.22	8.3	152	12.3
8/7/2012	8.01	8.12	7.3	151	11.8
8/10/2012	8.24	8.27	8.1	154	12.6
8/13/2012	8.00	8.32	9.4	147	11.9
8/16/2012	8.03	8.28	8.7	154	11.7
8/23/2012	7.91	8.29	7.0	159	13.4
8/25/2012	8.29	8.20	8.4	158	16.6
8/27/2012	8.32	8.36	6.6	156	13.0
9/3/2012	8.27	8.28	6.0	154	11.4
9/12/2012	6.30	8.13	1.2	127	16.7
9/19/2012	7.95	8.19	3.5	145	14.9
9/24/2012	7.95	8.24	5.3	147	13.7
10/4/2012	7.40	8.14	1.0	143	12.8
10/12/2012	7.83	8.11	0.0	151	14.9
10/16/2012	7.88	8.23	0.2	144	13.9
10/19/2012	8.70	8.12	0.0	147	11.9
10/22/2012	8.60	8.16	0.2	171	11.8
11/11/2012	7.47	8.11	-0.1	175	9.5
Count	410	476	384	385	312

Table 2: Summary Statistics Used for Input to the Biotic Ligand Model (Station W2, Lower Minto Creek, 2005-2012)

A) Mean by Month

Analyte	Units	April	May	June	July	August	Sept	Oct	Nov	Dec
pH (field)	pH units	8.00	7.86	7.72	8.14	8.08	8.08	8.09	7.65	7.25
pH (lab)	pH units	7.98	7.94	8.13	8.10	8.14	8.09	8.08	8.11	8.07
Temperature (field)	C	0.3	2.2	6.0	8.5	8.5	5.1	0.9	0.2	0.2
Alkalinity, total	mg/L	131	88	129	130	131	130	141	155	200
Alkalinity, Bicarbonate	mg/L	115	112	159	158	159	160	172	189	245
Dissolved Organic Carbon	mg/L	18.3	12.4	10.1	13.5	12.1	12.3	11.1	9.3	9.9

B) Median by Month

Analyte	Units	April	May	June	July	August	Sept	Oct	Nov	Dec
pH (field)	pH units	8.04	7.91	7.80	8.16	8.08	8.12	8.12	7.64	7.25
pH (lab)	pH units	8.08	7.99	8.15	8.11	8.17	8.10	8.11	8.11	8.07
Temperature (field)	C	0.0	2.4	5.7	8.4	8.5	5.8	0.6	0.0	0.2
Alkalinity, total	mg/L	110	91	131	130	130	130	140	150	200
Alkalinity, Bicarbonate	mg/L	68.2	120	160	160	160	160	170	190	245
Dissolved Organic Carbon	mg/L	19.1	10.6	9.1	12.6	11.8	12.4	11.1	9.4	9.9

C) Count by Month

Analyte	Units	April	May	June	July	August	Sept	Oct	Nov	Dec
pH (field)	pH units	57	41	40	66	63	67	63	11	1
pH (lab)	pH units	55	62	51	67	74	75	76	13	2
Temperature (field)	C	33	38	40	66	63	67	63	11	1
Alkalinity, total	mg/L	55	56	50	52	59	48	48	13	2
Alkalinity, Bicarbonate	mg/L	32	47	47	52	58	47	48	13	2
Dissolved Organic Carbon	mg/L	26	45	47	45	48	43	46	10	2

Table 3: Comparison of Summary Statistics Used for Input to the Biotic Ligand Model (All) to Summary Statistics for the Discharge Periods Only and No-Discharge Periods Only (2005-2012)

		April	May	June	July	August	Sept	Oct	Nov	Dec
pH (field)	All [1]	8.00	7.86	7.72	8.14	8.08	8.08	8.09	7.65	7.25
	Discharge [2]	7.76	7.53	8.17	8.18	8.08	8.11	8.10	-	-
	No Discharge [2]	8.08	7.91	7.67	8.02	8.05	7.83	8.04	7.65	7.25

		April	May	June	July	August	Sept	Oct	Nov	Dec
pH (lab)	All [1]	7.98	7.94	8.13	8.10	8.14	8.09	8.08	8.11	8.07
	Discharge [2]	7.82	7.81	8.20	8.14	8.15	8.09	8.14	-	-
	No Discharge [2]	8.00	7.94	8.12	8.05	8.13	8.07	8.12	8.11	8.06

		April	May	June	July	August	Sept	Oct	Nov	Dec
Temperature (field)	All [1]	0.31	2.22	5.99	8.53	8.46	5.09	0.89	0.17	0.21
	Discharge [2]	0.27	1.28	8.51	9.16	8.54	5.36	1.08	-	-
	No Discharge [2]	0.35	2.36	5.71	6.86	8.03	3.09	0.12	0.17	0.66

		April	May	June	July	August	Sept	Oct	Nov	Dec
Alkalinity, total	All [1]	131	88	129	130	131	130	141	155	200
	Discharge [2]	64	66	130	130	126	128	137	-	-
	No Discharge [2]	139	89	129	131	142	137	147	155	197

		April	May	June	July	August	Sept	Oct	Nov	Dec
Dissolved Organic Carbon	All [1]	18.3	12.4	10.1	13.5	12.1	12.3	11.1	9.3	9.9
	Discharge [2]	21.2	14.3	11.3	13.0	12.3	12.4	11.0	-	-
	No Discharge [2]	17.4	12.3	10.1	13.9	11.7	12.1	11.2	9.3	9.6

[1] - calculated by Minnow (above) from data in Table 1

[2] - provided by Access Consulting Group in e-mail on April 9, 2013

Table 4: Minto Creek Station W2 (Lower Minto Creek) Summary Statistics to Define Ranges for Sensitivity Analysis [1]

Analyte	Units	Mean	Minimum	Percentiles							Maximum
				5th	10th	25th	median	75th	90th	95th	
pH (field)	pH units	8.0	6.3	7.4	7.6	7.9	8.1	8.2	8.4	8.5	8.7
pH (lab)	pH units	8.1	4.3	7.7	7.8	8.0	8.1	8.2	8.3	8.3	8.5
Temperature (field)	C	4.8	-0.2	0.0	0.0	1.1	5.5	7.9	9.2	9.8	13.7
Alkalinity, total	mg/L	127	23	51	74	110	130	142	159	193	286
Dissolved Organic Carbon	mg/L	12.4	5.2	7.2	7.9	9.7	11.8	13.9	18.4	20.9	32.4

[1] Sensitivity analysis performed using data ranging from the 5th percentile to the 95th percentile

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 1

COPPER

OPERATIONAL BEST ESTIMATE, AVERAGE

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM1-1: BLM Input Parameters - Operational Best Estimate, Average

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	4.3	9.7	10	43.2	15.7	9.00	1.84	22.8	1.26	110	0.001
Feb	10	8	6.6	9.7	10	43.7	14.8	8.49	1.73	21.2	1.13	110	0.001
Mar	10	8	8.6	9.7	10	43.7	15.2	8.63	1.70	22.0	0.92	110	0.001
Apr	10	7.98	9.9	18.3	10	23.1	8.5	5.04	1.88	12.3	1.33	131	0.001
May	10	7.94	22.1	12.4	10	26.4	9.5	4.19	1.74	30.6	0.69	88	0.001
Jun	10	8.13	6.6	10.1	10	30.0	10.1	6.62	1.18	19.1	1.39	129	0.001
Jul	10	8.10	14.3	13.5	10	36.7	12.2	6.79	1.43	7.7	0.75	130	0.001
Aug	10	8.14	12.8	12.1	10	35.9	11.5	6.13	1.38	12.1	0.82	131	0.001
Sep	10	8.09	6.6	12.3	10	31.0	10.1	5.71	1.12	13.7	0.70	130	0.001
Oct	10	8.08	6.7	11.1	10	31.3	10.3	5.76	1.17	10.4	0.75	141	0.001
Nov	10	8.11	7.2	9.3	10	39.4	12.4	6.74	1.14	13.3	1.06	155	0.001
Dec	10	8.07	6.0	9.9	10	48.5	17.7	10.15	2.00	26.1	1.76	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM1-2: Instantaneous Water Quality Criteria for Copper - Operational Best Estimate, Average

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
OP BE Average	Jan	137	68.4	42.5	4.3	0.063
OP BE Average	Feb	136	68.1	42.3	6.6	0.097
OP BE Average	Mar	136	68.2	42.4	8.6	0.126
OP BE Average	Apr	236	118.2	73.4	9.9	0.084
OP BE Average	May	151	75.7	47.0	22.1	0.292
OP BE Average	Jun	149	74.3	46.2	6.6	0.089
OP BE Average	Jul	200.6	100.3	62.3	14.3	0.143
OP BE Average	Aug	183.5	91.7	57.0	12.8	0.140
OP BE Average	Sep	175.5	87.7	54.5	6.6	0.075
OP BE Average	Oct	157.1	78.5	48.8	6.7	0.085
OP BE Average	Nov	138.9	69.5	43.1	7.2	0.104
OP BE Average	Dec	149.9	75.0	46.6	6.0	0.080

Table BLM1-3: Predicted LC50 Values for Fathead Minnow - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"OP BE Average"	"Jan "	LC50	8	1.57E-05	6.41E-08	1.23E-05	4.525036	0.954993	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb "	LC50	8	1.56E-05	6.32E-08	1.23E-05	4.524661	0.955242	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar "	LC50	8	1.57E-05	6.37E-08	1.23E-05	4.525045	0.955157	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr "	LC50	8	2.5E-05	3.98E-08	2.23E-05	4.498796	0.980487	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May "	LC50	7.94	1.67E-05	4.35E-08	1.49E-05	4.618066	0.861859	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun "	LC50	8.13	1.64E-05	4.41E-08	1.3E-05	4.260508	1.219797	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul "	LC50	8.1	2.13E-05	5.23E-08	1.74E-05	4.316459	1.163549	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug "	LC50	8.14	1.96E-05	4.94E-08	1.58E-05	4.233607	1.246409	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep "	LC50	8.09	1.9E-05	4.55E-08	1.56E-05	4.339421	1.141202	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct "	LC50	8.08	1.77E-05	4.62E-08	1.41E-05	4.36713	1.117779	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov "	LC50	8.11	1.67E-05	5.36E-08	1.2E-05	4.31203	1.171948	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec "	LC50	8.07	1.98E-05	6.8E-08	1.29E-05	4.397227	1.08584	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	998	1.00
Feb	994	0.99
Mar	996	1.00
Apr	1588	1.59
May	1061	1.06
Jun	1041	1.04
Jul	1352	1.35
Aug	1248	1.25
Sep	1206	1.21
Oct	1124	1.12
Nov	1063	1.06
Dec	1257	1.26

Table BLM1-4: Predicted LC50 Values for Rainbow Trout - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Average"	"Jan	LC50	8	1.34551E-05	4.03E-08	1.13E-05	3.05434	0.644612	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb	LC50	8	1.34164E-05	3.98E-08	1.13E-05	3.054994	0.644971	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar	LC50	8	1.3439E-05	4.01E-08	1.13E-05	3.055096	0.644881	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr	LC50	8	2.22024E-05	2.5E-08	2.05E-05	3.03694	0.661892	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May	LC50	7.94	1.48112E-05	2.73E-08	1.37E-05	3.117235	0.581768	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun	LC50	8.13	1.40891E-05	2.78E-08	1.19E-05	2.876347	0.823513	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul	LC50	8.1	1.84741E-05	3.29E-08	1.61E-05	2.914338	0.785598	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug	LC50	8.14	1.6957E-05	3.11E-08	1.45E-05	2.858008	0.841428	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep	LC50	8.09	1.64898E-05	2.86E-08	1.44E-05	2.929514	0.770424	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct	LC50	8.08	1.52158E-05	2.91E-08	1.29E-05	2.945633	0.753949	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov	LC50	8.11	1.40345E-05	3.37E-08	1.11E-05	2.909253	0.790698	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec	LC50	8.07	1.62013E-05	4.28E-08	1.18E-05	2.969869	0.733375	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	855	0.86
Feb	853	0.85
Mar	854	0.85
Apr	1411	1.41
May	941	0.94
Jun	895	0.90
Jul	1174	1.17
Aug	1078	1.08
Sep	1048	1.05
Oct	967	0.97
Nov	892	0.89
Dec	1030	1.03

Table BLM1-5: Predicted LC50 Values for Daphnia magna - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Average"	"Jan	LC50	8	4.31E-06	1.14E-09	4.25E-06	0.098198	0.020725	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb	LC50	8	4.3E-06	1.12E-09	4.24E-06	0.098251	0.020744	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar	LC50	8	4.3E-06	1.13E-09	4.24E-06	0.098255	0.020741	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr	LC50	8	7.46E-06	7.05E-10	7.41E-06	0.097755	0.021307	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May	LC50	7.94	4.85E-06	7.72E-10	4.82E-06	0.100218	0.018705	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun	LC50	8.13	4.62E-06	7.84E-10	4.56E-06	0.092486	0.02648	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul	LC50	8.1	6.23E-06	9.28E-10	6.16E-06	0.093655	0.025247	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug	LC50	8.14	5.68E-06	8.78E-10	5.61E-06	0.09192	0.027064	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep	LC50	8.09	5.48E-06	8.08E-10	5.42E-06	0.094212	0.024778	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct	LC50	8.08	4.92E-06	8.21E-10	4.86E-06	0.094728	0.024247	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov	LC50	8.11	4.34E-06	9.53E-10	4.25E-06	0.093529	0.025421	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec	LC50	8.07	4.69E-06	1.21E-09	4.56E-06	0.095373	0.023552	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	274	0.27
Feb	273	0.27
Mar	273	0.27
Apr	474	0.47
May	308	0.31
Jun	293	0.29
Jul	396	0.40
Aug	361	0.36
Sep	348	0.35
Oct	313	0.31
Nov	276	0.28
Dec	298	0.30

Table BLM1-6: Predicted LC50 Values for Daphnia pulex - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Average"	"Jan	LC50	8	2.56E-06	4.27E-10	2.54E-06	0.036929	0.007794	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb	LC50	8	2.55E-06	4.21E-10	2.53E-06	0.036908	0.007792	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar	LC50	8	2.55E-06	4.24E-10	2.53E-06	0.036909	0.007791	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr	LC50	8	4.42E-06	2.64E-10	4.4E-06	0.036688	0.007997	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May	LC50	7.94	2.84E-06	2.89E-10	2.83E-06	0.037662	0.007029	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun	LC50	8.13	2.77E-06	2.94E-10	2.75E-06	0.034745	0.009948	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul	LC50	8.1	3.74E-06	3.47E-10	3.71E-06	0.035194	0.009487	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug	LC50	8.14	3.42E-06	3.29E-10	3.39E-06	0.034531	0.010167	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep	LC50	8.09	3.27E-06	3.03E-10	3.25E-06	0.035377	0.009304	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct	LC50	8.08	2.93E-06	3.07E-10	2.91E-06	0.035588	0.009109	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov	LC50	8.11	2.59E-06	3.57E-10	2.56E-06	0.035144	0.009552	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec	LC50	8.07	2.8E-06	4.52E-10	2.75E-06	0.035845	0.008852	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	163	0.16
Feb	162	0.16
Mar	162	0.16
Apr	281	0.28
May	181	0.18
Jun	176	0.18
Jul	238	0.24
Aug	217	0.22
Sep	208	0.21
Oct	186	0.19
Nov	165	0.16
Dec	178	0.18

Table BLM1-7: Predicted LC50 Values for Ceriodaphnia dubia - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Average"	"Jan	LC50	8	3.31E-06	6.7E-10	3.27E-06	0.057834	0.012206	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb	LC50	8	3.3E-06	6.61E-10	3.26E-06	0.057879	0.01222	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar	LC50	8	3.3E-06	6.66E-10	3.27E-06	0.057881	0.012218	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr	LC50	8	5.72E-06	4.14E-10	5.69E-06	0.05751	0.012535	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May	LC50	7.94	3.7E-06	4.54E-10	3.68E-06	0.059047	0.011021	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun	LC50	8.13	3.56E-06	4.61E-10	3.53E-06	0.054496	0.015603	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul	LC50	8.1	4.81E-06	5.46E-10	4.77E-06	0.055195	0.014879	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug	LC50	8.14	4.39E-06	5.16E-10	4.35E-06	0.054137	0.015939	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep	LC50	8.09	4.22E-06	4.75E-10	4.19E-06	0.055501	0.014597	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct	LC50	8.08	3.78E-06	4.82E-10	3.75E-06	0.055789	0.01428	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov	LC50	8.11	3.34E-06	5.6E-10	3.29E-06	0.055079	0.01497	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec	LC50	8.07	3.61E-06	7.1E-10	3.53E-06	0.056205	0.01388	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	210	0.21
Feb	209	0.21
Mar	210	0.21
Apr	363	0.36
May	235	0.24
Jun	226	0.23
Jul	306	0.31
Aug	279	0.28
Sep	268	0.27
Oct	240	0.24
Nov	212	0.21
Dec	229	0.23

Table BLM1-8: Predicted LC50 Values for Olfaction (User Defined) - Operational Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP BE Average LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Average"	"Jan	LC50	8	5.38E-06	1.91E-09	5.28E-06	0.164112	0.034636	9.7	10	0.001078	0.000646	0.000391	4.71E-05	0.000237	3.55E-05	0.002237	3.12E-08
"OP BE Average"	"Feb	LC50	8	5.36E-06	1.88E-09	5.26E-06	0.16414	0.034654	9.7	10	0.00109	0.000609	0.000369	4.42E-05	0.000221	3.19E-05	0.002237	3.12E-08
"OP BE Average"	"Mar	LC50	8	5.37E-06	1.9E-09	5.27E-06	0.164149	0.03465	9.7	10	0.00109	0.000625	0.000375	4.35E-05	0.000229	2.59E-05	0.002237	3.12E-08
"OP BE Average"	"Apr	LC50	8	9.32E-06	1.18E-09	9.24E-06	0.163079	0.035545	18.3	10	0.000576	0.00035	0.000219	4.81E-05	0.000128	3.75E-05	0.002664	3.12E-08
"OP BE Average"	"May	LC50	7.94	6.1E-06	1.29E-09	6.05E-06	0.167598	0.03128	12.4	10	0.000659	0.000391	0.000182	4.45E-05	0.000319	1.95E-05	0.001796	3.12E-08
"OP BE Average"	"Jun	LC50	8.13	5.74E-06	1.31E-09	5.64E-06	0.154399	0.044207	10.1	10	0.000749	0.000416	0.000288	3.02E-05	0.000199	3.92E-05	0.002604	3.12E-08
"OP BE Average"	"Jul	LC50	8.1	7.74E-06	1.56E-09	7.62E-06	0.156585	0.042211	13.5	10	0.000916	0.000502	0.000295	3.66E-05	8.02E-05	2.12E-05	0.002628	3.12E-08
"OP BE Average"	"Aug	LC50	8.14	7.05E-06	1.47E-09	6.94E-06	0.15352	0.045199	12.1	10	0.000896	0.000473	0.000267	3.53E-05	0.000126	2.31E-05	0.002643	3.12E-08
"OP BE Average"	"Sep	LC50	8.09	6.82E-06	1.35E-09	6.72E-06	0.157381	0.041391	12.3	10	0.000773	0.000416	0.000248	2.86E-05	0.000143	1.97E-05	0.00263	3.12E-08
"OP BE Average"	"Oct	LC50	8.08	6.14E-06	1.37E-09	6.03E-06	0.158198	0.040493	11.1	10	0.000781	0.000424	0.000251	2.99E-05	0.000108	2.12E-05	0.002854	3.12E-08
"OP BE Average"	"Nov	LC50	8.11	5.4E-06	1.6E-09	5.27E-06	0.15629	0.042479	9.3	10	0.000983	0.00051	0.000293	2.92E-05	0.000138	2.99E-05	0.003132	3.12E-08
"OP BE Average"	"Dec	LC50	8.07	5.85E-06	2.02E-09	5.65E-06	0.15941	0.039365	9.9	10	0.00121	0.000728	0.000442	5.12E-05	0.000272	4.96E-05	0.00405	3.12E-08

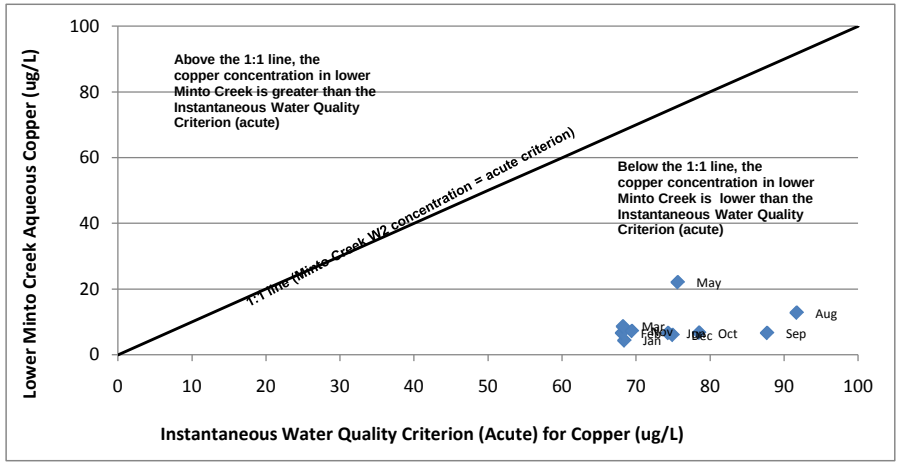
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	342	0.34
Feb	341	0.34
Mar	341	0.34
Apr	592	0.59
May	388	0.39
Jun	365	0.36
Jul	492	0.49
Aug	448	0.45
Sep	434	0.43
Oct	390	0.39
Nov	343	0.34
Dec	372	0.37

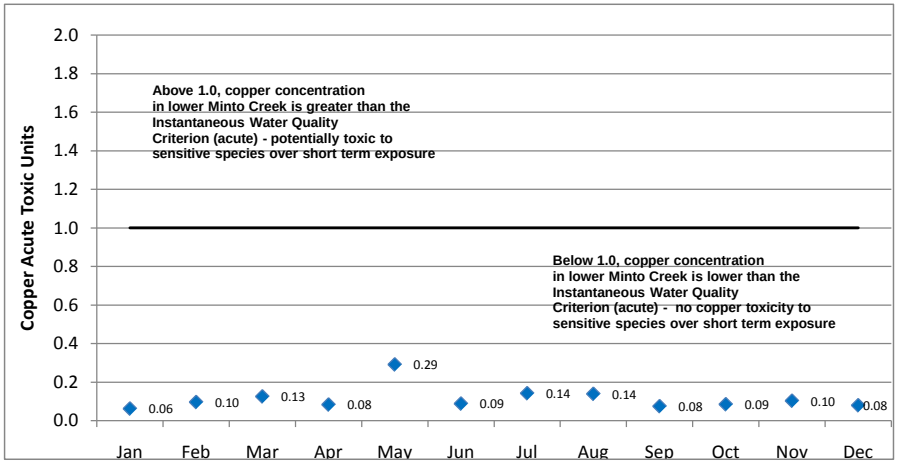
Table BLM1-9: BLM Model Results Summary - Operational Best Estimate, Average

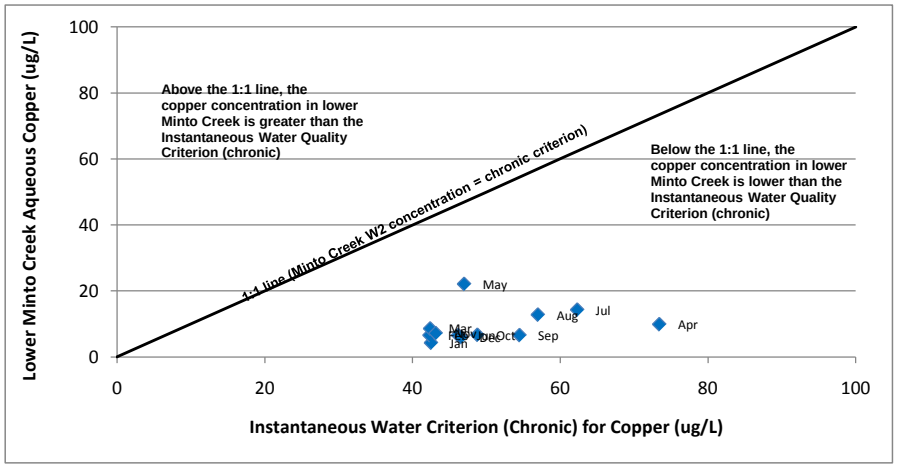
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	4.3	68.4	42.5	0.06	0.10	998	855	274	163	210	342
Feb	6.6	68.1	42.3	0.10	0.16	994	853	273	162	209	341
Mar	8.6	68.2	42.4	0.13	0.20	996	854	273	162	210	341
Apr	9.9	118.2	73.4	0.08	0.13	1,588	1,411	474	281	363	592
May	22.1	75.7	47.0	0.29	0.47	1,061	941	308	181	235	388
Jun	6.6	74.3	46.2	0.09	0.14	1,041	895	293	176	226	365
Jul	14.3	100.3	62.3	0.14	0.23	1,352	1,174	396	238	306	492
Aug	12.8	91.7	57.0	0.14	0.22	1,248	1,078	361	217	279	448
Sep	6.6	87.7	54.5	0.08	0.12	1,206	1,048	348	208	268	434
Oct	6.7	78.5	48.8	0.09	0.14	1,124	967	313	186	240	390
Nov	7.2	69.5	43.1	0.10	0.17	1,063	892	276	165	212	343
Dec	6.0	75.0	46.6	0.08	0.13	1,257	1,030	298	178	229	372

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







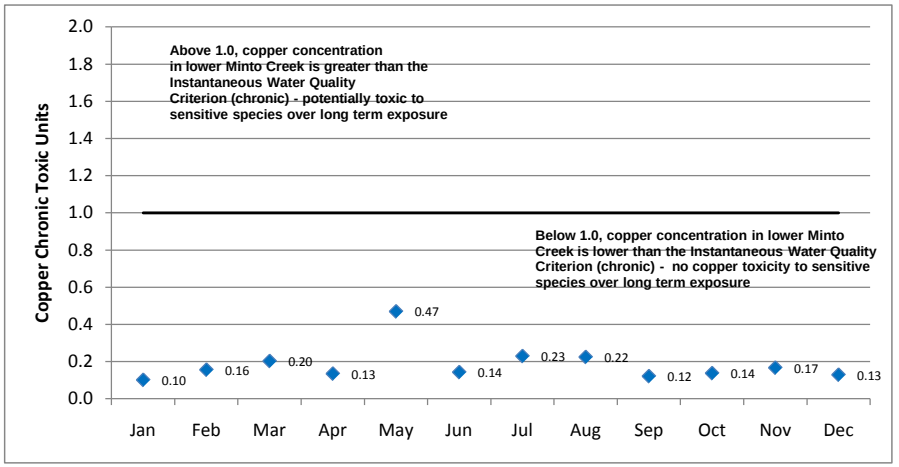


Figure BLM1-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Operational Phase Best Estimate, Average

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 2

COPPER

OPERATIONAL BEST ESTIMATE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM2-1: BLM Input Parameters - Operational Best Estimate, Maximum

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	6.0	9.7	10	51.9	19.7	11.41	2.38	31.0	2.02	110	0.001
Feb	10	8	8.3	9.7	10	45.7	15.6	8.89	1.84	22.6	1.24	110	0.001
Mar	10	8	9.6	9.7	10	45.7	15.8	8.90	1.79	23.4	1.24	110	0.001
Apr	10	7.98	10.6	18.3	10	45.1	15.8	8.90	1.96	23.4	1.43	131	0.001
May	10	7.94	23.2	12.4	10	28.6	10.2	5.03	1.94	32.0	1.40	88	0.001
Jun	10	8.13	22.5	10.1	10	30.9	10.4	6.85	1.73	31.6	1.46	129	0.001
Jul	10	8.1	15.0	13.5	10	37.6	12.5	6.87	1.47	18.7	1.46	130	0.001
Aug	10	8.14	14.9	12.1	10	37.6	12.5	6.87	1.46	12.7	0.86	131	0.001
Sep	10	8.09	12.9	12.3	10	36.6	11.6	6.17	1.40	14.3	0.85	130	0.001
Oct	10	8.08	7.1	11.1	10	32.3	10.6	5.89	1.22	14.3	0.80	141	0.001
Nov	10	8.11	7.7	9.3	10	43.5	13.5	7.23	1.22	15.2	1.22	155	0.001
Dec	10	8.07	7.7	9.9	10	51.9	19.7	11.39	2.37	30.9	2.02	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM2-2: Instantaneous Water Quality Criteria for Copper - Operational Best Estimate, Maximum

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
OP BE Maximum	Jan	142	71.1	44.2	6	0.084
OP BE Maximum	Feb	137	68.7	42.7	8.3	0.121
OP BE Maximum	Mar	137	68.7	42.7	9.6	0.140
OP BE Maximum	Apr	255	127.3	79.1	10.6	0.083
OP BE Maximum	May	153	76.7	47.6	23.2	0.303
OP BE Maximum	Jun	148	74.2	46.1	22.5	0.303
OP BE Maximum	Jul	200	100.1	62.2	15	0.150
OP BE Maximum	Aug	186	92.8	57.7	14.9	0.161
OP BE Maximum	Sep	179	89.7	55.7	12.9	0.144
OP BE Maximum	Oct	157	78.7	48.9	7.1	0.090
OP BE Maximum	Nov	141	70.5	43.8	7.7	0.109
OP BE Maximum	Dec	153	76.3	47.4	7.7	0.101

Table BLM2-3: Predicted LC50 Values for Fathead Minnow - Operational Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"OP BE Maximum	"Jan "	LC50	8	1.64E-05	7.59E-08	1.25E-05	4.527956	0.952411	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Maximum	"Feb "	LC50	8	1.58E-05	6.57E-08	1.23E-05	4.526717	0.954959	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Mar "	LC50	8	1.58E-05	6.59E-08	1.23E-05	4.525417	0.954584	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Apr "	LC50	7.98	2.71E-05	6.62E-08	2.31E-05	4.543595	0.936338	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Maximum	"May "	LC50	7.94	1.69E-05	4.63E-08	1.49E-05	4.618973	0.861035	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Maximum	"Jun "	LC50	8.13	1.64E-05	4.49E-08	1.3E-05	4.262368	1.218666	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Maximum	"Jul "	LC50	8.1	2.13E-05	5.29E-08	1.74E-05	4.317591	1.162418	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Maximum	"Aug "	LC50	8.14	1.99E-05	5.2E-08	1.58E-05	4.238386	1.24672	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Maximum	"Sep "	LC50	8.09	1.95E-05	5.13E-08	1.58E-05	4.341042	1.139334	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Maximum	"Oct "	LC50	8.08	1.78E-05	4.72E-08	1.41E-05	4.363844	1.116177	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Maximum	"Nov "	LC50	8.11	1.71E-05	5.78E-08	1.21E-05	4.311462	1.170302	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Maximum	"Dec "	LC50	8.07	2.03E-05	7.3E-08	1.3E-05	4.398494	1.084727	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	1042	1.04
Feb	1004	1.00
Mar	1005	1.00
Apr	1724	1.72
May	1072	1.07
Jun	1042	1.04
Jul	1353	1.35
Aug	1265	1.26
Sep	1239	1.24
Oct	1128	1.13
Nov	1088	1.09
Dec	1289	1.29

Table BLM2-4: Predicted LC50 Values for Rainbow Trout - Operational Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Maximum	"Jan	LC50	8	1.39512E-05	4.78E-08	1.15E-05	3.056762	0.642964	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Maximum	"Feb	LC50	8	1.35214E-05	4.13E-08	1.13E-05	3.052452	0.643952	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Mar	LC50	8	1.35337E-05	4.15E-08	1.13E-05	3.055474	0.644521	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Apr	LC50	7.98	2.37846E-05	4.16E-08	2.12E-05	3.06764	0.632181	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Maximum	"May	LC50	7.94	1.4951E-05	2.91E-08	1.37E-05	3.118366	0.581308	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Maximum	"Jun	LC50	8.13	1.41014E-05	2.83E-08	1.19E-05	2.87717	0.822626	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Maximum	"Jul	LC50	8.1	1.84783E-05	3.33E-08	1.6E-05	2.915104	0.784835	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Maximum	"Aug	LC50	8.14	1.71354E-05	3.27E-08	1.46E-05	2.858687	0.840888	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Maximum	"Sep	LC50	8.09	1.68607E-05	3.22E-08	1.45E-05	2.929573	0.768891	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Maximum	"Oct	LC50	8.08	1.5269E-05	2.97E-08	1.3E-05	2.945649	0.753439	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Maximum	"Nov	LC50	8.11	1.43035E-05	3.64E-08	1.12E-05	2.910069	0.789913	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Maximum	"Dec	LC50	8.07	1.654E-05	4.59E-08	1.19E-05	2.967992	0.73195	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	887	0.89
Feb	859	0.86
Mar	860	0.86
Apr	1511	1.51
May	950	0.95
Jun	896	0.90
Jul	1174	1.17
Aug	1089	1.09
Sep	1071	1.07
Oct	970	0.97
Nov	909	0.91
Dec	1051	1.05

Table BLM2-5: Predicted LC50 Values for Daphnia magna - Opertional Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Ma:	"Jan	LC50	8	4.45E-06	1.35E-09	4.38E-06	0.098268	0.02067	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Ma:	"Feb	LC50	8	4.33E-06	1.17E-09	4.27E-06	0.098265	0.020731	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Ma:	"Mar	LC50	8	4.33E-06	1.17E-09	4.27E-06	0.098182	0.020711	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Ma:	"Apr	LC50	7.98	8.02E-06	1.18E-09	7.95E-06	0.098731	0.020348	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Ma:	"May	LC50	7.94	4.91E-06	8.23E-10	4.88E-06	0.100362	0.01871	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Ma:	"Jun	LC50	8.13	4.61E-06	7.98E-10	4.55E-06	0.092495	0.026447	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Ma:	"Jul	LC50	8.1	6.22E-06	9.4E-10	6.15E-06	0.093682	0.025223	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Ma:	"Aug	LC50	8.14	5.74E-06	9.24E-10	5.67E-06	0.091944	0.027047	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Ma:	"Sep	LC50	8.09	5.59E-06	9.11E-10	5.53E-06	0.094257	0.024739	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Ma:	"Oct	LC50	8.08	4.93E-06	8.38E-10	4.87E-06	0.094722	0.024229	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Ma:	"Nov	LC50	8.11	4.4E-06	1.03E-09	4.31E-06	0.093567	0.025399	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Ma:	"Dec	LC50	8.07	4.76E-06	1.3E-09	4.63E-06	0.095396	0.023526	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	283	0.28
Feb	275	0.27
Mar	275	0.27
Apr	510	0.51
May	312	0.31
Jun	293	0.29
Jul	395	0.40
Aug	365	0.36
Sep	355	0.36
Oct	313	0.31
Nov	280	0.28
Dec	302	0.30

