APPENDIX E

SRWMP Water Quality Data

Appendix Table E.1: Background station water quality and 95% confidence limit [a], SRWMP 2009.

Station	Date	Barium	Cobalt	Iron	Manganese	pH	Radium	Sulphate	Uranium
		mg/L	mg/L	mg/L	mg/L	pH units	Bq/L	mg/L	mg/L
D-4	4-Apr-05	0.0142	< 0.0003	0.0128	0.006	6.7	< 0.005	5.73	< 0.0005
D-4	3-Oct-05	0.0135	< 0.0003	0.02	0.0118	6.8	< 0.005	6.34	0.0006
D-4	3-Apr-06	0.0153	< 0.0005	0.02	0.00667	6.9	< 0.005	5.6	0.00005
D-4	2-Oct-06	0.013	< 0.0005	0.07	0.027	7.0	< 0.005	5.3	< 0.0005
D-4	2-Apr-07	0.014	< 0.0005	0.03	0.01	7.0	< 0.005	5.1	< 0.0005
D-4	1-Oct-07	0.012	< 0.0005	0.03	0.011	6.9	< 0.005	5.3	< 0.0005
D-4	7-Apr-08	0.014	< 0.0005	0.03	0.007	6.9		5.7	< 0.0005
D-4	1-Oct-08	0.013	< 0.0005	0.02	0.011	7.0	< 0.005	4.9	< 0.0005
D-4	6-Apr-09	0.015	< 0.0005	0.02	0.006	6.8	< 0.005	5.3	< 0.0005
D-4	5-Oct-09	0.015	< 0.0005	0.1	0.019	6.9	< 0.005	4.4	< 0.0005
P-22	28-Mar-05	0.0317	< 0.0003	0.20	0.013	7.5	< 0.005	6.2	< 0.0005
P-22	17-Nov-05	0.0127	< 0.0003	0.22	0.048	6.1	< 0.005	4.5	< 0.0005
P-22	13-Mar-06	0.021	< 0.0003	0.22	0.028	6.5	< 0.005	7.0	< 0.0002
P-22	31-Oct-06	0.018	< 0.0005	0.25	0.067	6.4	< 0.005	4.4	< 0.0005
P-22	12-Mar-07	0.021	< 0.0005	0.14	0.010	6.4	< 0.005	5.4	< 0.0005
P-22	23-Oct-07	0.015	< 0.0005	0.03	0.011	6.7	< 0.005	4.6	< 0.0005
P-22	25-Mar-08	0.021	< 0.0005	0.21	0.013	6.4	< 0.005	5.5	< 0.0005
P-22	22-Oct-08	0.02	< 0.0005	0.09	0.025	6.8	< 0.005	3.7	< 0.0005
P-22	16-Mar-09	0.022	< 0.0005	0.28	0.013	6.2	< 0.005	4.5	< 0.0005
P-22	21-Sep-09	0.015	< 0.0005	0.08	0.017	5.7	< 0.005	3.2	< 0.0005
SR-05	4-Jan-05	0.0116	< 0.0003	0.02	0.010	6.8	< 0.005	5.6	< 0.0005
SR-05	17-Feb-05	0.0092	< 0.0003	0.03	0.008	7.1	0.009	5.9	< 0.0005
SR-05	17-Mar-05	0.007	< 0.0003	0.01	0.004	7.2	< 0.005	6.1	< 0.0005
SR-05	19-May-05	0.0091	< 0.0003	0.03	0.026	6.9	< 0.005	5.3	< 0.0005
SR-05	16-Jun-05	0.0067	< 0.0003	0.03	0.043	7.0	0.006	5.7	< 0.0005
SR-05	19-Jul-05	0.0074	< 0.0003	0.03	0.034	6.8	< 0.005	5.6	< 0.0005
SR-05	11-Aug-05	0.0064	< 0.0003	0.02	0.023	6.7	< 0.005	5.5	< 0.0005
SR-05	8-Sep-05	0.0052	< 0.0003	0.01	0.015	6.7	< 0.005	5.9	< 0.0005
SR-05	20-Oct-05	0.0046	< 0.0003	0.02	0.004	6.3	< 0.005	6.8	< 0.0005
SR-05	1-Nov-05	0.0049	< 0.0003	0.01	0.006	7.2	< 0.005	5.6	< 0.0005
SR-05	19-Jan-06	0.006	< 0.0003	0.03	0.005	6.5	< 0.005	5.7	< 0.0002
SR-05	16-Feb-06	0.006	< 0.0003	0.02	0.003	7.3	< 0.005	5.2	< 0.0002
SR-05	7-Mar-06	0.006	< 0.0003	0.02	0.002	6.9	< 0.005	5.3	< 0.0002
SR-05	26-Apr-06	0.00635	< 0.0005	0.02	0.008	7.1	< 0.005	4.8	< 0.0005
SR-05	16-May-06	0.00588	< 0.0005	0.02	0.010	7.0	< 0.005	4.7	< 0.0005
SR-05	20-Jun-06	0.0063	0.00006	0.02	0.024	6.4	< 0.005	5.0	< 0.0005
SR-05	20-Jul-06	0.006	< 0.0003	0.03	0.016	6.8	< 0.005	5.2	< 0.0002
SR-05	9-Aug-06	0.007	< 0.0005	0.03	0.033	7.7	< 0.005	4.8	< 0.0005
SR-05	14-Sep-06	0.005	< 0.0005	0.02	0.011	7.1	< 0.005	4.9	< 0.0005
SR-05	18-Oct-06	0.005	< 0.0005	0.04	0.021	7.2	< 0.005	4.6	< 0.0005
SR-05	22-Nov-06	0.006	< 0.0005	0.07	0.022	6.8	< 0.005	4.5	< 0.0005
SR-05	29-Jan-07	0.007	< 0.0005	0.03	0.013	6.7	< 0.005	5.9	< 0.0005
SR-05	20-Feb-07	0.007	< 0.0005	0.02	0.008	6.3	< 0.005	5.0	< 0.0005
SR-05	12-Mar-07	0.007	< 0.0005	0.02	0.007	6.5	< 0.005	5.3	< 0.0005
SR-05	10-May-07	0.006	< 0.0005	0.02	0.023	6.2	< 0.005	5.0	< 0.0005
SR-05	26-Jun-07	0.007	< 0.0005	0.05	0.036	6.8	< 0.005	4.7	< 0.0005
SR-05	27-Jul-07	0.007	< 0.0005	0.02	0.037	7.0	< 0.005	4.7	< 0.0005
SR-05	21-Aug-07	0.006	< 0.0005	0.02	0.016	7.2	< 0.005	5.2	< 0.0005
SR-05	25-Sep-07	0.006	< 0.0005	0.02	0.015	7.1	< 0.005	4.8	< 0.0005
SR-05	17-Oct-07	< 0.005	< 0.0005	0.02	0.009	7.1	< 0.005	4.7	< 0.0005
SR-05	7-Nov-07	< 0.005	< 0.0005	0.05	0.012	6.7	< 0.005	4.7	< 0.0005
SR-05	24-Jan-08	0.006	< 0.0005	0.04	0.012	6.6	< 0.005	5.1	< 0.0005
SR-05	21-Feb-08	0.006	< 0.0005	0.04	0.008	7.0	< 0.005	5.2	< 0.0005
SR-05	27-Mar-08	0.007	< 0.0005	0.02	0.005	7.0	< 0.005	5.2	< 0.0005
SR-05	15-May-08	0.006	< 0.0005	0.03	0.022	6.9	< 0.005	4.5	< 0.0005
SR-05	24-Jun-08	0.006	< 0.0005	0.02	0.021	6.7	< 0.005	4.6	< 0.0005
SR-05	22-Jul-08	0.007	< 0.0005	0.04	0.050	6.7	< 0.005	4.6	< 0.0005
SR-05	21-Aug-08	0.007	< 0.0005	0.07	0.059	7.0	< 0.005	4.6	< 0.0005
SR-05	18-Sep-08	0.006	< 0.0005	0.04	0.028	7.2	< 0.005	4.9	< 0.0005
SR-05	6-Oct-08	0.005	< 0.0005	0.03	0.014	7.2	< 0.005	4.5	< 0.0005
SR-05	5-Nov-08	0.006	< 0.0005	0.02	0.009	6.6	< 0.005	4.5	< 0.0005
SR-05	21-Jan-09	0.006	< 0.0005	0.03	0.011	6.7	< 0.005	4.7	< 0.0005
SR-05	19-Feb-09	0.006	< 0.0005	0.02	0.018	7.2	< 0.005	4.9	< 0.0005
SR-05	12-Mar-09	0.008	< 0.0005	0.02	0.007	7.1	< 0.005	4.9	< 0.0005
SR-05	26-May-09	0.006	< 0.0005	0.02	0.018	7.0	< 0.005	4.4	< 0.0005
SR-05	16-Jun-09	0.006	< 0.0005	0.03	0.031	7.3	< 0.005	4.5	< 0.0005
SR-05	20-Jul-09	0.006	< 0.0005	0.03	0.044	6.8	< 0.005	4.5	< 0.0005
SR-05	13-Aug-09	0.006	< 0.0005	0.04	0.038	6.9	< 0.005	4.4	< 0.0005
SR-05	26-Sep-09	0.006	< 0.0005	0.02	0.020	6.7	< 0.005	4.3	< 0.0005
SR-05	15-Oct-09	< 0.005	< 0.0005	0.02	0.013	6.7	< 0.005	4.3	< 0.0005
SR-05	5-Nov-09	0.006	< 0.0005	0.07	0.030	7.0	< 0.005	4.0	< 0.0005

Appendix Table E.1: Background station water quality and 95% confidence limit [a], SRWMP 2009.

Station	Date	Barium	Cobalt	Iron	Manganese	pH	Radium	Sulphate	Uranium
		mg/L	mg/L	mg/L	mg/L	pH units	Bq/L	mg/L	mg/L
SR-14	24-Sep-05	0.0085	< 0.0003	0.01	0.004	6.1	< 0.005	5.8	< 0.0005
SR-14	23-Oct-06	0.008	< 0.0005	< 0.02	< 0.002	6.8	< 0.005	5.0	< 0.0005
SR-14	15-Oct-07	0.008	< 0.0005	< 0.02	< 0.002	7.0	< 0.005	5.0	< 0.0005
SR-14	22-Oct-08	0.014	< 0.0005	< 0.02	0.004	6.6	< 0.005	4.9	< 0.0005
SR-14	20-Oct-09	0.008	< 0.0005	< 0.02	0.003	6.8	< 0.005	4.7	< 0.0005
SR-18	5-Apr-05	0.0537	< 0.0003	0.04	0.006	6.5	0.008	6.8	< 0.0005
SR-18	3-Oct-05	0.0449	< 0.0003	0.00	0.009	6.8	< 0.005	8.0	< 0.0005
SR-18	17-Apr-06	0.0455	0.00005	0.03	0.009	6.3	< 0.005	5.5	0.00006
SR-18	2-Oct-06	0.051	< 0.0005	0.03	0.012	6.8	< 0.005	6.1	< 0.0005
SR-18	2-Apr-07	0.053	< 0.0005	0.04	0.005	6.8	< 0.005	5.6	< 0.0005
SR-18	1-Oct-07	0.053	< 0.0005	< 0.02	0.007	7.1	0.006	6.1	< 0.0005
SR-18	14-Apr-08	0.05	< 0.0005	0.04	0.008	6.7	< 0.005	6.1	< 0.0005
SR-18	1-Oct-08	0.052	< 0.0005	0.02	0.012	7.1	< 0.005	5.5	< 0.0005
SR-18	16-Apr-09	0.05	< 0.0005	0.04	0.006	6.4	< 0.005	3.9	< 0.0005
SR-18	5-Oct-09	0.053	< 0.0005	0.06	0.014	6.9	< 0.005	5.5	< 0.0005
SR-19	17-Jan-05	0.0522	0.0018	0.30	0.030	6.4	< 0.005	5.8	0.0005
SR-19	21-Feb-05	0.0268	< 0.0003	0.24	0.024	6.5	0.005	6.0	< 0.0005
SR-19	21-Mar-05	0.0235	< 0.0003	0.25	0.027	7.1	< 0.005	6.1	< 0.0005
SR-19	18-Apr-05	0.0186	< 0.0003	0.10	0.017	6.5	< 0.005	4.6	< 0.0005
SR-19	16-May-05	0.0204	< 0.0003	0.16	0.033	7.3	< 0.005	5.2	< 0.0005
SR-19	20-Jun-05	0.0273	0.0006	0.73	0.103	6.9	0.007	5.0	< 0.0005
SR-19	18-Jul-05	0.0538	0.0024	2.27	0.884	6.7	< 0.005	3.9	< 0.0005
SR-19	15-Aug-05	0.0371	0.0009	1.67	0.310	6.6	< 0.005	4.5	< 0.0005
SR-19	19-Sep-05	0.0572	0.0019	2.68	0.998	6.5	< 0.005	3.7	< 0.0005
SR-19	17-Oct-05	0.0276	0.0006	1.38	0.189	6.7	0.007	5.6	< 0.0005
SR-19	21-Nov-05	0.0161	< 0.0003	0.14	0.017	6.3	< 0.005	5.7	< 0.0005
SR-19	12-Dec-05	0.0207	0.0004	0.12	0.020	7.1	< 0.005	5.9	< 0.0005
SR-19	17-Jan-06	0.024	< 0.0003	0.26	0.028	6.4	< 0.005	5.6	< 0.0002
SR-19	20-Feb-06	0.024	< 0.0003	0.26	0.026	7.0	< 0.005	5.7	< 0.0002
SR-19	20-Mar-06	0.022	< 0.0003	0.22	0.022	7.0	< 0.005	5.6	< 0.0002
SR-19	17-Apr-06	0.0183	0.0001	0.10	0.013	6.5	< 0.005	4.0	< 0.0005
SR-19	15-May-06	0.0206	0.00012	0.18	0.024	7.1	< 0.005	4.5	0.00006
SR-19	19-Jun-06	0.0298	0.00077	0.90	0.301	7.3	< 0.007	4.5	0.00006
SR-19	17-Jul-06	0.041	0.0009	1.58	0.348	7.2	< 0.005	4.0	< 0.0002
SR-19	14-Aug-06	0.029	< 0.0005	0.90	0.077	6.2	< 0.005	4.4	< 0.0005
SR-19	18-Sep-06	0.031	< 0.0005	0.77	0.105	6.8	< 0.005	4.5	< 0.0005
SR-19	16-Oct-06	0.019	< 0.0005	0.21	0.017	6.6	< 0.005	4.3	< 0.0005
SR-19	16-Nov-06	0.019	< 0.0005	0.21	0.018	6.9	< 0.005	4.5	< 0.0005
SR-19	11-Dec-06	0.02	< 0.0005	0.18	0.016	7.0	< 0.005	5.0	< 0.0005
SR-19	15-Jan-07	0.021	< 0.0005	0.12	0.015	7.1	< 0.005	5.2	< 0.0005
SR-19	19-Feb-07	0.023	< 0.0005	0.23	0.022	7.1	< 0.005	6.0	< 0.0005
SR-19	15-Mar-07	0.025	< 0.0005	0.39	0.039	7.1	< 0.005	5.4	< 0.0005
SR-19	16-Apr-07	0.02	< 0.0005	0.10	0.011	7.0	< 0.005	4.7	< 0.0005
SR-19	14-May-07	0.024	< 0.0005	0.21	0.049	6.8	< 0.005	4.6	< 0.0005
SR-19	18-Jun-07	0.031	< 0.0005	0.67	0.197	6.6	< 0.005	4.4	< 0.0005
SR-19	16-Jul-07	0.03	< 0.0005	0.89	0.103	6.8	< 0.005	3.7	< 0.0005
SR-19	20-Aug-07	0.035	< 0.0005	1.72	0.238	6.7	< 0.005	3.3	< 0.0005
SR-19	17-Sep-07	0.031	< 0.0005	1.50	0.097	6.8	< 0.005	4.2	< 0.0005
SR-19	11-Oct-07	0.027	< 0.0005	0.70	0.051	6.5	< 0.005	6.1	< 0.0005
SR-19	19-Nov-07	0.022	< 0.0005	0.25	0.020	6.5	< 0.005	4.9	< 0.0005
SR-19	17-Dec-07	0.022	< 0.0005	0.22	0.020	6.8	0.005	5.2	< 0.0005
SR-19	21-Jan-08	0.022	< 0.0005	0.17	0.010	6.8	< 0.005	5.6	< 0.0005
SR-19	19-Feb-08	0.02	< 0.0005	0.19	0.012	7.0	< 0.005	4.7	< 0.0005
SR-19	18-Mar-08	0.021	< 0.0005	0.20	0.015	7.0	< 0.005	5.2	< 0.0005
SR-19	21-Apr-08	0.019	< 0.0005	0.10	0.016	6.7	< 0.005	4.1	< 0.0005
SR-19	20-May-08	0.019	< 0.0005	0.13	0.025	6.9	< 0.005	4.8	< 0.0005
SR-19	16-Jun-08	0.025	< 0.0005	0.41	0.071	6.6	< 0.005	4.3	< 0.0005
SR-19	14-Jul-08	0.027	< 0.0005	0.56	0.107	6.6	< 0.005	4.5	< 0.0005
SR-19	18-Aug-08	0.03	< 0.0005	0.78	0.101	6.9	< 0.005	4.1	< 0.0005
SR-19	15-Sep-08	0.033	< 0.0005	0.88	0.147	6.7	< 0.005	4.1	< 0.0005
SR-19	2-Oct-08	0.027	< 0.0005	0.76	0.063	7.0	< 0.005	4.5	< 0.0005
SR-19	18-Nov-08	0.021	< 0.0005	0.25	0.024	6.6	< 0.005	4.8	< 0.0005
SR-19	22-Dec-08	0.019	0.002	0.23	0.060	7.1	< 0.005	5.0	< 0.0005
SR-19	21-Jan-09	0.02	< 0.0005	0.24	0.012	6.6	< 0.005	5.1	< 0.0005
SR-19	17-Feb-09	0.021	< 0.0005	0.26	0.014	6.8	< 0.005	4.8	< 0.0005
SR-19	16-Mar-09	0.022	< 0.0005	0.26	0.015	6.7	< 0.005	4.6	< 0.0005
SR-19	7-Apr-09	0.019	< 0.0005	0.15	0.018	6.7	< 0.005	4.7	< 0.0005
SR-19	19-May-09	0.02	< 0.0005	0.11	0.017	7.0	< 0.005	4.4	< 0.0005
SR-19	15-Jun-09	0.024	< 0.0005	0.22	0.059	6.8	< 0.005	4.7	< 0.0005
SR-19	20-Jul-09	0.026	< 0.0005	0.40	0.099	7.1	< 0.005	4.5	< 0.0005
SR-19	17-Aug-09	0.025	< 0.0005	0.43	0.072	7.1	< 0.005	4.3	< 0.0005
SR-19	10-Sep-09	0.026	< 0.0005	0.43	0.095	7.1	< 0.005	3.5	< 0.0005
SR-19	19-Oct-09	0.023	< 0.0005	0.30	0.018	6.9	< 0.005	4.1	< 0.0005
SR-19	16-Nov-09	0.02	< 0.0005	0.18	0.029	7.3	< 0.005	4.4	< 0.0005
SR-19	3-Dec-09	0.02	< 0.0005	0.22	0.023	7.1	< 0.005	4.0	< 0.0005