Table BLM2-6: Predicted LC50 Values for Daphnia pulex - Operational Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Ma	"Jan	LC50	8	2.66E-06	5.06E-10	2.63E-06	0.036929	0.007768	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Ma	"Feb	LC50	8	2.57E-06	4.38E-10	2.55E-06	0.036905	0.007786	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Ma	"Mar	LC50	8	2.57E-06	4.4E-10	2.55E-06	0.03694	0.007792	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Ma	"Apr	LC50	7.98	4.77E-06	4.4E-10	4.74E-06	0.037042	0.007634	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Ma	"May	LC50	7.94	2.88E-06	3.08E-10	2.87E-06	0.037662	0.007021	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Ma	"Jun	LC50	8.13	2.77E-06	2.99E-10	2.74E-06	0.034747	0.009935	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Ma	"Jul	LC50	8.1	3.73E-06	3.52E-10	3.71E-06	0.035203	0.009478	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Ma	"Aug	LC50	8.14	3.46E-06	3.46E-10	3.43E-06	0.034539	0.01016	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Ma	"Sep	LC50	8.09	3.35E-06	3.41E-10	3.32E-06	0.035398	0.009291	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Ma	"Oct	LC50	8.08	2.94E-06	3.14E-10	2.92E-06	0.035591	0.009104	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Ma	"Nov	LC50	8.11	2.63E-06	3.85E-10	2.6E-06	0.035154	0.009543	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Ma	"Dec	LC50	8.07	2.85E-06	4.86E-10	2.8E-06	0.035854	0.008842	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	169	0.17
Feb	163	0.16
Mar	163	0.16
Apr	303	0.30
May	183	0.18
Jun	176	0.18
Jul	237	0.24
Aug	220	0.22
Sep	213	0.21
Oct	187	0.19
Nov	167	0.17
Dec	181	0.18

Table BLM2-7: Predicted LC50 Values for Ceriodaphnia dubia - Operational Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Ma	"Jan	LC50	8	3.43E-06	7.95E-10	3.39E-06	0.057952	0.01219	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Ma	"Feb	LC50	8	3.32E-06	6.87E-10	3.29E-06	0.057852	0.012205	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Ma	"Mar	LC50	8	3.32E-06	6.89E-10	3.29E-06	0.057889	0.012211	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Ma	"Apr	LC50	7.98	6.16E-06	6.91E-10	6.12E-06	0.058098	0.011974	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Ma	"May	LC50	7.94	3.74E-06	4.83E-10	3.72E-06	0.059031	0.011005	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Ma	"Jun	LC50	8.13	3.56E-06	4.69E-10	3.52E-06	0.05451	0.015586	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Ma	"Jul	LC50	8.1	4.8E-06	5.53E-10	4.76E-06	0.05521	0.014865	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Ma	"Aug	LC50	8.14	4.44E-06	5.43E-10	4.4E-06	0.054154	0.01593	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Ma	"Sep	LC50	8.09	4.31E-06	5.35E-10	4.27E-06	0.055489	0.014564	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Ma	"Oct	LC50	8.08	3.79E-06	4.93E-10	3.75E-06	0.055781	0.014268	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Ma	"Nov	LC50	8.11	3.39E-06	6.04E-10	3.34E-06	0.055104	0.014958	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Ma	"Dec	LC50	8.07	3.66E-06	7.63E-10	3.59E-06	0.056219	0.013865	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	218	0.22
Feb	211	0.21
Mar	211	0.21
Apr	391	0.39
May	238	0.24
Jun	226	0.23
Jul	305	0.31
Aug	282	0.28
Sep	274	0.27
Oct	241	0.24
Nov	215	0.22
Dec	233	0.23

Table BLM2-8: Predicted LC50 Values for Olfaction (User Defined) - Operational Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP BE Maximum	"Jan	LC50	8	5.55E-06	2.26E-09	5.43E-06	0.164219	0.034543	9.7	10	0.001295	0.000811	0.000496	6.09E-05	0.000323	5.7E-05	0.002237	3.12E-08
"OP BE Maximum	"Feb	LC50	8	5.4E-06	1.96E-09	5.3E-06	0.164155	0.034631	9.7	10	0.00114	0.000642	0.000387	4.71E-05	0.000235	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Mar	LC50	8	5.4E-06	1.96E-09	5.3E-06	0.164024	0.0346	9.7	10	0.00114	0.00065	0.000387	4.58E-05	0.000244	3.5E-05	0.002237	3.12E-08
"OP BE Maximum	"Apr	LC50	7.98	1E-05	1.97E-09	9.88E-06	0.164973	0.033999	18.3	10	0.001125	0.00065	0.000387	5.01E-05	0.000244	4.03E-05	0.002667	3.12E-08
"OP BE Maximum	"May	LC50	7.94	6.17E-06	1.38E-09	6.11E-06	0.167407	0.031209	12.4	10	0.000714	0.00042	0.000219	4.96E-05	0.000333	3.95E-05	0.001796	3.12E-08
"OP BE Maximum	"Jun	LC50	8.13	5.74E-06	1.34E-09	5.63E-06	0.154577	0.044197	10.1	10	0.000771	0.000428	0.000298	4.42E-05	0.000329	4.12E-05	0.002604	3.12E-08
"OP BE Maximum	"Jul	LC50	8.1	7.72E-06	1.57E-09	7.61E-06	0.156473	0.042129	13.5	10	0.000938	0.000514	0.000299	3.76E-05	0.000195	4.12E-05	0.002628	3.12E-08
"OP BE Maximum	"Aug	LC50	8.14	7.12E-06	1.55E-09	7E-06	0.153575	0.045176	12.1	10	0.000938	0.000514	0.000299	3.73E-05	0.000132	2.43E-05	0.002643	3.12E-08
"OP BE Maximum	"Sep	LC50	8.09	6.96E-06	1.53E-09	6.85E-06	0.157462	0.041329	12.3	10	0.000913	0.000477	0.000268	3.58E-05	0.000149	2.4E-05	0.00263	3.12E-08
"OP BE Maximum	"Oct	LC50	8.08	6.15E-06	1.4E-09	6.04E-06	0.158284	0.040487	11.1	10	0.000806	0.000436	0.000256	3.12E-05	0.000149	2.26E-05	0.002854	3.12E-08
"OP BE Maximum	"Nov	LC50	8.11	5.48E-06	1.72E-09	5.33E-06	0.156229	0.042408	9.3	10	0.001085	0.000555	0.000314	3.12E-05	0.000158	3.44E-05	0.003132	3.12E-08
"OP BE Maximum	"Dec	LC50	8.07	5.94E-06	2.17E-09	5.72E-06	0.159451	0.039324	9.9	10	0.001295	0.000811	0.000495	6.06E-05	0.000322	5.7E-05	0.00405	3.12E-08

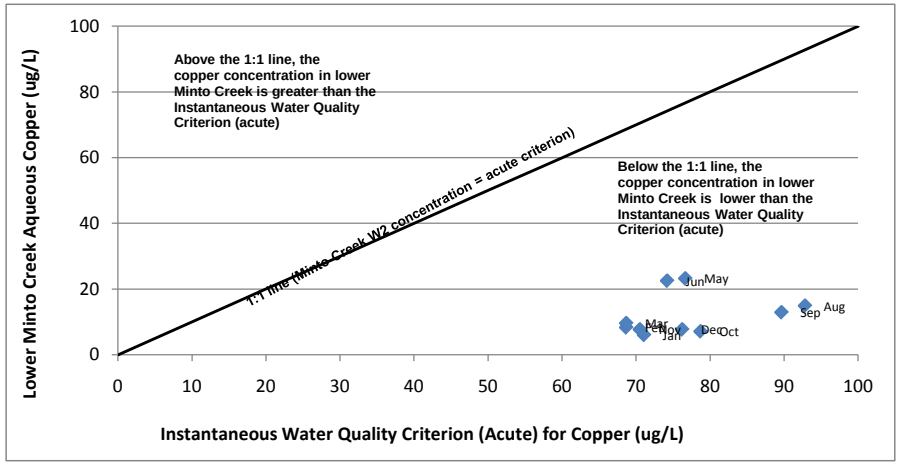
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	352	0.35
Feb	343	0.34
Mar	343	0.34
Apr	635	0.64
May	392	0.39
Jun	364	0.36
Jul	491	0.49
Aug	452	0.45
Sep	442	0.44
Oct	391	0.39
Nov	348	0.35
Dec	377	0.38

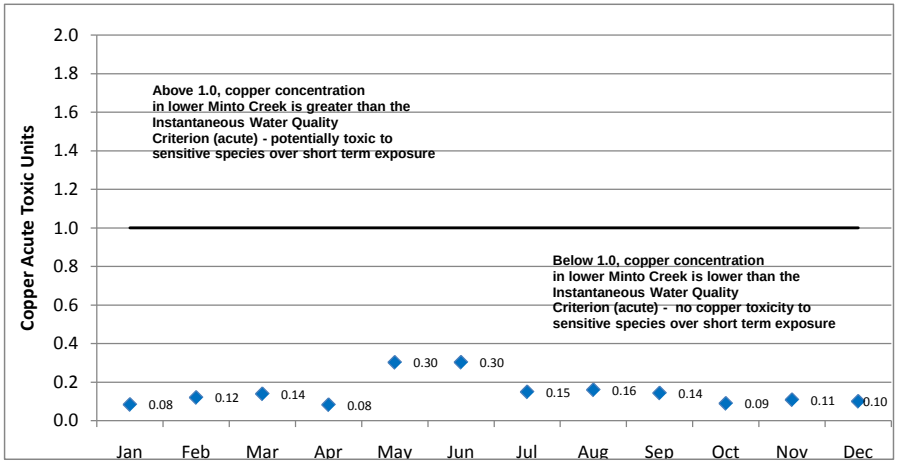
Table BLM2-9: BLM Model Results Summary - Operational Best Estimate, Maximum

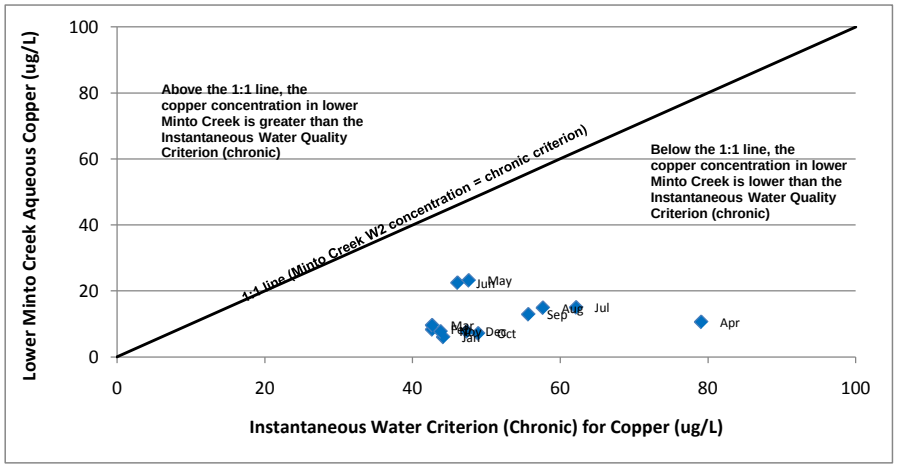
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	6.0	71.1	44.2	0.08	0.14	1,042	887	283	169	218	218
Feb	8.3	68.7	42.7	0.12	0.19	1,004	859	275	163	211	211
Mar	9.6	68.7	42.7	0.14	0.23	1,005	860	275	163	211	211
Apr	10.6	127.3	79.1	0.08	0.13	1,724	1,511	510	303	391	391
May	23.2	76.7	47.6	0.30	0.49	1,072	950	312	183	238	238
Jun	22.5	74.2	46.1	0.30	0.49	1,042	896	293	176	226	226
Jul	15.0	100.1	62.2	0.15	0.24	1,353	1,174	395	237	305	305
Aug	14.9	92.8	57.7	0.16	0.26	1,265	1,089	365	220	282	282
Sep	12.9	89.7	55.7	0.14	0.23	1,239	1,071	355	213	274	274
Oct	7.1	78.7	48.9	0.09	0.15	1,128	970	313	187	241	241
Nov	7.7	70.5	43.8	0.11	0.18	1,088	909	280	167	215	215
Dec	7.7	76.3	47.4	0.10	0.16	1,289	1,051	302	181	233	233

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







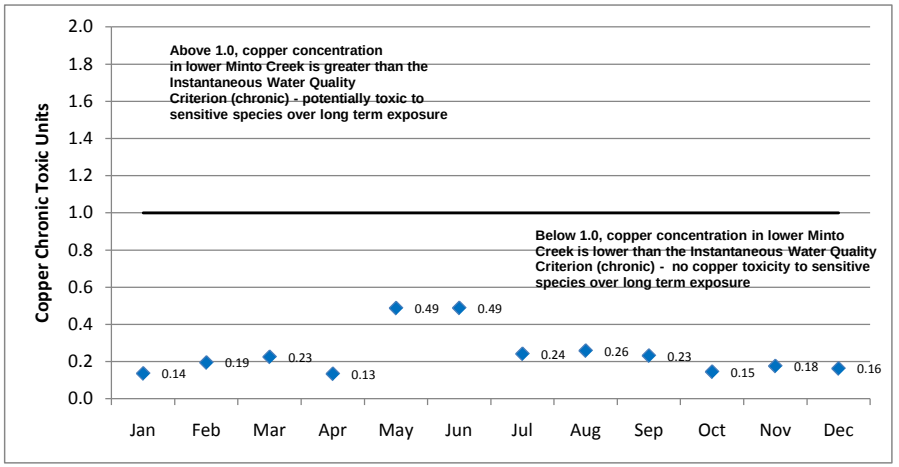


Figure BLM2-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Operational Phase Best Estimate, Maximum

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 3

COPPER

OPERATIONAL WORST CASE, AVERAGE

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM3-1: BLM Input Parameters - Operational Worst Case, Average

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	7.0	9.7	10	47.7	17.0	9.69	2.06	27.7	1.67	110	0.001
Feb	10	8	9.4	9.7	10	48.3	16.2	9.21	1.96	26.3	1.56	110	0.001
Mar	10	8	11.5	9.7	10	48.5	16.6	9.37	1.93	27.3	1.37	110	0.001
Apr	10	7.98	12.7	18.3	10	27.7	9.8	5.75	2.11	17.3	1.75	131	0.001
May	10	7.94	24.4	12.4	10	30.0	10.6	4.75	1.92	34.6	1.03	88	0.001
Jun	10	8.13	8.4	10.1	10	32.9	11.0	7.08	1.32	22.3	1.66	129	0.001
Jul	10	8.1	16.1	13.5	10	39.7	13.1	7.26	1.58	11.1	1.03	130	0.001
Aug	10	8.14	14.6	12.1	10	38.9	12.4	6.59	1.53	15.4	1.10	131	0.001
Sep	10	8.09	8.5	12.3	10	34.1	11.0	6.19	1.28	17.2	0.99	130	0.001
Oct	10	8.08	8.8	11.1	10	34.9	11.3	6.31	1.35	14.3	1.08	141	0.001
Nov	10	8.11	9.8	9.3	10	43.8	13.7	7.42	1.35	18.2	1.47	155	0.001
Dec	10	8.07	8.9	9.9	10	53.2	19.1	10.88	2.24	31.3	2.20	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM3-2: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Average

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
OP WC Average	Jan	139	69.4	43.1	7.0	0.101
OP WC Average	Feb	138	69.2	43.0	9.4	0.136
OP WC Average	Mar	139	69.3	43.1	11.5	0.166
OP WC Average	Apr	236	118.1	73.4	12.7	0.108
OP WC Average	May	154	76.9	47.7	24.4	0.318
OP WC Average	Jun	150	75.2	46.7	8.4	0.112
OP WC Average	Jul	203	101.4	63.0	16.1	0.159
OP WC Average	Aug	185	92.7	57.6	14.6	0.157
OP WC Average	Sep	178	88.8	55.1	8.5	0.096
OP WC Average	Oct	159	79.7	49.5	8.8	0.111
OP WC Average	Nov	141	70.6	43.9	9.8	0.139
OP WC Average	Dec	152	76.1	47.2	8.9	0.117

Table BLM3-3: Predicted LC50 Values for Fathead Minnow - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"OP WC Average	'"Jan "	LC50	8	1.6E-05	6.9E-08	1.24E-05	4.524792	0.953443	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	'"Feb "	LC50	8	1.59E-05	6.83E-08	1.23E-05	4.525963	0.953934	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	'"Mar "	LC50	8	1.6E-05	6.9E-08	1.24E-05	4.526241	0.953793	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	'"Apr "	LC50	7.98	2.53E-05	4.52E-08	2.24E-05	4.537626	0.941997	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	'"May "	LC50	7.94	1.69E-05	4.76E-08	1.5E-05	4.619438	0.86054	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	'"Jun "	LC50	8.13	1.67E-05	4.72E-08	1.3E-05	4.261696	1.218568	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	'"Jul "	LC50	8.1	2.16E-05	5.55E-08	1.75E-05	4.317708	1.162301	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	'"Aug "	LC50	8.14	1.99E-05	5.25E-08	1.58E-05	4.234882	1.245144	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	'"Sep "	LC50	8.09	1.93E-05	4.88E-08	1.57E-05	4.340956	1.139944	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	'"Oct "	LC50	8.08	1.8E-05	5E-08	1.41E-05	4.368668	1.116405	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	'"Nov "	LC50	8.11	1.71E-05	5.83E-08	1.21E-05	4.312819	1.170285	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	'"Dec "	LC50	8.07	2.03E-05	7.29E-08	1.29E-05	4.398441	1.084683	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	1016	1.02
Feb	1013	1.01
Mar	1016	1.02
Apr	1606	1.61
May	1076	1.08
Jun	1058	1.06
Jul	1370	1.37
Aug	1266	1.27
Sep	1224	1.22
Oct	1145	1.14
Nov	1090	1.09
Dec	1289	1.29

Table BLM3-4: Predicted LC50 Values for Rainbow Trout - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Average	"Jan	LC50	8	1.36573E-05	4.34E-08	1.14E-05	3.054002	0.643529	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	"Feb	LC50	8	1.36302E-05	4.3E-08	1.14E-05	3.055893	0.644092	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	"Mar	LC50	8	1.36576E-05	4.34E-08	1.14E-05	3.05596	0.643972	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	"Apr	LC50	7.98	2.23916E-05	2.84E-08	2.06E-05	3.063221	0.635923	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	"May	LC50	7.94	1.50004E-05	2.99E-08	1.38E-05	3.118461	0.580934	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	"Jun	LC50	8.13	1.42799E-05	2.97E-08	1.2E-05	2.877202	0.822698	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	"Jul	LC50	8.1	1.86727E-05	3.49E-08	1.61E-05	2.915208	0.784763	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	"Aug	LC50	8.14	1.71583E-05	3.3E-08	1.46E-05	2.858993	0.84061	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	"Sep	LC50	8.09	1.66965E-05	3.07E-08	1.45E-05	2.930416	0.76954	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	"Oct	LC50	8.08	1.54541E-05	3.14E-08	1.3E-05	2.946609	0.753006	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	"Nov	LC50	8.11	1.43227E-05	3.66E-08	1.12E-05	2.910268	0.789707	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	"Dec	LC50	8.07	1.65307E-05	4.59E-08	1.19E-05	2.968012	0.731934	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	868	0.87
Feb	866	0.87
Mar	868	0.87
Apr	1423	1.42
May	953	0.95
Jun	907	0.91
Jul	1187	1.19
Aug	1090	1.09
Sep	1061	1.06
Oct	982	0.98
Nov	910	0.91
Dec	1050	1.05

Table BLM3-5: Predicted LC50 Values for Daphnia magna - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Average	"Jan	LC50	8	4.37E-06	1.23E-09	4.3E-06	0.098292	0.020712	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	"Feb	LC50	8	4.35E-06	1.22E-09	4.29E-06	0.09828	0.020715	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	"Mar	LC50	8	4.36E-06	1.23E-09	4.3E-06	0.098287	0.020712	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	"Apr	LC50	7.98	7.48E-06	8.02E-10	7.43E-06	0.098622	0.020475	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	"May	LC50	7.94	4.93E-06	8.45E-10	4.89E-06	0.100252	0.018677	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	"Jun	LC50	8.13	4.67E-06	8.39E-10	4.6E-06	0.092507	0.026452	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	"Jul	LC50	8.1	6.29E-06	9.85E-10	6.22E-06	0.093682	0.02522	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	"Aug	LC50	8.14	5.74E-06	9.33E-10	5.67E-06	0.091948	0.027036	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	"Sep	LC50	8.09	5.54E-06	8.67E-10	5.48E-06	0.094241	0.024749	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	"Oct	LC50	8.08	4.99E-06	8.88E-10	4.92E-06	0.094759	0.024217	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	"Nov	LC50	8.11	4.4E-06	1.04E-09	4.31E-06	0.093562	0.025389	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	"Dec	LC50	8.07	4.75E-06	1.3E-09	4.62E-06	0.095401	0.023527	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	277	0.28
Feb	277	0.28
Mar	277	0.28
Apr	476	0.48
May	313	0.31
Jun	297	0.30
Jul	400	0.40
Aug	365	0.36
Sep	352	0.35
Oct	317	0.32
Nov	280	0.28
Dec	302	0.30

Table BLM3-6: Predicted LC50 Values for Daphnia pulex - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Average	"Jan	LC50	8	2.6E-06	4.59E-10	2.57E-06	0.036897	0.007775	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	"Feb	LC50	8	2.59E-06	4.55E-10	2.56E-06	0.036918	0.007782	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	"Mar	LC50	8	2.59E-06	4.59E-10	2.57E-06	0.03692	0.00778	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	"Apr	LC50	7.98	4.42E-06	3E-10	4.4E-06	0.037005	0.007683	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	"May	LC50	7.94	2.89E-06	3.16E-10	2.87E-06	0.037674	0.007019	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	"Jun	LC50	8.13	2.8E-06	3.14E-10	2.78E-06	0.034753	0.009938	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	"Jul	LC50	8.1	3.78E-06	3.69E-10	3.75E-06	0.035204	0.009477	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	"Aug	LC50	8.14	3.46E-06	3.5E-10	3.43E-06	0.034541	0.010157	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	"Sep	LC50	8.09	3.31E-06	3.24E-10	3.29E-06	0.035387	0.009293	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	"Oct	LC50	8.08	2.97E-06	3.33E-10	2.95E-06	0.035599	0.009098	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	"Nov	LC50	8.11	2.63E-06	3.88E-10	2.6E-06	0.035156	0.00954	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	"Dec	LC50	8.07	2.84E-06	4.86E-10	2.79E-06	0.035855	0.008842	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	165	0.16
Feb	164	0.16
Mar	165	0.16
Apr	281	0.28
May	183	0.18
Jun	178	0.18
Jul	240	0.24
Aug	220	0.22
Sep	211	0.21
Oct	189	0.19
Nov	167	0.17
Dec	180	0.18

Table BLM3-7: Predicted LC50 Values for Ceriodaphnia dubia - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Average	"Jan	LC50	8	3.36E-06	7.22E-10	3.32E-06	0.057914	0.012204	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	"Feb	LC50	8	3.34E-06	7.14E-10	3.31E-06	0.057896	0.012203	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	"Mar	LC50	8	3.35E-06	7.21E-10	3.31E-06	0.057899	0.012201	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	"Apr	LC50	7.98	5.73E-06	4.71E-10	5.7E-06	0.058012	0.012044	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	"May	LC50	7.94	3.76E-06	4.97E-10	3.73E-06	0.059067	0.011004	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	"Jun	LC50	8.13	3.61E-06	4.93E-10	3.57E-06	0.054511	0.015587	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	"Jul	LC50	8.1	4.86E-06	5.79E-10	4.82E-06	0.055211	0.014863	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	"Aug	LC50	8.14	4.44E-06	5.49E-10	4.4E-06	0.054154	0.015923	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	"Sep	LC50	8.09	4.27E-06	5.1E-10	4.23E-06	0.055518	0.01458	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	"Oct	LC50	8.08	3.84E-06	5.22E-10	3.8E-06	0.055808	0.014262	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	"Nov	LC50	8.11	3.39E-06	6.08E-10	3.34E-06	0.055099	0.014952	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	"Dec	LC50	8.07	3.66E-06	7.62E-10	3.58E-06	0.05622	0.013865	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	213	0.21
Feb	213	0.21
Mar	213	0.21
Apr	364	0.36
May	239	0.24
Jun	229	0.23
Jul	309	0.31
Aug	282	0.28
Sep	271	0.27
Oct	244	0.24
Nov	216	0.22
Dec	232	0.23

Table BLM3-8: Predicted LC50 Values for Olfaction (User Defined) - Operational Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Average	"Jan	LC50	8	5.44E-06	2.05E-09	5.34E-06	0.164063	0.034572	9.7	10	0.00119	0.000699	0.000421	5.27E-05	0.000288	4.71E-05	0.002237	3.12E-08
"OP WC Average	"Feb	LC50	8	5.43E-06	2.04E-09	5.33E-06	0.16419	0.034607	9.7	10	0.001205	0.000667	0.000401	5.01E-05	0.000274	4.4E-05	0.002237	3.12E-08
"OP WC Average	"Mar	LC50	8	5.44E-06	2.06E-09	5.34E-06	0.164197	0.034602	9.7	10	0.00121	0.000683	0.000408	4.94E-05	0.000284	3.86E-05	0.002237	3.12E-08
"OP WC Average	"Apr	LC50	7.98	9.36E-06	1.34E-09	9.27E-06	0.164509	0.034154	18.3	10	0.000691	0.000403	0.00025	5.4E-05	0.00018	4.94E-05	0.002667	3.12E-08
"OP WC Average	"May	LC50	7.94	6.19E-06	1.42E-09	6.13E-06	0.167683	0.031239	12.4	10	0.000749	0.000436	0.000207	4.91E-05	0.00036	2.91E-05	0.001796	3.12E-08
"OP WC Average	"Jun	LC50	8.13	5.8E-06	1.41E-09	5.7E-06	0.154581	0.044202	10.1	10	0.000821	0.000453	0.000308	3.38E-05	0.000232	4.68E-05	0.002604	3.12E-08
"OP WC Average	"Jul	LC50	8.1	7.81E-06	1.65E-09	7.69E-06	0.15663	0.042166	13.5	10	0.000991	0.000539	0.000316	4.04E-05	0.000116	2.91E-05	0.002628	3.12E-08
"OP WC Average	"Aug	LC50	8.14	7.12E-06	1.56E-09	7E-06	0.153566	0.045153	12.1	10	0.000971	0.00051	0.000287	3.91E-05	0.00016	3.1E-05	0.002643	3.12E-08
"OP WC Average	"Sep	LC50	8.09	6.9E-06	1.45E-09	6.79E-06	0.15743	0.041343	12.3	10	0.000851	0.000453	0.000269	3.27E-05	0.000179	2.79E-05	0.00263	3.12E-08
"OP WC Average	"Oct	LC50	8.08	6.21E-06	1.49E-09	6.1E-06	0.158252	0.040443	11.1	10	0.000871	0.000465	0.000274	3.45E-05	0.000149	3.05E-05	0.002854	3.12E-08
"OP WC Average	"Nov	LC50	8.11	5.48E-06	1.73E-09	5.33E-06	0.156344	0.042425	9.3	10	0.001093	0.000564	0.000323	3.45E-05	0.000189	4.15E-05	0.003132	3.12E-08
"OP WC Average	"Dec	LC50	8.07	5.93E-06	2.17E-09	5.71E-06	0.159454	0.039323	9.9	10	0.001327	0.000786	0.000473	5.73E-05	0.000326	6.21E-05	0.00405	3.12E-08

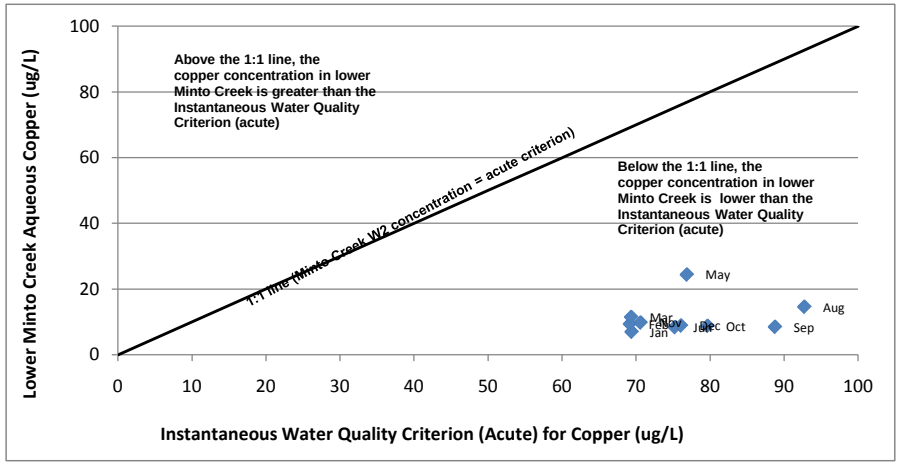
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	346	0.35
Feb	345	0.35
Mar	346	0.35
Apr	595	0.59
May	393	0.39
Jun	369	0.37
Jul	496	0.50
Aug	452	0.45
Sep	438	0.44
Oct	395	0.39
Nov	348	0.35
Dec	377	0.38

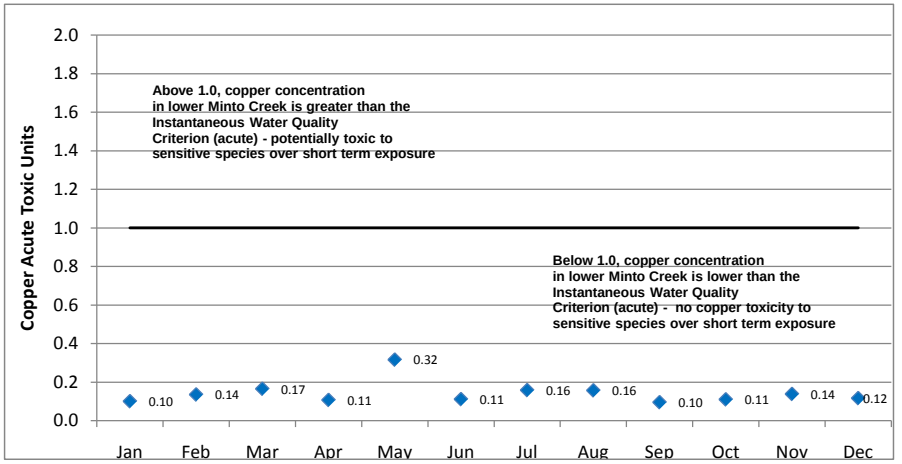
Table BLM3-9: BLM Model Results Summary - Operational Worst Case, Average

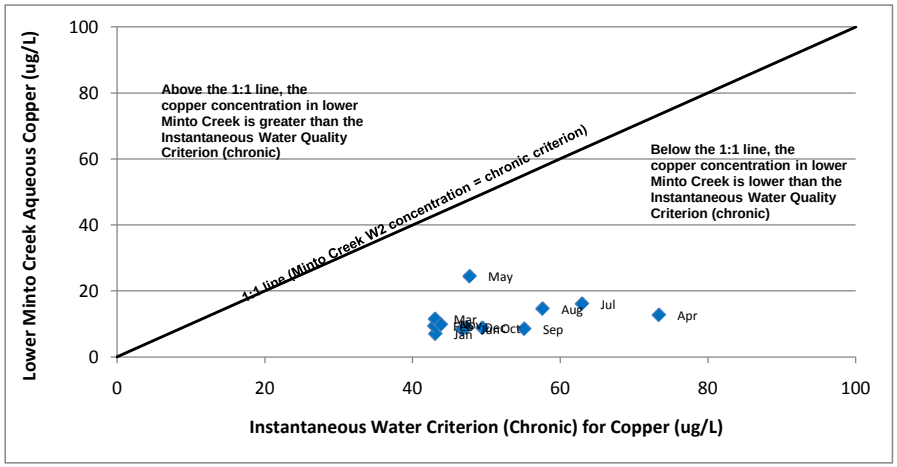
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	7.0	69.4	43.1	0.10	0.16	1,016	868	277	165	213	346
Feb	9.4	69.2	43.0	0.14	0.22	1,013	866	277	164	213	345
Mar	11.5	69.3	43.1	0.17	0.27	1,016	868	277	165	213	346
Apr	12.7	118.1	73.4	0.11	0.17	1,606	1,423	476	281	364	595
May	24.4	76.9	47.7	0.32	0.51	1,076	953	313	183	239	393
Jun	8.4	75.2	46.7	0.11	0.18	1,058	907	297	178	229	369
Jul	16.1	101.4	63.0	0.16	0.26	1,370	1,187	400	240	309	496
Aug	14.6	92.7	57.6	0.16	0.25	1,266	1,090	365	220	282	452
Sep	8.5	88.8	55.1	0.10	0.15	1,224	1,061	352	211	271	438
Oct	8.8	79.7	49.5	0.11	0.18	1,145	982	317	189	244	395
Nov	9.8	70.6	43.9	0.14	0.22	1,090	910	280	167	216	348
Dec	8.9	76.1	47.2	0.12	0.19	1,289	1,050	302	180	232	377

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







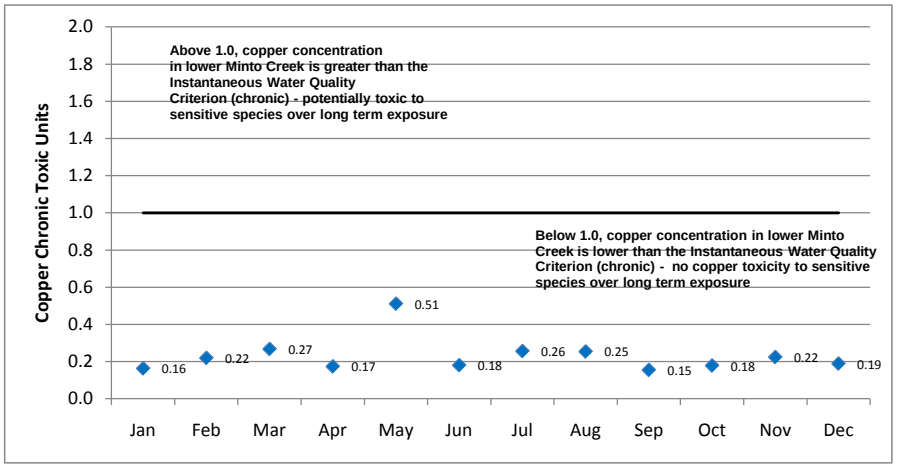


Figure BLM3-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Operational Worst Case, Average

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 4

COPPER

OPERATIONAL WORST CASE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM4-1: BLM Input Parameters - Operational Worst Case, Maximum

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	9.4	9.7	10	57.6	21.4	12.29	2.66	37.2	2.55	110	0.001
Feb	10	8	11.9	9.7	10	51.7	17.4	9.83	2.14	29.3	1.80	110	0.001
Mar	10	8	13.4	9.7	10	51.8	17.6	9.88	2.09	30.4	1.81	110	0.001
Apr	10	7.98	14.2	18.3	10	51.4	17.7	9.88	2.26	30.4	1.98	131	0.001
May	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Jun	10	8.13	24.8	10.1	10	34.4	11.4	7.39	1.92	35.7	1.78	129	0.001
Jul	10	8.10	17.2	13.5	10	41.3	13.5	7.42	1.65	22.6	1.79	130	0.001
Aug	10	8.14	17.1	12.1	10	41.1	13.5	7.41	1.64	16.6	1.18	131	0.001
Sep	10	8.09	15.1	12.3	10	40.1	12.7	6.72	1.58	18.5	1.18	130	0.001
Oct	10	8.08	9.7	11.1	10	36.7	11.9	6.57	1.43	18.5	1.20	141	0.001
Nov	10	8.11	11.1	9.3	10	49.0	15.1	8.09	1.44	21.3	1.74	155	0.001
Dec	10	8.07	11.1	9.9	10	57.6	21.4	12.27	2.65	37.2	2.55	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM4-2: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Maximum

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
OP WC Maximum	Jan	144	72.2	44.9	9.4	0.130
OP WC Maximum	Feb	140	70	43.5	11.9	0.170
OP WC Maximum	Mar	140	70.1	43.5	13.4	0.191
OP WC Maximum	Apr	260	129.9	80.7	14.2	0.109
OP WC Maximum	May	157	78	48.6	26.3	0.336
OP WC Maximum	Jun	150	75.2	46.7	24.8	0.330
OP WC Maximum	Jul	203	101.4	63.0	17.2	0.170
OP WC Maximum	Aug	188	94.0	58.4	17.1	0.182
OP WC Maximum	Sep	182	90.8	56.4	15.1	0.166
OP WC Maximum	Oct	160	80.1	49.8	9.7	0.121
OP WC Maximum	Nov	144	71.9	44.7	11.1	0.154
OP WC Maximum	Dec	155	77.6	48.2	11.1	0.143

Table BLM4-3: Predicted LC50 Values for Fathead Minnow - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Maximum"	"Jan "	LC50	8	1.68E-05	8.23E-08	1.25E-05	4.532944	0.951837	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb "	LC50	8	1.62E-05	7.24E-08	1.24E-05	4.528159	0.953296	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar "	LC50	8	1.62E-05	7.26E-08	1.24E-05	4.527063	0.95294	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr "	LC50	7.98	2.77E-05	7.32E-08	2.33E-05	4.545443	0.934363	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May "	LC50	7.94	1.72E-05	5.22E-08	1.51E-05	4.622451	0.859577	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun "	LC50	8.13	1.67E-05	4.85E-08	1.31E-05	4.263869	1.217354	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul "	LC50	8.1	2.16E-05	5.67E-08	1.75E-05	4.318981	1.161029	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug "	LC50	8.14	2.02E-05	5.56E-08	1.59E-05	4.235865	1.24416	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep "	LC50	8.09	1.98E-05	5.5E-08	1.59E-05	4.342481	1.137939	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct "	LC50	8.08	1.82E-05	5.19E-08	1.42E-05	4.3655	1.114542	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov "	LC50	8.11	1.76E-05	6.35E-08	1.22E-05	4.312643	1.168443	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec "	LC50	8.07	2.09E-05	7.9E-08	1.3E-05	4.399642	1.083362	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	1064	1.06
Feb	1028	1.03
Mar	1029	1.03
Apr	1758	1.76
May	1094	1.09
Jun	1062	1.06
Jul	1374	1.37
Aug	1284	1.28
Sep	1259	1.26
Oct	1155	1.15
Nov	1120	1.12
Dec	1327	1.33

Table BLM4-4: Predicted LC50 Values for Rainbow Trout - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"OP WC Maximum"	"Jan	LC50	8	1.4193E-05	5.17E-08	1.15E-05	3.057805	0.642088	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb	LC50	8	1.3794E-05	4.55E-08	1.14E-05	3.054512	0.643059	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar	LC50	8	1.38074E-05	4.57E-08	1.14E-05	3.056584	0.64341	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr	LC50	7.98	2.41747E-05	4.6E-08	2.14E-05	3.067028	0.630465	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May	LC50	7.94	1.52101E-05	3.28E-08	1.39E-05	3.119742	0.580143	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun	LC50	8.13	1.43216E-05	3.05E-08	1.2E-05	2.878116	0.821721	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul	LC50	8.1	1.87083E-05	3.57E-08	1.61E-05	2.913574	0.783234	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug	LC50	8.14	1.73608E-05	3.5E-08	1.47E-05	2.859716	0.839963	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep	LC50	8.09	1.70881E-05	3.46E-08	1.46E-05	2.930723	0.767996	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct	LC50	8.08	1.55662E-05	3.26E-08	1.31E-05	2.947056	0.752409	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov	LC50	8.11	1.46466E-05	3.99E-08	1.12E-05	2.909405	0.788262	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec	LC50	8.07	1.69348E-05	4.97E-08	1.2E-05	2.968884	0.731058	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	902	0.90
Feb	877	0.88
Mar	877	0.88
Apr	1536	1.54
May	967	0.97
Jun	910	0.91
Jul	1189	1.19
Aug	1103	1.10
Sep	1086	1.09
Oct	989	0.99
Nov	931	0.93
Dec	1076	1.08

Table BLM4-5: Predicted LC50 Values for Daphnia magna - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Maximum"	"Jan	LC50	8	4.52E-06	1.46E-09	4.44E-06	0.098428	0.020669	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb	LC50	8	4.4E-06	1.29E-09	4.33E-06	0.098301	0.020696	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar	LC50	8	4.4E-06	1.29E-09	4.34E-06	0.098306	0.020694	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr	LC50	7.98	8.16E-06	1.3E-09	8.08E-06	0.098736	0.020298	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May	LC50	7.94	5.01E-06	9.27E-10	4.97E-06	0.100382	0.018668	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun	LC50	8.13	4.67E-06	8.61E-10	4.61E-06	0.092508	0.026412	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul	LC50	8.1	6.29E-06	1.01E-09	6.22E-06	0.093711	0.025193	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug	LC50	8.14	5.81E-06	9.87E-10	5.73E-06	0.091974	0.027016	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep	LC50	8.09	5.66E-06	9.78E-10	5.59E-06	0.094287	0.024709	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct	LC50	8.08	5.01E-06	9.22E-10	4.94E-06	0.094763	0.024195	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov	LC50	8.11	4.48E-06	1.13E-09	4.38E-06	0.093604	0.025361	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec	LC50	8.07	4.83E-06	1.4E-09	4.69E-06	0.095428	0.023499	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	287	0.29
Feb	280	0.28
Mar	280	0.28
Apr	518	0.52
May	319	0.32
Jun	297	0.30
Jul	400	0.40
Aug	369	0.37
Sep	360	0.36
Oct	319	0.32
Nov	285	0.28
Dec	307	0.31

Table BLM4-6: Predicted LC50 Values for Daphnia pulex - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Maximum"	"Jan	LC50	8	2.7E-06	5.48E-10	2.67E-06	0.03697	0.007763	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb	LC50	8	2.62E-06	4.82E-10	2.59E-06	0.036919	0.007773	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar	LC50	8	2.62E-06	4.84E-10	2.6E-06	0.036958	0.00778	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr	LC50	7.98	4.86E-06	4.87E-10	4.83E-06	0.037057	0.007618	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May	LC50	7.94	2.94E-06	3.47E-10	2.93E-06	0.037676	0.007007	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun	LC50	8.13	2.8E-06	3.23E-10	2.78E-06	0.034752	0.009922	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul	LC50	8.1	3.78E-06	3.77E-10	3.75E-06	0.035214	0.009467	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug	LC50	8.14	3.5E-06	3.7E-10	3.47E-06	0.03455	0.010149	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep	LC50	8.09	3.39E-06	3.66E-10	3.36E-06	0.03541	0.00928	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct	LC50	8.08	2.99E-06	3.45E-10	2.97E-06	0.035605	0.009091	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov	LC50	8.11	2.68E-06	4.23E-10	2.65E-06	0.035168	0.009529	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec	LC50	8.07	2.89E-06	5.26E-10	2.84E-06	0.035865	0.008832	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	171	0.17
Feb	166	0.17
Mar	167	0.17
Apr	309	0.31
May	187	0.19
Jun	178	0.18
Jul	240	0.24
Aug	223	0.22
Sep	215	0.22
Oct	190	0.19
Nov	170	0.17
Dec	184	0.18

Table BLM4-7: Predicted LC50 Values for Ceriodaphnia dubia - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Maximum"	"Jan	LC50	8	3.48E-06	8.61E-10	3.44E-06	0.057983	0.012176	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb	LC50	8	3.38E-06	7.56E-10	3.34E-06	0.057879	0.012185	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar	LC50	8	3.38E-06	7.6E-10	3.35E-06	0.05791	0.01219	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr	LC50	7.98	6.27E-06	7.64E-10	6.23E-06	0.058121	0.011948	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May	LC50	7.94	3.82E-06	5.44E-10	3.8E-06	0.05905	0.010981	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun	LC50	8.13	3.61E-06	5.07E-10	3.57E-06	0.054526	0.015568	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul	LC50	8.1	4.86E-06	5.92E-10	4.82E-06	0.055228	0.014847	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug	LC50	8.14	4.49E-06	5.8E-10	4.45E-06	0.054172	0.015912	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep	LC50	8.09	4.36E-06	5.75E-10	4.32E-06	0.055509	0.014547	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct	LC50	8.08	3.86E-06	5.42E-10	3.82E-06	0.055805	0.014248	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov	LC50	8.11	3.45E-06	6.64E-10	3.4E-06	0.055126	0.014936	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec	LC50	8.07	3.72E-06	8.26E-10	3.64E-06	0.056236	0.013848	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	221	0.22
Feb	215	0.21
Mar	215	0.22
Apr	399	0.40
May	243	0.24
Jun	229	0.23
Jul	309	0.31
Aug	286	0.29
Sep	277	0.28
Oct	245	0.25
Nov	219	0.22
Dec	237	0.24

Table BLM4-8: Predicted LC50 Values for Olfaction (User Defined) - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Maximum LAB PH INPUT.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"OP WC Maximum"	"Jan	LC50	8	5.62E-06	2.45E-09	5.5E-06	0.164395	0.034521	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08
"OP WC Maximum"	"Feb	LC50	8	5.49E-06	2.16E-09	5.38E-06	0.164216	0.034573	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08
"OP WC Maximum"	"Mar	LC50	8	5.49E-06	2.17E-09	5.38E-06	0.164229	0.034571	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08
"OP WC Maximum"	"Apr	LC50	7.98	1.02E-05	2.18E-09	1E-05	0.164889	0.033897	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002667	3.12E-08
"OP WC Maximum"	"May	LC50	7.94	6.29E-06	1.55E-09	6.23E-06	0.167675	0.031182	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001796	3.12E-08
"OP WC Maximum"	"Jun	LC50	8.13	5.81E-06	1.44E-09	5.7E-06	0.154616	0.044145	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002604	3.12E-08
"OP WC Maximum"	"Jul	LC50	8.1	7.81E-06	1.69E-09	7.69E-06	0.15668	0.042121	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002628	3.12E-08
"OP WC Maximum"	"Aug	LC50	8.14	7.2E-06	1.65E-09	7.07E-06	0.153623	0.045124	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002643	3.12E-08
"OP WC Maximum"	"Sep	LC50	8.09	7.04E-06	1.64E-09	6.92E-06	0.157514	0.041278	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.00263	3.12E-08
"OP WC Maximum"	"Oct	LC50	8.08	6.25E-06	1.54E-09	6.13E-06	0.158221	0.040396	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002854	3.12E-08
"OP WC Maximum"	"Nov	LC50	8.11	5.57E-06	1.89E-09	5.41E-06	0.156292	0.042346	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003132	3.12E-08
"OP WC Maximum"	"Dec	LC50	8.07	6.03E-06	2.35E-09	5.79E-06	0.1595	0.039276	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.00405	3.12E-08

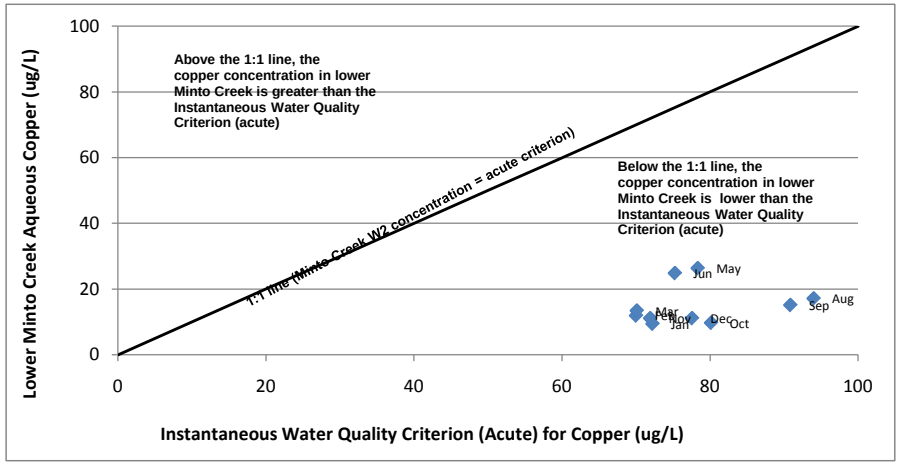
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	357	0.36
Feb	349	0.35
Mar	349	0.35
Apr	646	0.65
May	400	0.40
Jun	369	0.37
Jul	497	0.50
Aug	457	0.46
Sep	447	0.45
Oct	397	0.40
Nov	354	0.35
Dec	383	0.38

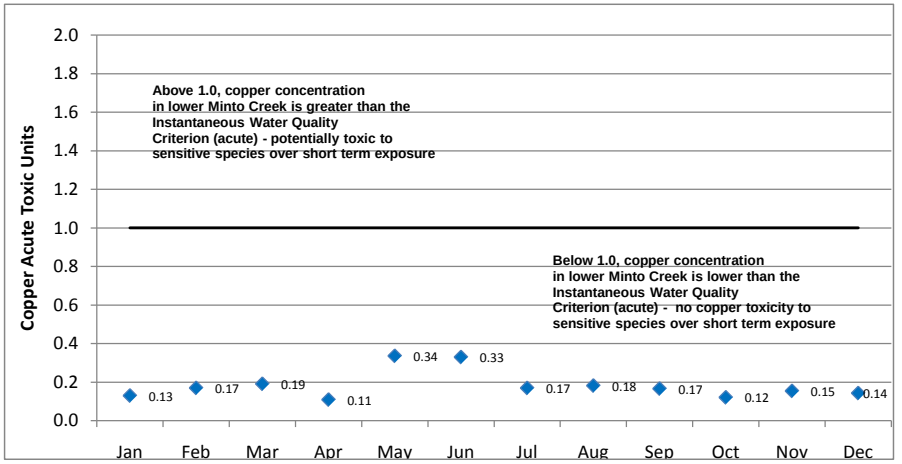
Table BLM4-9: BLM Model Results Summary - Operational Worst Case, Maximum

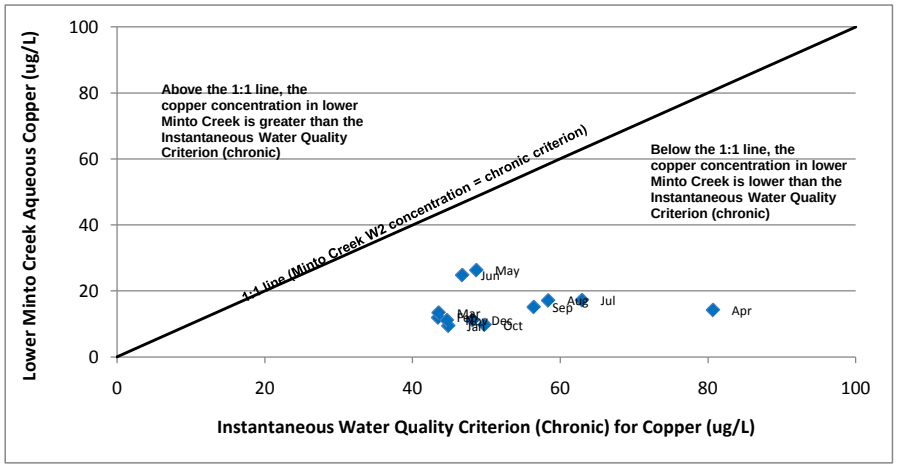
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	9.4	72.2	44.9	0.13	0.21	1,064	902	287	171	221	357
Feb	11.9	70	43.5	0.17	0.27	1,028	877	280	166	215	349
Mar	13.4	70.1	43.5	0.19	0.31	1,029	877	280	167	215	349
Apr	14.2	129.9	80.7	0.11	0.18	1,758	1,536	518	309	399	646
May	26.3	78	48.6	0.34	0.54	1,094	967	319	187	243	400
Jun	24.8	75.2	46.7	0.33	0.53	1,062	910	297	178	229	369
Jul	17.2	101.4	63.0	0.17	0.27	1,374	1,189	400	240	309	497
Aug	17.1	94.0	58.4	0.18	0.29	1,284	1,103	369	223	286	457
Sep	15.1	90.8	56.4	0.17	0.27	1,259	1,086	360	215	277	447
Oct	9.7	80.1	49.8	0.12	0.19	1,155	989	319	190	245	397
Nov	11.1	71.9	44.7	0.15	0.25	1,120	931	285	170	219	354
Dec	11.1	77.6	48.2	0.14	0.23	1,327	1,076	307	184	237	383

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







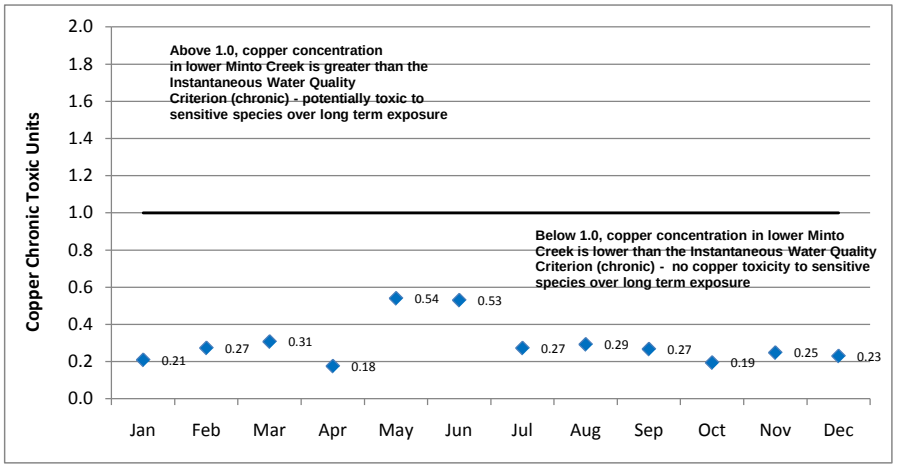


Figure BLM4-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Operational Phase Worst Case, Maximum

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 5

COPPER

CLOSURE BEST ESTIMATE, AVERAGE

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM5-1: BLM Input Parameters - Closure Best Estimate, Average

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	7.8	9.7	10	43.4	15.4	9.95	2.46	28.2	1.57	110	0.001
Feb	10	8	9.3	9.7	10	42.4	14.2	9.22	2.28	25.9	1.41	110	0.001
Mar	10	8	10.6	9.7	10	42.0	14.4	9.25	2.21	26.1	1.20	110	0.001
Apr	10	7.98	11.2	18.3	10	25.1	9.0	6.17	2.26	17.1	1.46	131	0.001
May	10	7.94	21.5	12.4	10	27.6	9.7	5.39	2.17	32.3	0.98	88	0.001
Jun	10	8.13	8.8	10.1	10	30.7	10.3	7.34	1.65	23.0	1.53	129	0.001
Jul	10	8.1	15.0	13.5	10	36.6	12.1	7.59	1.87	13.2	1.02	130	0.001
Aug	10	8.14	14.0	12.1	10	36.3	11.6	7.06	1.84	16.6	1.06	131	0.001
Sep	10	8.09	8.9	12.3	10	32.4	10.5	6.77	1.66	18.5	0.99	130	0.001
Oct	10	8.08	9.1	11.1	10	32.7	10.7	6.94	1.76	16.5	1.07	141	0.001
Nov	10	8.11	10.1	9.3	10	39.6	12.5	8.04	1.90	20.5	1.41	155	0.001
Dec	10	8.07	9.2	9.9	10	46.7	16.7	10.78	2.61	30.8	1.97	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM5-2: Instantaneous Water Quality Criteria for Copper - Closure Best Estimate, Average

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
CLOSE BE Average	Jan	137	68.4	42.5	7.8	0.114
CLOSE BE Average	Feb	136	67.8	42.1	9.3	0.137
CLOSE BE Average	Mar	136	67.8	42.1	10.6	0.156
CLOSE BE Average	Apr	235	117.4	72.9	11.2	0.095
CLOSE BE Average	May	153	76.4	47.5	21.5	0.281
CLOSE BE Average	Jun	149	74.7	46.4	8.8	0.118
CLOSE BE Average	Jul	201	100.4	62.3	15	0.149
CLOSE BE Average	Aug	184	92.1	57.2	14	0.152
CLOSE BE Average	Sep	177	88.5	54.9	8.9	0.101
CLOSE BE Average	Oct	158	79.2	49.2	9.1	0.115
CLOSE BE Average	Nov	139	69.7	43.3	10.1	0.145
CLOSE BE Average	Dec	149	74.4	46.2	9.2	0.124

Table BLM5-3: Predicted LC50 Values for Fathead Minnow - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Average	"Jan "	LC50	8	1.57E-05	6.41E-08	1.23E-05	4.520876	0.953728	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE Average	"Feb "	LC50	8	1.55E-05	6.17E-08	1.22E-05	4.524798	0.955296	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE Average	"Mar "	LC50	8	1.55E-05	6.17E-08	1.22E-05	4.526121	0.955588	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE Average	"Apr "	LC50	7.98	2.5E-05	4.26E-08	2.23E-05	4.536559	0.942768	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE Average	"May "	LC50	7.94	1.68E-05	4.51E-08	1.49E-05	4.618636	0.861316	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE Average	"Jun "	LC50	8.13	1.65E-05	4.51E-08	1.3E-05	4.2613	1.219221	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE Average	"Jul "	LC50	8.1	2.13E-05	5.23E-08	1.74E-05	4.316922	1.163084	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE Average	"Aug "	LC50	8.14	1.97E-05	5.01E-08	1.58E-05	4.23403	1.245763	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE Average	"Sep "	LC50	8.09	1.91E-05	4.73E-08	1.57E-05	4.340272	1.140205	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE Average	"Oct "	LC50	8.08	1.78E-05	4.81E-08	1.41E-05	4.368453	1.116839	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE Average	"Nov "	LC50	8.11	1.68E-05	5.43E-08	1.21E-05	4.313406	1.171492	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE Average	"Dec "	LC50	8.07	1.95E-05	6.57E-08	1.28E-05	4.396572	1.085893	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	997	1.00
Feb	988	0.99
Mar	988	0.99
Apr	1591	1.59
May	1068	1.07
Jun	1046	1.05
Jul	1352	1.35
Aug	1252	1.25
Sep	1215	1.22
Oct	1133	1.13
Nov	1066	1.07
Dec	1241	1.24

Table BLM5-4: Predicted LC50 Values for Rainbow Trout - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE	"Jan	LC50	8	1.34469E-05	4.03E-08	1.13E-05	3.052781	0.644022	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE	"Feb	LC50	8	1.33444E-05	3.89E-08	1.13E-05	3.054849	0.644958	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE	"Mar	LC50	8	1.33444E-05	3.88E-08	1.13E-05	3.055695	0.645145	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE	"Apr	LC50	7.98	2.22187E-05	2.68E-08	2.05E-05	3.06252	0.636448	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE	"May	LC50	7.94	1.49001E-05	2.84E-08	1.37E-05	3.117742	0.581424	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE	"Jun	LC50	8.13	1.41433E-05	2.84E-08	1.2E-05	2.876764	0.823091	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE	"Jul	LC50	8.1	1.84649E-05	3.29E-08	1.61E-05	2.91465	0.785284	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE	"Aug	LC50	8.14	1.69964E-05	3.15E-08	1.45E-05	2.858359	0.841011	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE	"Sep	LC50	8.09	1.66018E-05	2.98E-08	1.44E-05	2.930191	0.769778	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE	"Oct	LC50	8.08	1.53263E-05	3.02E-08	1.3E-05	2.946262	0.753247	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE	"Nov	LC50	8.11	1.40638E-05	3.41E-08	1.11E-05	2.909691	0.790257	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE	"Dec	LC50	8.07	1.60287E-05	4.14E-08	1.18E-05	2.968401	0.733158	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	854	0.85
Feb	848	0.85
Mar	848	0.85
Apr	1412	1.41
May	947	0.95
Jun	899	0.90
Jul	1173	1.17
Aug	1080	1.08
Sep	1055	1.05
Oct	974	0.97
Nov	894	0.89
Dec	1019	1.02

Table BLM5-5: Predicted LC50 Values for Daphnia magna - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Average	" "Jan	LC50	8	4.31E-06	1.14E-09	4.25E-06	0.09833	0.020745	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE Average	" "Feb	LC50	8	4.28E-06	1.1E-09	4.22E-06	0.098241	0.020742	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE Average	" "Mar	LC50	8	4.28E-06	1.1E-09	4.22E-06	0.098224	0.020739	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE Average	" "Apr	LC50	7.98	7.43E-06	7.56E-10	7.38E-06	0.098585	0.020489	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE Average	" "May	LC50	7.94	4.9E-06	8.01E-10	4.86E-06	0.100236	0.018694	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE Average	" "Jun	LC50	8.13	4.63E-06	8.01E-10	4.57E-06	0.092496	0.026466	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE Average	" "Jul	LC50	8.1	6.23E-06	9.28E-10	6.16E-06	0.09367	0.025238	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE Average	" "Aug	LC50	8.14	5.7E-06	8.9E-10	5.63E-06	0.091935	0.027051	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE Average	" "Sep	LC50	8.09	5.52E-06	8.4E-10	5.46E-06	0.094235	0.024757	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE Average	" "Oct	LC50	8.08	4.95E-06	8.53E-10	4.89E-06	0.094749	0.024225	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE Average	" "Nov	LC50	8.11	4.35E-06	9.64E-10	4.26E-06	0.093536	0.025405	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE Average	" "Dec	LC50	8.07	4.65E-06	1.17E-09	4.54E-06	0.095388	0.02356	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	274	0.27
Feb	272	0.27
Mar	272	0.27
Apr	472	0.47
May	311	0.31
Jun	294	0.29
Jul	396	0.40
Aug	362	0.36
Sep	351	0.35
Oct	315	0.31
Nov	276	0.28
Dec	296	0.30

Table BLM5-6: Predicted LC50 Values for Daphnia pulex - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Average	"Jan	LC50	8	2.56E-06	4.28E-10	2.54E-06	0.036943	0.007794	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE Average	"Feb	LC50	8	2.54E-06	4.11E-10	2.52E-06	0.036907	0.007792	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE Average	"Mar	LC50	8	2.54E-06	4.11E-10	2.52E-06	0.03689	0.007789	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE Average	"Apr	LC50	7.98	4.39E-06	2.83E-10	4.38E-06	0.036996	0.007689	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE Average	"May	LC50	7.94	2.87E-06	3E-10	2.86E-06	0.037667	0.007025	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE Average	"Jun	LC50	8.13	2.78E-06	3E-10	2.76E-06	0.034747	0.009942	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE Average	"Jul	LC50	8.1	3.74E-06	3.48E-10	3.72E-06	0.035198	0.009484	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE Average	"Aug	LC50	8.14	3.43E-06	3.33E-10	3.41E-06	0.034536	0.010162	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE Average	"Sep	LC50	8.09	3.3E-06	3.15E-10	3.28E-06	0.035388	0.009297	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE Average	"Oct	LC50	8.08	2.96E-06	3.19E-10	2.93E-06	0.035596	0.009101	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE Average	"Nov	LC50	8.11	2.6E-06	3.61E-10	2.57E-06	0.035148	0.009546	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE Average	"Dec	LC50	8.07	2.78E-06	4.38E-10	2.73E-06	0.035844	0.008853	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	163	0.16
Feb	161	0.16
Mar	161	0.16
Apr	279	0.28
May	182	0.18
Jun	177	0.18
Jul	238	0.24
Aug	218	0.22
Sep	210	0.21
Oct	188	0.19
Nov	165	0.17
Dec	176	0.18

Table BLM5-7: Predicted LC50 Values for Ceriodaphnia dubia - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Average	"Jan	LC50	8	3.31E-06	6.7E-10	3.27E-06	0.05783	0.0122	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE Average	"Feb	LC50	8	3.28E-06	6.46E-10	3.25E-06	0.057877	0.01222	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE Average	"Mar	LC50	8	3.28E-06	6.45E-10	3.25E-06	0.057859	0.012216	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE Average	"Apr	LC50	7.98	5.69E-06	4.44E-10	5.66E-06	0.057996	0.012054	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE Average	"May	LC50	7.94	3.73E-06	4.71E-10	3.71E-06	0.059057	0.011014	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE Average	"Jun	LC50	8.13	3.58E-06	4.71E-10	3.54E-06	0.054503	0.015595	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE Average	"Jul	LC50	8.1	4.81E-06	5.46E-10	4.77E-06	0.055202	0.014874	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE Average	"Aug	LC50	8.14	4.41E-06	5.23E-10	4.37E-06	0.054144	0.015931	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE Average	"Sep	LC50	8.09	4.25E-06	4.94E-10	4.21E-06	0.055464	0.014571	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE Average	"Oct	LC50	8.08	3.81E-06	5.01E-10	3.77E-06	0.055801	0.014267	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE Average	"Nov	LC50	8.11	3.35E-06	5.67E-10	3.3E-06	0.055082	0.01496	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE Average	"Dec	LC50	8.07	3.58E-06	6.87E-10	3.51E-06	0.056207	0.013883	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	210	0.21
Feb	209	0.21
Mar	209	0.21
Apr	361	0.36
May	237	0.24
Jun	227	0.23
Jul	306	0.31
Aug	280	0.28
Sep	270	0.27
Oct	242	0.24
Nov	213	0.21
Dec	228	0.23

Table BLM5-8: Predicted LC50 Values for Olfaction (User Defined) - Closure Best Estimate, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE BE Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Average "	"Jan	LC50	8	5.38E-06	1.91E-09	5.28E-06	0.164297	0.034661	9.7	10	0.001083	0.000634	0.000433	6.29E-05	0.000294	4.43E-05	0.002237	3.12E-08
"CLOSE BE Average "	"Feb	LC50	8	5.34E-06	1.84E-09	5.24E-06	0.164112	0.034649	9.7	10	0.001058	0.000584	0.000401	5.83E-05	0.00027	3.98E-05	0.002237	3.12E-08
"CLOSE BE Average "	"Mar	LC50	8	5.34E-06	1.84E-09	5.24E-06	0.164104	0.034648	9.7	10	0.001048	0.000592	0.000402	5.65E-05	0.000272	3.38E-05	0.002237	3.12E-08
"CLOSE BE Average "	"Apr	LC50	7.98	9.29E-06	1.27E-09	9.21E-06	0.164646	0.034219	18.3	10	0.000626	0.00037	0.000268	5.78E-05	0.000178	4.12E-05	0.002667	3.12E-08
"CLOSE BE Average "	"May	LC50	7.94	6.15E-06	1.34E-09	6.1E-06	0.167663	0.031269	12.4	10	0.000689	0.000399	0.000234	5.55E-05	0.000336	2.76E-05	0.001796	3.12E-08
"CLOSE BE Average "	"Jun	LC50	8.13	5.76E-06	1.34E-09	5.66E-06	0.154559	0.044223	10.1	10	0.000766	0.000424	0.000319	4.22E-05	0.000239	4.32E-05	0.002604	3.12E-08
"CLOSE BE Average "	"Jul	LC50	8.1	7.73E-06	1.56E-09	7.62E-06	0.156456	0.042155	13.5	10	0.000913	0.000498	0.00033	4.78E-05	0.000137	2.88E-05	0.002628	3.12E-08
"CLOSE BE Average "	"Aug	LC50	8.14	7.07E-06	1.49E-09	6.95E-06	0.153549	0.04518	12.1	10	0.000906	0.000477	0.000307	4.71E-05	0.000173	2.99E-05	0.002643	3.12E-08
"CLOSE BE Average "	"Sep	LC50	8.09	6.87E-06	1.41E-09	6.76E-06	0.157423	0.041358	12.3	10	0.000808	0.000432	0.000294	4.25E-05	0.000193	2.79E-05	0.00263	3.12E-08
"CLOSE BE Average "	"Oct	LC50	8.08	6.17E-06	1.43E-09	6.06E-06	0.158233	0.040455	11.1	10	0.000816	0.00044	0.000302	4.5E-05	0.000172	3.02E-05	0.002854	3.12E-08
"CLOSE BE Average "	"Nov	LC50	8.11	5.41E-06	1.62E-09	5.27E-06	0.156308	0.042454	9.3	10	0.000988	0.000514	0.00035	4.86E-05	0.000213	3.98E-05	0.003132	3.12E-08
"CLOSE BE Average "	"Dec	LC50	8.07	5.81E-06	1.96E-09	5.61E-06	0.159277	0.03934	9.9	10	0.001165	0.000687	0.000469	6.68E-05	0.000321	5.56E-05	0.00405	3.12E-08

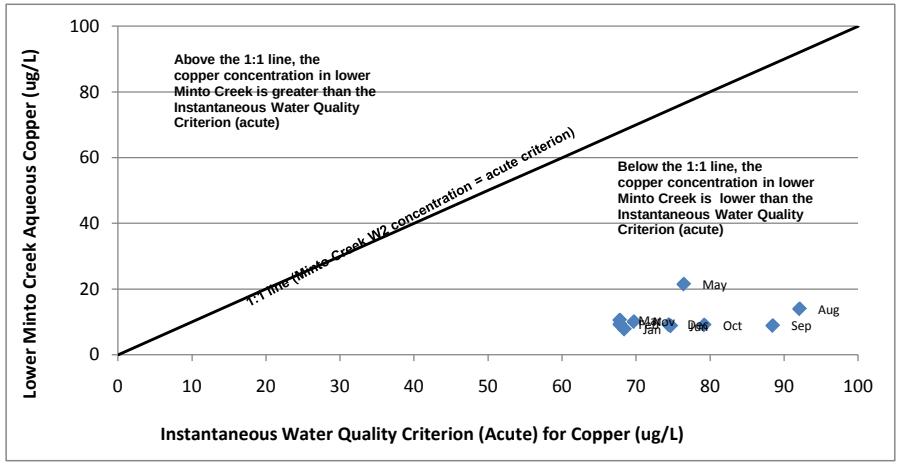
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	342	0.34
Feb	339	0.34
Mar	339	0.34
Apr	591	0.59
May	391	0.39
Jun	366	0.37
Jul	491	0.49
Aug	449	0.45
Sep	436	0.44
Oct	392	0.39
Nov	344	0.34
Dec	369	0.37