Appendix Table E.1: Background station water quality and 95% confidence limit [a], SRWMP 2009.

Station	Date	Barium	Cobalt	Iron	Manganese	pH	Radium	Sulphate	Uranium
		mg/L	mg/L	mg/L	mg/L	pH units	Bq/L	mg/L	mg/L
Annual Means									
D-4	**2005**	0.014	0.0003	0.02	0.009	6.8	0.005	6.0	0.0006
	2006	0.014	0.0005	0.05	0.017	7.0	0.005	5.5	0.0003
	2007	0.013	0.0005	0.03	0.011	7.0	0.005	5.2	0.0005
	2008	0.014	0.0005	0.03	0.009	7.0	0.005	5.3	0.0005
	2009	0.015	0.0005	0.06	0.013	6.9	0.005	4.9	0.0005
P-22	**2005**	0.022	0.0003	0.2	0.0	6.8	0.005	5.4	0.0005
	2006	0.020	0.0004	0.24	0.048	6.5	0.005	5.7	0.0004
	2007	0.018	0.0005	0.09	0.011	6.6	0.005	5.0	0.0005
	2008	0.021	0.0005	0.15	0.019	6.6	0.005	4.6	0.0005
	2009	0.019	0.0005	0.18	0.015	6.0	0.005	3.9	0.0005
SR-05	**2005**	0.007	0.0003	0.02	0.017	6.9	0.006	5.8	0.0005
	2006	0.006	0.0004	0.03	0.014	7.0	0.005	5.0	0.0004
	2007	0.006	0.0005	0.03	0.018	6.8	0.005	5.0	0.0005
	2008	0.006	0.0005	0.04	0.023	6.9	0.005	4.8	0.0005
	2009	0.006	0.0005	0.03	0.023	6.9	0.005	4.5	0.0005
SR-14	**2005**	0.009	0.0003	0.01	0.004	6.1	0.005	5.8	0.0005
	2006	0.008	0.0005	0.02	0.002	6.8	0.005	5.0	0.0005
	2007	0.008	0.0005	0.02	0.002	7.0	0.005	5.0	0.0005
	2008	0.014	0.0005	0.02	0.004	6.6	0.005	4.9	0.0005
	2009	0.008	0.0005	0.02	0.003	6.8	0.005	4.7	0.0005
SR-18	**2005**	0.049	0.0003	0.02	0.008	6.7	0.007	7.4	0.0005
	2006	0.048	0.0003	0.03	0.011	6.6	0.005	5.8	0.0003
	2007	0.053	0.0005	0.03	0.006	7.0	0.006	5.9	0.0005
	2008	0.051	0.0005	0.03	0.010	6.9	0.005	5.8	0.0005
	2009	0.052	0.0005	0.05	0.010	6.7	0.005	4.7	0.0005
SR-19	**2005**	0.032	0.0008	0.84	0.221	6.7	0.005	5.2	0.0005
	2006	0.025	0.0004	0.48	0.083	6.8	0.005	4.7	0.0003
	2007	0.026	0.0005	0.58	0.072	6.8	0.005	4.8	0.0005
	2008	0.024	0.0006	0.39	0.054	6.8	0.005	4.6	0.0005
	2009	0.022	0.0005	0.27	0.039	6.9	0.005	4.4	0.0005
Benchmark Calculation (t-statistic = 1.699)									
Mean of Means		0.021	0.0005	0.13	0.027	6.7	0.005	5.2	0.0005
SD of Means		0.015	0.0001	0.20	0.042	0.2	0.000	0.7	0.0001
Upper limit of Background		**0.047**	**0.0007**	**0.47**	**0.098**	**6.3**	**0.006**	**6.3**	**0.0006**
PWQO		**-**	**0.0009**	**0.30**	**-**	**6.5**	**1.0**	**100**	**0.005**

[a] Upper background limit calculated as mean of annual means plus *t* * standard deviation except for pH where lower 95% confidence limit was calculated (mean - t * standard deviation).

Shaded value indicates benchmark used for screening.

Appendix Table E.2: Water quality data for station D-5, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	Iron mg/L	Manganese mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**0.47**	**0.098**	**6.3**	**1.0**	**100**	**0.005**
D-5	4-Jan-05	0.0306	0.0006	0.041	0.0299	7.5	0.029	25.9	0.003
D-5	8-Feb-05	0.0301	< 0.0003	0.05	0.027	7	0.023	19.2	0.002
D-5	7-Mar-05	0.027	< 0.0003	0.042	0.025	7.3	0.035	23.3	0.0015
D-5	4-Apr-05	0.0325	< 0.0003	0.042	0.0398	6.6	0.029	32.2	0.0028
D-5	2-May-05	0.0444	< 0.0003	0.079	0.0411	7.2	0.055	25.9	0.0022
D-5	6-Jun-05	0.116	< 0.0003	0.069	0.0452	7	0.099	11.2	0.0015
D-5	4-Jul-05	0.151	0.0005	0.048	0.0276	7.1	0.14	18.4	0.0016
D-5	2-Aug-05	0.335	< 0.0003	0.055	0.0224	7	0.24	34	0.0026
D-5	6-Sep-05	0.31	< 0.0003	0.09	0.0246	7.1	0.26	69.8	0.0057
D-5	3-Oct-05	0.178	< 0.0003	0.076	0.0225	6.8	0.28	66.9	0.004
D-5	7-Nov-05	0.107	< 0.0003	0.087	0.0188	7	0.15	88	0.0057
D-5	5-Dec-05	0.0265	< 0.0003	0.047	0.0313	7.2	0.02	16	0.0009
D-5	4-Jan-06	0.024	< 0.0003	0.03	0.0184	7.6	0.017	8.9	0.0005
D-5	6-Feb-06	0.025	< 0.0003	0.03	0.0273	6.9	0.012	16	0.0014
D-5	6-Mar-06	0.024	< 0.0003	0.03	0.0249	7.3	0.009	15	0.0013
D-5	3-Apr-06	0.0324	0.00022	0.05	0.0507	6.9	0.018	27	0.00287
D-5	2-May-06	0.0408	< 0.0005	0.05	0.0272	6.9	0.03	15	0.00167
D-5	5-Jun-06	0.0793	0.00013	0.07	0.0466	7	0.095	9.9	0.00141
D-5	4-Jul-06	0.175	0.000074	0.07	0.0253	7.1	0.16	11	0.00189
D-5	1-Aug-06	0.148	< 0.0005	0.06	0.022	7.5	0.14	21	0.0018
D-5	11-Sep-06	0.348	< 0.0005	0.03	0.013	6.9	0.33	33	0.0031
D-5	2-Oct-06	0.316	< 0.0005	0.09	0.022	6.9	0.31	63	0.005
D-5	13-Nov-06	0.039	< 0.0005	0.05	0.032	6.9	0.041	23	0.002
D-5	5-Dec-06	0.027	< 0.0005	0.04	0.028	6.9	0.024	16	0.0014
D-5	3-Jan-07	0.0240	< 0.0005	0.04	0.024	7	0.015	23	0.0023
D-5	6-Feb-07	0.0240	< 0.0005	0.04	0.022	7.1	0.019	13	0.0012
D-5	5-Mar-07	0.0220	< 0.0005	0.05	0.021	7.2	0.013	16	0.0012
D-5	2-Apr-07	0.0300	< 0.0005	0.1	0.042	7	0.027	26	0.0024
D-5	2-May-07	0.0430	< 0.0005	0.05	0.032	7.1	0.048	19	0.002
D-5	7-Jun-07	0.1060	< 0.0005	0.08	0.038	7.1	0.1	20	0.0025
D-5	9-Jul-07	0.1770	< 0.0005	0.05	0.03	7.2	0.17	28	0.0021
D-5	7-Aug-07	0.1710	< 0.0005	0.05	0.022	7.1	0.26	24	0.0034
D-5	4-Sep-07	0.2470	< 0.0005	0.04	0.026	7.5	0.23	45	0.0035
D-5	1-Oct-07	0.209	< 0.0005	0.05	0.02	6.8	0.23	59	0.0039
D-5	6-Nov-07	0.055	< 0.0005	0.05	0.031	6.4	0.071	28	0.0021
D-5	6-Dec-07	0.029	0.0005	0.1	0.024	6.7	0.02	8.7	< 0.0005
D-5	7-Jan-08	0.023	< 0.0005	0.03	0.025	7	0.009	14	0.0012
D-5	4-Feb-08	0.018	< 0.0005	0.05	0.019	6.9	0.015	14	0.001
D-5	3-Mar-08	0.024	< 0.0005	0.06	0.023	6.8	0.015	19	0.0017
D-5	7-Apr-08	0.032	< 0.0005	0.08	0.043	6.9	0.035	35	0.0036
D-5	1-May-08	0.031	< 0.0005	0.06	0.026	6.5	0.027	14	0.0013
D-5	4-Jun-08	0.069	< 0.0005	0.06	0.038	7	0.074	11	0.0013
D-5	1-Jul-08	0.096	< 0.0005	0.07	0.041	6.8	0.1	13	0.0014
D-5	12-Aug-08	0.094	< 0.0005	0.07	0.025	6.8	0.1	30	0.0024
D-5	2-Sep-08	0.136	< 0.0005	0.04	0.023	7.2	0.14	18	0.0017
D-5	1-Oct-08	0.154	< 0.0005	0.06	0.024	7.2	0.15	24	0.002
D-5	3-Nov-08	0.081	< 0.0005	0.07	0.034	6.7	0.089	34	0.0021
D-5	1-Dec-08	0.034	< 0.0005	0.05	0.027	7	0.029	13	0.0007
D-5	5-Jan-09	0.043	< 0.0005	0.07	0.048	7.1	0.038	36	0.005
D-5	3-Feb-09	0.027	< 0.0005	0.07	0.026	6.9	0.022	14	0.0014
D-5	2-Mar-09	0.031	< 0.0005	0.07	0.031	7	0.023	25	0.0027
D-5	6-Apr-09	0.052	< 0.0005	0.12	0.052	6.7	0.052	45	0.0062
D-5	6-May-09	0.035	< 0.0005	0.06	0.025	7.4	0.037	11	0.0012
D-5	2-Jun-09	0.047	< 0.0005	0.04	0.023	7.3	0.051	8.8	0.001
D-5	6-Jul-09	0.138	< 0.0005	0.07	0.034	7.1	0.14	14	0.0018
D-5	6-Aug-09	0.123	< 0.0005	0.05	0.029	7	0.12	15	0.0015
D-5	8-Sep-09	0.137	< 0.0005	0.03	0.022	7.1	0.12	16	0.0015
D-5	5-Oct-09	0.231	< 0.0005	0.09	0.02	6.8	0.22	26	0.0025
D-5	2-Nov-09	0.045	< 0.0005	0.07	0.031	7.2	0.035	26	0.0021
D-5	7-Dec-09	0.031	< 0.0005	0.05	0.027	7	0.025	14	0.0013
Count		60	60	60	60	60	60	60	60
Minimum		0.018	0.0001	0.03	0.013	6.4	0.009	8.7	0.0005
Maximum		0.348	0.0006	0.12	0.052	7.6	0.330	88.0	0.0062
Mean		0.092	0.0004	0.06	0.029	7.0	0.090	24.8	0.0022
Median		0.045	0.0005	0.05	0.027	7.0	0.050	19.6	0.0019
10th Percentile		0.024	0.0003	0.04	0.021	6.8	0.015	11.0	0.0012

Note: Shaded values exceed benchmark.

Appendix Table E.3: Water quality data for station D-6, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	Iron mg/L	Manganese mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**0.47**	**0.098**	**6.3**	**1.0**	**100**	**0.005**
D-6	10-Jan-05	0.022	0.0004	0.121	0.0888	7	0.008	19.1	< 0.0005
D-6	14-Feb-05	0.0178	< 0.0003	0.178	0.126	6.3	< 0.005	20.3	0.0005
D-6	14-Mar-05	0.0162	< 0.0003	0.186	0.135	6.8	0.015	26.2	< 0.0005
D-6	11-Apr-05	0.0163	0.0007	0.471	0.234	6.9	0.015	33.1	< 0.0005
D-6	9-May-05	0.0192	< 0.0003	0.252	0.202	6.9	0.006	39.7	< 0.0005
D-6	13-Jun-05	0.0144	< 0.0003	0.269	0.234	6.6	< 0.005	48.9	< 0.0005
D-6	11-Jul-05	0.02	0.0007	0.452	0.631	6.8	0.011	122	< 0.0005
D-6	8-Aug-05	0.0182	0.0004	0.355	0.362	6.5	0.011	103	0.0005
D-6	12-Sep-05	0.0283	0.0008	0.486	0.948	6.4	0.011	233	< 0.0005
D-6	11-Oct-05	0.0214	0.0004	0.263	0.399	6.1	0.012	204	< 0.0005
D-6	14-Nov-05	0.0152	< 0.0003	0.179	0.074	6.6	0.007	74.5	< 0.0005
D-6	12-Dec-05	0.0136	< 0.0003	0.105	0.0924	7.1	< 0.005	19.9	< 0.0005
D-6	9-Jan-06	0.015	< 0.0003	0.12	0.13	6.7	< 0.005	27	< 0.0002
D-6	13-Feb-06	0.014	< 0.0003	0.1	0.0974	6.9	< 0.005	18	< 0.0002
D-6	13-Mar-06	0.014	< 0.0003	0.14	0.123	6.5	< 0.005	21	< 0.0002
D-6	10-Apr-06	0.015	0.00036	0.12	0.114	6.8	0.005	18	0.00017
D-6	8-May-06	0.0152	0.00034	0.2	0.205	6.8	0.005	32	0.00009
D-6	12-Jun-06	0.0131	0.00031	0.28	0.255	7	0.005	44	0.00037
D-6	11-Jul-06	0.012	< 0.0005	0.2	0.0977	7	< 0.005	31	< 0.0005
D-6	1-Aug-06	0.028	0.0011	0.73	1.29	7	0.011	180	< 0.0005
D-6	11-Sep-06	0.025	0.0005	0.35	0.604	6.8	0.013	160	< 0.0005
D-6	10-Oct-06	0.018	< 0.0005	0.12	0.093	6.7	0.008	83	< 0.0005
D-6	13-Nov-06	0.014	< 0.0005	0.08	0.072	6.9	< 0.005	21	< 0.0005
D-6	11-Dec-06	0.014	< 0.0005	0.08	0.076	6.9	< 0.005	17	< 0.0005
D-6	8-Jan-07	0.0140	< 0.0005	0.100	0.0730	6.6	< 0.005	14.0	< 0.0005
D-6	12-Feb-07	0.0150	< 0.0005	0.170	0.1330	6.6	0.005	20.0	< 0.0005
D-6	12-Mar-07	0.0150	< 0.0005	0.150	0.1520	6.5	< 0.005	20.0	< 0.0005
D-6	9-Apr-07	0.0160	< 0.0005	0.150	0.1640	7.0	0.007	18.0	< 0.0005
D-6	2-May-07	0.0150	< 0.0005	0.210	0.1590	6.7	0.007	22.0	< 0.0005
D-6	11-Jun-07	0.0130	< 0.0005	0.350	0.1900	6.9	0.007	5.0	< 0.0005
D-6	9-Oct-07	0.0180	< 0.0005	0.200	0.0810	6.9	0.013	63.0	< 0.0005
D-6	13-Nov-07	0.0130	< 0.0005	0.130	0.0580	7.0	0.007	23.0	< 0.0005
D-6	10-Dec-07	0.0140	< 0.0005	0.090	0.0740	7.1	< 0.005	17.0	< 0.0005
D-6	14-Jan-08	0.0150	< 0.0005	0.090	0.1080	6.7	0.007	16.0	< 0.0005
D-6	11-Feb-08	0.016	< 0.0005	0.15	0.066	6.6	< 0.005	12.0	< 0.0005
D-6	10-Mar-08	0.016	< 0.0005	0.24	0.099	6.5	< 0.005	16.0	< 0.0005
D-6	14-Apr-08	0.016	< 0.0005	0.34	0.141	6.7	< 0.005	17.0	< 0.0005
D-6	12-May-08	0.014	< 0.0005	0.2	0.13	6.6	< 0.005	19.0	< 0.0005
D-6	9-Jun-08	0.012	< 0.0005	0.2	0.087	6.6	< 0.005	17.0	< 0.0005
D-6	7-Jul-08	0.014	< 0.0005	0.51	0.174	6.7	< 0.005	23.0	< 0.0005
D-6	12-Aug-08	0.015	< 0.0005	0.39	0.151	6.6	0.005	33.0	< 0.0005
D-6	9-Sep-08	0.016	< 0.0005	0.47	0.266	6.8	< 0.005	67.0	< 0.0005
D-6	1-Oct-08	0.019	0.0005	0.49	0.375	6.7	0.007	96.0	< 0.0005
D-6	11-Nov-08	0.02	< 0.0005	0.28	0.146	6.8	< 0.005	66.0	< 0.0005
D-6	9-Dec-08	0.013	< 0.0005	0.11	0.08	7	< 0.005	20.0	< 0.0005
D-6	13-Jan-09	0.014	< 0.0005	0.13	0.079	6.9	< 0.005	15.0	0.0005
D-6	10-Feb-09	0.016	0.0006	0.2	0.122	6.7	0.005	18.0	< 0.0005
D-6	10-Mar-09	0.015	< 0.0005	0.22	0.124	6.9	< 0.005	17.0	< 0.0005
D-6	6-Apr-09	0.016	< 0.0005	0.16	0.098	6.8	< 0.005	14.0	< 0.0005
D-6	19-May-09	0.014	< 0.0005	0.13	0.07	7.4	< 0.005	15.0	< 0.0005
D-6	9-Jun-09	0.015	< 0.0005	0.32	0.283	7	0.007	26.0	< 0.0005
D-6	13-Jul-09	0.019	0.001	1.1	0.659	6.9	0.013	44.0	< 0.0005
D-6	11-Aug-09	0.018	0.0006	0.82	0.378	6.5	< 0.005	49.0	< 0.0005
D-6	22-Sep-09	0.028	0.001	0.8	0.708	6.8	0.009	110.0	< 0.0005
D-6	13-Oct-09	0.023	< 0.0005	0.29	0.188	7	0.012	98.0	< 0.0005
D-6	2-Nov-09	0.015	< 0.0005	0.11	0.046	6.7	< 0.005	31.0	< 0.0005
D-6	3-Dec-09	0.015	< 0.0005	0.18	0.092	6.9	< 0.005	24.0	< 0.0005
Count		57	57	57	57	57	57	57	57
Minimum		0.012	0.0003	0.08	0.046	6.1	0.005	5.0	0.0001
Maximum		0.028	0.0011	1.10	1.290	7.4	0.015	233.0	0.0005
Mean		0.017	0.0005	0.27	0.218	6.8	0.007	46.7	0.0005
Median		0.015	0.0005	0.20	0.130	6.8	0.005	23.0	0.0005
10th Percentile		0.013	0.0003	0.10	0.074	6.5	0.005	15.6	0.0004

Note: Shaded values exceed benchmark.

Appendix Table E.4: Water quality data for station DS-18, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	Iron mg/L	Manganese mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**0.47**	**0.098**	**6.3**	**1.0**	**100**	**0.005**
DS-18	18-Jan-05	0.0213	0.0004	0.31	0.030	7.1	0.100	138.0	0.0012
DS-18	22-Feb-05	0.0153	< 0.0003	0.24	0.019	6.7	0.100	107.0	0.0011
DS-18	22-Mar-05	0.0111	< 0.0003	0.25	0.019	7.1	0.083	74.3	0.0009
DS-18	19-Apr-05	0.0154	0.0003	0.23	0.023	7.0	0.130	130.0	0.0015
DS-18	17-May-05	0.015	< 0.0003	0.09	0.005	7.1	0.097	125.0	0.0013
DS-18	14-Jun-05	0.0128	< 0.0003	0.13	0.012	7.2	0.120	81.1	0.0019
DS-18	19-Jul-05	0.0099	< 0.0003	0.13	0.011	7.4	0.080	59.2	0.0023
DS-18	16-Aug-05	0.0074	< 0.0003	0.09	0.010	7.4	0.084	48.1	0.0025
DS-18	20-Sep-05	0.0077	< 0.0003	0.10	0.009	7.1	0.075	49.7	0.0037
DS-18	18-Oct-05	0.0078	< 0.0003	0.04	0.003	6.9	0.068	60.6	0.0044
DS-18	22-Nov-05	0.0088	< 0.0003	0.13	0.005	6.7	0.110	64.1	0.0036
DS-18	20-Dec-05	0.0151	0.0005	0.22	0.030	7.3	0.120	94.5	0.0019
DS-18	17-Jan-06	0.016	0.0005	0.34	0.052	7.0	0.130	100.0	0.0011
DS-18	21-Feb-06	0.016	0.0004	0.27	0.054	7.3	0.150	110.0	0.0011
DS-18	14-Mar-06	0.015	0.0005	0.62	0.058	7.2	0.110	80.0	0.0013
DS-18	18-Apr-06	0.0172	0.00038	0.16	0.014	7.2	0.100	98.0	0.00122
DS-18	16-May-06	0.0157	0.00012	0.09	0.007	7.4	0.110	88.0	0.001
DS-18	20-Jun-06	0.0134	0.00016	0.13	0.011	7.2	0.120	76.0	0.00092
DS-18	18-Jul-06	0.012	< 0.0003	0.23	0.014	7.2	0.100	55.0	0.0013
DS-18	15-Aug-06	0.008	< 0.0005	0.15	0.008	7.8	0.066	38.0	0.0015
DS-18	19-Sep-06	0.007	< 0.0005	0.13	0.008	7.0	0.068	31.0	0.0014
DS-18	17-Oct-06	0.012	< 0.0005	0.17	0.009	7.1	0.110	54.0	0.0013
DS-18	21-Nov-06	0.014	< 0.0005	0.14	0.008	7.0	0.160	120.0	0.0008
DS-18	18-Dec-06	0.012	< 0.0005	0.19	0.016	7.1	0.095	100.0	0.0007
DS-18	16-Jan-07	0.0110	< 0.0005	0.43	0.017	7.1	0.062	76.0	0.0006
DS-18	20-Feb-07	0.0120	< 0.0005	0.70	0.025	6.9	0.091	74.0	0.0007
DS-18	20-Mar-07	0.0130	< 0.0005	0.48	0.026	7.4	0.094	90.0	0.0006
DS-18	17-Apr-07	0.0120	< 0.0005	0.30	0.017	6.4	0.081	78.0	0.0006
DS-18	15-May-07	0.0150	< 0.0005	0.25	0.014	7.0	0.120	55.0	0.0013
DS-18	19-Jun-07	0.0100	< 0.0005	0.21	0.014	7.2	0.099	86.0	0.0014
DS-18	17-Jul-07	0.0080	< 0.0005	0.08	0.007	7.4	0.077	71.0	0.0024
DS-18	22-Aug-07	0.0070	< 0.0005	0.10	0.008	7.4	0.073	55.0	0.0029
DS-18	19-Sep-07	0.0080	< 0.0005	0.13	0.007	7.6	0.065	49.0	0.0036
DS-18	11-Oct-07	0.0090	< 0.0005	0.09	0.005	7.1	0.079	51.0	0.0031
DS-18	20-Nov-07	0.0160	< 0.0005	0.16	0.011	7.2	0.190	120.0	0.0017
DS-18	17-Dec-07	0.0110	< 0.0005	0.19	0.024	7.0	0.080	54.0	0.0007
DS-18	15-Jan-08	0.0130	< 0.0005	0.30	0.024	6.8	0.110	150.0	0.0009
DS-18	19-Feb-08	0.0120	< 0.0005	0.50	0.020	6.7	0.078	100.0	0.0009
DS-18	18-Mar-08	0.0110	< 0.0005	0.72	0.022	6.8	0.072	85.0	0.0008
DS-18	15-Apr-08	0.0170	< 0.0005	0.27	0.023	6.8	0.058	110.0	0.0007
DS-18	20-May-08	0.0160	< 0.0005	0.22	0.007	7.0	0.095	73.0	0.0005
DS-18	17-Jun-08	0.0140	< 0.0005	0.32	0.011	7.0	0.100	58.0	0.0008
DS-18	15-Jul-08	0.0130	< 0.0005	0.16	0.009	7.1	0.075	79.0	0.0010
DS-18	19-Aug-08	0.0090	< 0.0005	0.12	0.007	7.3	0.058	49.0	0.0012
DS-18	16-Sep-08	0.008	< 0.0005	0.11	0.006	7.4	0.049	39.0	0.0009
DS-18	28-Oct-08	0.009	< 0.0005	0.08	0.003	7.1	0.052	41.0	0.0006
DS-18	18-Nov-08	0.009	< 0.0005	0.07	0.006	6.9	0.061	48.0	0.0008
DS-18	16-Dec-08	0.012	< 0.0005	0.31	0.020	7.0	0.100	49.0	0.0008
DS-18	13-Jan-09	0.013	0.0006	1.56	0.051	6.7	0.087	83.0	0.0015
DS-18	17-Feb-09	0.014	0.0006	2.01	0.054	6.7	0.120	85.0	0.0016
DS-18	17-Mar-09	0.014	0.0006	1.62	0.067	6.9	0.130	110.0	0.0014
DS-18	7-Apr-09	0.015	0.0006	0.52	0.044	6.7	0.079	150.0	0.0012
DS-18	26-May-09	0.019	< 0.0005	0.31	0.012	6.6	0.110	86.0	0.0006
DS-18	16-Jun-09	0.013	< 0.0005	0.20	0.010	7.2	0.099	72.0	0.0006
DS-18	21-Jul-09	0.009	< 0.0005	0.18	0.009	7.0	0.074	49.0	0.0011
DS-18	18-Aug-09	0.008	< 0.0005	0.19	0.010	7.2	0.060	38.0	0.0011
DS-18	22-Sep-09	0.008	< 0.0005	0.14	0.014	7.2	0.068	37.0	0.0016
DS-18	19-Oct-09	0.006	< 0.0005	0.08	0.004	6.9	0.055	39.0	0.001
DS-18	17-Nov-09	0.016	< 0.0005	0.14	0.011	7.0	0.140	120.0	0.0008
DS-18	17-Dec-09	0.013	< 0.0005	0.18	0.023	7.1	0.110	79.0	< 0.0005
Count		60	60	60	60	60	60	60	60
Minimum		0.006	0.0001	0.04	0.003	6.4	0.049	31.0	0.0005
Maximum		0.021	0.0006	2.01	0.067	7.8	0.190	150.0	0.0044
Mean		0.012	0.0005	0.30	0.018	7.1	0.094	77.8	0.0014
Median		0.012	0.0005	0.19	0.012	7.1	0.095	76.0	0.0011
10th Percentile		0.008	0.0003	0.09	0.006	6.7	0.061	40.8	0.0006

Note: Shaded values exceed benchmark.