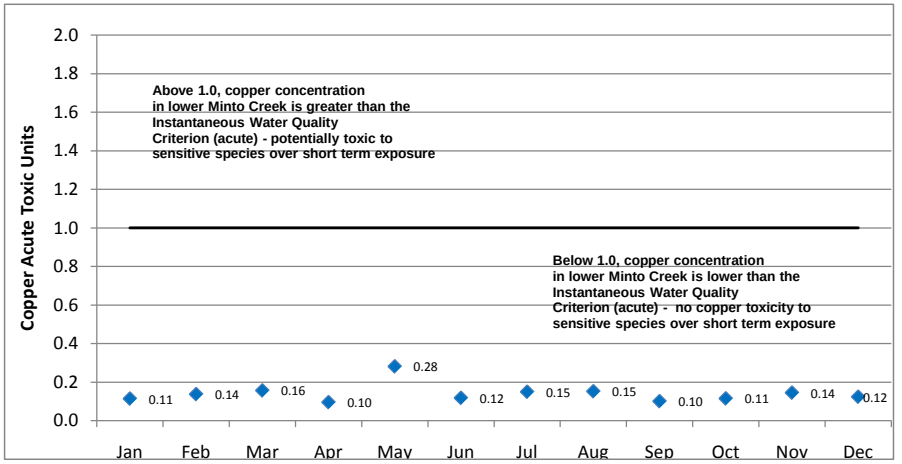
Table BLM5-9: BLM Model Results Summary - Closure Best Estimate, Average

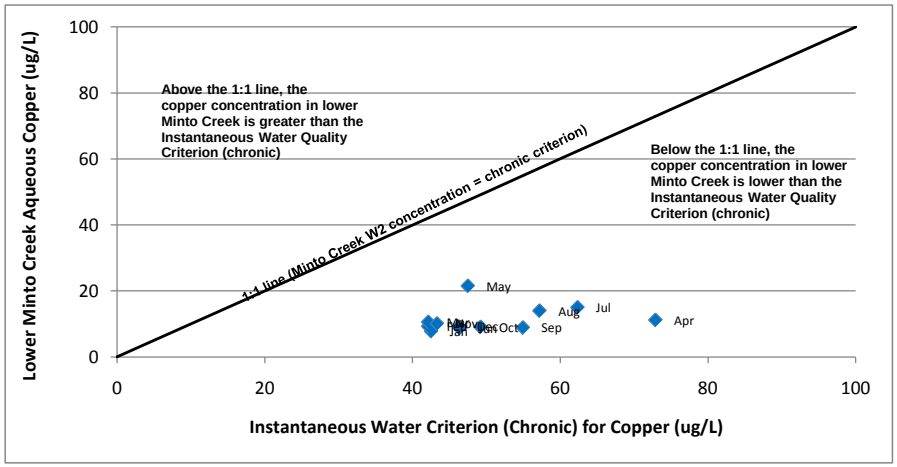
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	7.8	68.4	42.5	0.11	0.18	997	854	274	163	210	342
Feb	9.3	67.8	42.1	0.14	0.22	988	848	272	161	209	339
Mar	10.6	67.8	42.1	0.16	0.25	988	848	272	161	209	339
Apr	11.2	117.4	72.9	0.10	0.15	1,591	1,412	472	279	361	591
May	21.5	76.4	47.5	0.28	0.45	1,068	947	311	182	237	391
Jun	8.8	74.7	46.4	0.12	0.19	1,046	899	294	177	227	366
Jul	15	100.4	62.3	0.15	0.24	1,352	1,173	396	238	306	491
Aug	14	92.1	57.2	0.15	0.24	1,252	1,080	362	218	280	449
Sep	8.9	88.5	54.9	0.10	0.16	1,215	1,055	351	210	270	436
Oct	9.1	79.2	49.2	0.11	0.18	1,133	974	315	188	242	392
Nov	10.1	69.7	43.3	0.14	0.23	1,066	894	276	165	213	344
Dec	9.2	74.4	46.2	0.12	0.20	1,241	1,019	296	176	228	369

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







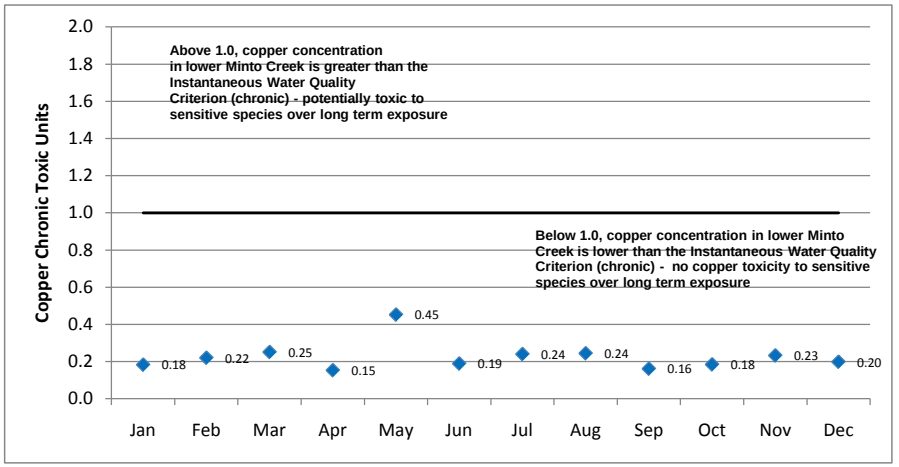


Figure BLM5-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Closure Phase Best Estimate, Average

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 6

COPPER

CLOSURE BEST ESTIMATE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM6-1: BLM Input Parameters - Closure Best Estimate, Maximum

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	10.1	9.7	10	50.3	18.5	13.64	3.84	39.0	2.58	110	0.001
Feb	10	8	11.3	9.7	10	45.0	15.2	11.86	3.50	32.5	1.96	110	0.001
Mar	10	8	12.1	9.7	10	45.0	15.3	11.59	3.37	32.0	1.95	110	0.001
Apr	10	7.98	12.3	18.3	10	44.1	15.3	11.29	3.15	31.5	1.91	131	0.001
May	10	7.94	22.9	12.4	10	30.6	10.7	7.58	3.02	37.6	1.84	88	0.001
Jun	10	8.13	22.6	10.1	10	32.8	11.0	9.00	2.92	37.6	1.89	129	0.001
Jul	10	8.1	16.2	13.5	10	38.9	12.8	9.13	2.60	25.5	1.89	130	0.001
Aug	10	8.14	16.1	12.1	10	38.6	12.7	8.77	2.54	20.9	1.40	131	0.001
Sep	10	8.09	14.5	12.3	10	38.0	12.1	8.50	2.51	22.7	1.40	130	0.001
Oct	10	8.08	10.2	11.1	10	35.1	11.5	8.83	2.63	22.7	1.49	141	0.001
Nov	10	8.11	11.8	9.3	10	44.5	13.9	10.72	3.02	28.1	2.04	155	0.001
Dec	10	8.07	11.6	9.9	10	50.3	18.5	13.63	3.83	39.0	2.57	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM6-2: Instantaneous Water Quality Criteria for Copper - Closure Best Estimate, Maximum

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
CLOSE BE Maximum	Jan	142	70.9	44.0	10.1	0.143
CLOSE BE Maximum	Feb	138	69.0	42.9	11.3	0.164
CLOSE BE Maximum	Mar	138	69.0	42.9	12.1	0.175
CLOSE BE Maximum	Apr	256	127.8	79.4	12.3	0.096
CLOSE BE Maximum	May	156	78.1	48.5	22.9	0.293
CLOSE BE Maximum	Jun	151	75.4	46.9	22.6	0.300
CLOSE BE Maximum	Jul	203	101.3	62.9	16.2	0.160
CLOSE BE Maximum	Aug	187	93.6	58.1	16.1	0.172
CLOSE BE Maximum	Sep	182	90.8	56.4	14.5	0.160
CLOSE BE Maximum	Oct	161	80.5	50.0	10.2	0.127
CLOSE BE Maximum	Nov	143	71.5	44.4	11.8	0.165
CLOSE BE Maximum	Dec	152	76.1	47.2	11.6	0.153

Table BLM6-3: Predicted LC50 Values for Fathead Minnow - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"CLOSE BE Maximum	"Jan "	LC50	8	1.62891E-05	7.42127E-08	1.24394E-05	4.531078	0.952974	9.7	10	0.001255	0.000761	0.000593	9.8214E-05	0.000406	7.27724E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Feb "	LC50	8	1.57945E-05	6.58583E-08	1.23121E-05	4.526849	0.954304	9.7	10	0.001123	0.000625	0.000516	8.9518E-05	0.000338	5.52845E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Mar "	LC50	8	1.57945E-05	6.58629E-08	1.23113E-05	4.526894	0.954342	9.7	10	0.001123	0.00063	0.000504	8.6193E-05	0.000333	5.50024E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Apr "	LC50	7.98	2.70927E-05	6.58433E-08	2.30733E-05	4.543996	0.93593	18.3	10	0.0011	0.00063	0.000491	8.05662E-05	0.000328	5.38741E-05	0.002667	3.11876E-08
"CLOSE BE Maximum	"May "	LC50	7.94	1.70765E-05	4.94966E-08	1.50354E-05	4.620125	0.859896	12.4	10	0.000763	0.00044	0.00033	7.72412E-05	0.000391	5.18997E-05	0.001796	3.11876E-08
"CLOSE BE Maximum	"Jun "	LC50	8.13	1.66501E-05	4.76817E-08	1.30447E-05	4.26346	1.217345	10.1	10	0.000818	0.000453	0.000391	7.46836E-05	0.000391	5.331E-05	0.002604	3.11876E-08
"CLOSE BE Maximum	"Jul "	LC50	8.1	2.14777E-05	5.50409E-08	1.74954E-05	4.318703	1.161304	13.5	10	0.000971	0.000527	0.000397	6.64991E-05	0.000265	5.331E-05	0.002628	3.11876E-08
"CLOSE BE Maximum	"Aug "	LC50	8.14	2.002E-05	5.35083E-08	1.58771E-05	4.235587	1.244437	12.1	10	0.000963	0.000523	0.000381	6.49645E-05	0.000218	3.94889E-05	0.002643	3.11876E-08
"CLOSE BE Maximum	"Sep "	LC50	8.09	1.96902E-05	5.36519E-08	1.58433E-05	4.342271	1.137997	12.3	10	0.000948	0.000498	0.00037	6.41972E-05	0.000236	3.94889E-05	0.00263	3.11876E-08
"CLOSE BE Maximum	"Oct "	LC50	8.08	1.81228E-05	5.12977E-08	1.41823E-05	4.365626	1.114409	11.1	10	0.000876	0.000473	0.000384	6.72664E-05	0.000236	4.20275E-05	0.002854	3.11876E-08
"CLOSE BE Maximum	"Nov "	LC50	8.11	1.73099E-05	6.01739E-08	1.21659E-05	4.313671	1.16919	9.3	10	0.00111	0.000572	0.000466	7.72412E-05	0.000293	5.7541E-05	0.003132	3.11876E-08
"CLOSE BE Maximum	"Dec "	LC50	8.07	2.00989E-05	7.13078E-08	1.29284E-05	4.397755	1.084427	9.9	10	0.001255	0.000761	0.000593	9.79582E-05	0.000406	7.24903E-05	0.00405	3.11876E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	1035	1.04
Feb	1004	1.00
Mar	1004	1.00
Apr	1722	1.72
May	1085	1.09
Jun	1058	1.06
Jul	1365	1.36
Aug	1272	1.27
Sep	1251	1.25
Oct	1152	1.15
Nov	1100	1.10
Dec	1277	1.28

Table BLM6-4: Predicted LC50 Values for Rainbow Trout - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Maximum	"Jan	LC50	8	1.38709E-05	4.6661E-08	1.14491E-05	3.056826	0.642914	9.7	10	0.001255	0.000761	0.000593	9.8214E-05	0.000406	7.27724E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Feb	LC50	8	1.35213E-05	4.14062E-08	1.13309E-05	3.053785	0.643772	9.7	10	0.001123	0.000625	0.000516	8.9518E-05	0.000338	5.52845E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Mar	LC50	8	1.35213E-05	4.14105E-08	1.13304E-05	3.053911	0.643818	9.7	10	0.001123	0.00063	0.000504	8.6193E-05	0.000333	5.50024E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	"Apr	LC50	7.98	2.37629E-05	4.14292E-08	2.12329E-05	3.067909	0.631906	18.3	10	0.0011	0.00063	0.000491	8.05662E-05	0.000328	5.38741E-05	0.002667	3.11876E-08
"CLOSE BE Maximum	"May	LC50	7.94	1.51093E-05	3.11439E-08	1.38247E-05	3.119213	0.580552	12.4	10	0.000763	0.00044	0.00033	7.72412E-05	0.000391	5.18997E-05	0.001796	3.11876E-08
"CLOSE BE Maximum	"Jun	LC50	8.13	1.42786E-05	2.99998E-08	1.20094E-05	2.878069	0.82178	10.1	10	0.000818	0.000453	0.000391	7.46836E-05	0.000391	5.331E-05	0.002604	3.11876E-08
"CLOSE BE Maximum	"Jul	LC50	8.1	1.86138E-05	3.46354E-08	1.61068E-05	2.915874	0.784088	13.5	10	0.000971	0.000527	0.000397	6.64991E-05	0.000265	5.331E-05	0.002628	3.11876E-08
"CLOSE BE Maximum	"Aug	LC50	8.14	1.72252E-05	3.3668E-08	1.46175E-05	2.859458	0.840129	12.1	10	0.000963	0.000523	0.000381	6.49645E-05	0.000218	3.94889E-05	0.002643	3.11876E-08
"CLOSE BE Maximum	"Sep	LC50	8.09	1.70057E-05	3.37507E-08	1.45847E-05	2.930932	0.768127	12.3	10	0.000948	0.000498	0.00037	6.41972E-05	0.000236	3.94889E-05	0.00263	3.11876E-08
"CLOSE BE Maximum	"Oct	LC50	8.08	1.55348E-05	3.22761E-08	1.30546E-05	2.947152	0.752322	11.1	10	0.000876	0.000473	0.000384	6.72664E-05	0.000236	4.20275E-05	0.002854	3.11876E-08
"CLOSE BE Maximum	"Nov	LC50	8.11	1.44363E-05	3.78461E-08	1.11993E-05	2.910979	0.789005	9.3	10	0.00111	0.000572	0.000466	7.72412E-05	0.000293	5.7541E-05	0.003132	3.11876E-08
"CLOSE BE Maximum	"Dec	LC50	8.07	1.64132E-05	4.48559E-08	1.18999E-05	2.968074	0.73189	9.9	10	0.001255	0.000761	0.000593	9.79582E-05	0.000406	7.24903E-05	0.00405	3.11876E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	881	0.88
Feb	859	0.86
Mar	859	0.86
Apr	1510	1.51
May	960	0.96
Jun	907	0.91
Jul	1183	1.18
Aug	1095	1.09
Sep	1081	1.08
Oct	987	0.99
Nov	917	0.92
Dec	1043	1.04

Table BLM6-5: Predicted LC50 Values for Daphnia magna - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Maximum	" "Jan	LC50	8	4.43493E-06	1.31882E-09	4.36674E-06	0.098295	0.020674	9.7	10	0.001255	0.000761	0.000593	9.8214E-05	0.000406	7.27724E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	" "Feb	LC50	8	4.33482E-06	1.17117E-09	4.27312E-06	0.098279	0.020719	9.7	10	0.001123	0.000625	0.000516	8.9518E-05	0.000338	5.52845E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	" "Mar	LC50	8	4.33482E-06	1.1718E-09	4.27307E-06	0.098326	0.020729	9.7	10	0.001123	0.00063	0.000504	8.6193E-05	0.000333	5.50024E-05	0.002237	3.11876E-08
"CLOSE BE Maximum	" "Apr	LC50	7.98	8.0242E-06	1.16999E-09	7.95326E-06	0.098723	0.020335	18.3	10	0.0011	0.00063	0.000491	8.05662E-05	0.000328	5.38741E-05	0.002667	3.11876E-08
"CLOSE BE Maximum	" "May	LC50	7.94	4.98866E-06	8.79828E-10	4.95269E-06	0.100381	0.018684	12.4	10	0.000763	0.00044	0.00033	7.72412E-05	0.000391	5.18997E-05	0.001796	3.11876E-08
"CLOSE BE Maximum	" "Jun	LC50	8.13	4.6694E-06	8.47061E-10	4.6056E-06	0.092516	0.026417	10.1	10	0.000818	0.000453	0.000391	7.46836E-05	0.000391	5.331E-05	0.002604	3.11876E-08
"CLOSE BE Maximum	" "Jul	LC50	8.1	6.27239E-06	9.77303E-10	6.20209E-06	0.093706	0.025199	13.5	10	0.000971	0.000527	0.000397	6.64991E-05	0.000265	5.331E-05	0.002628	3.11876E-08
"CLOSE BE Maximum	" "Aug	LC50	8.14	5.77442E-06	9.51015E-10	5.70116E-06	0.091967	0.027022	12.1	10	0.000963	0.000523	0.000381	6.49645E-05	0.000218	3.94889E-05	0.002643	3.11876E-08
"CLOSE BE Maximum	" "Sep	LC50	8.09	5.64788E-06	9.53484E-10	5.57983E-06	0.094286	0.024711	12.3	10	0.000948	0.000498	0.00037	6.41972E-05	0.000236	3.94889E-05	0.00263	3.11876E-08
"CLOSE BE Maximum	" "Oct	LC50	8.08	5.01982E-06	9.11538E-10	4.95013E-06	0.094769	0.024193	11.1	10	0.000876	0.000473	0.000384	6.72664E-05	0.000236	4.20275E-05	0.002854	3.11876E-08
"CLOSE BE Maximum	" "Nov	LC50	8.11	4.43996E-06	1.06928E-09	4.34873E-06	0.093586	0.025367	9.3	10	0.00111	0.000572	0.000466	7.72412E-05	0.000293	5.7541E-05	0.003132	3.11876E-08
"CLOSE BE Maximum	" "Dec	LC50	8.07	4.74039E-06	1.26751E-09	4.61307E-06	0.095423	0.023531	9.9	10	0.001255	0.000761	0.000593	9.79582E-05	0.000406	7.24903E-05	0.00405	3.11876E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	282	0.28
Feb	275	0.28
Mar	275	0.28
Apr	510	0.51
May	317	0.32
Jun	297	0.30
Jul	399	0.40
Aug	367	0.37
Sep	359	0.36
Oct	319	0.32
Nov	282	0.28
Dec	301	0.30

Table BLM6-6: Predicted LC50 Values for Daphnia pulex - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE	"Jan	LC50	8	2.65E-06	4.94E-10	2.62E-06	0.036937	0.007769	9.7	10	0.001255	0.000761	0.000593	9.82E-05	0.000406	7.28E-05	0.002237	3.12E-08
"CLOSE BE	"Feb	LC50	8	2.58E-06	4.39E-10	2.56E-06	0.036912	0.007782	9.7	10	0.001123	0.000625	0.000516	8.95E-05	0.000338	5.53E-05	0.002237	3.12E-08
"CLOSE BE	"Mar	LC50	8	2.58E-06	4.39E-10	2.56E-06	0.036936	0.007787	9.7	10	0.001123	0.00063	0.000504	8.62E-05	0.000333	5.5E-05	0.002237	3.12E-08
"CLOSE BE	"Apr	LC50	7.98	4.78E-06	4.38E-10	4.75E-06	0.037043	0.00763	18.3	10	0.0011	0.00063	0.000491	8.06E-05	0.000328	5.39E-05	0.002667	3.12E-08
"CLOSE BE	"May	LC50	7.94	2.93E-06	3.29E-10	2.92E-06	0.037672	0.007012	12.4	10	0.000763	0.00044	0.00033	7.72E-05	0.000391	5.19E-05	0.001796	3.12E-08
"CLOSE BE	"Jun	LC50	8.13	2.81E-06	3.17E-10	2.78E-06	0.034755	0.009924	10.1	10	0.000818	0.000453	0.000391	7.47E-05	0.000391	5.33E-05	0.002604	3.12E-08
"CLOSE BE	"Jul	LC50	8.1	3.77E-06	3.66E-10	3.75E-06	0.035212	0.009469	13.5	10	0.000971	0.000527	0.000397	6.65E-05	0.000265	5.33E-05	0.002628	3.12E-08
"CLOSE BE	"Aug	LC50	8.14	3.49E-06	3.56E-10	3.46E-06	0.034548	0.010151	12.1	10	0.000963	0.000523	0.000381	6.5E-05	0.000218	3.95E-05	0.002643	3.12E-08
"CLOSE BE	"Sep	LC50	8.09	3.39E-06	3.57E-10	3.36E-06	0.03541	0.009281	12.3	10	0.000948	0.000498	0.00037	6.42E-05	0.000236	3.95E-05	0.00263	3.12E-08
"CLOSE BE	"Oct	LC50	8.08	3E-06	3.41E-10	2.98E-06	0.035606	0.00909	11.1	10	0.000876	0.000473	0.000384	6.73E-05	0.000236	4.2E-05	0.002854	3.12E-08
"CLOSE BE	"Nov	LC50	8.11	2.66E-06	4.01E-10	2.63E-06	0.035162	0.009531	9.3	10	0.00111	0.000572	0.000466	7.72E-05	0.000293	5.75E-05	0.003132	3.12E-08
"CLOSE BE	"Dec	LC50	8.07	2.84E-06	4.75E-10	2.79E-06	0.035856	0.008842	9.9	10	0.001255	0.000761	0.000593	9.8E-05	0.000406	7.25E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	168	0.17
Feb	164	0.16
Mar	164	0.16
Apr	304	0.30
May	186	0.19
Jun	178	0.18
Jul	240	0.24
Aug	221	0.22
Sep	215	0.22
Oct	191	0.19
Nov	169	0.17
Dec	180	0.18

Table BLM6-7: Predicted LC50 Values for Ceriodaphnia dubia - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Maximum "	"Jan	LC50	8	3.41543E-06	7.76062E-10	3.37542E-06	0.057949	0.012188	9.7	10	0.001255	0.000761	0.000593	9.8214E-05	0.000406	7.27724E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Feb	LC50	8	3.33098E-06	6.88356E-10	3.29482E-06	0.057872	0.0122	9.7	10	0.001123	0.000625	0.000516	8.9518E-05	0.000338	5.52845E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Mar	LC50	8	3.33098E-06	6.88788E-10	3.29479E-06	0.057905	0.012208	9.7	10	0.001123	0.00063	0.000504	8.6193E-05	0.000333	5.50024E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Apr	LC50	7.98	6.16847E-06	6.87139E-10	6.12697E-06	0.058102	0.011968	18.3	10	0.0011	0.00063	0.000491	8.05662E-05	0.000328	5.38741E-05	0.002667	3.11876E-08
"CLOSE BE Maximum "	"May	LC50	7.94	3.8067E-06	5.16469E-10	3.7857E-06	0.059045	0.01099	12.4	10	0.000763	0.00044	0.00033	7.72412E-05	0.000391	5.18997E-05	0.001796	3.11876E-08
"CLOSE BE Maximum "	"Jun	LC50	8.13	3.60864E-06	4.98255E-10	3.57122E-06	0.054526	0.015569	10.1	10	0.000818	0.000453	0.000391	7.46836E-05	0.000391	5.331E-05	0.002604	3.11876E-08
"CLOSE BE Maximum "	"Jul	LC50	8.1	4.84864E-06	5.74768E-10	4.80732E-06	0.055222	0.01485	13.5	10	0.000971	0.000527	0.000397	6.64991E-05	0.000265	5.331E-05	0.002628	3.11876E-08
"CLOSE BE Maximum "	"Aug	LC50	8.14	4.47054E-06	5.59009E-10	4.42751E-06	0.054166	0.015915	12.1	10	0.000963	0.000523	0.000381	6.49645E-05	0.000218	3.94889E-05	0.002643	3.11876E-08
"CLOSE BE Maximum "	"Sep	LC50	8.09	4.35719E-06	5.60294E-10	4.31733E-06	0.055516	0.01455	12.3	10	0.000948	0.000498	0.00037	6.41972E-05	0.000236	3.94889E-05	0.00263	3.11876E-08
"CLOSE BE Maximum "	"Oct	LC50	8.08	3.8672E-06	5.35736E-10	3.82628E-06	0.055808	0.014247	11.1	10	0.000876	0.000473	0.000384	6.72664E-05	0.000236	4.20275E-05	0.002854	3.11876E-08
"CLOSE BE Maximum "	"Nov	LC50	8.11	3.42564E-06	6.28463E-10	3.37206E-06	0.055108	0.014937	9.3	10	0.00111	0.000572	0.000466	7.72412E-05	0.000293	5.7541E-05	0.003132	3.11876E-08
"CLOSE BE Maximum "	"Dec	LC50	8.07	3.65218E-06	7.45463E-10	3.57737E-06	0.056226	0.013865	9.9	10	0.001255	0.000761	0.000593	9.79582E-05	0.000406	7.24903E-05	0.00405	3.11876E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	217	0.22
Feb	212	0.21
Mar	212	0.21
Apr	392	0.39
May	242	0.24
Jun	229	0.23
Jul	308	0.31
Aug	284	0.28
Sep	277	0.28
Oct	246	0.25
Nov	218	0.22
Dec	232	0.23

Table BLM6-8: Predicted LC50 Values for Olfaction (User Defined) - Closure Best Estimate, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE BE Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE BE Maximum "	"Jan	LC50	8	5.52531E-06	2.21089E-09	5.41092E-06	0.164307	0.034558	9.7	10	0.001255	0.000761	0.000593	9.8214E-05	0.000406	7.27724E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Feb	LC50	8	5.4071E-06	1.96223E-09	5.30365E-06	0.16418	0.034612	9.7	10	0.001123	0.000625	0.000516	8.9518E-05	0.000338	5.52845E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Mar	LC50	8	5.4071E-06	1.96312E-09	5.30358E-06	0.164246	0.034627	9.7	10	0.001123	0.00063	0.000504	8.6193E-05	0.000333	5.50024E-05	0.002237	3.11876E-08
"CLOSE BE Maximum "	"Apr	LC50	7.98	9.99427E-06	1.95893E-09	9.87524E-06	0.164776	0.033941	18.3	10	0.0011	0.00063	0.000491	8.05662E-05	0.000328	5.38741E-05	0.002667	3.11876E-08
"CLOSE BE Maximum "	"May	LC50	7.94	6.25435E-06	1.47345E-09	6.19407E-06	0.167592	0.031194	12.4	10	0.000763	0.00044	0.00033	7.72412E-05	0.000391	5.18997E-05	0.001796	3.11876E-08
"CLOSE BE Maximum "	"Jun	LC50	8.13	5.80264E-06	1.41993E-09	5.69562E-06	0.154619	0.04415	10.1	10	0.000818	0.000453	0.000391	7.46836E-05	0.000391	5.331E-05	0.002604	3.11876E-08
"CLOSE BE Maximum "	"Jul	LC50	8.1	7.78428E-06	1.63738E-09	7.66626E-06	0.156516	0.042089	13.5	10	0.000971	0.000527	0.000397	6.64991E-05	0.000265	5.331E-05	0.002628	3.11876E-08
"CLOSE BE Maximum "	"Aug	LC50	8.14	7.15482E-06	1.59326E-09	7.03186E-06	0.15361	0.045133	12.1	10	0.000963	0.000523	0.000381	6.49645E-05	0.000218	3.94889E-05	0.002643	3.11876E-08
"CLOSE BE Maximum "	"Sep	LC50	8.09	7.02025E-06	1.59772E-09	6.90603E-06	0.157512	0.041282	12.3	10	0.000948	0.000498	0.00037	6.41972E-05	0.000236	3.94889E-05	0.00263	3.11876E-08
"CLOSE BE Maximum "	"Oct	LC50	8.08	6.25007E-06	1.52663E-09	6.13311E-06	0.158239	0.040395	11.1	10	0.000876	0.000473	0.000384	6.72664E-05	0.000236	4.20275E-05	0.002854	3.11876E-08
"CLOSE BE Maximum "	"Nov	LC50	8.11	5.5237E-06	1.792E-09	5.3707E-06	0.156383	0.042388	9.3	10	0.00111	0.000572	0.000466	7.72412E-05	0.000293	5.7541E-05	0.003132	3.11876E-08
"CLOSE BE Maximum "	"Dec	LC50	8.07	5.9104E-06	2.1227E-09	5.69702E-06	0.159343	0.039293	9.9	10	0.001255	0.000761	0.000593	9.79582E-05	0.000406	7.24903E-05	0.00405	3.11876E-08

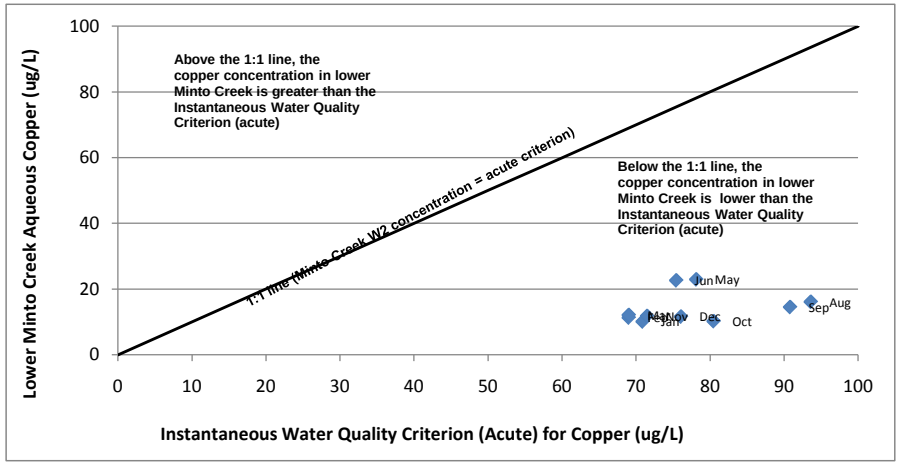
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	351	0.35
Feb	344	0.34
Mar	344	0.34
Apr	635	0.64
May	397	0.40
Jun	369	0.37
Jul	495	0.49
Aug	455	0.45
Sep	446	0.45
Oct	397	0.40
Nov	351	0.35
Dec	376	0.38

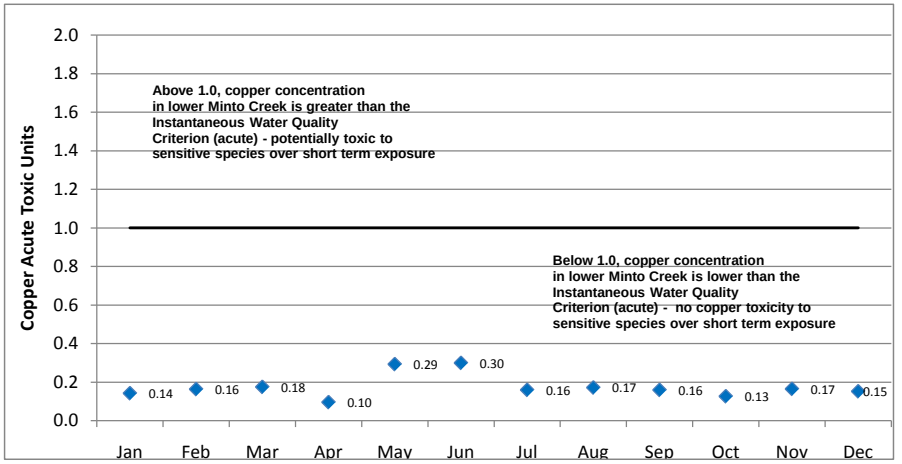
Table BLM6-9: BLM Model Results Summary - Closure Best Estimate, Maximum

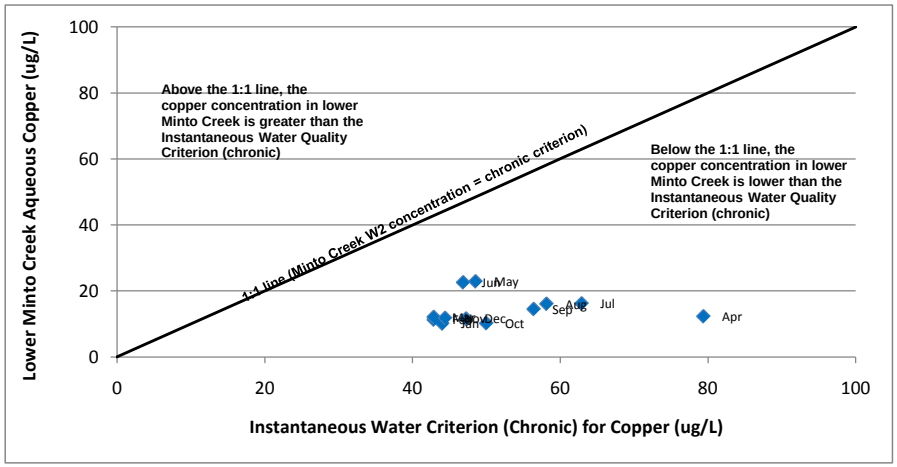
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	10.1	70.9	44.0	0.14	0.23	1,035	881	282	168	217	351
Feb	11.3	69.0	42.9	0.16	0.26	1,004	859	275	164	212	344
Mar	12.1	69.0	42.9	0.18	0.28	1,004	859	275	164	212	344
Apr	12.3	127.8	79.4	0.10	0.15	1,722	1,510	510	304	392	635
May	22.9	78.1	48.5	0.29	0.47	1,085	960	317	186	242	397
Jun	22.6	75.4	46.9	0.30	0.48	1,058	907	297	178	229	369
Jul	16.2	101.3	62.9	0.16	0.26	1,365	1,183	399	240	308	495
Aug	16.1	93.6	58.1	0.17	0.28	1,272	1,095	367	221	284	455
Sep	14.5	90.8	56.4	0.16	0.26	1,251	1,081	359	215	277	446
Oct	10.2	80.5	50.0	0.13	0.20	1,152	987	319	191	246	397
Nov	11.8	71.5	44.4	0.17	0.27	1,100	917	282	169	218	351
Dec	11.6	76.1	47.2	0.15	0.25	1,277	1,043	301	180	232	376

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







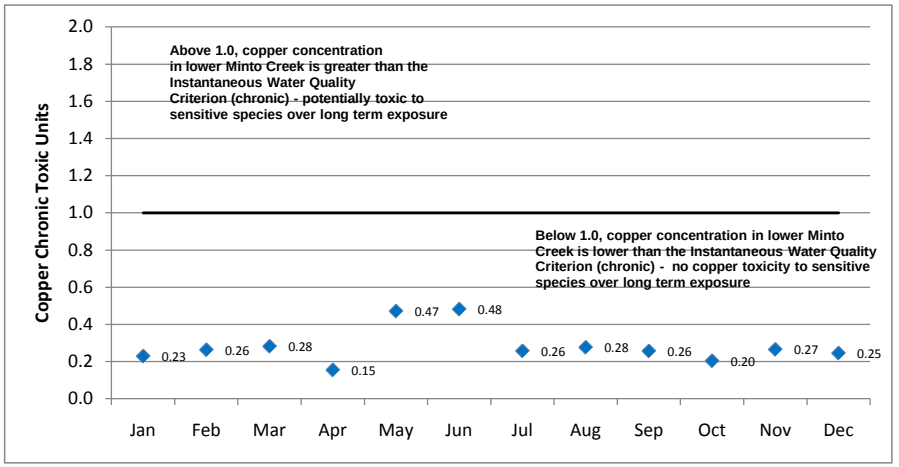


Figure BLM6-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Closure Best Estimate, Maximum