Appendix Table E.5: Water quality data for station M-01, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	Iron mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**0.47**	**6.3**	**1.0**	**100**	**0.005**
M-01	17-Jan-05	0.0236	0.0006	0.392	6.3	0.016	20.6	0.0052
M-01	21-Feb-05	0.0187	0.0008	0.542	6.2	0.019	21	0.0049
M-01	21-Mar-05	0.0185	0.0008	0.491	6.5	0.021	26.2	0.004
M-01	18-Apr-05	0.0155	0.0009	0.38	6.4	0.041	18	0.0028
M-01	16-May-05	0.023	0.0012	0.357	6.8	0.023	25.2	0.0023
M-01	21-Nov-05	0.017	0.0005	0.177	6.5	0.028	33.4	0.0032
M-01	12-Dec-05	0.0193	0.001	0.295	7	0.038	26.2	0.0054
M-01	17-Jan-06	0.022	0.0011	0.55	6.2	0.023	26	0.0038
M-01	20-Feb-06	0.018	0.0007	0.76	6.6	0.027	24	0.0049
M-01	20-Mar-06	0.022	0.0012	0.52	6.7	0.032	25	0.005
M-01	17-Apr-06	0.0152	0.00074	0.19	6.9	0.021	15	0.00269
M-01	15-May-06	0.0176	0.00034	0.23	7	0.027	20	0.00235
M-01	19-Jun-06	0.0242	0.00073	1.07	7.5	0.028	19	0.00341
M-01	16-Oct-06	0.016	< 0.0005	0.56	6.8	0.026	18	0.0032
M-01	16-Nov-06	0.014	< 0.0005	0.32	7.3	0.027	19	0.0034
M-01	11-Dec-06	0.016	< 0.0005	0.24	6.8	0.019	19	0.0043
M-01	15-Jan-07	0.0160	0.0007	0.390	7.0	0.038	18.0	0.0052
M-01	19-Feb-07	0.0210	0.0011	0.740	6.9	0.028	23.0	0.0045
M-01	15-Mar-07	0.0190	0.0012	0.930	6.8	0.029	23.0	0.0064
M-01	16-Apr-07	0.0150	0.0006	0.260	6.9	0.022	16.0	0.0033
M-01	16-Jul-07	0.0200	0.0005	0.860	7.2	0.046	10.0	0.0105
M-01	27-Aug-07	0.0160	0.0008	2.800	6.7	0.031	4.6	0.0081
M-01	24-Sep-07	0.0240	0.0014	1.140	6.4	0.047	10.0	0.0058
M-01	24-Oct-07	0.025	0.0015	0.86	6.9	0.054	14.0	0.0062
M-01	19-Nov-07	0.019	0.0009	0.76	6.9	0.032	21.0	0.0041
M-01	17-Dec-07	0.02	0.0005	0.4	6.8	0.027	21.0	0.0038
M-01	21-Jan-08	0.016	0.0005	0.33	6.5	0.023	21.0	0.0055
M-01	19-Feb-08	0.015	0.0005	0.29	6.7	0.017	17.0	0.0047
M-01	18-Mar-08	0.019	0.0009	0.41	6.9	0.017	18.0	0.0046
M-01	21-Apr-08	0.012	< 0.0005	0.17	6.9	0.022	9.4	0.0025
M-01	20-May-08	0.017	< 0.0005	0.26	7.0	0.021	15.0	0.0033
M-01	16-Jun-08	0.018	0.0005	0.77	7.1	0.023	13.0	0.004
M-01	14-Jul-08	0.021	0.0016	2.08	6.5	0.038	5.9	0.0082
M-01	18-Aug-08	0.025	0.001	1.04	6.8	0.035	11.0	0.006
M-01	15-Sep-08	0.023	0.002	0.71	7.0	0.034	15.0	0.0069
M-01	2-Oct-08	0.016	< 0.0005	0.78	6.9	0.023	9.5	0.0043
M-01	17-Nov-08	0.016	0.0006	0.52	7.0	0.022	18.0	0.0031
M-01	17-Dec-08	0.018	0.0006	0.65	6.6	0.01	16.0	0.0031
M-01	21-Jan-09	0.017	0.0005	0.46	6.7	0.018	20.0	0.0037
M-01	17-Feb-09	0.018	0.0008	0.55	6.7	0.014	20.0	0.0033
M-01	16-Mar-09	0.018	0.0007	0.61	6.4	0.017	18.0	0.0038
M-01	8-Apr-09	0.014	0.0006	0.3	6.5	0.025	14.0	0.0047
M-01	19-May-09	0.016	< 0.0005	0.2	6.8	0.015	12.0	0.0033
M-01	15-Jun-09	0.022	0.0006	0.78	7.0	0.021	11.0	0.0037
M-01	20-Jul-09	0.017	< 0.0005	1.46	6.9	0.017	8.1	0.0042
M-01	17-Aug-09	0.02	< 0.0005	1.38	6.9	0.026	6.9	0.005
M-01	10-Sep-09	0.018	< 0.0005	0.95	6.7	0.017	5.4	0.0037
M-01	19-Oct-09	0.016	< 0.0005	0.65	6.6	< 0.005	13.7	0.002
M-01	11-Nov-09	0.013	< 0.0005	0.26	6.6	0.019	13.0	0.0034
M-01	3-Dec-09	0.014	< 0.0005	0.42	6.9	0.023	15.0	0.0037
Count		50	50	50	50	50	50	50
Minimum		0.012	0.0003	0.17	6.2	0.005	4.6	0.0020
Maximum		0.025	0.0020	2.80	7.5	0.054	33.4	0.0105
Mean		0.018	0.0008	0.64	6.8	0.025	16.8	0.0044
Median		0.018	0.0006	0.53	6.8	0.023	18.0	0.0040
10th Percentile		0.015	0.0005	0.24	6.4	0.017	9.3	0.0028

Note: Shaded values exceed benchmark.

Appendix Table E.6: Water quality data for station Q-09, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
Q-09	4-Jan-05	0.0355	0.001	7.1	0.039	67.9	0.0062
Q-09	8-Feb-05	0.0362	0.001	6.9	0.018	79.9	0.0039
Q-09	7-Mar-05	0.0321	0.0006	7	0.027	78.5	0.0037
Q-09	4-Apr-05	0.033	0.0008	6.6	0.049	41.4	0.0038
Q-09	2-May-05	0.0598	0.0013	7	0.097	61	0.0051
Q-09	6-Jun-05	0.129	0.0003	7	0.16	61	0.0065
Q-09	4-Jul-05	0.164	0.0003	6.9	0.17	69	0.0035
Q-09	2-Aug-05	0.276	0.0005	6.9	0.2	94.1	0.0076
Q-09	6-Sep-05	0.21	0.0006	6.8	0.17	181	0.007
Q-09	3-Oct-05	0.146	< 0.0003	6.7	0.18	189	0.0077
Q-09	7-Nov-05	0.0627	0.0007	6.6	0.094	194	0.0073
Q-09	5-Dec-05	0.03	0.0008	6.8	0.031	56.4	0.0037
Q-09	4-Jan-06	0.029	0.001	7.2	0.019	58	0.0023
Q-09	6-Feb-06	0.03	0.0008	6.9	0.025	76	0.0029
Q-09	6-Mar-06	0.029	0.0009	7	0.024	76	0.0033
Q-09	3-Apr-06	0.0335	0.00094	6.6	0.03	41	0.00394
Q-09	2-May-06	0.04689	0.00064	6.9	0.055	34	0.00323
Q-09	5-Jun-06	0.0934	0.00041	7	0.12	37	0.00299
Q-09	4-Jul-06	0.211	0.000354	7	0.2	38	0.00497
Q-09	1-Aug-06	0.149	< 0.0005	7	0.12	76	0.0037
Q-09	11-Sep-06	0.104	< 0.0005	6.9	0.085	260	0.0109
Q-09	2-Oct-06	0.091	0.0006	6.8	0.087	370	0.011
Q-09	13-Nov-06	0.04	< 0.0005	6.8	0.045	50	0.0042
Q-09	5-Dec-06	0.031	< 0.0005	6.9	0.026	49	0.0038
Q-09	3-Jan-07	0.0270	0.0009	7.0	0.027	67.0	0.0035
Q-09	6-Feb-07	0.0280	0.0009	6.9	0.018	61.0	0.0031
Q-09	5-Mar-07	0.0270	0.0011	6.9	0.016	79.0	0.0036
Q-09	2-Apr-07	0.0320	0.0008	6.9	0.037	59.0	0.0044
Q-09	2-May-07	0.0460	< 0.0005	6.9	0.043	46.0	0.0034
Q-09	7-Jun-07	0.1100	< 0.0005	6.9	0.100	63.0	0.0050
Q-09	9-Jul-07	0.2460	< 0.0005	7.1	0.200	61.0	0.0047
Q-09	7-Aug-07	0.2330	0.0005	7.0	0.210	91.0	0.0163
Q-09	4-Sep-07	0.2500	< 0.0005	7.2	0.210	180.0	0.0081
Q-09	1-Oct-07	0.1660	< 0.0005	6.9	0.140	190.0	0.0101
Q-09	6-Nov-07	0.0540	< 0.0005	6.3	0.066	93.0	0.0046
Q-09	6-Dec-07	0.027	< 0.0005	6.7	0.028	59.0	0.0006
Q-09	7-Jan-08	0.027	0.0006	6.8	0.024	55.0	0.0032
Q-09	4-Feb-08	0.024	0.0007	6.7	0.029	41.0	0.0021
Q-09	3-Mar-08	0.029	0.001	6.8	0.023	65.0	0.0031
Q-09	7-Apr-08	0.031	0.0011	6.9	0.035	62.0	0.0047
Q-09	1-May-08	0.037	< 0.0005	6.5	0.032	20.0	0.0024
Q-09	4-Jun-08	0.084	0.0006	7.0	0.1	59.0	0.0033
Q-09	1-Jul-08	0.118	< 0.0005	6.7	0.11	40.0	0.0028
Q-09	12-Aug-08	0.121	< 0.0005	6.8	0.12	65.0	0.0043
Q-09	2-Sep-08	0.169	< 0.0005	6.9	0.16	110.0	0.0033
Q-09	1-Oct-08	0.152	< 0.0005	7.1	0.16	150.0	0.0048
Q-09	3-Nov-08	0.087	< 0.0005	6.9	0.085	74.0	0.0035
Q-09	1-Dec-08	0.039	0.0006	6.8	0.042	66.0	0.0029
Q-09	5-Jan-09	0.042	0.0008	7.0	0.038	69.0	0.0053

Appendix Table E.6: Water quality data for station Q-09, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
Q-09	3-Feb-09	0.035	0.0012	6.7	0.028	90.0	0.0028
Q-09	2-Mar-09	0.036	0.0008	6.8	0.032	78.0	0.0038
Q-09	6-Apr-09	0.042	0.0008	6.7	0.05	58.0	0.0057
Q-09	6-May-09	0.042	< 0.0005	6.8	0.048	19.0	0.0025
Q-09	2-Jun-09	0.056	< 0.0005	7.3	0.07	30.0	0.0024
Q-09	6-Jul-09	0.179	< 0.0005	7.0	0.18	58.0	0.0043
Q-09	6-Aug-09	0.163	< 0.0005	6.5	0.16	50.0	0.0029
Q-09	8-Sep-09	0.187	< 0.0005	7.0	0.2	100.0	0.0033
Q-09	5-Oct-09	0.141	0.0007	6.8	0.14	230.0	0.0095
Q-09	2-Nov-09	0.052	< 0.0005	7.0	0.035	40.0	0.0027
Q-09	7-Dec-09	0.036	0.0006	7.0	0.039	60.0	0.0022
Count		60	60	60	60	60	60
Minimum		0.024	0.0003	6.3	0.016	19.0	0.0006
Maximum		0.276	0.0013	7.3	0.210	370.0	0.0163
Mean		0.088	0.0007	6.9	0.085	84.6	0.0046
Median		0.049	0.0006	6.9	0.053	64.0	0.0038
10th Percentile		0.029	0.0005	6.7	0.024	39.8	0.0025

Note: Shaded values exceed benchmark.

Appendix Table E.7: Water quality data for station Q-20, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
Q-20	30-Sep-05	0.0181	0.0011	6.4	0.005	21.6	< 0.0005
Q-20	17-Oct-06	0.019	< 0.0005	6.9	< 0.005	21	< 0.0005
Q-20	21-Nov-07	0.0190	< 0.0005	6.8	< 0.005	22.0	< 0.0005
Q-20	7-Oct-08	0.0180	< 0.0005	7.0	< 0.005	22.0	< 0.0005
Q-20	8-Oct-09	0.019	< 0.0005	6.7	< 0.005	22.0	< 0.0005
Count		5	5	5	5	5	5
Minimum		0.018	0.0005	6.4	0.005	21.0	0.0005
Maximum		0.019	0.0011	7.0	0.005	22.0	0.0005
Mean		0.019	0.0006	6.8	0.005	21.7	0.0005
Median		0.019	0.0005	6.8	0.005	22.0	0.0005
10th Percentile		0.018	0.0005	6.5	0.005	21.2	0.0005

Note: Shaded values exceed benchmark.

Appendix Table E.8: Water quality data for station SC-01, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	Iron mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**0.47**	**6.3**	**1.0**	**100**	**0.005**
SC-01	8-Jun-05	0.0263	0.0202	0.316	4.8	0.12	59.2	0.0009
SC-01	17-Aug-05	0.0291	0.0145	0.204		0.13	58.6	0.0006
SC-01	7-Sep-05	0.0314	0.0126	0.193		0.15	62.5	< 0.0005
SC-01	5-Oct-05	0.0238	0.0062	0.17		0.13	67.6	< 0.0005
SC-01	9-Nov-05	0.0223	0.0049	0.227		0.12	58.5	< 0.0005
SC-01	21-Dec-05	0.0254	0.0058	0.309		0.095	58.8	< 0.0005
SC-01	9-Mar-06	0.032	0.0063	0.46	6.4	0.085	69	0.0004
SC-01	6-Apr-06	0.0175	0.00218	0.1	5.9	0.026	15	0.00013
SC-01	28-Apr-06	0.0201	0.00236	0.32	6.5		38	0.0002
SC-01	16-May-06	0.0171	0.00119	0.22	7.3	0.03	36	0.0002
SC-01	19-Jun-06	0.0144	0.00039	0.32	6.8	< 0.01	37	0.00022
SC-01	18-Oct-06	0.011	< 0.0005	0.38	7.1	0.015	35	< 0.0005
SC-01	22-Nov-06	0.012	< 0.0005	0.32	6.6	0.013	33	< 0.0005
SC-01	15-Nov-07	0.011	0.001	0.18	7.2	0.013	32.0	< 0.0005
SC-01	19-Nov-08	0.012	< 0.0005	0.21	7.3	0.012	33.0	< 0.0005
SC-01	21-Oct-09	0.01	< 0.0005	0.12	6.7	0.006	25.0	< 0.0005
Count		16	16	16	11	15	16	16
Minimum		0.010	0.0004	0.10	4.8	0.006	15.0	0.0001
Maximum		0.032	0.0202	0.46	7.3	0.150	69.0	0.0009
Mean		0.020	0.0050	0.25	6.6	0.064	44.9	0.0004
Median		0.019	0.0023	0.22	6.7	0.030	37.5	0.0005
10th Percentile		0.011	0.0005	0.15	5.9	0.011	28.5	0.0002

Note: Shaded values exceed benchmark.

Appendix Table E.9: Water quality data for station SR-01, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
SR-01	24-Sep-05	0.0416	< 0.0003		0.037	73.4	0.0023
SR-01	23-Oct-06	0.038	< 0.0005	7.3	0.028	55	0.0014
SR-01	22-Oct-07	0.04	< 0.0005	6.5	0.035	56.0	0.0013
SR-01	16-Oct-08	0.042	< 0.0005	6.8	0.028	54.0	0.0015
SR-01	20-Oct-09	0.039	< 0.0005	6.9	0.026	47.0	0.0015
Count		5	5	4	5	5	5
Minimum		0.038	0.0003	6.5	0.026	47.0	0.0013
Maximum		0.042	0.0005	7.3	0.037	73.4	0.0023
Mean		0.040	0.0005	6.9	0.031	57.1	0.0016
Median		0.040	0.0005	6.9	0.028	55.0	0.0015
10th Percentile		0.038	0.0004	6.6	0.027	49.8	0.0013

Note:Shaded values exceed benchmark.

Appendix Table E.10: Water quality data for station SR-06, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
SR-06	19-May-05	0.0499	< 0.0003	6.8	0.025	180	0.0015
SR-06	1-Nov-05	0.0694	< 0.0003	7	0.04	178	0.0014
SR-06	16-May-06	0.0584	0.00009	7.2	0.035	120	0.00122
SR-06	22-Nov-06	0.076	< 0.0005	6.8	0.046	130	0.0013
SR-06	10-May-07	0.0770	< 0.0005	6.3	0.043	120.0	0.0014
SR-06	7-Nov-07	0.0730	< 0.0005	6.5	0.046	120.0	0.0012
SR-06	15-May-08	0.0820	< 0.0005	7.0	0.038	88.0	0.0012
SR-06	6-Oct-08	0.1730	< 0.0005	7.2	0.054	100.0	0.0014
SR-06	26-May-09	0.1740	< 0.0005	6.7	0.056	100.0	0.0012
SR-06	15-Oct-09	0.183	< 0.0005	7.5	0.072	98.0	0.0013
Count		10	10	10	10	10	10
Minimum		0.050	0.0001	6.3	0.025	88.0	0.0012
Maximum		0.183	0.0005	7.5	0.072	180.0	0.0015
Mean		0.102	0.0004	6.9	0.046	123.4	0.0013
Median		0.077	0.0005	6.9	0.045	120.0	0.0013
10th Percentile		0.058	0.0003	6.5	0.034	97.0	0.0012

Note: Shaded values exceed benchmark.

Appendix Table E.11: Water quality data for station SR-08, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
SR-08	17-Jan-05	0.0334	< 0.0003	6.9	0.067	208	0.0013
SR-08	21-Feb-05	0.0329	0.0005	6.5	0.1	206	0.0012
SR-08	21-Mar-05	0.0274	< 0.0003	6.6	0.052	210	0.0014
SR-08	18-Apr-05	0.0213	0.0006	6.2	0.072	101	0.0009
SR-08	16-May-05	0.0229	< 0.0003	6.9	0.05	172	0.0014
SR-08	20-Jun-05	0.0248	< 0.0003	7.3	0.058	192	0.0031
SR-08	18-Jul-05	0.0256	0.0004	6.9	0.062	195	0.0019
SR-08	15-Aug-05	0.0234	< 0.0003	6.9	0.049	207	0.0022
SR-08	19-Sep-05	0.026	< 0.0003	6.9	0.063	224	0.0026
SR-08	17-Oct-05	0.0217	< 0.0003	7.1	0.061	241	0.0019
SR-08	21-Nov-05	0.0213	0.0003	7	0.053	214	0.0018
SR-08	12-Dec-05	0.0252	0.0004	7	0.048	229	0.0026
SR-08	16-Jan-06	0.028	< 0.0003	6.7	0.048	240	0.0013
SR-08	20-Feb-06	0.03	< 0.0003	7.1	0.039	240	0.0013
SR-08	20-Mar-06	0.028	< 0.0003	6.8	0.042	210	0.0012
SR-08	17-Apr-06	0.0155	0.00049	6.9	0.038	93	0.00073
SR-08	15-May-06	0.0219	0.00014	7.5	0.038	180	0.00108
SR-08	19-Jun-06	0.0217	0.00021	7.5	0.037	210	0.00124
SR-08	17-Jul-06	0.025	< 0.0003	7.4	0.041	220	0.0012
SR-08	14-Aug-06	0.023	< 0.0005	6.4	0.034	220	0.0013
SR-08	18-Sep-06	0.024	< 0.0005	6.8	0.04	220	0.0015
SR-08	16-Oct-06	0.024	< 0.0005	7.2	0.054	210	0.0016
SR-08	16-Nov-06	0.023	< 0.0005	7.6	0.044	240	0.0014
SR-08	11-Dec-06	0.025	< 0.0005	7.3	0.04	250	0.0014
SR-08	15-Jan-07	0.0200	0.0005	7.3	0.039	200.0	0.0010
SR-08	19-Feb-07	0.0200	< 0.0005	6.9	0.024	190.0	0.0010
SR-08	15-Mar-07	0.0200	< 0.0005	6.9	0.034	210.0	0.0010
SR-08	16-Apr-07	0.0170	< 0.0005	6.6	0.035	140.0	0.0008
SR-08	14-May-07	0.0200	< 0.0005	6.9	0.033	190.0	0.0010
SR-08	18-Jun-07	0.0200	< 0.0005	6.9	0.035	200.0	0.0012
SR-08	16-Jul-07	0.0210	< 0.0005	7.2	0.036	210.0	0.0013
SR-08	20-Aug-07	0.0190	< 0.0005	7.2	0.038	230.0	0.0015
SR-08	17-Sep-07	0.0170	< 0.0005	6.9	0.026	100.0	0.0006
SR-08	11-Oct-07	0.022	< 0.0005	6.8	0.042	120.0	0.001
SR-08	19-Nov-07	0.023	< 0.0005	7.0	0.045	240.0	0.0017
SR-08	17-Dec-07	0.023	< 0.0005	6.9	0.038	240.0	0.0017
SR-08	21-Jan-08	0.019	< 0.0005	6.8	0.038	210.0	0.0014
SR-08	19-Feb-08	0.017	0.0007	6.8	0.025	170.0	0.0013
SR-08	18-Mar-08	0.02	0.0005	6.8	0.04	200.0	0.0012
SR-08	21-Apr-08	0.015	0.0005	6.7	0.027	250.0	0.001
SR-08	20-May-08	0.018	< 0.0005	7.0	0.031	190.0	0.0012
SR-08	16-Jun-08	0.018	< 0.0005	7.0	0.027	190.0	0.0012
SR-08	14-Jul-08	0.019	< 0.0005	6.9	0.029	200.0	0.0013
SR-08	18-Aug-08	0.021	< 0.0005	7.0	0.031	200.0	0.0012
SR-08	15-Sep-08	0.021	< 0.0005	7.6	0.045	220.0	0.0016
SR-08	2-Oct-08	0.021	< 0.0005	7.1	0.028	220.0	0.0017
SR-08	18-Nov-08	0.021	< 0.0005	7.1	0.043	240.0	0.0018
SR-08	16-Dec-08	0.023	< 0.0005	6.8	0.036	240.0	0.0016
SR-08	21-Jan-09	0.02	< 0.0005	7.0	0.041	240.0	0.0014

Appendix Table E.11: Water quality data for station SR-08, SRWMP 2005-2009.

Station	Date	Barium mg/L	Cobalt mg/L	pH pH units	Radium Bq/L	Sulphate mg/L	Uranium mg/L
Benchmark		**0.047**	**0.0009**	**6.3**	**1.0**	**100**	**0.005**
SR-08	17-Feb-09	0.02	< 0.0005	6.8	0.044	230.0	0.0014
SR-08	16-Mar-09	0.02	< 0.0005	6.8	0.037	220.0	0.0014
SR-08	7-Apr-09	0.019	0.0005	6.7	0.045	170.0	0.0012
SR-08	19-May-09	0.02	< 0.0005	6.8	0.034	190.0	0.0012
SR-08	15-Jun-09	0.021	< 0.0005	6.8	0.036	210.0	0.0012
SR-08	20-Jul-09	0.02	< 0.0005	6.9	0.027	210.0	0.0014
SR-08	17-Aug-09	0.018	< 0.0005	7.1	0.021	220.0	0.0014
SR-08	10-Sep-09	0.034	< 0.0005	7.3	0.037	220.0	0.0013
SR-08	19-Oct-09	0.014	< 0.0005	7.1	0.033	210.0	0.0011
SR-08	16-Nov-09	0.02	< 0.0005	7.3	0.028	230.0	0.0014
SR-08	3-Dec-09	0.02	< 0.0005	6.7	0.04	210.0	0.0013
Count		60	60	60	60	60	60
Minimum		0.014	0.0001	6.2	0.021	93.0	0.0006
Maximum		0.034	0.0007	7.6	0.100	250.0	0.0031
Mean		0.022	0.0005	7.0	0.041	204.9	0.0014
Median		0.021	0.0005	6.9	0.039	210.0	0.0013
10th Percentile		0.018	0.0003	6.7	0.027	170.0	0.0010

Note: Shaded values exceed benchmark.

Appendix Table E.12: Field measurements collected at lake stations, SRWMP 2009.

Lake	Station	Depth	Secchi Depth	Temperature	Dissolved Oxygen		pH	Conductivity
		m	m	ºC	mg/L	% saturation	pH units	uS/cm
Reference								
Dunlop (DUL)	1	14.6	7.00	10.05	8.41	74.6	5.22	.
	2	14.8	7.55	10.85	10.38	94.0	4.94	.
	3	14.5	7.55	9.92	10.10	89.5	4.90	.
	4	14.5	7.40	9.85	10.35	91.5	4.98	.
	5	14.6	7.20	9.57	9.24	80.9	5.21	.
Ten Mile (TML)	1	16.5	11.00	8.60	15.02	128.8	5.49	.
	2	17.8	10.60	8.69	15.51	132.5	5.99	.
	3	17.1	10.00	10.13	14.75	131.1	5.51	.
	4	17.1	10.65	8.61	15.41	132.8	5.82	.
	5	17.7	11.60	8.70	15.64	134.2	6.20	.
Rochester (RL)	1	14.7	4.72	6.60	5.65	46.6	5.24	15.2
	2	14.5	4.71	5.90	4.03	32.4	4.38	15.3
	3	14.2	4.15	5.20	2.96	23.8	5.27	17.0
	4	14.4	4.15	5.10	2.20	17.6	5.21	17.7
	5	14.6	4.43	6.40	3.90	32.5	5.29	15.5
Summers (SUL)	1	14.9	6.95	6.90	8.94	73.6	4.69	12.0
	2	15.0	7.46	6.70	8.85	72.3	4.73	12.1
	3	14.7	7.16	8.20	7.71	65.9	5.38	12.4
	4	14.9	6.88	9.00	4.85	42.4	4.78	13.7
	5	14.6	6.80	7.90	6.84	58.0	4.10	12.6
Semiwhite (SL)	1	14.5	6.80	8.33	9.20	78.4	5.06	.
	2	14.5	7.15	8.40	9.39	80.1	4.51	.
	3	14.2	8.50	8.85	9.07	78.3	5.20	.
	4	14.7	7.22	8.96	9.88	85.7	4.95	.
	5	14.5	7.54	8.42	9.46	82.2	5.12	.
Exposed								
Quirke (QL)	1	20.5	11.50	7.42	14.72	122.6	5.75	.
	2	17.7	7.75	7.02	12.33	101.7	5.19	.
	3	20.1	8.50	9.63	13.15	115.9	6.13	.
	4	20.5	11.50	6.79	15.20	124.4	5.66	.
	5	22.7	9.85	10.51	13.52	123.1	5.62	.
Elliott (EL)	1	14.7	5.25	8.96	8.51	73.5	5.48	87.0
	2	14.6	5.68	9.76	8.52	75.0	5.15	.
	3	15.0	5.88	8.86	7.80	67.3	5.00	74.0
	4	15.3	5.90	8.71	9.04	78.1	5.53	66.0
	5	14.8	5.65	10.48	9.10	81.5	6.27	59.0
Hough (HOL)	1	14.3	7.63	8.20	7.44	63.6	6.83	110.4
	2	14.5	8.91	8.30	6.84	57.7	.	110.7
	3	15.5	7.55	7.80	7.36	62.7	6.28	109.2
	4	15.3	7.84	8.20	7.17	62.5	6.33	110.1
	5	14.2	7.95	8.50	7.61	65.3	6.28	111.0
May (MAL)	1	14.5	7.85	8.70	7.98	70.7	6.32	125.8
	2	14.3	6.61	7.60	8.67	72.5	.	136.8
	3	14.6	7.50	7.50	8.86	74.5	6.53	137.8
	4	14.3	7.53	7.70	8.63	75.3	6.42	136.5
	5	14.3	8.26	7.60	8.74	73.0	6.43	138.2

Appendix Table E.12: Field measurements collected at lake stations, SRWMP 2009.

Lake	Station	Depth	Secchi Depth	Temperature	Dissolved Oxygen		pH	Conductivity
Exposed								
McCabe (ML)	1	14.6	6.40	10.15	9.17	81.6	6.29	.
	2	14.7	6.65	10.76	8.51	75.8	6.45	.
	3	14.1	6.63	12.15	6.44	60.1	6.58	.
	4	15.1	6.66	11.10	8.93	81.3	6.62	.
	5	14.6	6.66	9.68	8.10	72.2	6.54	.
McCarthy (MCL)	1	14.9	5.67	7.00	6.96	58.2	6.13	67.5
	2	14.8	5.46	7.10	2.81	23.4	5.61	70.1
	3	14.5	5.39	8.10	6.11	52.4	6.96	80.4
	4	14.4	5.88	8.20	5.14	44.9	5.91	70.0
	5	14.6	5.86	8.30	6.21	53.1	5.82	80.1
Nordic (NL)	1	12.5	7.45	8.60	4.74	41.1	6.63	435.6
	2	14.8	6.88	7.30	6.51	54.4	6.37	424.1
	3	14.2	7.58	7.90	7.30	61.9	6.58	427.4
	4	14.3	7.30	8.00	6.70	57.3	6.61	428.8
	5	14.8	8.42	6.60	6.27	51.6	6.43	424.4
Pecors (PL)	1	13.7	6.75	10.80	8.07	72.9	.	89.6
	2	14.8	7.88	7.10	7.46	61.4	7.00	88.7
	3	13.5	8.36	7.50	7.51	63.3	6.85	88.2
	4	14.4	8.50	7.40	8.10	67.2	.	88.4
	5	14.5	6.78	9.50	8.16	71.6	.	87.7

Appendix Table E.13: Summary of seasonal trends for station D-4, 2000 to 2009.

Season	Spearman rho	Barium	Iron	Manganese	pH	Sulphate
April	Correlation Coefficient	0.162169	0.691023	0.684712472	0.236403	-0.785714
	Sig. (2-tailed)	0.7283	0.08557	0.089666453	0.60979	0.036238
	N	7	7	7	7	7
Sept/Oct	Correlation Coefficient	0.167668	0.604392	0.562884343	-0.351573	-0.426782
	Sig. (2-tailed)	0.691465	0.084721	0.146331533	0.393106	0.251957
	N	8	9	8	8	9

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.14: Summary of seasonal trends for station P-22, 2000 to 2009.

Season	Spearman rho	Barium	pH	Sulphate
March/May	Correlation Coefficient	0.68103286	-0.106302	-0.20060883
	Sig. (2-tailed)	0.03015088	0.770074	0.578406145
	N	10	10	10
Sept/Oct/Nov	Correlation Coefficient	0.18845072	0.030395	-0.83030303
	Sig. (2-tailed)	0.60209475	0.933572	0.002940227
	N	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.15: Summary of seasonal trends for station SR-05, 2000 to 2009.

Season	Spearman rho	Barium	pH	Sulphate
January	Correlation Coefficient	-0.018406	-0.054711	-0.668696098
	Sig. (2-tailed)	0.95975	0.880676	0.034509542
	N	10	10	10
February	Correlation Coefficient	0.050855	0.066946	-0.786617764
	Sig. (2-tailed)	0.896623	0.864127	0.011909212
	N	9	9	9
March	Correlation Coefficient	0.443898	-0.118661	-0.376572334
	Sig. (2-tailed)	0.231337	0.761084	0.317822682
	N	9	9	9
May	Correlation Coefficient	0.06749	0.067074	-0.951515152
	Sig. (2-tailed)	0.853037	0.853933	2.27985E-05
	N	10	10	10
June	Correlation Coefficient	-0.267478	0.413376	-0.903030303
	Sig. (2-tailed)	0.454986	0.235062	0.000343612
	N	10	10	10
July	Correlation Coefficient	-0.335372	-0.07528	-0.857146817
	Sig. (2-tailed)	0.343468	0.836255	0.00152784
	N	10	10	10
August	Correlation Coefficient	-0.21541	0.460157	-0.890909091
	Sig. (2-tailed)	0.550053	0.180833	0.000542144
	N	10	10	10
September	Correlation Coefficient	0.468979	0.356965	-0.844988706
	Sig. (2-tailed)	0.171528	0.311263	0.002085797
	N	10	10	10
October	Correlation Coefficient	-0.218857	0.268298	-0.757575758
	Sig. (2-tailed)	0.54353	0.453553	0.011143447
	N	10	10	10
November	Correlation Coefficient	-0.061546	-0.69697	-0.796356262
	Sig. (2-tailed)	0.865877	0.025097	0.005836997
	N	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.16: Summary of seasonal trends for station SR-14, 2000 to 2009.