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 7

COPPER

CLOSURE WORST CASE, AVERAGE

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM7-1: BLM Input Parameters - Closure Worst Case, Average

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	14.7	9.7	10	49.9	17.2	11.04	2.91	36.8	2.24	110	0.001
Feb	10	8	16.0	9.7	10	48.6	16.0	10.27	2.72	34.2	2.05	110	0.001
Mar	10	8	17.0	9.7	10	48.1	16.2	10.26	2.62	34.1	1.81	110	0.001
Apr	10	7.98	16.7	18.3	10	30.2	10.5	7.04	2.62	24.1	1.99	131	0.001
May	10	7.94	26.7	12.4	10	32.4	11.1	6.21	2.51	38.7	1.47	88	0.001
Jun	10	8.13	13.3	10.1	10	34.9	11.5	8.03	1.95	28.5	1.95	129	0.001
Jul	10	8.1	19.7	13.5	10	41.0	13.3	8.32	2.18	19.0	1.47	130	0.001
Aug	10	8.14	18.8	12.1	10	40.7	12.9	7.80	2.16	22.4	1.52	131	0.001
Sep	10	8.09	14.0	12.3	10	37.0	11.8	7.55	1.99	24.7	1.47	130	0.001
Oct	10	8.08	14.8	11.1	10	38.0	12.2	7.83	2.14	23.6	1.62	141	0.001
Nov	10	8.11	17.3	9.3	10	46.2	14.4	9.15	2.37	29.3	2.09	155	0.001
Dec	10	8.07	16.5	9.9	10	53.5	18.6	11.92	3.10	39.9	2.67	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM7-2: Instantaneous Water Quality Criteria for Copper - Closure Worst Case, Average

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
CLOSE WC Average	Jan	140	69.8	43.4	14.7	0.211
CLOSE WC Average	Feb	138	69.2	43.0	16.0	0.231
CLOSE WC Average	Mar	138	69.2	43.0	17	0.246
CLOSE WC Average	Apr	239	119.6	74.3	16.7	0.140
CLOSE WC Average	May	156	77.9	48.4	26.7	0.343
CLOSE WC Average	Jun	152	75.9	47.1	13.3	0.175
CLOSE WC Average	Jul	204	101.8	63.3	19.7	0.194
CLOSE WC Average	Aug	187	93.5	58.1	18.8	0.201
CLOSE WC Average	Sep	180	90.0	55.9	14	0.156
CLOSE WC Average	Oct	162	80.8	50.2	14.8	0.183
CLOSE WC Average	Nov	143	71.4	44.3	17.3	0.242
CLOSE WC Average	Dec	152	76.0	47.2	16.5	0.217

Table BLM7-3: Predicted LC50 Values for Fathead Minnow - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Average "	"Jan "	LC50	8	1.61E-05	7.11E-08	1.24E-05	4.52567	0.95258	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb "	LC50	8	1.59E-05	6.85E-08	1.23E-05	4.52652	0.95349	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar "	LC50	8	1.59E-05	6.85E-08	1.23E-05	4.530336	0.954343	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr "	LC50	7.98	2.55E-05	4.83E-08	2.25E-05	4.538923	0.94055	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May "	LC50	7.94	1.71E-05	5.06E-08	1.5E-05	4.620429	0.859571	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun "	LC50	8.13	1.68E-05	4.94E-08	1.31E-05	4.262922	1.217467	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul "	LC50	8.1	2.17E-05	5.68E-08	1.75E-05	4.318715	1.161294	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug "	LC50	8.14	2.01E-05	5.46E-08	1.59E-05	4.236068	1.243962	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep "	LC50	8.09	1.95E-05	5.21E-08	1.58E-05	4.342459	1.138373	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct "	LC50	8.08	1.83E-05	5.36E-08	1.42E-05	4.370368	1.114763	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov "	LC50	8.11	1.74E-05	6.11E-08	1.22E-05	4.31451	1.169027	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec "	LC50	8.07	2.02E-05	7.28E-08	1.29E-05	4.39833	1.084173	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	1023	1.02
Feb	1013	1.01
Mar	1013	1.01
Apr	1623	1.62
May	1088	1.09
Jun	1069	1.07
Jul	1376	1.38
Aug	1278	1.28
Sep	1242	1.24
Oct	1164	1.16
Nov	1104	1.10
Dec	1285	1.29

Table BLM7-4: Predicted LC50 Values for Rainbow Trout - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"CLOSE WC Average "	"Jan	LC50	8	1.37352E-05	4.48E-08	1.14E-05	3.056385	0.643324	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb	LC50	8	1.36251E-05	4.31E-08	1.14E-05	3.055948	0.643725	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar	LC50	8	1.36251E-05	4.31E-08	1.14E-05	3.058525	0.644301	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr	LC50	7.98	2.26012E-05	3.04E-08	2.07E-05	3.064325	0.634993	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May	LC50	7.94	1.51393E-05	3.18E-08	1.38E-05	3.119284	0.580307	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun	LC50	8.13	1.44048E-05	3.11E-08	1.21E-05	2.877973	0.821939	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul	LC50	8.1	1.87371E-05	3.57E-08	1.62E-05	2.913609	0.78347	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug	LC50	8.14	1.72837E-05	3.44E-08	1.46E-05	2.85977	0.839804	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep	LC50	8.09	1.68915E-05	3.28E-08	1.45E-05	2.929097	0.767866	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct	LC50	8.08	1.56668E-05	3.37E-08	1.31E-05	2.947818	0.751914	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov	LC50	8.11	1.44817E-05	3.84E-08	1.12E-05	2.911186	0.788797	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec	LC50	8.07	1.64982E-05	4.58E-08	1.19E-05	2.968286	0.731676	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	873	0.87
Feb	866	0.87
Mar	866	0.87
Apr	1436	1.44
May	962	0.96
Jun	915	0.92
Jul	1191	1.19
Aug	1098	1.10
Sep	1073	1.07
Oct	996	1.00
Nov	920	0.92
Dec	1048	1.05

Table BLM7-5: Predicted LC50 Values for Daphnia magna - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Average "	"Jan	LC50	8	4.39E-06	1.27E-09	4.32E-06	0.098327	0.020697	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb	LC50	8	4.35E-06	1.22E-09	4.29E-06	0.09828	0.020703	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar	LC50	8	4.35E-06	1.22E-09	4.29E-06	0.098303	0.020709	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr	LC50	7.98	7.57E-06	8.57E-10	7.51E-06	0.098625	0.020439	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May	LC50	7.94	4.98E-06	8.98E-10	4.95E-06	0.100265	0.018654	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun	LC50	8.13	4.7E-06	8.78E-10	4.64E-06	0.092524	0.026425	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul	LC50	8.1	6.31E-06	1.01E-09	6.24E-06	0.093708	0.025199	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug	LC50	8.14	5.78E-06	9.71E-10	5.71E-06	0.091975	0.027011	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep	LC50	8.09	5.61E-06	9.26E-10	5.54E-06	0.094277	0.024716	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct	LC50	8.08	5.05E-06	9.52E-10	4.97E-06	0.094795	0.024181	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov	LC50	8.11	4.44E-06	1.09E-09	4.35E-06	0.093586	0.025358	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec	LC50	8.07	4.75E-06	1.29E-09	4.62E-06	0.095429	0.023524	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	279	0.28
Feb	277	0.28
Mar	277	0.28
Apr	481	0.48
May	317	0.32
Jun	299	0.30
Jul	401	0.40
Aug	367	0.37
Sep	356	0.36
Oct	321	0.32
Nov	282	0.28
Dec	302	0.30

Table BLM7-6: Predicted LC50 Values for Daphnia pulex - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Average "	"Jan	LC50	8	2.61E-06	4.74E-10	2.59E-06	0.036911	0.007769	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb	LC50	8	2.59E-06	4.57E-10	2.56E-06	0.036922	0.007778	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar	LC50	8	2.59E-06	4.56E-10	2.56E-06	0.036918	0.007777	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr	LC50	7.98	4.48E-06	3.21E-10	4.46E-06	0.037015	0.007671	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May	LC50	7.94	2.93E-06	3.36E-10	2.91E-06	0.037681	0.007011	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun	LC50	8.13	2.83E-06	3.29E-10	2.8E-06	0.034759	0.009928	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul	LC50	8.1	3.79E-06	3.78E-10	3.77E-06	0.035212	0.009469	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug	LC50	8.14	3.49E-06	3.64E-10	3.46E-06	0.034551	0.010147	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep	LC50	8.09	3.36E-06	3.47E-10	3.33E-06	0.035404	0.009282	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct	LC50	8.08	3.02E-06	3.57E-10	2.99E-06	0.035613	0.009084	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov	LC50	8.11	2.66E-06	4.07E-10	2.63E-06	0.035166	0.009529	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec	LC50	8.07	2.84E-06	4.84E-10	2.79E-06	0.035859	0.008839	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	166	0.17
Feb	164	0.16
Mar	164	0.16
Apr	285	0.28
May	186	0.19
Jun	180	0.18
Jul	241	0.24
Aug	221	0.22
Sep	213	0.21
Oct	192	0.19
Nov	169	0.17
Dec	180	0.18

Table BLM7-7: Predicted LC50 Values for Ceriodaphnia dubia - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Average "	"Jan	LC50	8	3.37E-06	7.44E-10	3.33E-06	0.057882	0.012184	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb	LC50	8	3.34E-06	7.17E-10	3.31E-06	0.0579	0.012197	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar	LC50	8	3.34E-06	7.15E-10	3.31E-06	0.057904	0.012198	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr	LC50	7.98	5.8E-06	5.03E-10	5.76E-06	0.058024	0.012025	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May	LC50	7.94	3.8E-06	5.28E-10	3.78E-06	0.059077	0.010991	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun	LC50	8.13	3.63E-06	5.16E-10	3.6E-06	0.054525	0.015573	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul	LC50	8.1	4.88E-06	5.94E-10	4.84E-06	0.055225	0.014851	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug	LC50	8.14	4.47E-06	5.71E-10	4.43E-06	0.05417	0.015908	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep	LC50	8.09	4.32E-06	5.44E-10	4.28E-06	0.055491	0.014548	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct	LC50	8.08	3.89E-06	5.6E-10	3.84E-06	0.055828	0.014241	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov	LC50	8.11	3.42E-06	6.38E-10	3.37E-06	0.055111	0.014933	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec	LC50	8.07	3.65E-06	7.61E-10	3.58E-06	0.05623	0.013861	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	214	0.21
Feb	212	0.21
Mar	212	0.21
Apr	368	0.37
May	242	0.24
Jun	231	0.23
Jul	310	0.31
Aug	284	0.28
Sep	275	0.27
Oct	247	0.25
Nov	218	0.22
Dec	232	0.23

Table BLM7-8: Predicted LC50 Values for Olfaction (User Defined) - Closure Worst Case, Average

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\CLOSE WC Average.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Average "	"Jan	LC50	8	5.47E-06	2.12E-09	5.36E-06	0.164227	0.034568	9.7	10	0.001245	0.000708	0.00048	7.44E-05	0.000383	6.32E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Feb	LC50	8	5.43E-06	2.04E-09	5.32E-06	0.16418	0.034585	9.7	10	0.001213	0.000658	0.000447	6.96E-05	0.000356	5.78E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Mar	LC50	8	5.43E-06	2.04E-09	5.32E-06	0.164241	0.034599	9.7	10	0.0012	0.000667	0.000446	6.7E-05	0.000355	5.11E-05	0.002237	3.12E-08
"CLOSE WC Average "	"Apr	LC50	7.98	9.46E-06	1.44E-09	9.37E-06	0.164741	0.03414	18.3	10	0.000753	0.000432	0.000306	6.7E-05	0.000251	5.61E-05	0.002667	3.12E-08
"CLOSE WC Average "	"May	LC50	7.94	6.26E-06	1.51E-09	6.2E-06	0.167701	0.0312	12.4	10	0.000808	0.000457	0.00027	6.42E-05	0.000403	4.15E-05	0.001796	3.12E-08
"CLOSE WC Average "	"Jun	LC50	8.13	5.84E-06	1.47E-09	5.73E-06	0.154619	0.04416	10.1	10	0.000871	0.000473	0.000349	4.99E-05	0.000297	5.5E-05	0.002604	3.12E-08
"CLOSE WC Average "	"Jul	LC50	8.1	7.83E-06	1.69E-09	7.71E-06	0.156517	0.042089	13.5	10	0.001023	0.000547	0.000362	5.58E-05	0.000198	4.15E-05	0.002628	3.12E-08
"CLOSE WC Average "	"Aug	LC50	8.14	7.17E-06	1.63E-09	7.04E-06	0.153617	0.045113	12.1	10	0.001015	0.000531	0.000339	5.52E-05	0.000233	4.29E-05	0.002643	3.12E-08
"CLOSE WC Average "	"Sep	LC50	8.09	6.97E-06	1.55E-09	6.86E-06	0.157494	0.041289	12.3	10	0.000923	0.000485	0.000328	5.09E-05	0.000257	4.15E-05	0.00263	3.12E-08
"CLOSE WC Average "	"Oct	LC50	8.08	6.29E-06	1.6E-09	6.16E-06	0.158312	0.040383	11.1	10	0.000948	0.000502	0.000341	5.47E-05	0.000246	4.57E-05	0.002854	3.12E-08
"CLOSE WC Average "	"Nov	LC50	8.11	5.53E-06	1.82E-09	5.37E-06	0.156389	0.042375	9.3	10	0.001153	0.000592	0.000398	6.06E-05	0.000305	5.9E-05	0.003132	3.12E-08
"CLOSE WC Average "	"Dec	LC50	8.07	5.92E-06	2.17E-09	5.7E-06	0.15935	0.03928	9.9	10	0.001335	0.000765	0.000518	7.93E-05	0.000415	7.53E-05	0.00405	3.12E-08

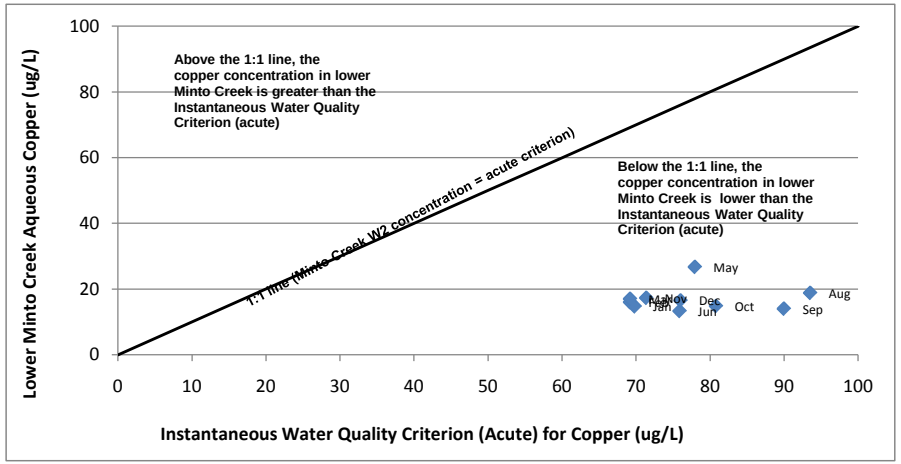
Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	348	0.35
Feb	345	0.35
Mar	345	0.35
Apr	601	0.60
May	398	0.40
Jun	371	0.37
Jul	498	0.50
Aug	455	0.46
Sep	443	0.44
Oct	399	0.40
Nov	351	0.35
Dec	376	0.38

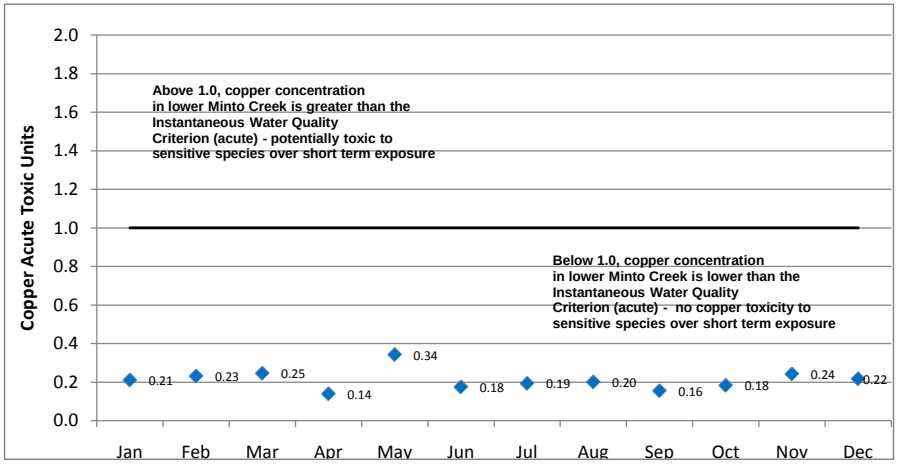
Table BLM7-9: BLM Model Results Summary - Closure Worst Case, Average

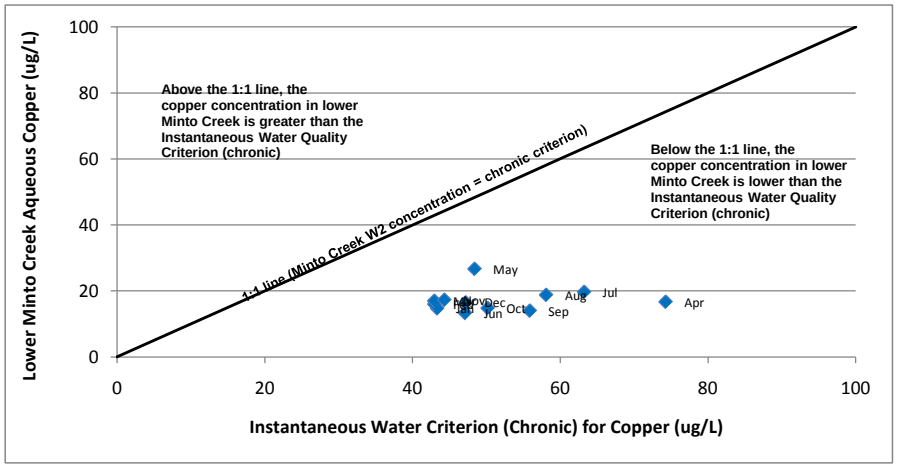
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	14.7	69.8	43.4	0.21	0.34	1,023	873	279	166	214	348
Feb	16.0	69.2	43.0	0.23	0.37	1,013	866	277	164	212	345
Mar	17.0	69.2	43.0	0.25	0.40	1,013	866	277	164	212	345
Apr	16.7	119.6	74.3	0.14	0.22	1,623	1,436	481	285	368	601
May	26.7	77.9	48.4	0.34	0.55	1,088	962	317	186	242	398
Jun	13.3	75.9	47.1	0.18	0.28	1,069	915	299	180	231	371
Jul	19.7	101.8	63.3	0.19	0.31	1,376	1,191	401	241	310	498
Aug	18.8	93.5	58.1	0.20	0.32	1,278	1,098	367	221	284	455
Sep	14.0	90.0	55.9	0.16	0.25	1,242	1,073	356	213	275	443
Oct	14.8	80.8	50.2	0.18	0.29	1,164	996	321	192	247	399
Nov	17.3	71.4	44.3	0.24	0.39	1,104	920	282	169	218	351
Dec	16.5	76.0	47.2	0.22	0.35	1,285	1,048	302	180	232	376

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







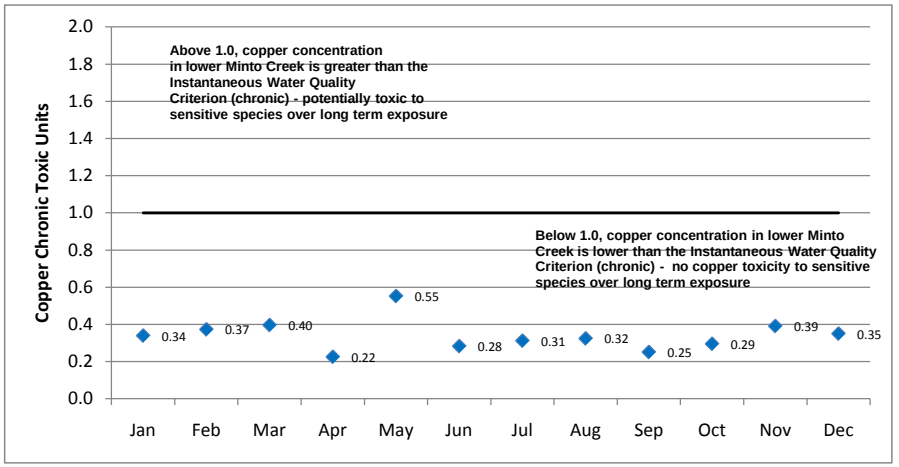


Figure BLM7-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Closure Worst Case, Average

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 8

COPPER

CLOSURE WORST CASE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM8-1: BLM Input Parameters - Closure Worst Case, Maximum

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	19.0	9.7	10	58.5	20.9	15.09	4.57	50.4	3.40	110	0.001
Feb	10	8	19.6	9.7	10	52.7	17.6	13.29	4.23	43.6	2.76	110	0.001
Mar	10	8	20.1	9.7	10	52.6	17.5	12.91	4.06	42.3	2.72	110	0.001
Apr	10	7.98	20.1	18.3	10	51.7	17.5	12.61	3.78	42.0	2.56	131	0.001
May	10	7.94	29.5	12.4	10	36.7	12.5	8.70	3.56	45.9	2.48	88	0.001
Jun	10	8.13	28.8	10.1	10	37.8	12.4	9.89	3.43	45.4	2.40	129	0.001
Jul	10	8.1	22.0	13.5	10	44.2	14.4	10.07	3.07	32.4	2.39	130	0.001
Aug	10	8.14	21.8	12.1	10	43.8	14.3	9.69	3.01	28.2	1.94	131	0.001
Sep	10	8.09	20.3	12.3	10	43.3	13.7	9.44	2.98	30.6	1.93	130	0.001
Oct	10	8.08	17.4	11.1	10	41.7	13.4	9.99	3.20	30.6	2.16	141	0.001
Nov	10	8.11	21.0	9.3	10	53.0	16.4	12.23	3.76	39.9	2.89	155	0.001
Dec	10	8.07	20.7	9.9	10	58.5	20.9	15.08	4.54	50.3	3.40	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM8-2: Instantaneous Water Quality Criteria for Copper - Closure Worst Case, Maximum

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Cu ug/L	Acute Toxic Units (Acute TU=Cu/CMC)
CLOSE WC Maximum	Jan	145	72.4	45.0	19	0.262
CLOSE WC Maximum	Feb	141	71	43.9	19.6	0.277
CLOSE WC Maximum	Mar	141	70.6	43.8	20.1	0.285
CLOSE WC Maximum	Apr	261	131	81.1	20.1	0.154
CLOSE WC Maximum	May	160	80	49.7	29.5	0.369
CLOSE WC Maximum	Jun	154	76.8	47.7	28.8	0.375
CLOSE WC Maximum	Jul	206	103	64.0	22	0.213
CLOSE WC Maximum	Aug	191	95.3	59.2	21.8	0.229
CLOSE WC Maximum	Sep	185	92.5	57.4	20.3	0.220
CLOSE WC Maximum	Oct	165	82.4	51.2	17.4	0.211
CLOSE WC Maximum	Nov	147	73.5	45.6	21	0.286
CLOSE WC Maximum	Dec	156	77.9	48.4	20.7	0.266

Table BLM8-3: Predicted LC50 Values for Fathead Minnow - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"CLOSE WC Maximur	"Jan "	LC50	8	1.68E-05	8.31E-08	1.26E-05	4.531135	0.95059	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximur	"Feb "	LC50	8	1.63E-05	7.45E-08	1.24E-05	4.529089	0.952199	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximur	"Mar "	LC50	8	1.63E-05	7.41E-08	1.24E-05	4.52782	0.95207	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximur	"Apr "	LC50	7.98	2.77E-05	7.42E-08	2.33E-05	4.546465	0.93357	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximur	"May "	LC50	7.94	1.75E-05	5.64E-08	1.52E-05	4.619285	0.857308	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximur	"Jun "	LC50	8.13	1.71E-05	5.27E-08	1.31E-05	4.265299	1.21539	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximur	"Jul "	LC50	8.1	2.2E-05	6.07E-08	1.76E-05	4.320721	1.159288	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximur	"Aug "	LC50	8.14	2.05E-05	5.9E-08	1.6E-05	4.237697	1.242335	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximur	"Sep "	LC50	8.09	2.01E-05	5.93E-08	1.6E-05	4.344298	1.135935	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximur	"Oct "	LC50	8.08	1.87E-05	5.83E-08	1.43E-05	4.367941	1.1121	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximur	"Nov "	LC50	8.11	1.81E-05	6.9E-08	1.23E-05	4.315187	1.166364	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximur	"Dec "	LC50	8.07	2.09E-05	7.99E-08	1.31E-05	4.39982	1.082506	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	1066	1.07
Feb	1035	1.03
Mar	1034	1.03
Apr	1762	1.76
May	1109	1.11
Jun	1085	1.08
Jul	1395	1.39
Aug	1302	1.30
Sep	1280	1.28
Oct	1189	1.19
Nov	1148	1.15
Dec	1330	1.33

Table BLM8-4: Predicted LC50 Values for Rainbow Trout - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Rainbow_Trout_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Maximum "	"Jan	LC50	8	1.42113E-05	5.23E-08	1.16E-05	3.058324	0.641612	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Feb	LC50	8	1.38668E-05	4.68E-08	1.14E-05	3.055789	0.642455	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Mar	LC50	8	1.38565E-05	4.67E-08	1.14E-05	3.057162	0.642837	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Apr	LC50	7.98	2.42183E-05	4.66E-08	2.14E-05	3.067543	0.629894	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximum "	"May	LC50	7.94	1.53966E-05	3.55E-08	1.4E-05	3.118465	0.578771	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximum "	"Jun	LC50	8.13	1.45762E-05	3.32E-08	1.21E-05	2.879417	0.820491	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximum "	"Jul	LC50	8.1	1.89493E-05	3.82E-08	1.62E-05	2.916002	0.782395	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximum "	"Aug	LC50	8.14	1.75573E-05	3.71E-08	1.47E-05	2.860987	0.838741	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximum "	"Sep	LC50	8.09	1.73306E-05	3.73E-08	1.47E-05	2.932432	0.76677	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximum "	"Oct	LC50	8.08	1.59529E-05	3.67E-08	1.32E-05	2.948939	0.75082	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximum "	"Nov	LC50	8.11	1.49499E-05	4.34E-08	1.13E-05	2.911323	0.786914	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximum "	"Dec	LC50	8.07	1.69714E-05	5.03E-08	1.2E-05	2.969391	0.730575	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	903	0.90
Feb	881	0.88
Mar	881	0.88
Apr	1539	1.54
May	978	0.98
Jun	926	0.93
Jul	1204	1.20
Aug	1116	1.12
Sep	1101	1.10
Oct	1014	1.01
Nov	950	0.95
Dec	1078	1.08

Table BLM8-5: Predicted LC50 Values for Daphnia magna - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Magna_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Maximum "	"Jan	LC50	8	4.53E-06	1.48E-09	4.45E-06	0.0984	0.020644	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Feb	LC50	8	4.43E-06	1.32E-09	4.36E-06	0.098231	0.020653	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Mar	LC50	8	4.42E-06	1.32E-09	4.36E-06	0.098324	0.020675	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Apr	LC50	7.98	8.18E-06	1.32E-09	8.11E-06	0.098732	0.020275	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximum "	"May	LC50	7.94	5.1E-06	1E-09	5.06E-06	0.100402	0.018635	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximum "	"Jun	LC50	8.13	4.75E-06	9.37E-10	4.68E-06	0.092542	0.026371	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximum "	"Jul	LC50	8.1	6.38E-06	1.08E-09	6.3E-06	0.093746	0.025154	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximum "	"Aug	LC50	8.14	5.87E-06	1.05E-09	5.79E-06	0.092013	0.026976	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximum "	"Sep	LC50	8.09	5.74E-06	1.05E-09	5.67E-06	0.094331	0.024667	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximum "	"Oct	LC50	8.08	5.13E-06	1.04E-09	5.05E-06	0.094823	0.024143	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximum "	"Nov	LC50	8.11	4.55E-06	1.23E-09	4.45E-06	0.093643	0.025312	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximum "	"Dec	LC50	8.07	4.85E-06	1.42E-09	4.71E-06	0.09547	0.02349	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	288	0.29
Feb	281	0.28
Mar	281	0.28
Apr	520	0.52
May	324	0.32
Jun	302	0.30
Jul	405	0.41
Aug	373	0.37
Sep	365	0.36
Oct	326	0.33
Nov	289	0.29
Dec	308	0.31

Table BLM8-6: Predicted LC50 Values for Daphnia pulex - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Daphnia_Pulex_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Maximum	" "Jan	LC50	8	2.71E-06	5.54E-10	2.68E-06	0.036945	0.007751	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximum	" "Feb	LC50	8	2.64E-06	4.96E-10	2.61E-06	0.03693	0.007764	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximum	" "Mar	LC50	8	2.64E-06	4.94E-10	2.61E-06	0.036964	0.007773	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximum	" "Apr	LC50	7.98	4.88E-06	4.93E-10	4.85E-06	0.037062	0.007611	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximum	" "May	LC50	7.94	3E-06	3.75E-10	2.98E-06	0.037688	0.006995	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximum	" "Jun	LC50	8.13	2.86E-06	3.51E-10	2.83E-06	0.034766	0.009907	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximum	" "Jul	LC50	8.1	3.84E-06	4.04E-10	3.81E-06	0.035228	0.009453	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximum	" "Aug	LC50	8.14	3.55E-06	3.92E-10	3.52E-06	0.034565	0.010134	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximum	" "Sep	LC50	8.09	3.45E-06	3.95E-10	3.42E-06	0.035427	0.009264	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximum	" "Oct	LC50	8.08	3.07E-06	3.88E-10	3.05E-06	0.035625	0.009071	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximum	" "Nov	LC50	8.11	2.74E-06	4.6E-10	2.7E-06	0.035183	0.00951	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximum	" "Dec	LC50	8.07	2.9E-06	5.32E-10	2.85E-06	0.035872	0.008826	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	172	0.17
Feb	168	0.17
Mar	168	0.17
Apr	310	0.31
May	191	0.19
Jun	182	0.18
Jul	244	0.24
Aug	225	0.23
Sep	219	0.22
Oct	195	0.20
Nov	174	0.17
Dec	185	0.18

Table BLM8-7: Predicted LC50 Values for Ceriodaphnia dubia - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Ceriodaphnia_Dubia_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cu	Free Cu	TOrg Cu	BL-Cu	BL-CuOH	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S
				mol/L	mol/L	mol/L	nmol/gw	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"CLOSE WC Maximum "	"Jan	LC50	8	3.49E-06	8.69E-10	3.44E-06	0.057924	0.012152	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Feb	LC50	8	3.41E-06	7.79E-10	3.37E-06	0.057902	0.012174	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Mar	LC50	8	3.4E-06	7.75E-10	3.36E-06	0.057921	0.012179	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Apr	LC50	7.98	6.3E-06	7.74E-10	6.25E-06	0.05813	0.011937	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximum "	"May	LC50	7.94	3.89E-06	5.89E-10	3.87E-06	0.059114	0.010972	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximum "	"Jun	LC50	8.13	3.67E-06	5.51E-10	3.63E-06	0.054549	0.015544	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximum "	"Jul	LC50	8.1	4.93E-06	6.34E-10	4.89E-06	0.055249	0.014825	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximum "	"Aug	LC50	8.14	4.55E-06	6.16E-10	4.5E-06	0.054193	0.015888	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximum "	"Sep	LC50	8.09	4.43E-06	6.19E-10	4.39E-06	0.055543	0.014524	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximum "	"Oct	LC50	8.08	3.96E-06	6.09E-10	3.91E-06	0.055841	0.014218	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximum "	"Nov	LC50	8.11	3.52E-06	7.21E-10	3.46E-06	0.055142	0.014905	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximum "	"Dec	LC50	8.07	3.74E-06	8.35E-10	3.65E-06	0.056252	0.01384	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

Month	Dis. Cu	Dis. Cu
	ug/L	mg/L
Jan	222	0.22
Feb	216	0.22
Mar	216	0.22
Apr	400	0.40
May	247	0.25
Jun	233	0.23
Jul	313	0.31
Aug	289	0.29
Sep	282	0.28
Oct	251	0.25
Nov	223	0.22
Dec	237	0.24

Table BLM8-8: Predicted LC50 Values for Olfaction (User Defined) - Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\Program Files\BLM\Model\Cu_Fathead_Minnow_06-10-07.DAT
E:\OP WC Maximum.blm
/S BLM.SCR, /W /Q /O3 /L /A4 /E

Site Label	Sample La	Mode	pH	Dis. Cu mol/L	Free Cu mol/L	TOrg Cu mol/L	BL-Cu nmol/gw	BL-CuOH nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L
"CLOSE WC Maximum "	"Jan	LC50	8	5.63E-06	2.48E-09	5.5E-06	0.164283	0.034466	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Feb	LC50	8	5.52E-06	2.22E-09	5.4E-06	0.164259	0.034535	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Mar	LC50	8	5.51E-06	2.21E-09	5.4E-06	0.164259	0.03454	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08
"CLOSE WC Maximum "	"Apr	LC50	7.98	1.02E-05	2.21E-09	1.01E-05	0.165036	0.03389	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08
"CLOSE WC Maximum "	"May	LC50	7.94	6.38E-06	1.68E-09	6.31E-06	0.167597	0.031106	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08
"CLOSE WC Maximum "	"Jun	LC50	8.13	5.9E-06	1.57E-09	5.78E-06	0.154683	0.044078	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08
"CLOSE WC Maximum "	"Jul	LC50	8.1	7.91E-06	1.81E-09	7.78E-06	0.156739	0.042056	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08
"CLOSE WC Maximum "	"Aug	LC50	8.14	7.27E-06	1.76E-09	7.13E-06	0.153683	0.045056	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08
"CLOSE WC Maximum "	"Sep	LC50	8.09	7.13E-06	1.77E-09	7.01E-06	0.157587	0.041207	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08
"CLOSE WC Maximum "	"Oct	LC50	8.08	6.38E-06	1.74E-09	6.25E-06	0.15834	0.040316	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08
"CLOSE WC Maximum "	"Nov	LC50	8.11	5.66E-06	2.06E-09	5.49E-06	0.156476	0.042296	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08
"CLOSE WC Maximum "	"Dec	LC50	8.07	6.04E-06	2.38E-09	5.8E-06	0.15943	0.039226	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08