Season	Spearman rho	Barium	pH	Sulphate
Sept/Oct/Nov	Correlation Coefficient	-0.21474	0.024316	-0.607906
	Sig. (2-tailed)	ns	ns	ns
	N	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.17: Summary of seasonal trends for station SR-18, 2003 to 2009.

Season	Spearman's rho	Barium	pH	Sulphate
April	Correlation Coefficient	-0.522544	0.522544	-0.75
	Sig. (2-tailed)	0.228878	0.228878	0.052181
	N	7	7	7
Sept/Oct combined	Correlation Coefficient	0.324337	0.056136	-0.691023
	Sig. (2-tailed)	0.477885	0.904851	0.08557
	N	7	7	7

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.18: Summary of seasonal trends for station SR-19, 2003 to 2009.

Season	Spearman rho	Barium	pH	Sulphate
January	Correlation Coefficient	-0.857143	-0.218218	-0.936975
	Sig. (2-tailed)	0.013697	0.638299	0.00185103
	N	7	7	7
February	Correlation Coefficient	-0.357143	-0.059108	-0.7142857
	Sig. (2-tailed)	0.431611	0.89983	0.07134356
	N	7	7	7
March	Correlation Coefficient	-0.270281	-0.545545	-0.8214286
	Sig. (2-tailed)	0.557731	0.205282	0.02344881
	N	7	7	7
April	Correlation Coefficient	0.306319	0.872872	0.25226249
	Sig. (2-tailed)	0.504027	0.010323	0.58524109
	N	7	7	7
May	Correlation Coefficient	-0.571429	-0.306319	-0.6785714
	Sig. (2-tailed)	0.180202	0.504027	0.09375025
	N	7	7	7
June	Correlation Coefficient	0	-0.702731	-0.6785714
	Sig. (2-tailed)	1	0.078237	0.09375025
	N	7	7	7
July	Correlation Coefficient	0.035714	-0.054056	-0.4144312
	Sig. (2-tailed)	0.939408	0.908365	0.35526894
	N	7	7	7
August	Correlation Coefficient	-0.270281	0.5766	-0.8214286
	Sig. (2-tailed)	0.557731	0.175382	0.02344881
	N	7	7	7
September	Correlation Coefficient	-0.738769	0.763763	-0.7027312
	Sig. (2-tailed)	0.057858	0.045659	0.07823745
	N	7	7	7
October	Correlation Coefficient	0.090094	0.630656	-0.2857143
	Sig. (2-tailed)	0.847672	0.128888	0.53450923
	N	7	7	7
November	Correlation Coefficient	0.607143	0.270281	-0.4285714
	Sig. (2-tailed)	0.148231	0.557731	0.33736831
	N	7	7	7
December	Correlation Coefficient	-0.270281	-0.18712	-0.72075
	Sig. (2-tailed)	0.557731	0.687867	0.06763499
	N	7	7	7

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.19: Summary of seasonal trends for station D-5, 2000 to 2009.

Season	Spearman rho	Barium	Iron	Manganese	pH	Radium-226	Sulphate	Uranium
January	Correlation Coefficient	0.35259	0.01824	-0.260606061	0.22843	-0.200608829	-0.1337392	0.1030303
	Sig. (2-tailed)	0.31766	0.96012	0.467089054	0.52557	0.578406145	0.71262222	0.7769985
	N	10	10	10	10	10	10	10
February	Correlation Coefficient	-0.00606	0.40245	-0.539393939	-0.40363	-0.757575758	-0.5714312	-0.270801
	Sig. (2-tailed)	0.98674	0.24891	0.107593188	0.24739	0.011143447	0.08441186	0.4491852
	N	10	10	10	10	10	10	10
March	Correlation Coefficient	-0.05471	0.59575	-0.696969697	0.33131	-0.454545455	-0.4559292	-0.188451
	Sig. (2-tailed)	0.88068	0.06916	0.025096676	0.3497	0.18690481	0.18539676	0.6020948
	N	10	10	10	10	10	10	10
April	Correlation Coefficient	0.29697	0.4303	0.212121212	0.30582	0.553194045	0.16363636	0.6242424
	Sig. (2-tailed)	0.4047	0.21449	0.556305775	0.39015	0.097168791	0.65147734	0.0537178
	N	10	10	10	10	10	10	10
May	Correlation Coefficient	-0.22424	0.38415	-0.393939394	0.11113	-0.36969697	-0.6484848	0.3829805
	Sig. (2-tailed)	0.5334	0.27308	0.259997767	0.75988	0.293050075	0.04254013	0.274673
	N	10	10	10	10	10	10	10
June	Correlation Coefficient	-0.52727	-0.44985	-0.158055441	0.43286	-0.609767433	-0.547115	-0.620064
	Sig. (2-tailed)	0.11731	0.19208	0.662762297	0.21148	0.061239771	0.10167803	0.0558226
	N	10	10	10	10	10	10	10
July	Correlation Coefficient	-0.35758	-0.61968	-0.187878788	-0.29389	-0.844988706	-0.3454545	-0.725623
	Sig. (2-tailed)	0.31038	0.05602	0.60321761	0.40982	0.002085797	0.32822651	0.0175281
	N	10	10	10	10	10	10	10
August	Correlation Coefficient	-0.89091	-0.74772	-0.036474333	-0.39513	-0.818181818	-0.6848485	-0.717329
	Sig. (2-tailed)	0.00054	0.0129	0.92031846	0.25843	0.00381492	0.0288828	0.0195283
	N	10	10	10	10	10	10	10
September	Correlation Coefficient	-0.50303	-0.88416	-0.575757576	0.28747	-0.624242424	-0.6727273	-0.672727
	Sig. (2-tailed)	0.13833	0.00068	0.081552815	0.42059	0.053717767	0.03304122	0.0330412
	N	10	10	10	10	10	10	10
October	Correlation Coefficient	0.6	-0.40122	-0.322189938	-0.18749	0.151976386	-0.2242424	-0.224242
	Sig. (2-tailed)	0.06669	0.2505	0.363927076	0.60399	0.675124332	0.53340056	0.5334006
	N	10	10	10	10	10	10	10
November	Correlation Coefficient	0.04242	-0.10366	-0.662617043	-0.23928	-0.21276694	-0.1515152	-0.258492
	Sig. (2-tailed)	0.90736	0.77566	0.036806402	0.50552	0.555075996	0.67606518	0.4708403
	N	10	10	10	10	10	10	10
December	Correlation Coefficient	-0.21212	-0.231	-0.778119096	-0.31487	-0.670744177	-0.6686961	-0.741645
	Sig. (2-tailed)	0.55631	0.52079	0.008033138	0.37555	0.033758137	0.03450954	0.0140752
	N	10	10	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.20: Summary of seasonal trends for station D-6, 2000 to 2009.

Season	Spearman rho	Barium	Iron	Manganese	pH	Radium-226	Sulphate
January	Correlation Coefficient	-0.39757	-0.18788	-0.236363636	-0.51243	-0.369786998	-0.490909
	Sig. (2-tailed)	0.25523	0.60322	0.510885318	0.12992	0.292923368	0.1496557
	N	10	10	10	10	10	10
February	Correlation Coefficient	0.49848	0.51064	0.284848485	-0.63416	-0.190128171	-0.656538
	Sig. (2-tailed)	0.14252	0.1315	0.425038155	0.04894	0.598805795	0.0392044
	N	10	10	10	10	10	10
March	Correlation Coefficient	-0.43161	0.75758	0.090909091	0.10037	-0.224899695	-0.006061
	Sig. (2-tailed)	0.21295	0.01114	0.802771731	0.78263	0.532169527	0.9867429
	N	10	10	10	10	10	10
April	Correlation Coefficient	-0.27609	0.17576	0.182371663	0.50924	-0.412356495	-0.583589
	Sig. (2-tailed)	0.44001	0.62719	0.614067751	0.13274	0.236334758	0.0765377
	N	10	10	10	10	10	10
May	Correlation Coefficient	-0.32318	-0.22493	-0.296969697	0.21952	-0.765563379	-0.563636
	Sig. (2-tailed)	0.36237	0.53212	0.404701671	0.54229	0.009848581	0.089724
	N	10	10	10	10	10	10
June	Correlation Coefficient	-0.40606	0.10303	0.03030303	0.43562	-0.059005294	-0.589668
	Sig. (2-tailed)	0.24428	0.777	0.933772958	0.20826	0.871374368	0.0727859
	N	10	10	10	10	10	10
July	Correlation Coefficient	-0.03571	0.39286	0.142857143	0.72075	0	-0.142857
	Sig. (2-tailed)	0.93941	0.38332	0.7599453	0.06763	1	0.7599453
	N	7	7	7	7	7	7
August	Correlation Coefficient	-0.07207	0.57143	-0.071428571	-0.03858	-0.450468731	-0.142857
	Sig. (2-tailed)	0.87796	0.1802	0.879048193	0.93456	0.310429302	0.7599453
	N	7	7	7	7	7	7
September	Correlation Coefficient	0.31429	0.77143	0.314285714	0.88041	0.029424494	-0.085714
	Sig. (2-tailed)	0.54409	0.0724	0.544093294	0.0206	0.955875996	0.8717434
	N	6	6	6	6	6	6
October	Correlation Coefficient	0.79499	0.61088	0.166666667	-0.11918	0.502096445	0.5333333
	Sig. (2-tailed)	0.01044	0.08054	0.66823104	0.76007	0.168397435	0.1392269
	N	9	9	9	9	9	9
November	Correlation Coefficient	-0.08368	-0.11667	-0.433333333	-0.57635	-0.710496168	0.2092069
	Sig. (2-tailed)	0.83051	0.76501	0.243952436	0.10429	0.031939472	0.5890472
	N	9	9	9	9	9	9
December	Correlation Coefficient	-0.5228	-0.21212	-0.612121212	-0.5672	-0.703272404	-0.413376
	Sig. (2-tailed)	0.12103	0.55631	0.059972142	0.08727	0.023269515	0.235062
	N	10	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.21: Summary of seasonal trends for station DS-18, 2000 to 2009.

Season	Spearman rho	Barium	Iron	Manganese	pH	Radium-226	Sulphate	Uranium
January	Correlation Coefficient	0.18237	0.73333	0.054545455	-0.38895	-0.534956878	0.06666667	-0.2317116
	Sig. (2-tailed)	0.61407	0.0158	0.881036181	0.26663	0.11108833	0.85481309	0.5194793
	N	10	10	10	10	10	10	10
February	Correlation Coefficient	0.38906	0.84242	-0.418181818	-0.63591	-0.371958134	0.12727273	-0.0186989
	Sig. (2-tailed)	0.26648	0.00222	0.229112841	0.04812	0.289876582	0.72605701	0.95911037
	N	10	10	10	10	10	10	10
March	Correlation Coefficient	-0.30909	0.39394	-0.563636364	0.15291	-0.49240349	-0.2242424	-0.7575758
	Sig. (2-tailed)	0.38484	0.26	0.089724028	0.67322	0.148230415	0.53340056	0.01114345
	N	10	10	10	10	10	10	10
April	Correlation Coefficient	-0.01818	0.28485	-0.43030303	-0.00627	-0.863225872	-0.4741663	-0.2317116
	Sig. (2-tailed)	0.96024	0.42504	0.214492333	0.98628	0.001293815	0.16619193	0.5194793
	N	10	10	10	10	10	10	10
May	Correlation Coefficient	0.58967	0.52727	-0.024316222	0.16052	-0.486324435	-0.6606061	0.1590281
	Sig. (2-tailed)	0.07279	0.11731	0.946839705	0.65777	0.154079965	0.03758838	0.66079105
	N	10	10	10	10	10	10	10
June	Correlation Coefficient	-0.33333	0.53939	-0.27963655	0.22628	-0.774136285	-0.5757576	-0.3865322
	Sig. (2-tailed)	0.34659	0.10759	0.43392584	0.52959	0.00858089	0.08155281	0.26986858
	N	10	10	10	10	10	10	10
July	Correlation Coefficient	-0.57576	0.22424	-0.231004107	-0.06314	-0.978727925	-0.5272727	-0.0487814
	Sig. (2-tailed)	0.08155	0.5334	0.520791533	0.86242	0.000001	0.11730807	0.89354426
	N	10	10	10	10	10	10	10
August	Correlation Coefficient	-0.47417	0.33333	-0.660578259	-0.32411	-0.963262697	-0.4863244	-0.2500046
	Sig. (2-tailed)	0.16619	0.34659	0.037599266	0.3609	7.6231E-06	0.15407997	0.48603365
	N	10	10	10	10	10	10	10
September	Correlation Coefficient	-0.25234	0.18237	-0.393939394	0.21474	-0.874654547	-0.5151515	-0.0243907
	Sig. (2-tailed)	0.48184	0.61407	0.259997767	0.55132	0.00092586	0.12755287	0.94667708
	N	10	10	10	10	10	10	10
October	Correlation Coefficient	-0.6687	-0.03647	-0.757575758	0.11843	-0.820672484	-0.9030303	-0.1272727
	Sig. (2-tailed)	0.03451	0.92032	0.011143447	0.74454	0.003621706	0.00034361	0.72605701
	N	10	10	10	10	10	10	10
November	Correlation Coefficient	0.15854	-0.15806	-0.48024538	-0.02493	-0.378055809	-0.4724282	-0.5169843
	Sig. (2-tailed)	0.66178	0.66276	0.16006701	0.9455	0.281411116	0.16796856	0.12596958
	N	10	10	10	10	10	10	10
December	Correlation Coefficient	-0.13982	0.54605	0.333333333	-0.43835	-0.478787879	-0.662617	-0.617763
	Sig. (2-tailed)	0.70006	0.10248	0.346593507	0.20509	0.161522928	0.0368064	0.05700443
	N	10	10	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.22: Summary of seasonal trends for station M-01, 2000 to 2009.

Season	Spearman rho	Barium	Cobalt	Iron	pH	Radium-226	Sulphate	Uranium
January	Correlation Coefficient	-0.06079	-0.25	-0.21212	0.44928	-0.597572085	-0.6930123	0.407296714
	Sig. (2-tailed)	0.86751	0.48603	0.55631	0.1927	0.068089787	0.02629288	0.24271027
	N	10	10	10	10	10	10	10
February	Correlation Coefficient	-0.37806	-0.52929	-0.05455	0.32827	-0.790277207	-0.8181818	0.268297671
	Sig. (2-tailed)	0.28141	0.11565	0.88104	0.35442	0.006514224	0.00381492	0.453552732
	N	10	10	10	10	10	10	10
March	Correlation Coefficient	0.08511	-0.25078	0.26061	0.47562	-0.717328542	-0.4756186	0.753802874
	Sig. (2-tailed)	0.81517	0.48465	0.46709	0.16472	0.019528343	0.16471615	0.011794786
	N	10	10	10	10	10	10	10
April	Correlation Coefficient	-0.57143	-0.45069	-0.53939	0.41539	-0.603669759	-0.5393939	0.449850102
	Sig. (2-tailed)	0.08441	0.19114	0.10759	0.23256	0.064605278	0.10759319	0.192075697
	N	10	10	10	10	10	10	10
May	Correlation Coefficient	-0.21667	-0.26892	-0.56667	0.6514	-0.9	-0.4333333	-0.560674364
	Sig. (2-tailed)	0.57551	0.48412	0.11163	0.05735	0.000943062	0.24395244	0.116326795
	N	9	9	9	9	9	9	9
June	Correlation Coefficient	0.39286	-0.12729	0.55858	0.81084	-0.892857143	-0.6428571	0.642857143
	Sig. (2-tailed)	0.38332	0.78565	0.19245	0.02692	0.006807187	0.11939237	0.119392373
	N	7	7	7	7	7	7	7
July	Correlation Coefficient	-0.35714	0.0241	0.2381	0.35714	-0.666666667	-0.6904762	0.409668289
	Sig. (2-tailed)	0.38512	0.95483	0.57016	0.38512	0.070987654	0.05799032	0.313487214
	N	8	8	8	8	8	8	8
October	Correlation Coefficient	-0.2724	0.15526	0.16667	0.46169	-0.483333333	-0.7	-0.066666667
	Sig. (2-tailed)	0.47825	0.68998	0.66823	0.21091	0.187469855	0.03576957	0.864689785
	N	9	9	9	9	9	9	9
November	Correlation Coefficient	-0.49091	-0.09909	0.17576	0.08511	-0.32317674	-0.4787879	-0.509240789
	Sig. (2-tailed)	0.14966	0.78535	0.62719	0.81517	0.362374972	0.16152293	0.132742676
	N	10	10	10	10	10	10	10
December	Correlation Coefficient	-0.32121	-0.33141	0.04242	0.192	-0.672727273	-0.7212121	-0.115151515
	Sig. (2-tailed)	0.36547	0.34955	0.90736	0.59515	0.033041223	0.01857316	0.751419652
	N	10	10	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.23: Summary of seasonal trends for station Q-09, 2000 to 2009.