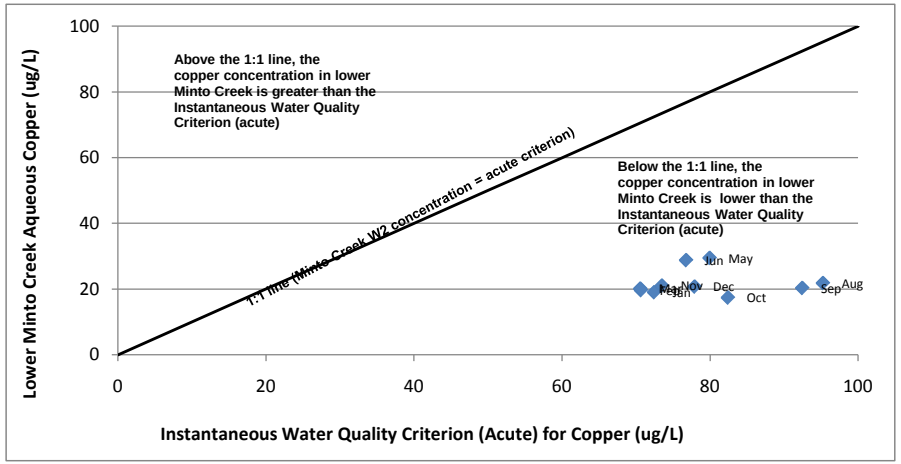
Month	Dis. Cu ug/L	Dis. Cu mg/L
Jan	358	0.36
Feb	351	0.35
Mar	350	0.35
Apr	647	0.65
May	406	0.41
Jun	375	0.37
Jul	503	0.50
Aug	462	0.46
Sep	453	0.45
Oct	406	0.41
Nov	360	0.36
Dec	384	0.38

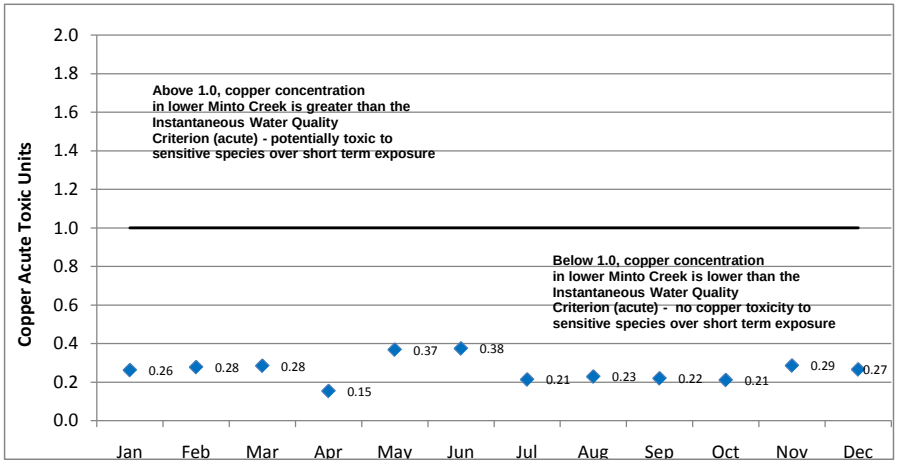
Table BLM8-9: BLM Model Results Summary - Closure Worst Case, Maximum

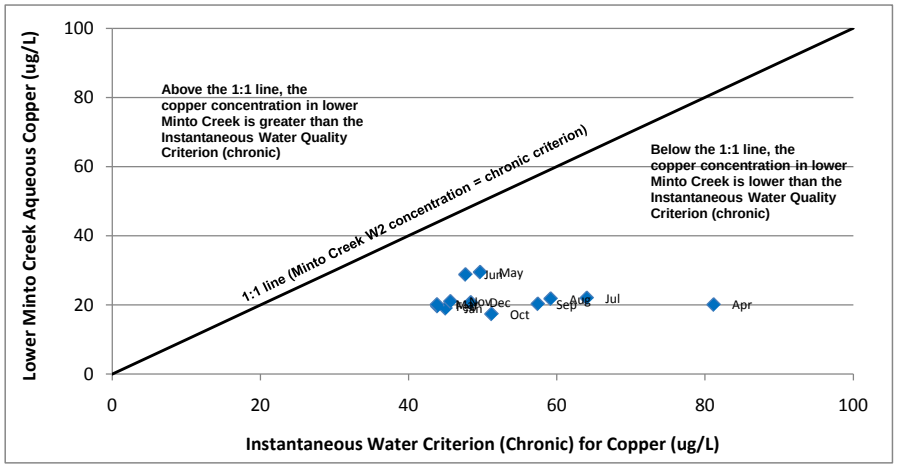
Month	Copper	USEPA (2007) Criteria and Toxic Units				Effect Concentrations					
		Maximum Criterion	Chronic Criterion	Acute Toxic Units	Chronic Toxic Units	Fathead	Rainbow	D.magna	D. pulex	C. dubia	Olfaction
	ug/L	ug/L	ug/L	ug/L	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	19.0	72.4	45.0	0.26	0.42	1,066	903	288	172	222	358
Feb	19.6	71	43.9	0.28	0.45	1,035	881	281	168	216	351
Mar	20.1	70.6	43.8	0.28	0.46	1,034	881	281	168	216	350
Apr	20.1	131	81.1	0.15	0.25	1,762	1,539	520	310	400	647
May	29.5	80	49.7	0.37	0.59	1,109	978	324	191	247	406
Jun	28.8	76.8	47.7	0.38	0.60	1,085	926	302	182	233	375
Jul	22.0	103	64.0	0.21	0.34	1,395	1,204	405	244	313	503
Aug	21.8	95.3	59.2	0.23	0.37	1,302	1,116	373	225	289	462
Sep	20.3	92.5	57.4	0.22	0.35	1,280	1,101	365	219	282	453
Oct	17.4	82.4	51.2	0.21	0.34	1,189	1,014	326	195	251	406
Nov	21.0	73.5	45.6	0.29	0.46	1,148	950	289	174	223	360
Dec	20.7	77.9	48.4	0.27	0.43	1,330	1,078	308	185	237	384

[1] Maximum criterion (Continuous Maximum Criterion or CMC) = Final Acute Value / 2

[2] Chronic criterion (Continuous Chronic Criterion or CCC) = Final Acute Value / Acute:Chronic Ratio







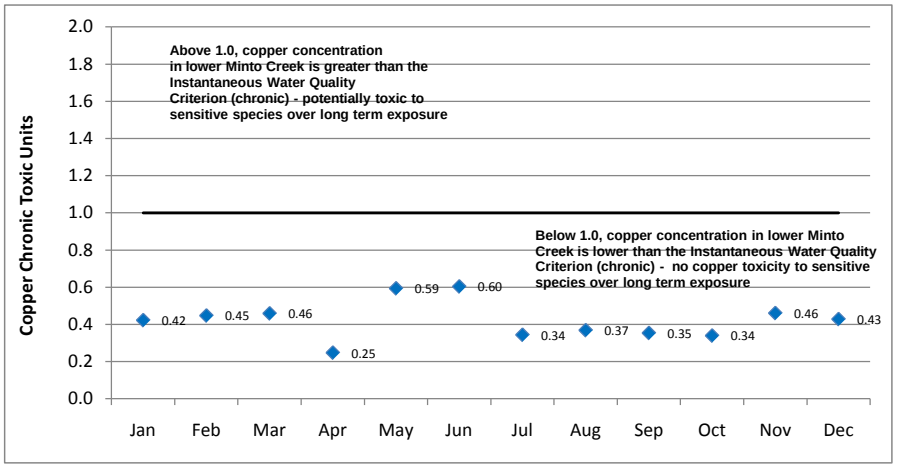


Figure BLM8-1 - Plots of Dissolved Copper in Minto Creek Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Closure Phase Worst Case, Maximum

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 9

COPPER

SENSITIVITY ANALYSIS

May, Operational Worst Case, Maximum

Temperature = 0 to 20°C

pH = 7.6 to 8.3 pH units

DOC = 7 to 21 mg/L

Alkalinity = 50 to 190 mg/L

Table BLM9-1: BLM Input Parameters - Operational Worst Case, Maximum, Sensitivity

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Raw	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 0.1	0.1	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 2	2	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 4	4	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 6	6	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 8	8	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 10	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 12	12	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 14	14	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 16	16	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 18	18	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Temp 20	20	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4	10	7.4	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5	10	7.5	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6	10	7.6	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7	10	7.7	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8	10	7.8	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9	10	7.9	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0	10	8	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.1	10	8.1	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.2	10	8.2	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.3	10	8.3	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.4	10	8.4	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.5	10	8.5	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 7	10	7.94	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 8	10	7.94	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 9	10	7.94	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 10	10	7.94	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 11	10	7.94	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 12	10	7.94	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 13	10	7.94	26.3	13	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001

Table BLM9-1: BLM Input Parameters - Operational Worst Case, Maximum, Sensitivity

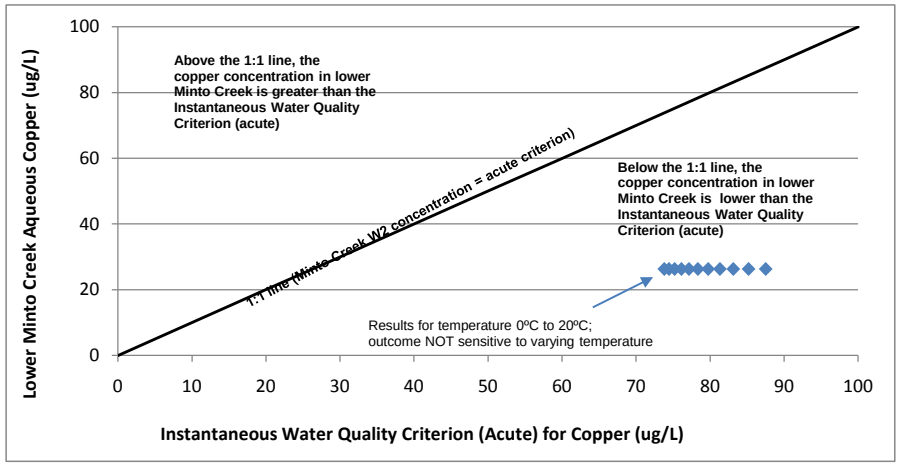
Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DOC 14	10	7.94	26.3	14	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 15	10	7.94	26.3	15	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 16	10	7.94	26.3	16	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 17	10	7.94	26.3	17	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 18	10	7.94	26.3	18	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 19	10	7.94	26.3	19	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 20	10	7.94	26.3	20	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
DOC 21	10	7.94	26.3	21	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
ALK 50	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	50	0.001
ALK 60	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	60	0.001
ALK 70	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	70	0.001
ALK 80	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	80	0.001
ALK 90	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	90	0.001
ALK 100	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	100	0.001
ALK 110	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	110	0.001
ALK 120	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	120	0.001
ALK 130	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	130	0.001
ALK 140	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	140	0.001
ALK 150	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	150	0.001
ALK 160	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	160	0.001
ALK 170	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	170	0.001
ALK 180	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	180	0.001
ALK 190	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	190	0.001

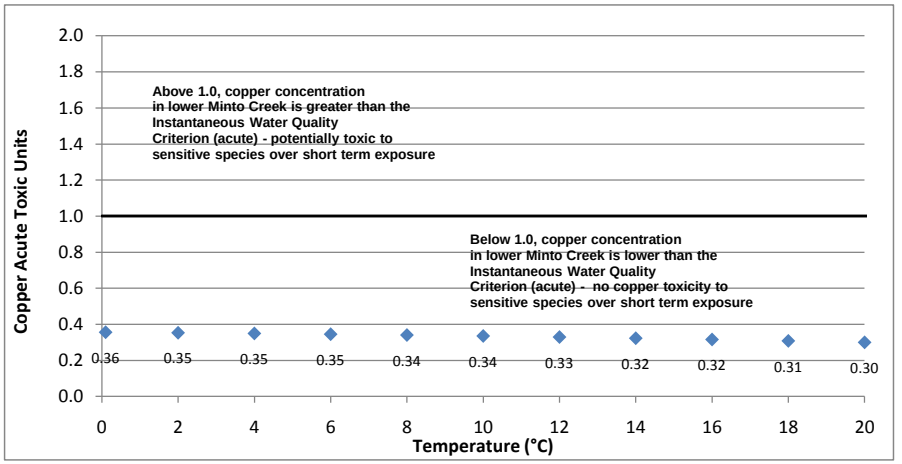
Table BLM9-2: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Maximum, Sensitivity

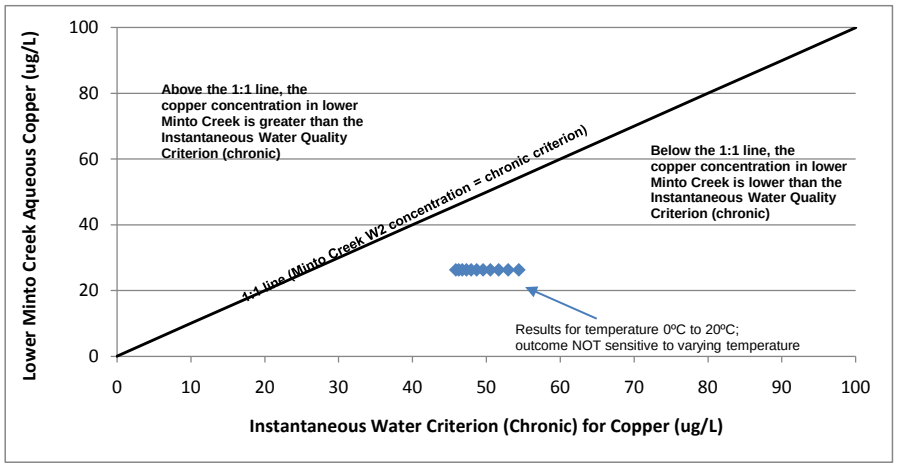
Site Label	Sample Label	Final Acute Value	CMC	CCC	Copper	Acute Toxic Units	Chronic Toxic Units
		(FAV), ug/L	(CMC=FAV/2), ug/L	(CCC=FAV/ACR), ug/L	ug/L	(Acute TU=Cu/CMC)	(Chronic TU=Cu/CCC)
Sensitivity	Raw	157	78.4	48.7	26.3	0.336	0.540
Sensitivity	Temp 0.1	148	73.8	45.8	26.3	0.356	0.574
Sensitivity	Temp 2	149	74	46.2	26.3	0.353	0.569
Sensitivity	Temp 4	150	75.2	46.7	26.3	0.350	0.563
Sensitivity	Temp 6	152	76.1	47.3	26.3	0.346	0.556
Sensitivity	Temp 8	154	77.1	47.9	26.3	0.341	0.549
Sensitivity	Temp 10	157	78.4	48.7	26.3	0.336	0.540
Sensitivity	Temp 12	160	79.8	49.5	26.3	0.330	0.531
Sensitivity	Temp 14	163	81.3	50.5	26.3	0.323	0.521
Sensitivity	Temp 16	166	83.1	51.6	26.3	0.316	0.509
Sensitivity	Temp 18	170	85.2	52.9	26.3	0.309	0.497
Sensitivity	Temp 20	175	87.5	54.4	26.3	0.301	0.484
Sensitivity	pH 7.6	111	55.3	34.3	26.3	0.476	0.766
Sensitivity	pH 7.65	117	58.4	36.3	26.3	0.450	0.725
Sensitivity	pH 7.7	123	61.7	38.3	26.3	0.427	0.687
Sensitivity	pH 7.75	130	65.0	40.4	26.3	0.405	0.651
Sensitivity	pH 7.8	137	68.4	42.5	26.3	0.384	0.619
Sensitivity	pH 7.85	144	71.9	44.7	26.3	0.366	0.589
Sensitivity	pH 7.9	151	75.5	46.9	26.3	0.349	0.561
Sensitivity	pH 7.95	158	79.1	49.1	26.3	0.333	0.536
Sensitivity	pH 8.0	165	82.7	51.4	26.3	0.318	0.512
Sensitivity	pH 8.05	173	86.4	53.7	26.3	0.304	0.490
Sensitivity	pH 8.1	180	90.1	56.0	26.3	0.292	0.470
Sensitivity	pH 8.15	188	93.9	58.3	26.3	0.280	0.451
Sensitivity	pH 8.2	195	97.7	60.7	26.3	0.269	0.433
Sensitivity	pH 8.25	203	101.5	63.1	26.3	0.259	0.417
Sensitivity	pH 8.3	211	105.4	65.4	26.3	0.250	0.402
Sensitivity	DOC 7	88	44.0	27.3	26.3	0.598	0.962
Sensitivity	DOC 8	101	50.3	31.3	26.3	0.523	0.841
Sensitivity	DOC 9	113	56.7	35.2	26.3	0.464	0.747
Sensitivity	DOC 10	126	63.0	39.2	26.3	0.417	0.672
Sensitivity	DOC 11	139	69.4	43.1	26.3	0.379	0.610
Sensitivity	DOC 12	152	75.8	47.1	26.3	0.347	0.559
Sensitivity	DOC 13	164	82.2	51.1	26.3	0.320	0.515

Table BLM9-2: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Maximum, Sensitivity

Site Label	Sample Label	Final Acute Value	CMC	CCC	Copper	Acute Toxic Units	Chronic Toxic Units
		(FAV), ug/L	(CMC=FAV/2), ug/L	(CCC=FAV/ACR), ug/L	ug/L	(Acute TU=Cu/CMC)	(Chronic TU=Cu/CCC)
Sensitivity	DOC 14	177	88.6	55.0	26.3	0.297	0.478
Sensitivity	DOC 15	190	95.1	59.0	26.3	0.277	0.445
Sensitivity	DOC 16	203	101.5	63.1	26.3	0.259	0.417
Sensitivity	DOC 17	216	108.0	67.1	26.3	0.244	0.392
Sensitivity	DOC 18	229	114.4	71.1	26.3	0.230	0.370
Sensitivity	DOC 19	242	120.9	75.1	26.3	0.218	0.350
Sensitivity	DOC 20	255	127.4	79.1	26.3	0.207	0.332
Sensitivity	DOC 21	268	133.9	83.2	26.3	0.196	0.316
Sensitivity	ALK 50	158	79.0	49.1	26.3	0.333	0.536
Sensitivity	ALK 60	158	78.9	49.0	26.3	0.333	0.537
Sensitivity	ALK 70	157	78.7	48.9	26.3	0.334	0.538
Sensitivity	ALK 80	157	78.5	48.8	26.3	0.335	0.539
Sensitivity	ALK 90	157	78.4	48.7	26.3	0.336	0.540
Sensitivity	ALK 100	156	78.2	48.6	26.3	0.336	0.542
Sensitivity	ALK 110	156	78.0	48.5	26.3	0.337	0.543
Sensitivity	ALK 120	156	77.9	48.4	26.3	0.338	0.544
Sensitivity	ALK 130	155	77.7	48.3	26.3	0.338	0.545
Sensitivity	ALK 140	155	77.5	48.2	26.3	0.339	0.546
Sensitivity	ALK 150	155	77.4	48.1	26.3	0.340	0.547
Sensitivity	ALK 160	154	77.2	48.0	26.3	0.341	0.548
Sensitivity	ALK 170	154	77.1	47.9	26.3	0.341	0.549
Sensitivity	ALK 180	154	76.9	47.8	26.3	0.342	0.550
Sensitivity	ALK 190	154	76.8	47.7	26.3	0.343	0.552
Sensitivity	pH 7.6 DOC 7	62	31.0	19.3	26.3	0.848	1.365
Sensitivity	pH 7.7 DOC 7	69	34.6	21.5	26.3	0.759	1.223
Sensitivity	pH 7.8 DOC7	77	38.4	23.9	26.3	0.685	1.102
Sensitivity	pH 7.9 DOC7	85	42.4	26.3	26.3	0.621	0.999
Sensitivity	pH 8.0 DOC7	93	46.5	28.9	26.3	0.566	0.911
Sensitivity	pH 7.6 DOC 8	71	35.5	22.0	26.3	0.741	1.193
Sensitivity	pH 7.6 DOC 9	80	40.0	24.8	26.3	0.658	1.059
Sensitivity	pH 7.6 DOC 10	89	44.5	27.6	26.3	0.592	0.953
Sensitivity	pH 7.6 DOC 11	98	49.0	30.4	26.3	0.537	0.865
Sensitivity	pH 7.6 DOC 12	107	53.5	33.2	26.3	0.492	0.792







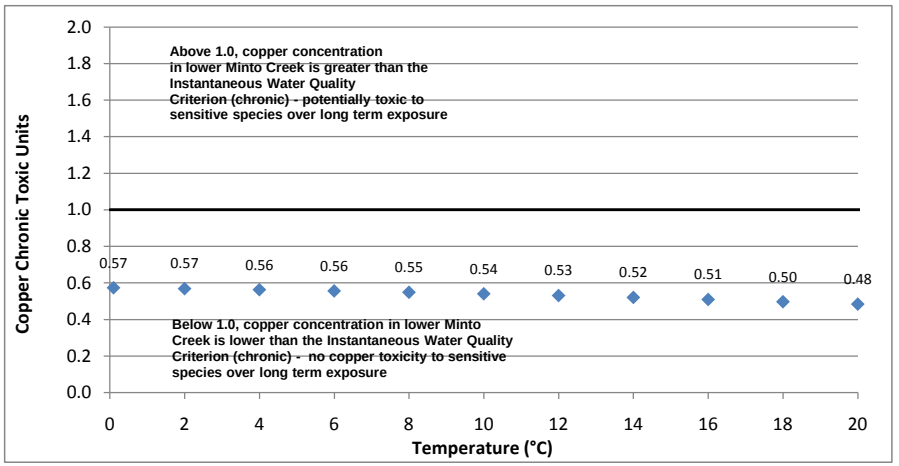
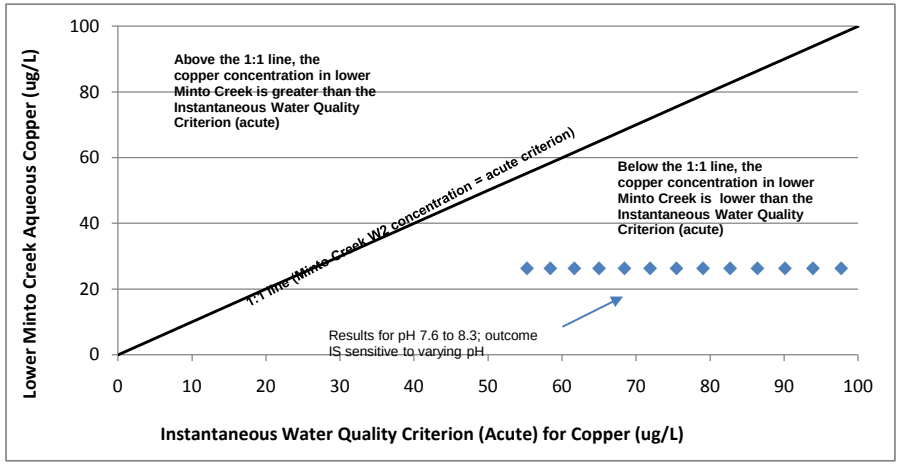
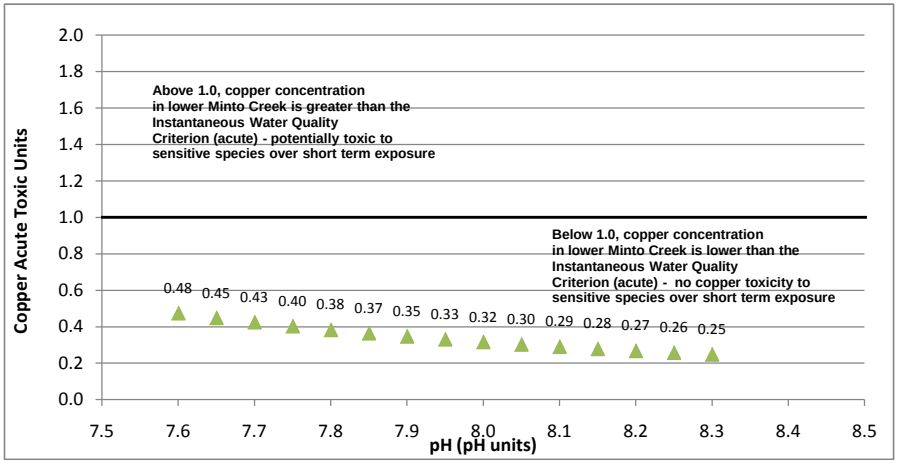
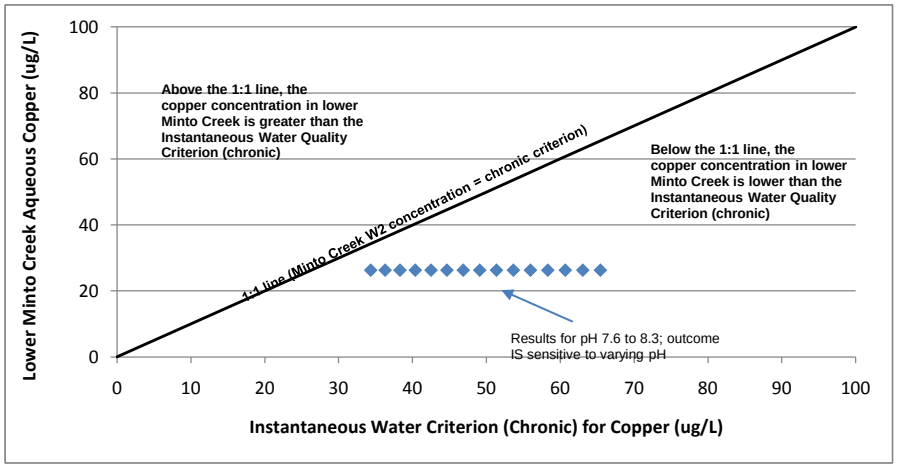


Figure BLM9-1: Plots of Dissolved Copper in Minto Creek in May Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Sensitivity to Temperature of 0°C to 20°C







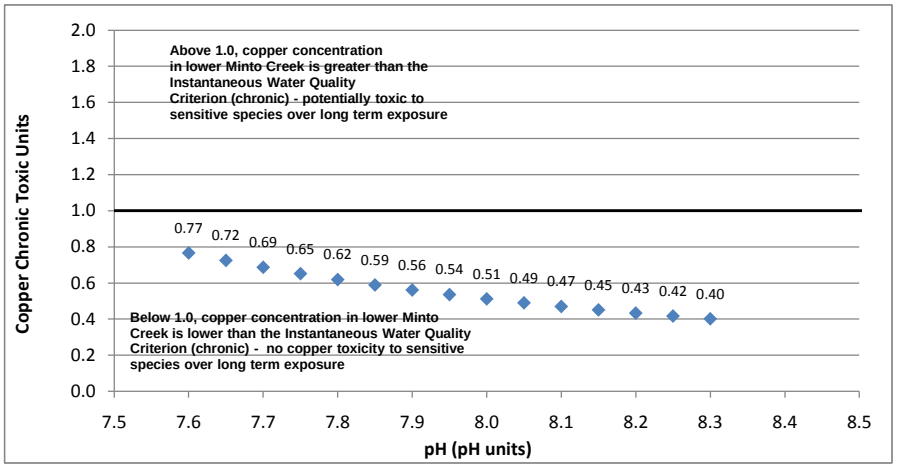
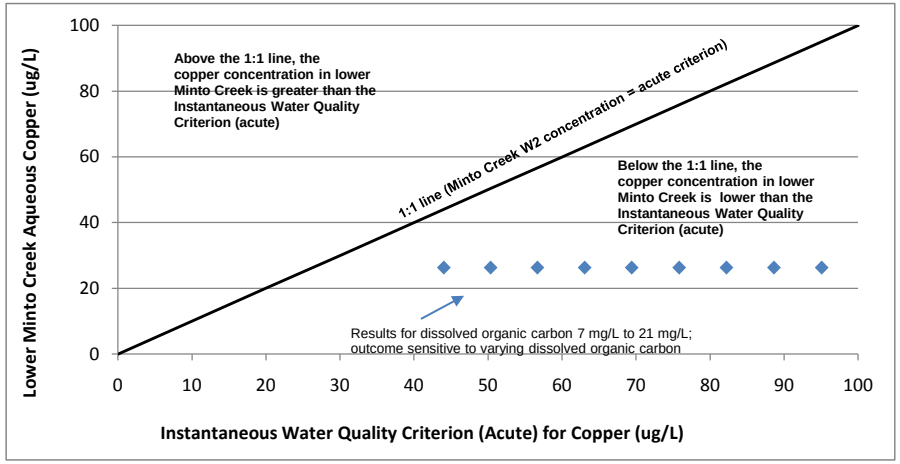
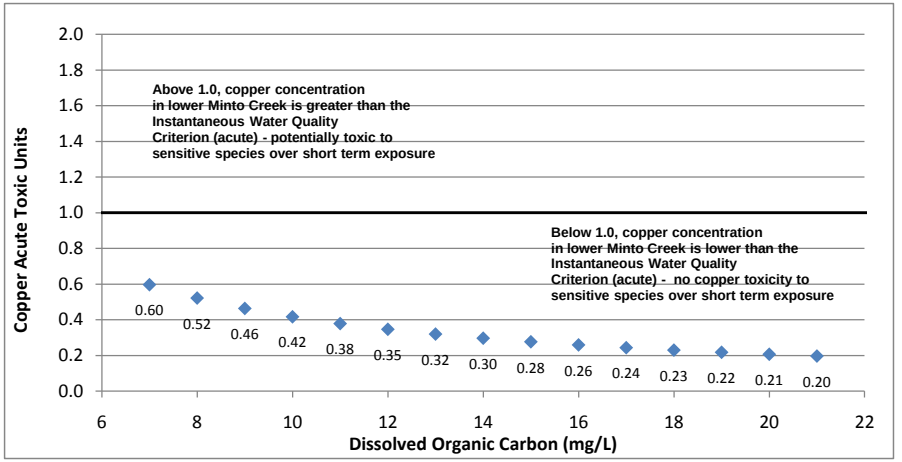
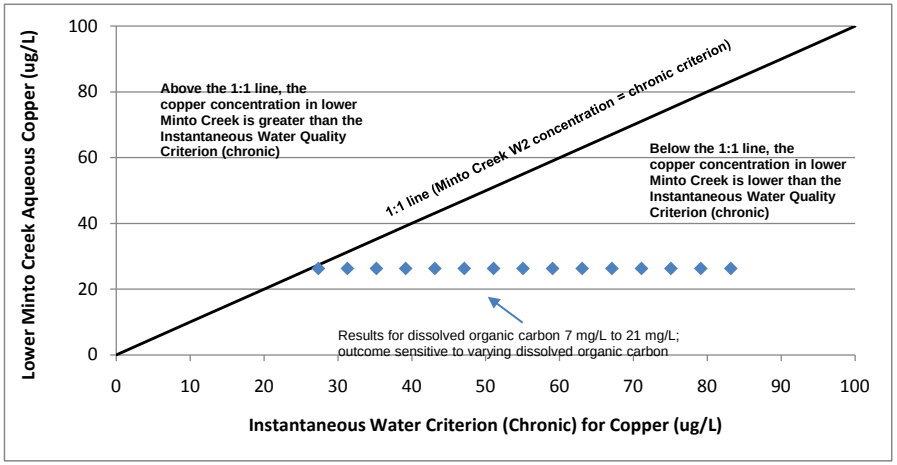


Figure BLM9-2: Plots of Dissolved Copper in Minto Creek in May Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Sensitivity to pH of 7.6 to 8.3







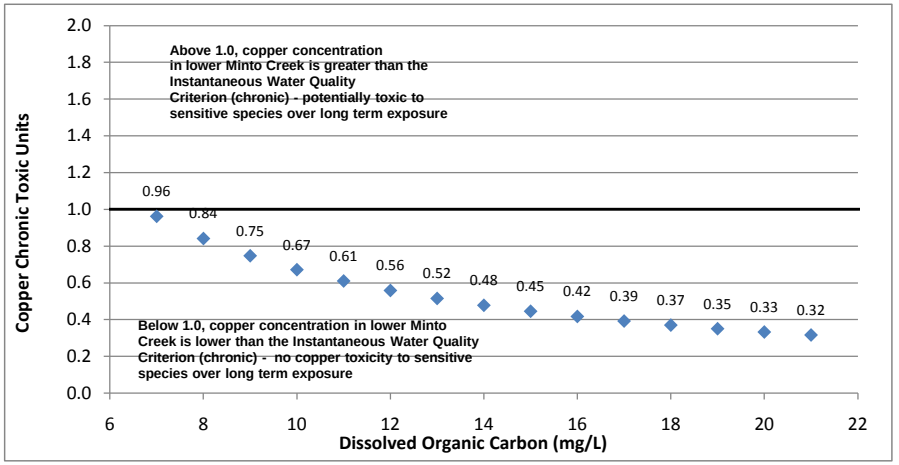
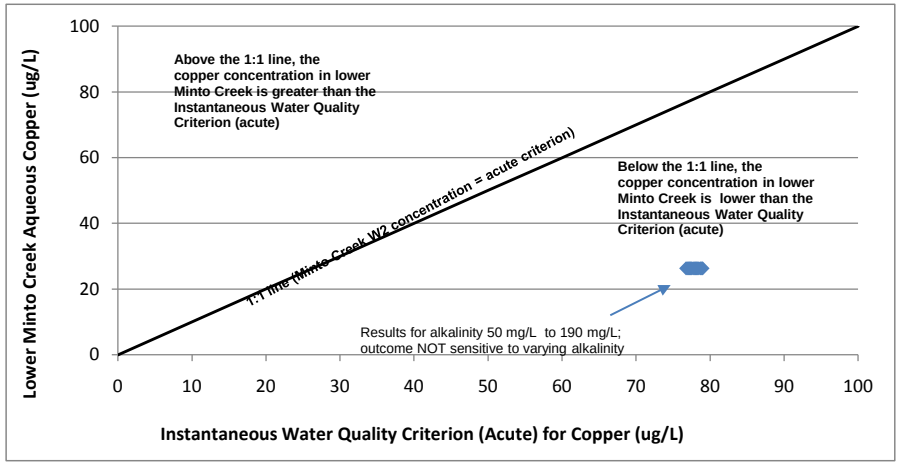
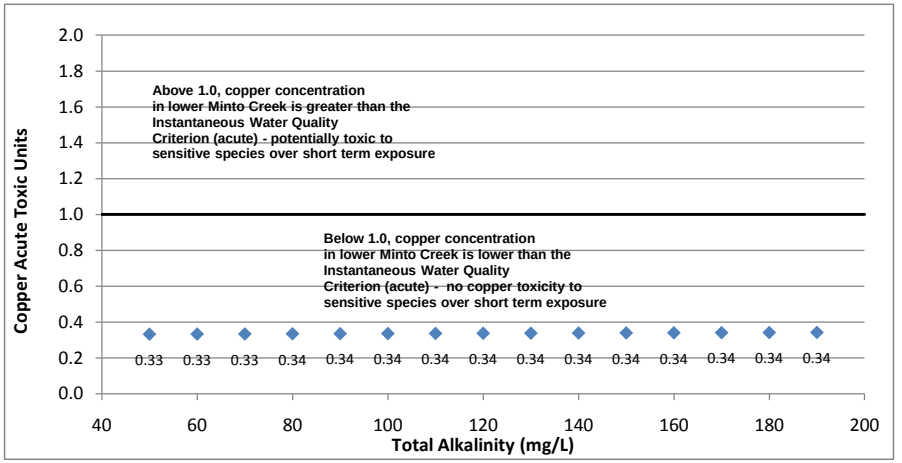
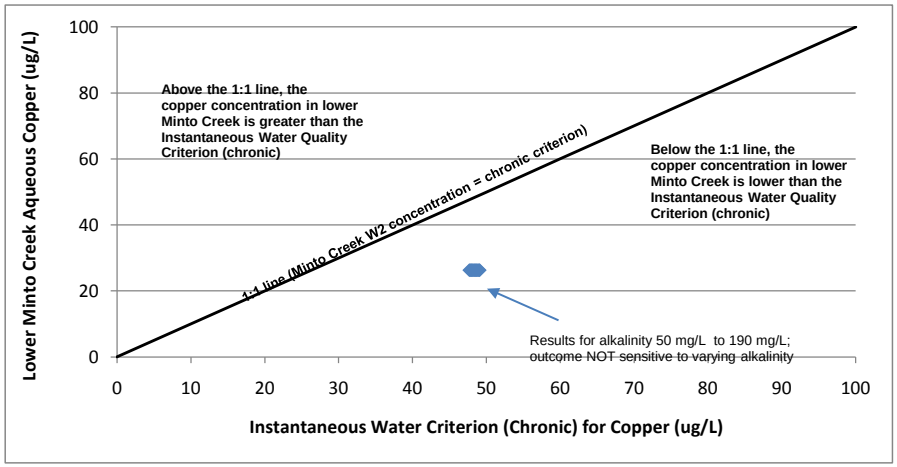


Figure BLM9-3: Plots of Dissolved Copper in Minto Creek in May Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Sensitivity to Dissolved Organic Carbon of 7 mg/L to 21 mg/L







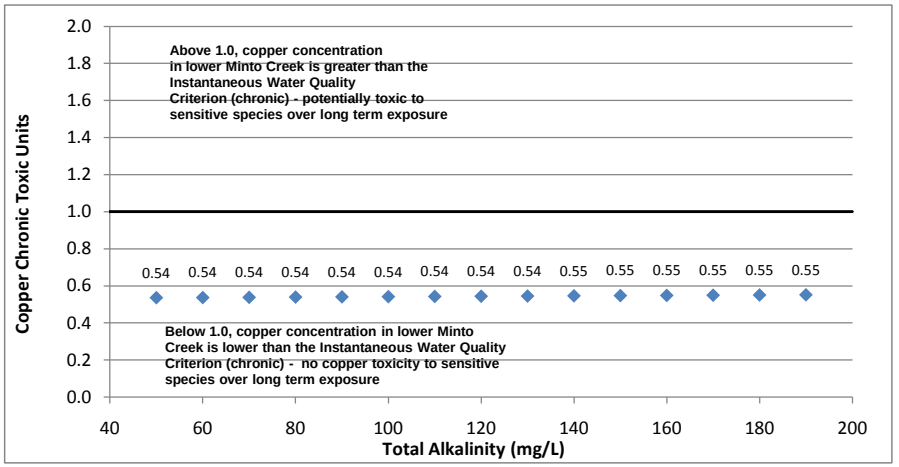


Figure BLM9-4: Plots of Dissolved Copper in Minto Creek in May Relative to IWQG, and Copper Toxic Units - Acute and Chronic; Sensitivity to Alkalinity of 50 mg/L to 190 mg/L

Table BLM9-3: BLM Input Parameters - Operational Worst Case, Maximum, Sensitivity

Month	Temp	pH	Cu	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	ug/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Raw	10	7.94	26.3	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 7	10	7.4	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 8	10	7.4	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 9	10	7.4	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 10	10	7.4	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 11	10	7.4	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.4 DOC 12	10	7.4	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 7	10	7.5	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 8	10	7.5	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 9	10	7.5	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 10	10	7.5	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 11	10	7.5	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.5 DOC 12	10	7.5	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 7	10	7.6	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 8	10	7.6	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 9	10	7.6	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 10	10	7.6	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 11	10	7.6	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.6 DOC 12	10	7.6	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 7	10	7.7	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 8	10	7.7	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 9	10	7.7	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 10	10	7.7	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 11	10	7.7	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.7 DOC 12	10	7.7	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 7	10	7.8	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 8	10	7.8	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 9	10	7.8	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 10	10	7.8	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 11	10	7.8	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.8 DOC 12	10	7.8	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 7	10	7.9	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 8	10	7.9	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 9	10	7.9	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 10	10	7.9	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 11	10	7.9	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 7.9 DOC 12	10	7.9	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 7	10	8	26.3	7	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 8	10	8	26.3	8	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 9	10	8	26.3	9	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 10	10	8	26.3	10	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 11	10	8	26.3	11	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
pH 8.0 DOC 12	10	8	26.3	12	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001

Table BLM9-4: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Maximum, Bivariate Sensitivity

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Copper ug/L	Acute Toxic Units (Acute TU=Cu/CMC)	Chronic Toxic Units (Chronic TU=Cu/CCC)
Sensitivity Bivar	Raw	157	78	48.7	26.3	0.336	0.540
Sensitivity Bivar	pH 7.4 DOC 7	49	24.5	15.2	26.3	1.074	1.730
Sensitivity Bivar	pH 7.4 DOC 8	56	28.0	17.4	26.3	0.939	1.512
Sensitivity Bivar	pH 7.4 DOC 9	63	31.5	19.6	26.3	0.834	1.342
Sensitivity Bivar	pH 7.4 DOC 10	70	35.1	21.8	26.3	0.750	1.207
Sensitivity Bivar	pH 7.4 DOC 11	77	38.6	24.0	26.3	0.681	1.096
Sensitivity Bivar	pH 7.4 DOC 12	84	42.2	26.2	26.3	0.623	1.004
Sensitivity Bivar	pH 7.5 DOC 7	55	27.6	17.2	26.3	0.952	1.533
Sensitivity Bivar	pH 7.5 DOC 8	63	31.6	19.6	26.3	0.832	1.340
Sensitivity Bivar	pH 7.5 DOC 9	71	35.6	22.1	26.3	0.739	1.190
Sensitivity Bivar	pH 7.5 DOC 10	79	39.6	24.6	26.3	0.664	1.070
Sensitivity Bivar	pH 7.5 DOC 11	87	43.6	27.1	26.3	0.603	0.971
Sensitivity Bivar	pH 7.5 DOC 12	95	47.7	29.6	26.3	0.552	0.888
Sensitivity Bivar	pH 7.6 DOC 7	62	31.0	19.3	26.3	0.848	1.365
Sensitivity Bivar	pH 7.6 DOC 8	71	35.5	22.0	26.3	0.741	1.193
Sensitivity Bivar	pH 7.6 DOC 9	80	40.0	24.8	26.3	0.658	1.059
Sensitivity Bivar	pH 7.6 DOC 10	89	44.5	27.6	26.3	0.592	0.953
Sensitivity Bivar	pH 7.6 DOC 11	98	49.0	30.4	26.3	0.537	0.865
Sensitivity Bivar	pH 7.6 DOC 12	107	53.5	33.2	26.3	0.492	0.792
Sensitivity Bivar	pH 7.7 DOC 7	69	34.6	21.5	26.3	0.760	1.224
Sensitivity Bivar	pH 7.7 DOC 8	79	39.6	24.6	26.3	0.664	1.069
Sensitivity Bivar	pH 7.7 DOC 9	89	44.6	27.7	26.3	0.590	0.949
Sensitivity Bivar	pH 7.7 DOC 10	99	49.6	30.8	26.3	0.530	0.853
Sensitivity Bivar	pH 7.7 DOC 11	109	54.6	33.9	26.3	0.481	0.775
Sensitivity Bivar	pH 7.7 DOC 12	119	59.7	37.1	26.3	0.441	0.709
Sensitivity Bivar	pH 7.8 DOC 7	77	38.4	23.9	26.3	0.685	1.102
Sensitivity Bivar	pH 7.8 DOC 8	88	43.9	27.3	26.3	0.599	0.964
Sensitivity Bivar	pH 7.8 DOC 9	99	49.5	30.7	26.3	0.531	0.855
Sensitivity Bivar	pH 7.8 DOC 10	110	55.1	34.2	26.3	0.478	0.769
Sensitivity Bivar	pH 7.8 DOC 11	121	60.6	37.7	26.3	0.434	0.698

Table BLM9-4: Instantaneous Water Quality Criteria for Copper - Operational Worst Case, Maximum, Bivariate Sensitivity

Site Label	Sample Label	Final Acute Value (FAV), ug/L	CMC (CMC=FAV/2), ug/L	CCC (CCC=FAV/ACR), ug/L	Copper ug/L	Acute Toxic Units (Acute TU=Cu/CMC)	Chronic Toxic Units (Chronic TU=Cu/CCC)
Sensitivity Bivar	pH 7.8 DOC 12	132	66.2	41.1	26.3	0.397	0.639
Sensitivity Bivar	pH 7.9 DOC 7	85	42.4	26.3	26.3	0.621	0.999
Sensitivity Bivar	pH 7.9 DOC 8	97	48.5	30.1	26.3	0.542	0.873
Sensitivity Bivar	pH 7.9 DOC 9	109	54.6	33.9	26.3	0.482	0.776
Sensitivity Bivar	pH 7.9 DOC 10	121	60.7	37.7	26.3	0.433	0.697
Sensitivity Bivar	pH 7.9 DOC 11	134	66.9	41.5	26.3	0.393	0.633
Sensitivity Bivar	pH 7.9 DOC 12	146	73.0	45.4	26.3	0.360	0.580
Sensitivity Bivar	pH 8.0 DOC 7	93	46.5	28.9	26.3	0.566	0.912
Sensitivity Bivar	pH 8.0 DOC 8	106	53.2	33.0	26.3	0.495	0.797
Sensitivity Bivar	pH 8.0 DOC 9	120	59.8	37.2	26.3	0.440	0.708
Sensitivity Bivar	pH 8.0 DOC 10	133	66.6	41.3	26.3	0.395	0.636
Sensitivity Bivar	pH 8.0 DOC 11	147	73.3	45.5	26.3	0.359	0.578
Sensitivity Bivar	pH 8.0 DOC 12	160	80.0	49.7	26.3	0.329	0.529

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 1

CADMIUM

OPERATIONAL WORST CASE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM-Cd-1-1: BLM Input Parameters - Operational Worst Case, Maximum

Month	Temp	pH	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	9.7	10	57.6	21.4	12.29	2.66	37.2	2.55	110	0.001
Feb	10	8	9.7	10	51.7	17.4	9.83	2.14	29.3	1.80	110	0.001
Mar	10	8	9.7	10	51.8	17.6	9.88	2.09	30.4	1.81	110	0.001
Apr	10	7.98	18.3	10	51.4	17.7	9.88	2.26	30.4	1.98	131	0.001
May	10	7.94	12.4	10	33.8	11.7	5.87	2.21	37.7	1.90	88	0.001
Jun	10	8.13	10.1	10	34.4	11.4	7.39	1.92	35.7	1.78	129	0.001
Jul	10	8.10	13.5	10	41.3	13.5	7.42	1.65	22.6	1.79	130	0.001
Aug	10	8.14	12.1	10	41.1	13.5	7.41	1.64	16.6	1.18	131	0.001
Sep	10	8.09	12.3	10	40.1	12.7	6.72	1.58	18.5	1.18	130	0.001
Oct	10	8.08	11.1	10	36.7	11.9	6.57	1.43	18.5	1.20	141	0.001
Nov	10	8.11	9.3	10	49.0	15.1	8.09	1.44	21.3	1.74	155	0.001
Dec	10	8.07	9.9	10	57.6	21.4	12.27	2.65	37.2	2.55	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM-Cd-1-2: Predicted LC50 Values for Fathead Minnow - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Fathead_Minnow_04-03-26.dat
E:\Cd OP WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cd	Free Cd	TOrg Cd	BL-Cd	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S	T.S
				mol/L	mol/L	mol/L	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"Cd OP WC Max	'"Jan "	LC50	8	4.601E-07	1.75E-07	2.77E-07	4.752794	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Feb "	LC50	8	4.342E-07	1.57E-07	2.72E-07	4.750941	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Mar "	LC50	8	4.342E-07	1.57E-07	2.71E-07	4.750677	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Apr "	LC50	8	6.634E-07	1.53E-07	5.05E-07	4.75204	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002664	3.12E-08	3.12E-08
"Cd OP WC Max	'"May "	LC50	7.86	3.512E-07	1.02E-07	2.44E-07	4.750575	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001807	3.12E-08	3.12E-08
"Cd OP WC Max	'"Jun "	LC50	7.72	2.723E-07	1.05E-07	1.63E-07	4.754379	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002681	3.12E-08	3.12E-08
"Cd OP WC Max	'"Jul "	LC50	8.14	5.437E-07	1.24E-07	4.16E-07	4.753506	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002623	3.12E-08	3.12E-08
"Cd OP WC Max	'"Aug "	LC50	8.08	4.745E-07	1.25E-07	3.47E-07	4.752066	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002651	3.12E-08	3.12E-08
"Cd OP WC Max	'"Sep "	LC50	8.08	4.745E-07	1.21E-07	3.51E-07	4.751127	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.002631	3.12E-08	3.12E-08
"Cd OP WC Max	'"Oct "	LC50	8.09	4.221E-07	1.11E-07	3.08E-07	4.751802	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002852	3.12E-08	3.12E-08
"Cd OP WC Max	'"Nov "	LC50	7.65	3.109E-07	1.48E-07	1.59E-07	4.750446	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003246	3.12E-08	3.12E-08
"Cd OP WC Max	'"Dec "	LC50	7.25	2.782E-07	1.75E-07	9.54E-08	4.752143	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.004498	3.12E-08	3.12E-08

Month	Dis. Cd	Dis. Cd
	ug/L	mg/L
Jan	52	0.052
Feb	49	0.049
Mar	49	0.049
Apr	75	0.075
May	39	0.039
Jun	31	0.031
Jul	61	0.061
Aug	53	0.053
Sep	53	0.053
Oct	47	0.047
Nov	35	0.035
Dec	31	0.031

Table BLM-Cd-1-3: Predicted LC50 Values for Rainbow Trout - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Rainbow_Trout_04-03-26.dat
E:\Cd OP WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cd	Free Cd	TOrg Cd	BL-Cd	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S	T.S
				mol/L	mol/L	mol/L	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"Cd OP WC Max	"Jan	LC50	8	2.09269E-07	7.82E-08	1.28E-07	3.162437	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	"Feb	LC50	8	1.97728E-07	7E-08	1.25E-07	3.162205	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	"Mar	LC50	8	1.97728E-07	7.02E-08	1.25E-07	3.162058	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	"Apr	LC50	8	3.03084E-07	6.85E-08	2.32E-07	3.162861	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002664	3.12E-08	3.12E-08
"Cd OP WC Max	"May	LC50	7.86	1.58971E-07	4.57E-08	1.11E-07	3.160386	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001807	3.12E-08	3.12E-08
"Cd OP WC Max	"Jun	LC50	7.72	1.22449E-07	4.67E-08	7.36E-08	3.160207	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002681	3.12E-08	3.12E-08
"Cd OP WC Max	"Jul	LC50	8.14	2.48736E-07	5.53E-08	1.92E-07	3.160177	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002623	3.12E-08	3.12E-08
"Cd OP WC Max	"Aug	LC50	8.08	2.16571E-07	5.56E-08	1.6E-07	3.160093	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002651	3.12E-08	3.12E-08
"Cd OP WC Max	"Sep	LC50	8.08	2.16571E-07	5.4E-08	1.61E-07	3.159026	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.002631	3.12E-08	3.12E-08
"Cd OP WC Max	"Oct	LC50	8.09	1.92539E-07	4.96E-08	1.42E-07	3.16008	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002852	3.12E-08	3.12E-08
"Cd OP WC Max	"Nov	LC50	7.65	1.39975E-07	6.63E-08	7.19E-08	3.160251	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003246	3.12E-08	3.12E-08
"Cd OP WC Max	"Dec	LC50	7.25	1.24458E-07	7.83E-08	4.29E-08	3.160106	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.004498	3.12E-08	3.12E-08

Month	Dis. Cd	Dis. Cd
	ug/L	mg/L
Jan	24	0.024
Feb	22	0.022
Mar	22	0.022
Apr	34	0.034
May	18	0.018
Jun	14	0.014
Jul	28	0.028
Aug	24	0.024
Sep	24	0.024
Oct	22	0.022
Nov	16	0.016
Dec	14	0.014

Table BLM-Cd-1-4: Predicted LC50 Values for Ceriodaphnia dubia - Operational Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Ceriodaphnia_Dubia_04-03-26.dat
E:\Cd OP WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cd	Free Cd	TOrg Cd	BL-Cd	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S	T.S
				mol/L	mol/L	mol/L	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"Cd OP WC Max	'"Jan	LC50	8	4.12E-06	1.92E-06	2.11E-06	7.531767	9.7	10	0.001437	0.00088	0.000535	6.8E-05	0.000387	7.19E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Feb	LC50	8	3.9E-06	1.74E-06	2.09E-06	7.536443	9.7	10	0.00129	0.000716	0.000428	5.47E-05	0.000305	5.08E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Mar	LC50	8	3.9E-06	1.74E-06	2.09E-06	7.536068	9.7	10	0.001292	0.000724	0.00043	5.35E-05	0.000316	5.11E-05	0.002237	3.12E-08	3.12E-08
"Cd OP WC Max	'"Apr	LC50	8	5.68E-06	1.71E-06	3.91E-06	7.537146	18.3	10	0.001282	0.000728	0.00043	5.78E-05	0.000316	5.58E-05	0.002664	3.12E-08	3.12E-08
"Cd OP WC Max	'"May	LC50	7.86	3.26E-06	1.13E-06	2.07E-06	7.534764	12.4	10	0.000843	0.000481	0.000255	5.65E-05	0.000392	5.36E-05	0.001807	3.12E-08	3.12E-08
"Cd OP WC Max	'"Jun	LC50	7.72	2.67E-06	1.16E-06	1.46E-06	7.535896	10.1	10	0.000858	0.000469	0.000321	4.91E-05	0.000372	5.02E-05	0.002681	3.12E-08	3.12E-08
"Cd OP WC Max	'"Jul	LC50	8.14	4.53E-06	1.38E-06	3.1E-06	7.537258	13.5	10	0.00103	0.000555	0.000323	4.22E-05	0.000235	5.05E-05	0.002623	3.12E-08	3.12E-08
"Cd OP WC Max	'"Aug	LC50	8.08	4.06E-06	1.39E-06	2.65E-06	7.536273	12.1	10	0.001025	0.000555	0.000322	4.19E-05	0.000173	3.33E-05	0.002651	3.12E-08	3.12E-08
"Cd OP WC Max	'"Sep	LC50	8.08	4.06E-06	1.35E-06	2.68E-06	7.536995	12.3	10	0.001	0.000523	0.000292	4.04E-05	0.000193	3.33E-05	0.002631	3.12E-08	3.12E-08
"Cd OP WC Max	'"Oct	LC50	8.09	3.64E-06	1.24E-06	2.37E-06	7.536399	11.1	10	0.000916	0.00049	0.000286	3.66E-05	0.000193	3.38E-05	0.002852	3.12E-08	3.12E-08
"Cd OP WC Max	'"Nov	LC50	7.65	3.09E-06	1.65E-06	1.4E-06	7.535057	9.3	10	0.001223	0.000621	0.000352	3.68E-05	0.000222	4.91E-05	0.003246	3.12E-08	3.12E-08
"Cd OP WC Max	'"Dec	LC50	7.25	2.97E-06	1.94E-06	9.45E-07	7.534971	9.9	10	0.001437	0.00088	0.000534	6.78E-05	0.000387	7.19E-05	0.004498	3.12E-08	3.12E-08

Month	Dis. Cd	Dis. Cd
	ug/L	mg/L
Jan	463	0.463
Feb	438	0.438
Mar	438	0.438
Apr	638	0.638
May	367	0.367
Jun	300	0.300
Jul	509	0.509
Aug	457	0.457
Sep	457	0.457
Oct	409	0.409
Nov	348	0.348
Dec	334	0.334

Table BLM-Cd-1-5: BLM Model Results Summary - Operational Worst Case, Maximum

Month	Cadmium	Effect Concentrations			Acute Toxic Units		
		Fathead	Rainbow	C. dubia	Fathead	Rainbow	C. dubia
	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	0.032	52	24	463	0.0006	0.0014	0.0001
Feb	0.044	49	22	438	0.0009	0.0020	0.0001
Mar	0.044	49	22	438	0.0009	0.0020	0.0001
Apr	0.056	75	34	638	0.0008	0.0016	0.0001
May	0.161	39	18	367	0.0041	0.0090	0.0004
Jun	0.154	31	14	300	0.0050	0.0112	0.0005
Jul	0.093	61	28	509	0.0015	0.0033	0.0002
Aug	0.093	53	24	457	0.0017	0.0038	0.0002
Sep	0.083	53	24	457	0.0016	0.0034	0.0002
Oct	0.040	47	22	409	0.0008	0.0018	0.0001
Nov	0.074	35	16	348	0.0021	0.0047	0.0002
Dec	0.074	31	14	334	0.0024	0.0053	0.0002

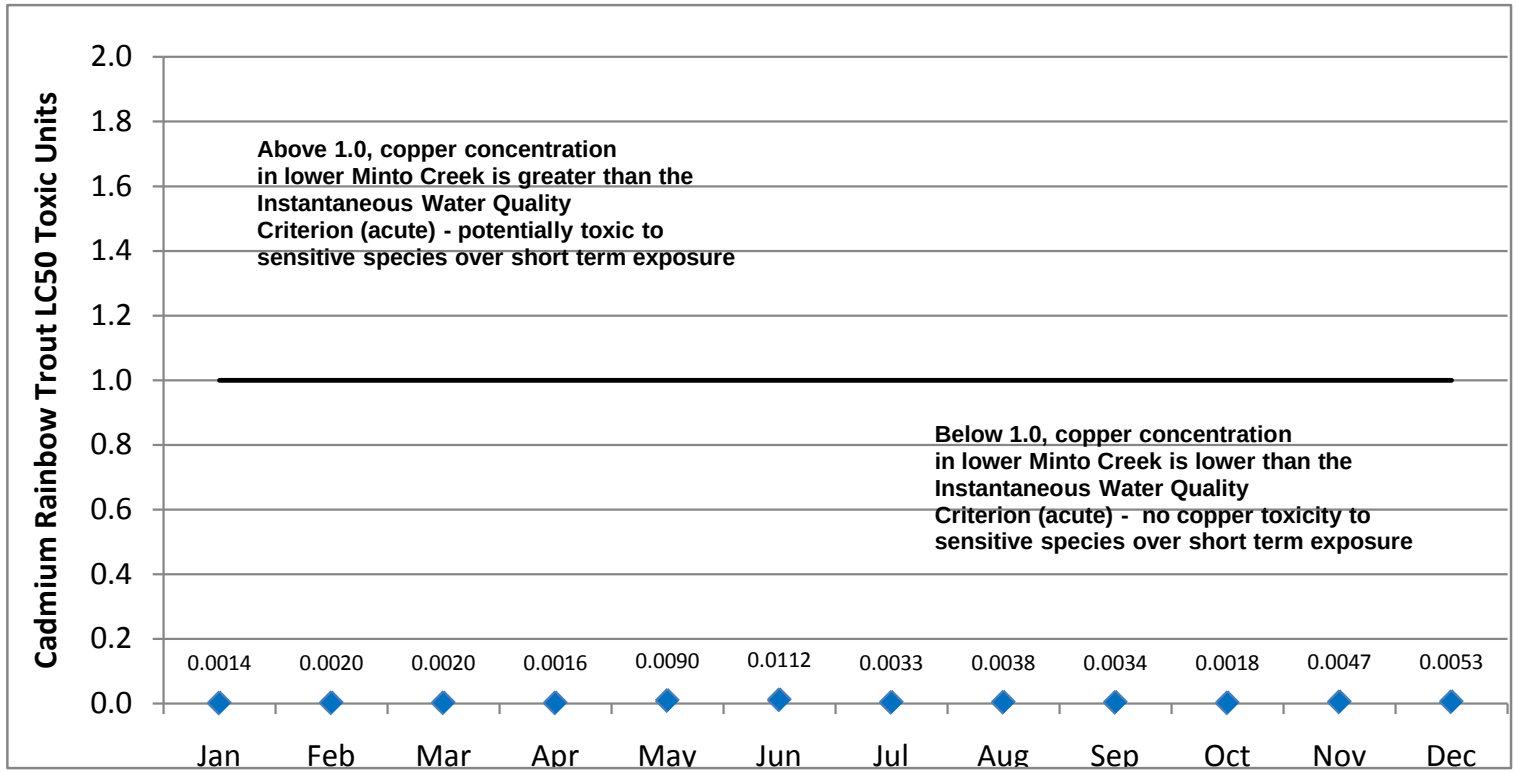


Figure BLM-Cd-1-1 - Cadmium in lower Minto Creek Relative to Rainbow Trout LC50s, Operational Worst Case, Maximum

MINTO EFFECTS ASSESSMENT

BIOTIC LIGAND MODELLING (BLM)

BLM RUN 2

CADMIUM

POST CLOSURE WORST CASE, MAXIMUM

Temperature = 10°C
pH, DOC, Alkalinity = W2 Historical

Table BLM-Cd-2-1: BLM Input Parameters - Post Closure Worst Case, Maximum

Month	Temp	pH	DOC	HA	Ca	Mg	Na	K	SO4	Cl	Alk	S
	C	pH units	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	10	8	9.7	10	58.5	20.9	15.09	4.57	50.4	3.40	110	0.001
Feb	10	8	9.7	10	52.7	17.6	13.29	4.23	43.6	2.76	110	0.001
Mar	10	8	9.7	10	52.6	17.5	12.91	4.06	42.3	2.72	110	0.001
Apr	10	7.98	18.3	10	51.7	17.5	12.61	3.78	42.0	2.56	131	0.001
May	10	7.94	12.4	10	36.7	12.5	8.70	3.56	45.9	2.48	88	0.001
Jun	10	8.13	10.1	10	37.8	12.4	9.89	3.43	45.4	2.40	129	0.001
Jul	10	8.10	13.5	10	44.2	14.4	10.07	3.07	32.4	2.39	130	0.001
Aug	10	8.14	12.1	10	43.8	14.3	9.69	3.01	28.2	1.94	131	0.001
Sep	10	8.09	12.3	10	43.3	13.7	9.44	2.98	30.6	1.93	130	0.001
Oct	10	8.08	11.1	10	41.7	13.4	9.99	3.20	30.6	2.16	141	0.001
Nov	10	8.11	9.3	10	53.0	16.4	12.23	3.76	39.9	2.89	155	0.001
Dec	10	8.07	9.9	10	58.5	20.9	15.08	4.54	50.3	3.40	200	0.001

Red Text = Default values

Green Text = Monthly values from historical W2 datset

Blue text = 25th percentile of all historical W2 data (no data for Jan, Feb, Mar)

Purple text = model results provided by SRK

Table BLM-Cd-2-2: Predicted LC50 Values for Fathead Minnow - Post Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Fathead_Minnow_04-03-26.dat
E:\Cd CLOSE WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample Label	Mode	pH	Dis. Cd	Free Cd	TOrg Cd	BL-Cd	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S	T.S
				mol/L	mol/L	mol/L	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"Cd PC WC Max	" "Jan "	LC50	8	4.65E-07	1.76E-07	2.78E-07	4.752287	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	" "Feb "	LC50	8	4.39E-07	1.59E-07	2.71E-07	4.750948	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	" "Mar "	LC50	8	4.39E-07	1.59E-07	2.72E-07	4.75251	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	" "Apr "	LC50	7.98	6.51E-07	1.53E-07	4.9E-07	4.751565	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08	3.12E-08
"Cd PC WC Max	" "May "	LC50	7.94	3.97E-07	1.11E-07	2.8E-07	4.750508	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08	3.12E-08
"Cd PC WC Max	" "Jun "	LC50	8.13	4.12E-07	1.13E-07	2.92E-07	4.750388	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08	3.12E-08
"Cd PC WC Max	" "Jul "	LC50	8.1	5.41E-07	1.32E-07	4.03E-07	4.752648	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08	3.12E-08
"Cd PC WC Max	" "Aug "	LC50	8.14	5.15E-07	1.32E-07	3.79E-07	4.750728	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08	3.12E-08
"Cd PC WC Max	" "Sep "	LC50	8.09	4.96E-07	1.3E-07	3.61E-07	4.750577	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08	3.12E-08
"Cd PC WC Max	" "Oct "	LC50	8.08	4.47E-07	1.26E-07	3.16E-07	4.751628	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08	3.12E-08
"Cd PC WC Max	" "Nov "	LC50	8.11	4.63E-07	1.58E-07	2.97E-07	4.750376	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08	3.12E-08
"Cd PC WC Max	" "Dec "	LC50	8.07	4.84E-07	1.73E-07	3E-07	4.750448	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08	3.12E-08

Month	Dis. Cd	Dis. Cd
	ug/L	mg/L
Jan	52	0.052
Feb	49	0.049
Mar	49	0.049
Apr	73	0.073
May	45	0.045
Jun	46	0.046
Jul	61	0.061
Aug	58	0.058
Sep	56	0.056
Oct	50	0.050
Nov	52	0.052
Dec	54	0.054

Table BLM-Cd-2-3: Predicted LC50 Values for Rainbow Trout - Post Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Rainbow_Trout_04-03-26.dat
E:\Cd CLOSE WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cd	Free Cd	TOrg Cd	BL-Cd	DOC	HA%	T.Ca	T.Mg	T.Na	T.K	T.SO4	T.Cl	T.CO3	T.S	T.S
				mol/L	mol/L	mol/L	nmol/gw	mg/L		mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L	mol/L
"Cd PC WC Max	"Jan	LC50	8	2.11453E-07	7.88E-08	1.28E-07	3.162417	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Feb	LC50	8	1.99662E-07	7.1E-08	1.25E-07	3.162233	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Mar	LC50	8	1.9929E-07	7.08E-08	1.25E-07	3.160072	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Apr	LC50	7.98	2.97289E-07	6.86E-08	2.25E-07	3.16252	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08	3.12E-08
"Cd PC WC Max	"May	LC50	7.94	1.80266E-07	4.94E-08	1.28E-07	3.160317	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08	3.12E-08
"Cd PC WC Max	"Jun	LC50	8.13	1.8824E-07	5.06E-08	1.35E-07	3.160072	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08	3.12E-08
"Cd PC WC Max	"Jul	LC50	8.1	2.47184E-07	5.91E-08	1.86E-07	3.160953	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08	3.12E-08
"Cd PC WC Max	"Aug	LC50	8.14	2.36074E-07	5.88E-08	1.75E-07	3.1617	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08	3.12E-08
"Cd PC WC Max	"Sep	LC50	8.09	2.26978E-07	5.8E-08	1.67E-07	3.161473	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08	3.12E-08
"Cd PC WC Max	"Oct	LC50	8.08	2.03774E-07	5.6E-08	1.45E-07	3.160074	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08	3.12E-08
"Cd PC WC Max	"Nov	LC50	8.11	2.11353E-07	7.04E-08	1.37E-07	3.160072	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08	3.12E-08
"Cd PC WC Max	"Dec	LC50	8.07	2.20467E-07	7.75E-08	1.38E-07	3.16008	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08	3.12E-08

Month	Dis. Cd	Dis. Cd
	ug/L	mg/L
Jan	24	0.024
Feb	22	0.022
Mar	22	0.022
Apr	33	0.033
May	20	0.020
Jun	21	0.021
Jul	28	0.028
Aug	27	0.027
Sep	26	0.026
Oct	23	0.023
Nov	24	0.024
Dec	25	0.025

Table BLM-Cd-2-4: Predicted LC50 Values for Ceriodaphnia dubia - Post Closure Worst Case, Maximum

ver 2.1.2, build 2005-04-05
C:\PROGRA~1\BLM\Model\Cd_Ceriodaphnia_Dubia_04-03-26.dat
E:\Cd CLOSE WC Max.blm
/S BLM.SCR, /W /Q /O3 /L /A4

Site Label	Sample La	Mode	pH	Dis. Cd mol/L	Free Cd mol/L	TOrg Cd mol/L	BL-Cd nmol/gw	DOC mg/L	HA%	T.Ca mol/L	T.Mg mol/L	T.Na mol/L	T.K mol/L	T.SO4 mol/L	T.Cl mol/L	T.CO3 mol/L	T.S mol/L	T.S mol/L
"Cd PC WC Max	"Jan	LC50	8	4.13E-06	1.92E-06	2.1E-06	7.527673	9.7	10	0.00146	0.00086	0.000656	0.000117	0.000525	9.59E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Feb	LC50	8	3.95E-06	1.76E-06	2.09E-06	7.535589	9.7	10	0.001315	0.000724	0.000578	0.000108	0.000454	7.78E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Mar	LC50	8	3.95E-06	1.76E-06	2.09E-06	7.53621	9.7	10	0.001312	0.00072	0.000562	0.000104	0.00044	7.67E-05	0.002237	3.12E-08	3.12E-08
"Cd PC WC Max	"Apr	LC50	7.98	5.61E-06	1.71E-06	3.82E-06	7.535987	18.3	10	0.00129	0.00072	0.000549	9.67E-05	0.000437	7.22E-05	0.002667	3.12E-08	3.12E-08
"Cd PC WC Max	"May	LC50	7.94	3.59E-06	1.23E-06	2.29E-06	7.534609	12.4	10	0.000916	0.000514	0.000378	9.11E-05	0.000478	7E-05	0.001796	3.12E-08	3.12E-08
"Cd PC WC Max	"Jun	LC50	8.13	3.55E-06	1.26E-06	2.22E-06	7.536443	10.1	10	0.000943	0.00051	0.00043	8.77E-05	0.000473	6.77E-05	0.002604	3.12E-08	3.12E-08
"Cd PC WC Max	"Jul	LC50	8.1	4.53E-06	1.46E-06	3.01E-06	7.532137	13.5	10	0.001103	0.000592	0.000438	7.85E-05	0.000337	6.74E-05	0.002628	3.12E-08	3.12E-08
"Cd PC WC Max	"Aug	LC50	8.14	4.32E-06	1.46E-06	2.81E-06	7.535567	12.1	10	0.001093	0.000588	0.000421	7.7E-05	0.000294	5.47E-05	0.002643	3.12E-08	3.12E-08
"Cd PC WC Max	"Sep	LC50	8.09	4.23E-06	1.44E-06	2.73E-06	7.535524	12.3	10	0.00108	0.000564	0.000411	7.62E-05	0.000319	5.44E-05	0.00263	3.12E-08	3.12E-08
"Cd PC WC Max	"Oct	LC50	8.08	3.86E-06	1.39E-06	2.41E-06	7.535427	11.1	10	0.00104	0.000551	0.000435	8.18E-05	0.000319	6.09E-05	0.002854	3.12E-08	3.12E-08
"Cd PC WC Max	"Nov	LC50	8.11	4E-06	1.73E-06	2.18E-06	7.531437	9.3	10	0.001322	0.000675	0.000532	9.62E-05	0.000415	8.15E-05	0.003132	3.12E-08	3.12E-08
"Cd PC WC Max	"Dec	LC50	8.07	4.28E-06	1.92E-06	2.24E-06	7.534223	9.9	10	0.00146	0.00086	0.000656	0.000116	0.000524	9.59E-05	0.00405	3.12E-08	3.12E-08