Season	Spearman rho	Barium	Cobalt	pH	Radium-226	Sulphate	Uranium
January	Correlation Coefficient	-0.19453	-0.43903	-0.05628	-0.76969697	-0.7333333	-0.5272727
	Sig. (2-tailed)	0.59021	0.2043	0.87728	0.009221953	0.0158006	0.11730807
	N	10	10	10	10	10	10
February	Correlation Coefficient	0.49091	0.03659	-0.55936	-0.455929158	-0.3212121	-0.823186
	Sig. (2-tailed)	0.14966	0.92008	0.09272	0.185396764	0.3654683	0.00343394
	N	10	10	10	10	10	10
March	Correlation Coefficient	0.41464	-0.17073	0.11657	-0.660606061	-0.1030303	-0.7575758
	Sig. (2-tailed)	0.23349	0.63722	0.74843	0.037588378	0.7769985	0.01114345
	N	10	10	10	10	10	10
April	Correlation Coefficient	-0.15152	-0.23839	0.11767	0.006097674	-0.3575758	-0.030303
	Sig. (2-tailed)	0.67607	0.50717	0.74612	0.986661833	0.3103761	0.93377296
	N	10	10	10	10	10	10
May	Correlation Coefficient	-0.44242	-0.59024	0.01235	-0.672727273	-0.5030303	-0.1393939
	Sig. (2-tailed)	0.20042	0.07244	0.97299	0.033041223	0.1383337	0.70093188
	N	10	10	10	10	10	10
June	Correlation Coefficient	-0.07879	0.3371	0.42521	-0.2697529	-0.0545455	-0.2727273
	Sig. (2-tailed)	0.82872	0.34083	0.22057	0.451011775	0.8810362	0.44583834
	N	10	10	10	10	10	10
July	Correlation Coefficient	-0.18788	-0.76409	-0.06155	-0.680854209	-0.2969697	-0.218846
	Sig. (2-tailed)	0.60322	0.01008	0.86588	0.030211171	0.4047017	0.54355092
	N	10	10	10	10	10	10
August	Correlation Coefficient	-0.74545	0.06742	-0.69547	-0.589668377	-0.3939394	-0.4909091
	Sig. (2-tailed)	0.01333	0.85319	0.02555	0.072785937	0.2599978	0.14965567
	N	10	10	10	10	10	10
September	Correlation Coefficient	0.06667	-0.40837	0.01703	-0.217575126	-0.1166667	-0.6975036
	Sig. (2-tailed)	0.86469	0.27519	0.96533	0.573874658	0.7650079	0.03672232
	N	9	9	9	9	9	9
October	Correlation Coefficient	0.72121	-0.36111	-0.07409	0.326192451	0.3939394	0.5045616
	Sig. (2-tailed)	0.01857	0.30526	0.83882	0.357652225	0.2599978	0.13694197
	N	10	10	10	10	10	10
November	Correlation Coefficient	0.44242	-0.68279	-0.06487	-0.2	-0.4133758	-0.4060606
	Sig. (2-tailed)	0.20042	0.02956	0.85868	0.579584	0.235062	0.24428229
	N	10	10	10	10	10	10
December	Correlation Coefficient	0.12727	-0.29143	-0.30773	-0.291794661	-0.0181818	-0.7112495
	Sig. (2-tailed)	0.72606	0.41395	0.38705	0.413326603	0.9602404	0.02109093
	N	10	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.24: Summary of seasonal trends for station Q-20, 2000 to 2009.

Season	Spearman rho	Barium	pH	Radium-226	Sulphate
Sept/Oct/Nov	Correlation Coefficient	0.621612	0.581534	-0.833508753	-0.26382354
	Sig. (2-tailed)	ns	ns	<0.05	ns
	N	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.25: Summary of seasonal trends for station SC-01, 2000 to 2009.

Season	Spearman rho	Barium	Iron	pH	Radium-226	Sulphate
October	Correlation Coefficient		0.285714			-0.14285714
	Sig. (2-tailed)		0.534509			0.7599453
	N		7			7
November	Correlation Coefficient	-0.36037	0.607143	0.654654	-0.738768719	0.0360375
	Sig. (2-tailed)	ns	0.148231	ns	ns	0.93886056
	N	7	7	7	7	7

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.26: Summary of seasonal trends for station SR-01, 2000 to 2009.

Season	Spearman's rho	Barium	pH	Radium-226	Sulphate	Uranium
Sept/Oct	Correlation Coefficient	-0.2142857	0.1428571	-0.887037053	-0.96666667	-0.8451957
	Sig. (2-tailed)	ns	ns	<0.05	<0.001	<0.05
	N	7	7	9	9	9

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.27: Summary of seasonal trends for station SR-06, 2000 to 2009.

Season	Spearman rho	Barium	pH	Radium-226	Sulphate	Uranium
May	Correlation Coefficient	1	-0.252338	0.376901437	-0.91185832	-0.95733487
	Sig. (2-tailed)	0.000	0.481837	0.283003365	0.000237144	1.37676E-05
	N	10	10	10	10	10
November	Correlation Coefficient	0.964286	-0.964286	0.414431233	-0.96428571	-1
	Sig. (2-tailed)	0.000454	0.000454	0.355268944	0.000454149	0.000001
	N	7	7	7	7	7

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.28: Summary of seasonal trends for station SR-08, 2000 to 2009.

Season	Spearman rho	Barium	pH	Radium-226	Sulphate	Uranium
January	Correlation Coefficient	0.21277	-0.23461	-0.31611088	-0.6443799	-0.798795
	Sig. (2-tailed)	0.55508	0.51412	0.373561333	0.04431151	0.00558
	N	10	10	10	10	10
February	Correlation Coefficient	0.21277	-0.31487	-0.03039528	-0.8060606	-0.784198
	Sig. (2-tailed)	0.55508	0.37555	0.933571725	0.00486206	0.007245
	N	10	10	10	10	10
March	Correlation Coefficient	0.27609	0.42023	-0.43030303	-0.7323944	-0.697277
	Sig. (2-tailed)	0.44001	0.2266	0.214492333	0.01600434	0.025005
	N	10	10	10	10	10
April	Correlation Coefficient	0.13939	0.23243	-0.49090909	-0.0545455	-0.243162
	Sig. (2-tailed)	0.70093	0.51816	0.149655673	0.88103618	0.498434
	N	10	10	10	10	10
May	Correlation Coefficient	0.41945	-0.35586	-0.37690144	-0.7791998	-0.742387
	Sig. (2-tailed)	0.22755	0.31288	0.283003365	0.00788889	0.013928
	N	10	10	10	10	10
June	Correlation Coefficient	-0.01824	-0.21342	-0.26060606	-0.6930123	-0.865096
	Sig. (2-tailed)	0.96012	0.55384	0.467089054	0.02629288	0.001227
	N	10	10	10	10	10
July	Correlation Coefficient	0.05455	-0.00627	-0.84242424	-0.4316129	-0.847577
	Sig. (2-tailed)	0.88104	0.98628	0.002220031	0.21294529	0.001956
	N	10	10	10	10	10
August	Correlation Coefficient	-0.16364	0.06294	-0.70909091	-0.6322218	-0.8997
	Sig. (2-tailed)	0.65148	0.86287	0.021665923	0.0498461	0.000392
	N	10	10	10	10	10
September	Correlation Coefficient	0.58359	0.45544	-0.2969697	-0.5337825	-0.830303
	Sig. (2-tailed)	0.07654	0.18593	0.404701671	0.11202517	0.00294
	N	10	10	10	10	10
October	Correlation Coefficient	0.09091	-0.2539	-0.01823717	-0.2674784	-0.51672
	Sig. (2-tailed)	0.80277	0.47904	0.960119464	0.45498601	0.126197
	N	10	10	10	10	10
November	Correlation Coefficient	0.06079	-0.04893	-0.51515152	-0.3497196	-0.801257
	Sig. (2-tailed)	0.86751	0.89322	0.12755287	0.32188624	0.005329
	N	10	10	10	10	10
December	Correlation Coefficient	0.19453	-0.65036	-0.70517043	-0.547115	-0.857147
	Sig. (2-tailed)	0.59021	0.04175	0.022737737	0.10167803	0.001528
	N	10	10	10	10	10

Note: p-values for n<10 where there is only one season used are based on Table of Critical Values of the Spearman Rank Correlation Coefficient (Zar 1984).

"ns" denotes not significant.

Significant trend where p<0.05.

Appendix Table E.29: T-test results for comparison of 1999 and 2009 SRWMP parameters.

Lake		Barium		Cobalt		Iron		Manganese		Nickel		Uranium		Ra-226	
		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		Bq/g	
		2009	1999	2009	1999	2009	1999	2009	1999	2009	1999	2009	1999	2009	1999
Reference	**Mean**	177	126	14.5	12.7	26,340	24,011	2,057	1,674	20.8	23.2	3.8	4.4	0.12	0.05
	SD	142	49	6.5	5.1	13,260	15,012	2,266	2,413	4.2	5.1	1.3	1.2	0.07	0.02
	t-test	**0.298**		**0.454**		**0.665**		**0.672**		**0.168**		**0.203**		**0.004**	
Quirke	**Mean**	706	470	38.4	14.2	57,800	36,800	4,140	886	25.4	17.6	352	234	3.64	1.81
	SD	430	273	26.7	8.6	11,584	15,802	2,387	672	8.8	3.2	144	40	2.26	0.71
	t-test	**0.331**		**0.089**		**0.043**		**0.019**		**0.100**		**0.116**		**0.122**	
Elliott	**Mean**	218	207	74.0	99.7	52,000	58,667	10,760	12,333	53.6	68.7	170	213	1.59	1.56
	SD	65	80	14.1	30.0	9,460	28,937	6,163	7,024	5.4	16.6	40	12	0.36	0.80
	t-test	**0.833**		**0.142**		**0.638**		**0.750**		**0.098**		**0.125**		**0.944**	
Nordic	**Mean**	294	262	109.0	179.0	69,000	84,667	19,460	30,667	44.0	54.0	154	132	4.78	3.77
	SD	98	162	49.0	140.7	27,902	26,558	10,904	25,697	6.8	30.5	42	66	1.68	2.22
	t-test	**0.733**		**0.331**		**0.464**		**0.409**		**0.487**		**0.572**		**0.487**	
McCarthy	**Mean**	160	190	101.0	102.3	49,800	40,667	12,360	14,907	43.2	55.0	138	109	1.55	1.18
	SD	32	69	26.0	49.0	12,276	9,292	3,694	12,921	7.2	18.7	28	21	0.65	0.11
	t-test	**0.425**		**0.961**		**0.313**		**0.680**		**0.237**		**0.178**		**0.376**	
Hough	**Mean**	80	87	26.8	42.7	51,400	52,667	2,880	8,133	40.2	53.3	87	92	1.90	2.79
	SD	9	13	3.3	7.0	8,678	5,508	606	1,589	3.0	3.8	5	3	0.37	0.37
	t-test	**0.398**		**0.004**		**0.831**		**0.000**		**0.002**		**0.227**		**0.016**	
Pecors	**Mean**	98	79	40.0	47.0	33,400	29,667	3,060	3,233	35.4	37.0	114	125	0.67	0.77
	SD	18	41	4.2	18.7	10,359	13,503	1,387	2,542	6.5	14.9	11	28	0.21	0.37
	t-test	**0.381**		**0.431**		**0.672**		**0.902**		**0.836**		**0.468**		**0.649**	
McCabe	**Mean**	2,090	2,690	175.2	236.7	75,400	91,667	16,800	22,333	100.8	77.3	326	280	13.80	10.65
	SD	1,879	2,366	82.0	104.1	17,358	23,629	11,862	22,591	36.4	16.3	149	70	1.30	1.03
	t-test	**0.703**		**0.386**		**0.301**		**0.657**		**0.343**		**0.640**		**0.012**	

Indicates comparison was statistically significant at p<0.05.

Appendix Table E.30: Reference sediment concentrations relative to guidelines, SRWMP 2009.

Parameter		Barium	Cobalt	Iron	Manganese	Nickel	Uranium	TOC	Ra-226
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	Bq/g
PSQG[a]	LEL	-	-	20,000	460	16	-	1	-
	SEL	-	-	40,000	1100	75	-	10	-
CNSC[b]	LEL	-	-	-	-	23.4	104.4	-	0.6
	SEL	-	-	-	-	484	5874.1	-	14.4
Rochester (RL)	1	110	13	27,000	590	18	3.1	9.8	0.1
	2	130	18	50,000	790	23	4.1	12	0.17
	3	160	21	28,000	710	23	6.9	16	0.14
	4	160	24	25,000	850	27	7.0	18	0.24
	5	130	19	24,000	610	23	4.1	15	0.12
Semiwhite (SL)	1	390	14	34,000	5,200	25	4.8	6.6	0.16
	2	360	11	23,000	2,400	21	4.3	7.6	0.09
	3	560	14	46,000	7,800	26	4.0	7	0.27
	4	310	9.9	20,000	1,900	22	3.6	7	0.07
	5	540	14	49,000	8,400	24	4.1	6.7	0.18
Dunlop (DL)	1	170	18	35,000	5,300	24	4.4	11	0.07
	2	140	12	19,000	1,800	22	4.8	8.6	0.07
	3	150	16	35,000	2,300	23	3.5	6.2	0.14
	4	52	6.8	11,000	670	12	1.8	3.6	0.05
	5	170	19	42,000	2,600	26	4.6	9.2	0.11
Ten Mile (TML)	1	110	7.2	10,000	560	22	3.8	13	0.1
	2	95	7.9	11,000	660	21	4.3	10	0.06
	3	51	5.0	8,200	340	12	2.4	9	0.07
	4	61	6.0	9,300	630	13	2.7	3.6	0.05
	5	91	8.2	10,000	400	20	3.4	5.4	0.04
Summers (SUL)	1	120	26	34,000	2,600	21	2.9	8.7	0.17
	2	99	15	21,000	2,200	17	2.5	9.3	0.11
	3	100	30	46,000	1,100	20	2.9	11	0.28
	4	86	10	17,000	290	18	2.8	11	0.14
	5	88	17	24,000	730	17	2.4	9.6	0.09
Reference Mean		177	14.5	26,340	2,057	20.8	3.8	9.4	0.12
Standard Deviation		142	6.45	13,260	2,266	4.16	1.3	3.5	0.07
Upper Background Concentration[e]		**481**	**28.3**	**54,783**	**6,918**	**29.7**	**6.5**	**17.0**	**0.27**

[a] Provincial Sediment Qulaity Guidelines (PSQGs). Lowest Effect Level (LEL) and Severe Effects Level (SEL) (MOE 1993)

[b] Thompson *et al*., 2005

[c] Anon, 1988

[d] Uranium value derived from site specific data (Minnow and Beak 2001) and Radium-226 value also derived from site specific data (Minnow 2009c)

[e] Upper background concentration based on the following equation = mean + (2.145 x SD)

Appendix Table E.31: Particle size distribution and TOC content in lake sediments, SRWMP 2009.