Month	Dis. Cd ug/L	Dis. Cd mg/L
Jan	465	0.465
Feb	444	0.444
Mar	444	0.444
Apr	631	0.631
May	403	0.403
Jun	399	0.399
Jul	509	0.509
Aug	486	0.486
Sep	476	0.476
Oct	434	0.434
Nov	450	0.450
Dec	481	0.481

Table BLM-Cd-2-5: BLM Model Results Summary - Post Closure Worst Case, Maximum

Month	Cadmium	Effect Concentrations			Acute Toxic Units		
		Fathead	Rainbow	C. dubia	Fathead	Rainbow	C. dubia
	ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	LC50, ug/L	IC50, ug/L
Jan	0.068	52	24	465	0.0013	0.0029	0.0001
Feb	0.074	49	22	444	0.0015	0.0033	0.0002
Mar	0.073	49	22	444	0.0015	0.0033	0.0002
Apr	0.077	73	33	631	0.0011	0.0023	0.0001
May	0.161	45	20	403	0.0036	0.0079	0.0004
Jun	0.158	46	21	399	0.0034	0.0075	0.0004
Jul	0.106	61	28	509	0.0017	0.0038	0.0002
Aug	0.106	58	27	486	0.0018	0.0040	0.0002
Sep	0.098	56	26	476	0.0018	0.0038	0.0002
Oct	0.067	50	23	434	0.0013	0.0029	0.0002
Nov	0.101	52	24	450	0.0019	0.0043	0.0002
Dec	0.101	54	25	481	0.0019	0.0041	0.0002

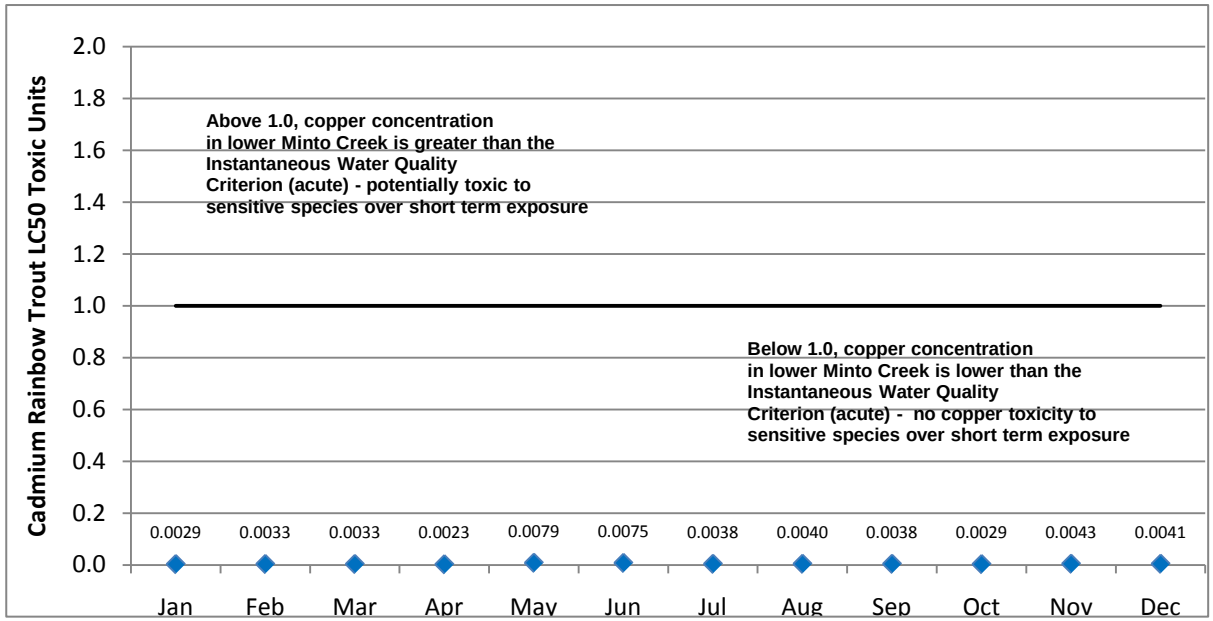


Figure BLM-Cd-2-1 - Cadmium in lower Minto Creek Relative to Rainbow Trout LC50s, Post Closure Worst Case, Maximum

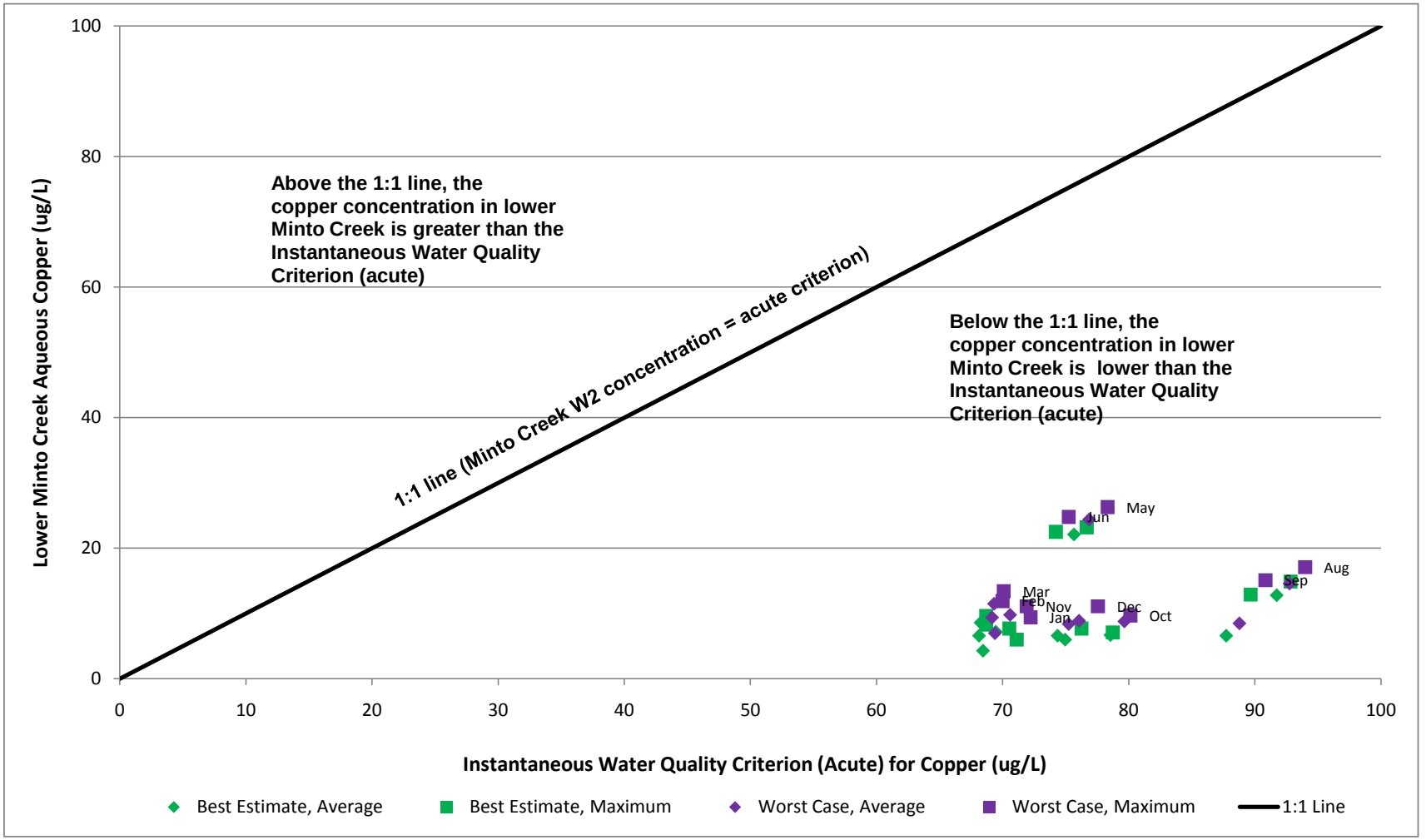


Figure 1: Plots of Operational Phase Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units
a) Plot of Copper versus Acute Instantaneous Water Quality Criteria

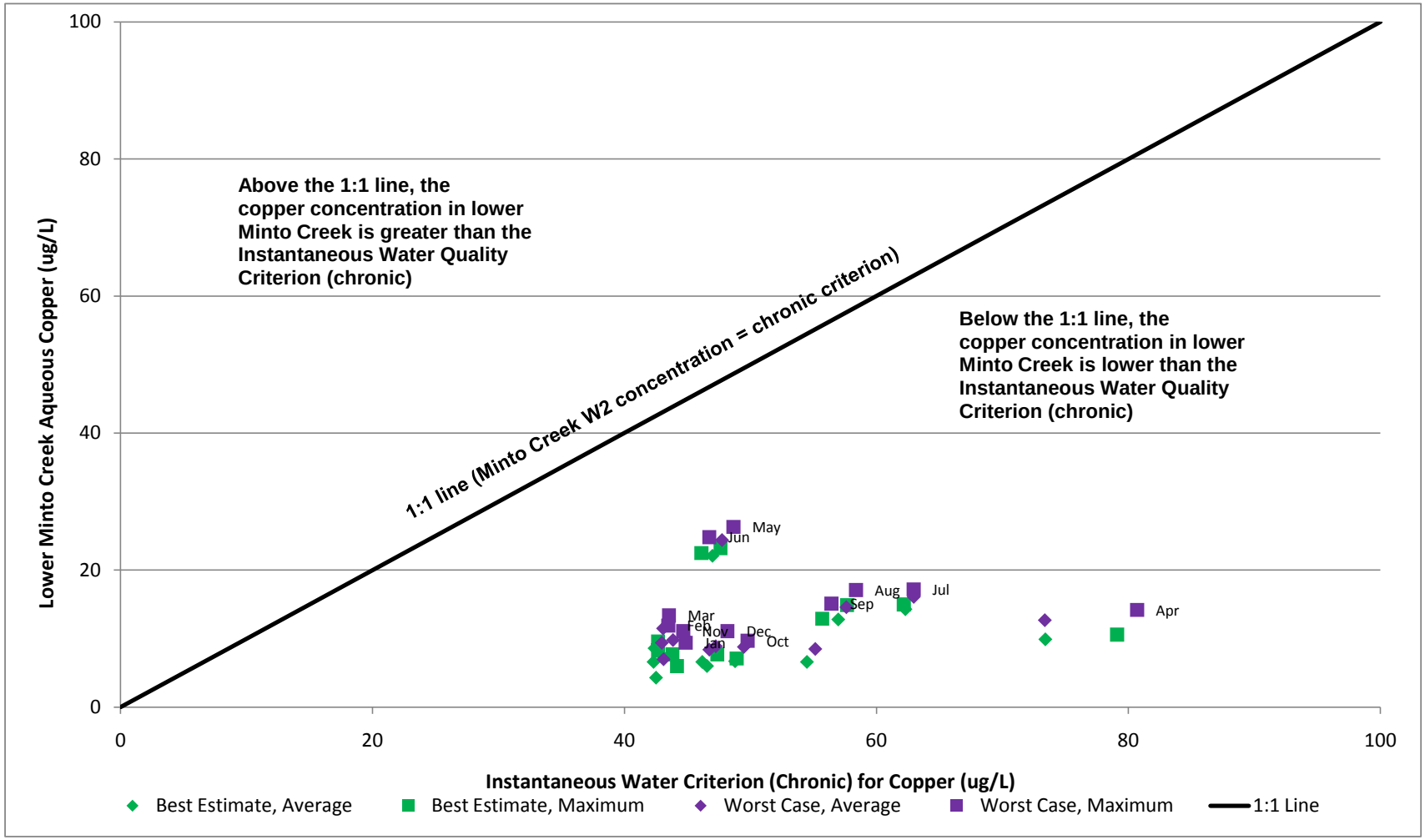


Figure 1: Plots of Operational Phase Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units
b) Plot of Copper versus Chronic Instantaneous Water Quality Criteria

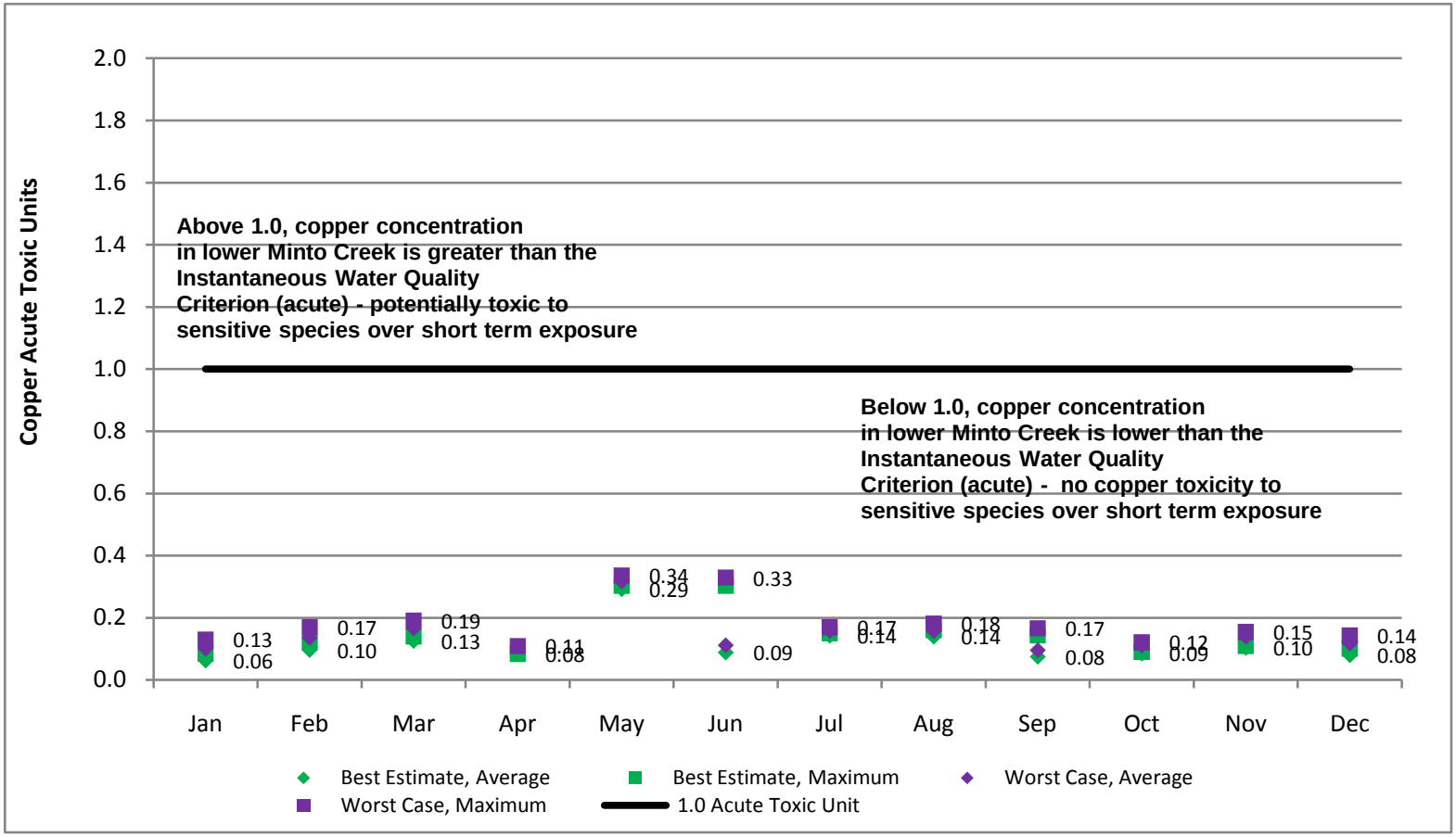


Figure 1: Plots of Operational Phase Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units

c) Plot of Copper Acute Toxic Units

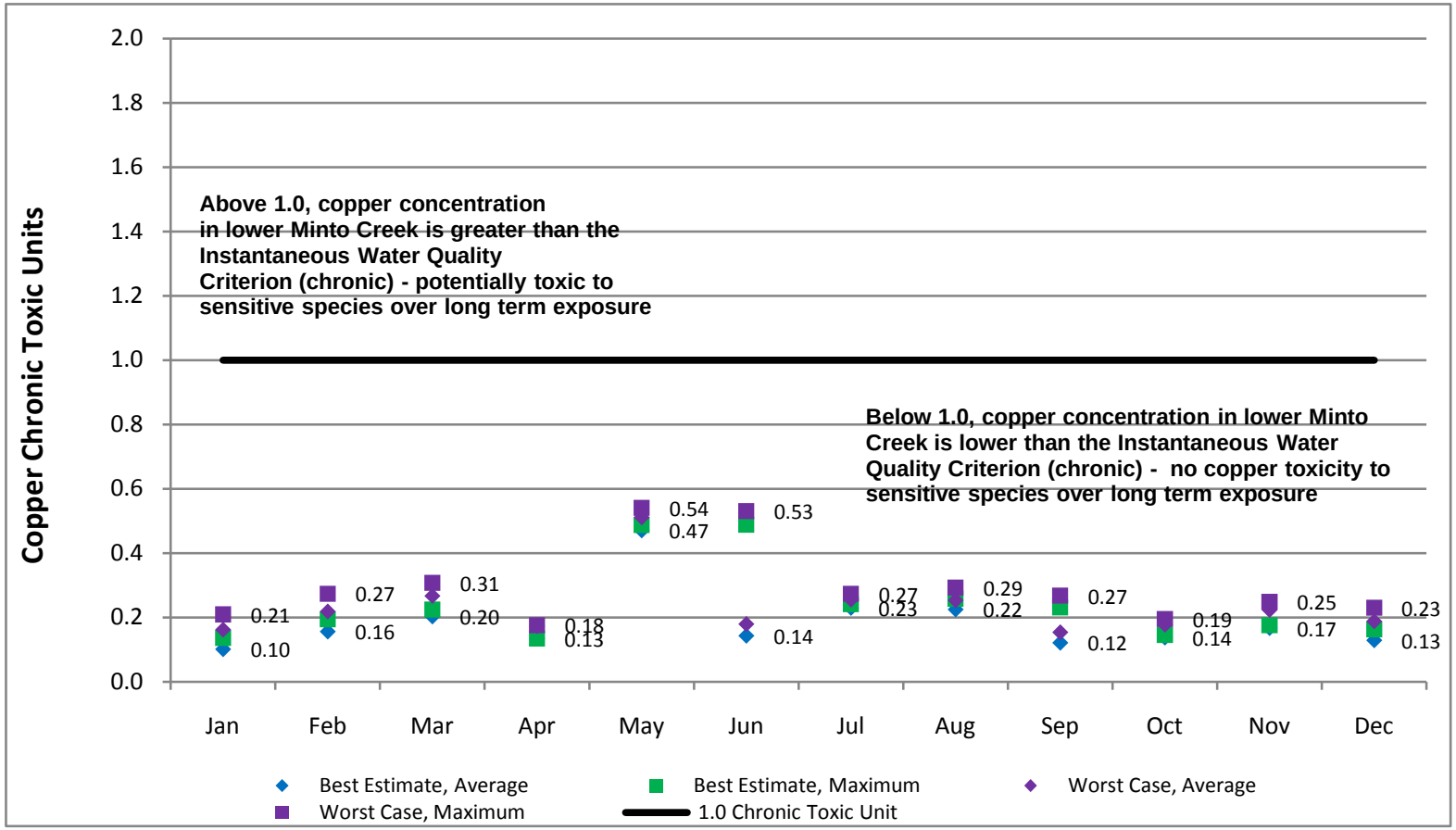


Figure 1: Plots of Operational Phase Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units

d) Plot of Copper Chronic Toxic Units

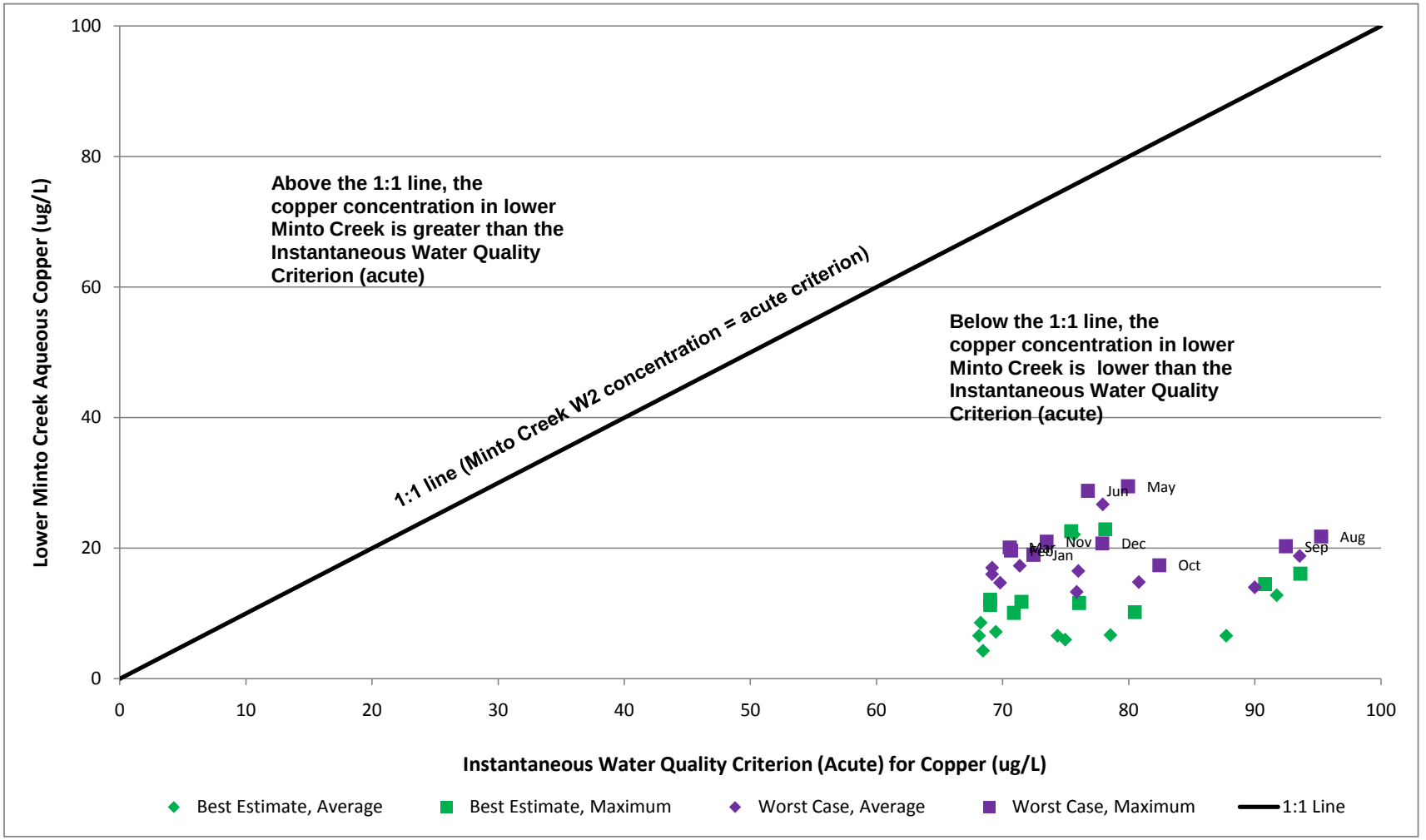


Figure 2: Plots of Post-Closure Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units
a) Plot of Copper versus Acute Instantaneous Water Quality Criteria

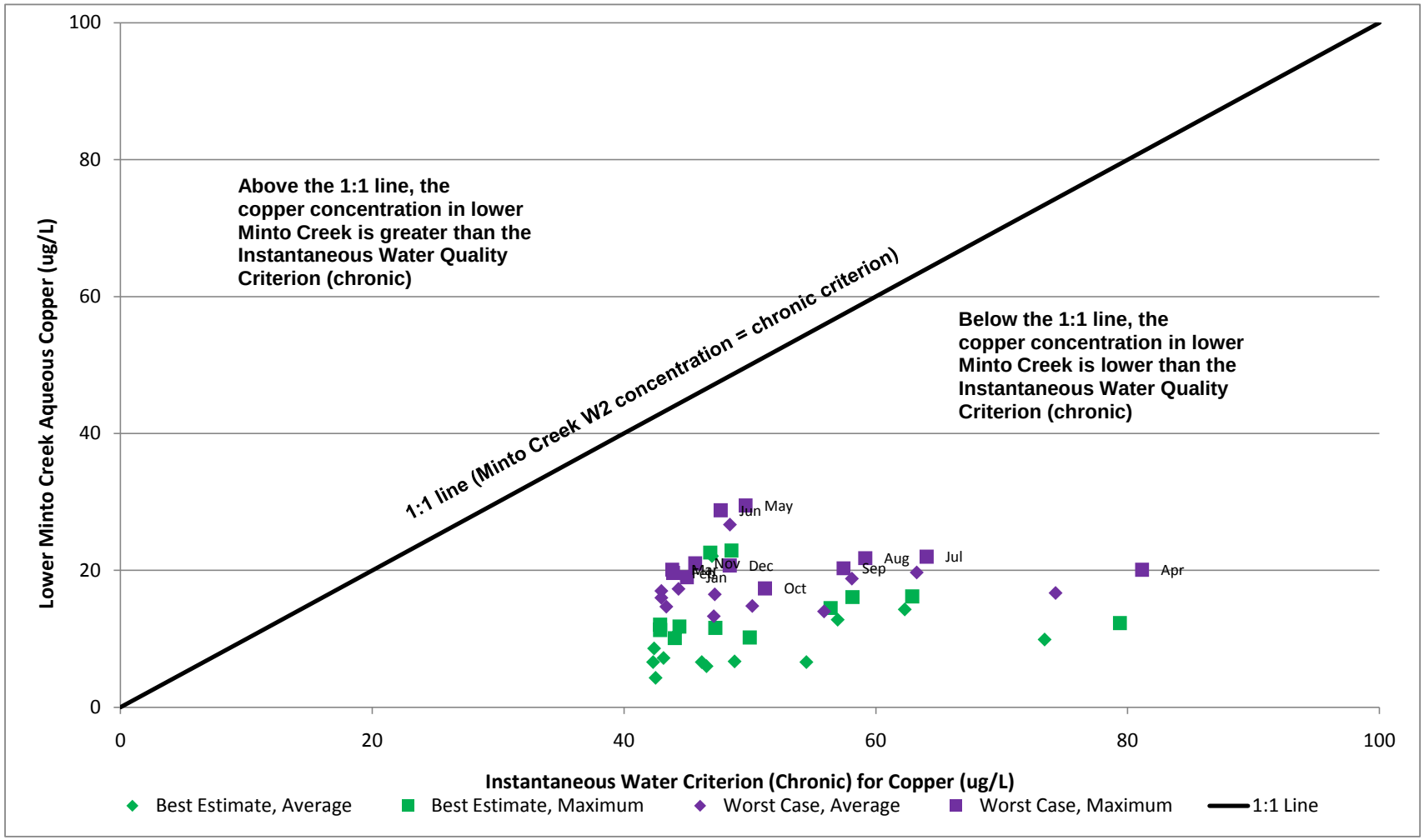


Figure 2: Plots of Post-Closure Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units
b) Plot of Copper versus Chronic Instantaneous Water Quality Criteria

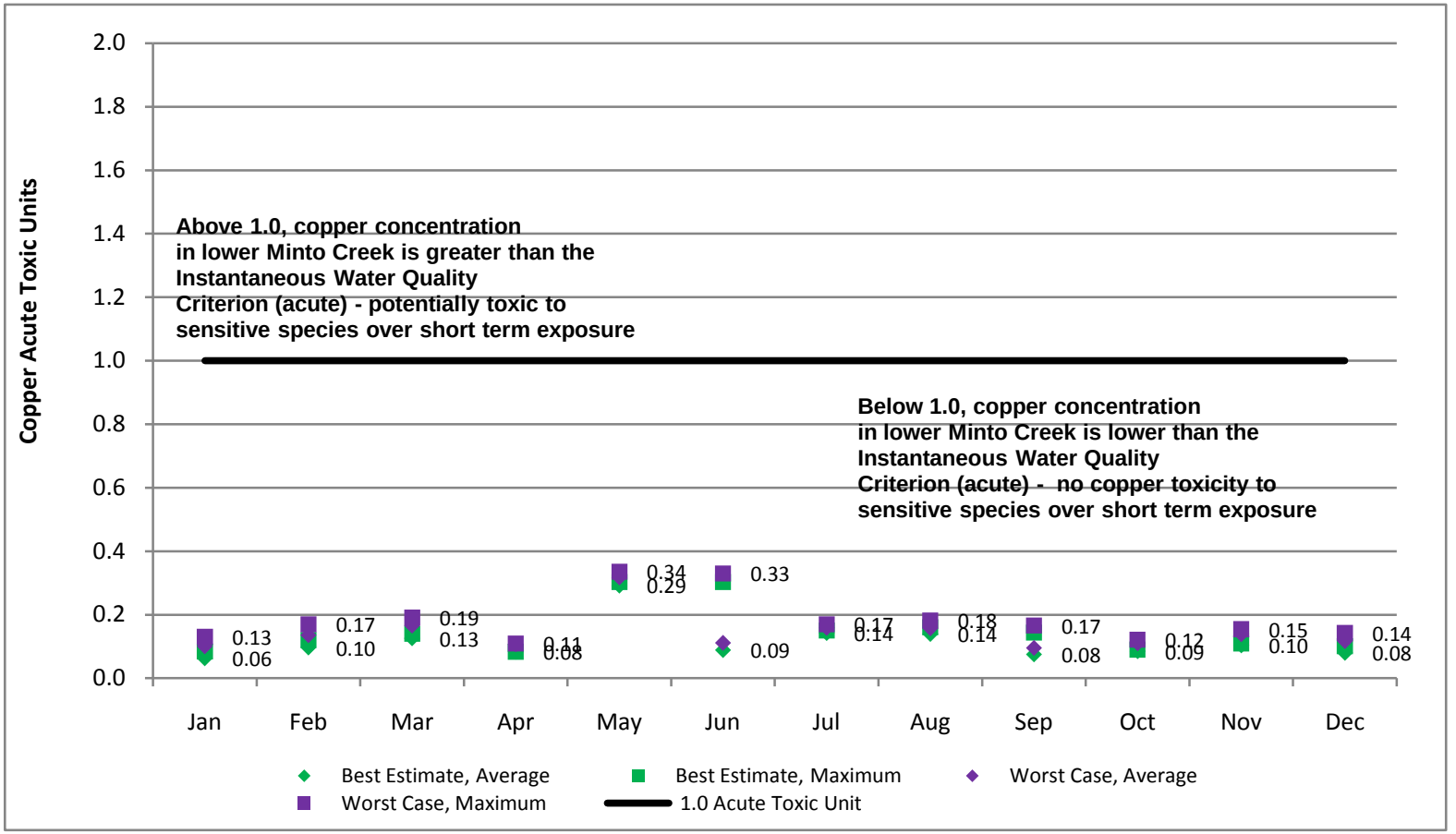


Figure 2: Plots of Post-Closure Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units

c) Plot of Copper Acute Toxic Units

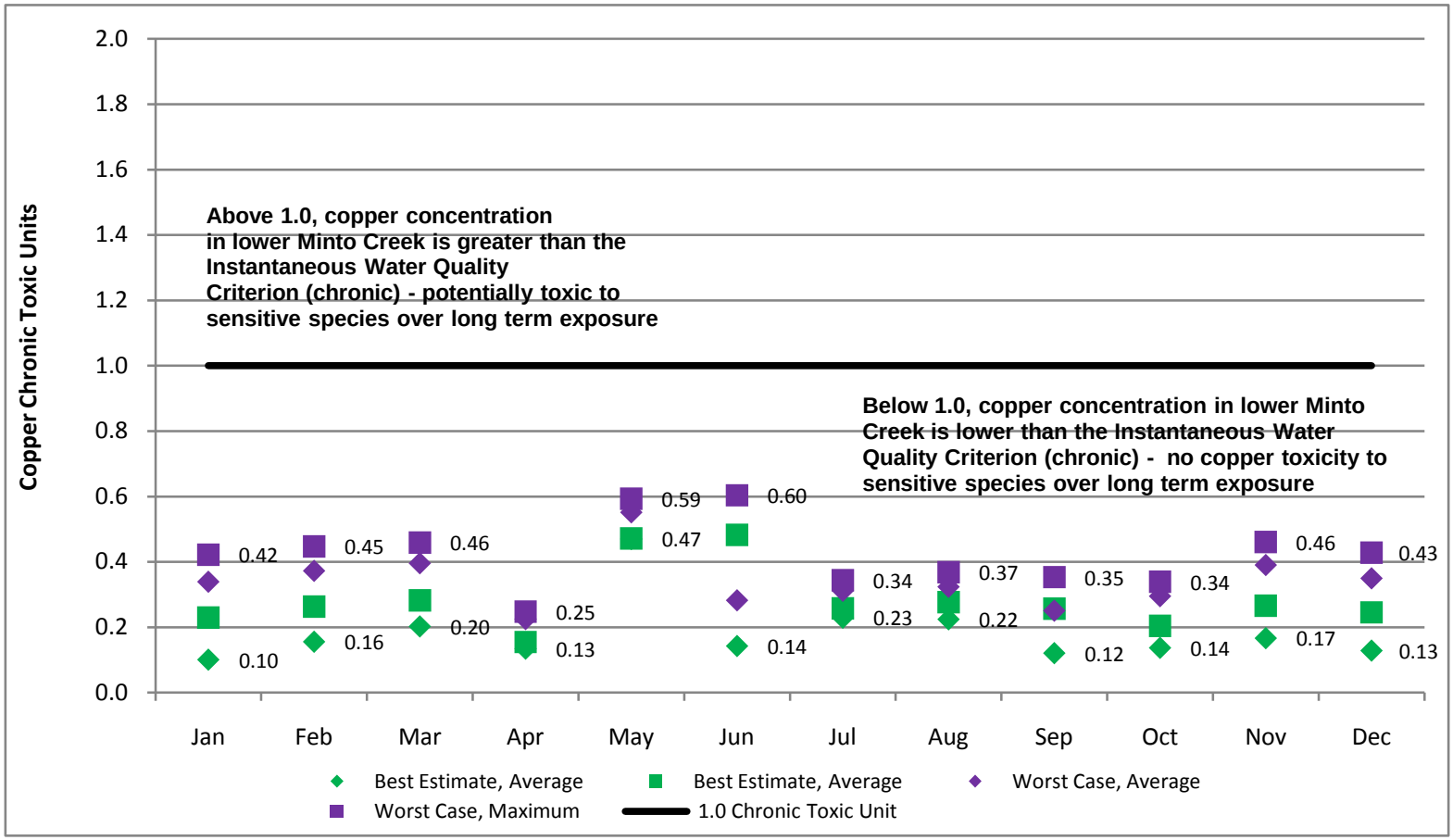


Figure 2: Plots of Post-Closure Copper versus Instantaneous Water Quality Criteria and Copper Toxic Units

d) Plot of Copper Chronic Toxic Units