Lake	Sample	TOC (%)	% Gravel	% Sand	% Silt	% Clay
Reference						
Rochester	1	9.8	*0.1*	22	65	13
	2	12.0	*0.1*	44	43	13
	3	16.0	*0.1*	36	40	24
	4	18.0	0.3	41	40	18
	5	15.0	*0.1*	33	43	25
	mean	14.2	0.14	35.2	46.2	18.6
Semiwhite	1	6.6	*0.1*	24	62	13
	2	7.6	*0.1*	24	60	16
	3	7.0	*0.1*	32	55	12
	4	7.0	*0.1*	25	61	14
	5	6.7	*0.1*	28	60	12
	mean	7.0	0.1	26.6	59.6	13.4
Dunlop	1	11.0	*0.1*	25	56	19
	2	8.6	*0.1*	27	57	15
	3	6.2	*0.1*	30	59	11
	4	3.6	*0.1*	17	74	8.9
	5	9.2	*0.1*	28	55	18
	mean	7.7	0.1	25.4	60.2	14.38
Ten Mile	1	13.0	*0.1*	28	48	24
	2	10.0	*0.1*	23	51	26
	3	9.0	*0.1*	26	48	26
	4	3.6	*0.1*	32	55	13
	5	5.4	*0.1*	28	58	14
	mean	8.2	0.1	27.4	52	20.6
Summers	1	8.7	*0.1*	38	45	17
	2	9.3	*0.1*	36	45	19
	3	11.0	*0.1*	35	47	18
	4	11.0	*0.1*	44	42	14
	5	9.6	*0.1*	24	52	24
	mean	9.9	0.1	35.4	46.2	18.4
Exposed						
Quirke	1	9.6	*0.1*	45	39	16
	2	7.2	*0.1*	27	57	16
	3	2.2	*0.1*	43	50	7.2
	4	7.5	*0.1*	41	40	19
	5	5.8	*0.1*	46	42	11
	mean	6.5	0.1	40.4	45.6	13.84
Elliott	1	3.7	*0.1*	39	46	15
	2	6.6	*0.1*	29	47	24
	3	5.0	*0.1*	28	50	22
	4	5.6	*0.1*	42	44	15
	5	6.6	*0.1*	23	51	25
	mean	5.5	0.1	32.2	47.6	20.2

Appendix Table E.31: Particle size distribution and TOC content in lake sediments, SRWMP 2009.

Lake	Sample	TOC (%)	% Gravel	% Sand	% Silt	% Clay
Exposed						
Nordic	1	7.6	*0.1*	18	46	36
	2	5.7	*0.1*	43	46	12
	3	6.2	*0.1*	45	43	12
	4	6.8	*0.1*	43	42	15
	5	6.6	*0.1*	40	44	16
	mean	6.6	0.1	37.8	44.2	18.2
McCarthy	1	5.5	*0.1*	38	51	11
	2	5.5	*0.1*	35	47	18
	3	3.8	*0.1*	24	53	23
	4	5.3	*0.1*	30	47	23
	5	3.7	*0.1*	26	58	16
	mean	4.8	0.1	30.6	51.2	18.2
Hough	1	5.4	*0.1*	38	51	12
	2	6.7	*0.1*	31	55	14
	3	6.2	*0.1*	34	52	13
	4	6.2	*0.1*	28	57	16
	5	5.5	*0.1*	26	59	15
	mean	6.0	0.1	31.4	54.8	14
Pecors	1	4.0	*0.1*	26	63	12
	2	4.6	*0.1*	22	61	17
	3	3.5	*0.1*	28	56	16
	4	5.0	*0.1*	31	54	15
	5	2.7	*0.1*	51	44	5.1
	mean	4.0	0.1	31.6	55.6	13.02
McCabe	1	8.6	*0.1*	46	42	12
	2	8.0	*0.1*	45	47	7.7
	3	9.7	*0.1*	42	42	17
	4	8.3	0.1	47	41	12
	5	7.0	*0.1*	49	43	8.1
	mean	8.3	0.1	45.8	43	11.36
May	1	8.0	*0.1*	38	44	18
	2	9.4	*0.1*	45	43	12
	3	7.1	*0.1*	52	39	8.3
	4	6.6	*0.1*	51	32	17
	5	6.4	0.2	40	52	7.7
	mean	7.5	0.12	45.2	42	12.6

italics indicate less than detection

Appendix Table E.32: Lake sediment concentrations, SRWMP 2009.

Parameter		Barium	Cobalt	Iron	Manganese	Nickel	Uranium	TOC	Ra-226
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	Bq/g
Quirke (QL)	1	1,400	40	64,000	4,800	30	470	9.6	7
	2	530	26	49,000	3,100	24	300	7.2	2.2
	3	240	22	42,000	2,800	16	180	2.2	1.1
	4	610	20	66,000	2,000	19	280	7.5	3.5
	5	750	84	68,000	8,000	38	530	5.8	4.4
Elliott (EL)	1	300	80	50,000	18,000	49	120	3.7	1.7
	2	200	59	63,000	7,800	55	200	6.6	1.7
	3	130	59	40,000	3,000	47	150	5	0.96
	4	260	83	47,000	16,000	58	160	5.6	1.7
	5	200	89	60,000	9,000	59	220	6.6	1.9
Nordic (NL)	1	130	25	33,000	300	37	110	7.6	2.3
	2	330	130	75,000	24,000	50	150	5.7	5.3
	3	320	110	59,000	26,000	38	130	6.2	4.1
	4	390	130	68,000	21,000	52	220	6.8	6.8
	5	300	150	110,000	26,000	43	160	6.6	5.4
McCarthy (MCL)	1	180	120	56,000	16,000	53	180	5.5	2.3
	2	180	120	52,000	14,000	41	130	5.5	1.2
	3	130	71	43,000	8,000	44	120	3.8	0.86
	4	190	120	65,000	15,000	45	150	5.3	2.2
	5	120	74	33,000	8,800	33	110	3.7	1.2
Hough (HOL)	1	86	29	55,000	3,300	41	89	5.4	1.7
	2	72	25	46,000	2,500	39	91	6.7	1.6
	3	84	28	57,000	3,200	39	90	6.2	2.5
	4	90	30	60,000	3,400	45	89	6.2	2.0
	5	70	22	39,000	2,000	37	78	5.5	1.7
Pecors (PL)	1	96	43	41,000	4,300	32	120	4	0.58
	2	120	42	43,000	4,000	42	110	4.6	0.82
	3	89	33	28,000	1,600	37	100	3.5	0.66
	4	110	39	37,000	1,500	40	110	5	0.92
	5	75	43	18,000	3,900	26	130	2.7	0.38
McCabe (ML)	1	470	290	100,000	18,000	160	590	8.6	15
	2	1,400	220	75,000	35,000	110	280	8	13
	3	4,200	76	51,000	2,000	68	230	9.7	12
	4	4,000	150	74,000	15,000	85	270	8.3	15
	5	380	140	77,000	14,000	81	260	7	14
May (MAL)	1	100	25	100,000	2,400	21	75	8	3.3
	2	260	49	75,000	9,100	59	110	9.4	1.2
	3	120	31	67,000	5,600	39	97	7.1	2.5
	4	140	33	67,000	6,600	43	94	6.6	2.9
	5	96	21	59,000	3,000	32	86	6.4	2.1

Table E.33: Benthic macroinvertebrates collected from SRWMP lakes, 2009.

Station	DUL-09					ELO-09					HOL-09				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	20	60	316	384	20	-	-	1	-	-	3	4	-	-	-
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Naididae															
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	8	4	-	20	-	-	-	-	-	-	-	-	-	-	6
immatures without hair chaetae	-	4	-	-	-	1	3	4	-	2	-	-	-	-	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	-	4	12	4	12	1	-	1	8	-	3	-	3	1	-
HARPACTICOIDS															
O. Harpacticoida	8	12	4	140	48	-	-	-	-	1	-	-	-	-	-
SEED SHRIMPS															
Cl. Ostracoda	532	1028	628	524	132	12	35	21	74	67	76	148	405	62	176
WATER SCUDS															
O. Amphipoda															
F. Hyalellidae															
Hyalella	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	-	-	-	-	1	4	1	8	5	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Dytiscidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES															
O. Ephemeroptera															
F. Caenidae															
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae															
Hexagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CADDISFLIES															
O. Trichoptera															
F. Leptoceridae															
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES															
O. Diptera															
BITING-MIDGE															
F. Ceratopogonidae															
Bezzia	-	-	-	-	4	-	-	-	-	-	1	-	-	-	-
Mallochohelea	-	-	4	-	-	-	-	-	-	1	-	-	-	-	2
Probezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus flavicans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus punctipennis	-	-	-	-	-	1	7	5	-	2	-	-	-	-	-
MIDGES															
F. Chironomidae															
chironomid pupae	-	**4**	-	**4**	**4**	-	**6**	**6**	**4**	**1**	**49**	**28**	**36**	**19**	**36**
S.F. Chironominae															
Chironomus	-	-	-	-	-	-	-	-	-	-	-	-	4	2	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2
Micropsectra	96	68	44	128	40	31	43	28	98	36	50	172	192	34	140
Microtendipes	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pagastiella	-	-	4	-	-	-	-	-	-	3	-	-	-	-	-
Paracladopelma	-	-	-	4	-	-	-	1	-	-	3	-	-	1	4
Polypedilum halterale	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-
Polypedilum scalaenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	60	32	80	36	4	-	8	8	-	34	3	24	10	9	8
Stempellina	-	4	8	-	4	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	24	8	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	24	4	36	20	156	30	111	108	54	141	2	-	13	3	4
Tanytarsus	40	36	44	8	12	-	27	3	12	9	-	-	21	-	40
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
S.F. Diamesinae															
Protanypus	-	4	4	12	8	4	2	5	-	1	7	4	1	1	-
S.F. Orthocladiinae															
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	84	68	128	92	40	105	122	254	111	33	68	109	49	68
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	48	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae															
Ablabesmyia	-	-	8	-	-	-	-	-	-	1	1	-	-	-	-
Procladius	24	120	72	40	60	-	8	1	12	2	2	-	3	-	-
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Planorbidae															
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	352	280	192	196	328	20	171	134	152	133	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS	1164	1784	1584	1648	928	141	531	450	676	551	234	452	799	181	490
TOTAL NUMBER OF TAXA [a]	10	18	19	14	15	10	13	16	9	17	13	8	12	9	12

[a] Bold entries excluded from taxa count

Table E.33: Benthic macroinvertebrates collected from SRWMP lakes, 2009.

Station	MAL-09					MCL-09					ML-09				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	-	-	-	4	-	-	-	-	-	-	4	8	8	48	1
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Naididae															
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Limnodrilus hoffmeisteri	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	8	-	-	-	2	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-	-	24	8	24	32
immatures without hair chaetae	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	15	24	2	3	-	4	-	12	1	14	-	-	4	-	6
HARPACTICOIDS															
O. Harpacticoida	4	-	-	-	-	-	-	-	-	30	-	-	-	-	-
SEED SHRIMPS															
Cl. Ostracoda	20	158	336	122	90	146	48	168	54	262	260	192	352	248	165
WATER SCUDS															
O. Amphipoda															
F. Hyalellidae															
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	-	-	-	-	28	2	-	11	-	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Dytiscidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES															
O. Ephemeroptera															
F. Caenidae															
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae															
Hexagenia	-	-	2	-	-	-	-	-	-	-	-	2	-	8	-
F. Leptophlebiidae															
immature	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES															
O. Trichoptera															
F. Leptoceridae															
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES															
O. Diptera															
BITING-MIDGE															
F. Ceratopogonidae															
Bezzia	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Mallochohelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Probezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus flavicans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus punctipennis	-	-	-	-	-	8	4	6	6	6	-	-	-	-	-
MIDGES															
F. Chironomidae															
chironomid pupae	**6**	**21**	**26**	**10**	**14**	**4**	**8**	**4**	**11**	**8**	-	-	**16**	**32**	**48**
S.F. Chironominae															
Chironomus	70	4	10	5	-	-	2	36	-	-	-	-	-	8	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	8	8	8	2
Micropsectra	12	202	296	31	30	182	44	26	141	122	76	-	4	-	2
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Pagastiella	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	2	4	-	-	8	-
Polypedilum halterale	-	-	-	3	-	-	-	-	-	-	-	-	-	24	-
Polypedilum scalaenum	-	-	-	-	-	-	-	-	-	-	-	-	8	8	-
Polypedilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Sergentia	221	42	6	7	-	28	68	30	66	60	-	-	12	-	4
Stempellina	-	-	-	-	-	-	-	-	-	-	-	8	-	8	128
Stempellinella	-	-	-	-	-	-	-	-	-	-	-	56	44	16	98
Stictochironomus	-	8	14	13	10	2	-	2	-	-	-	-	-	-	-
Tanytarsus	-	-	-	9	-	58	-	20	12	46	20	16	12	8	77
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae															
Protanypus	5	-	4	4	12	4	4	20	-	12	4	-	4	-	1
S.F. Orthocladiinae															
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
Heterotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	21	36	54	20	50	178	2	194	14	70	108	64	20	64	122
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	2	2	-	2	-	-	-	-	-	48	-	32	130
Psectrocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
S.F. Tanypodinae															
Ablabesmyia	-	-	-	-	-	-	-	-	-	2	-	-	-	8	-
Procladius	2	-	-	-	-	8	-	-	-	4	8	56	80	56	59
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Planorbidae															
Menetus	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	-	-	-	-	-	28	6	38	17	78	132	104	220	112	51
TOTAL NUMBER OF ORGANISMS	376	495	752	239	208	688	188	556	340	720	616	594	800	720	954
TOTAL NUMBER OF TAXA [a]	9	7	10	14	6	14	9	11	11	15	9	13	14	17	21

[a] Bold entries excluded from taxa count

Table E.33: Benthic macroinvertebrates collected from SRWMP lakes, 2009.

Station	NL-05					PL-09					QL-09				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	1	-	4	4	-	-	-	2	-	-	-	4	-	-	-
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Naididae															
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	2	30	-	-	-	-	-	-	16	1	-	2	-	10
Tubifex tubifex	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	5	-	-	-	4	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	1	4	13	4	10	4	4	6	10	16	1	-	-	-	-
HARPACTICOIDS															
O. Harpacticoida	1	5	9	6	-	-	-	-	-	16	-	-	-	-	-
SEED SHRIMPS															
Cl. Ostracoda	32	57	33	48	96	140	26	210	110	144	35	4	2	-	6
WATER SCUDS															
O. Amphipoda															
F. Hyalellidae															
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Dytiscidae															
immature	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES															
O. Ephemeroptera															
F. Caenidae															
Caenis	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae															
Hexagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES															
O. Trichoptera															
F. Leptoceridae															
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES															
O. Diptera															
BITING-MIDGE															
F. Ceratopogonidae															
Bezzia	2	1	1	2	2	-	-	-	-	-	-	-	-	-	-
Mallochohelea	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-
Probezzia	10	3	-	-	4	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus flavicans	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus punctipennis	-	-	-	-	-	-	4	6	-	-	-	-	-	-	-
MIDGES															
F. Chironomidae															
chironomid pupae	**3**	**14**	**1**	**8**	**4**	**8**	**4**	**2**	-	-	**11**	**12**	**22**	**10**	**8**
S.F. Chironominae															
Chironomus	91	11	14	2	2	-	2	-	-	-	57	40	32	20	6
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-
Micropsectra	6	42	37	22	122	124	190	388	382	304	1	4	10	2	4
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	64	-	-	-	-	-
Paracladopelma	-	1	1	-	-	-	-	-	4	-	-	4	-	-	-
Polypedilum halterale	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Polypedilum scalaenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	2	-	15	4	2	-	2	16	2	16	-	-	-	2	-
Stempellina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-
Stictochironomus	-	23	1	2	-	-	-	-	-	-	-	-	-	-	-
Tanytarsus	5	12	-	12	16	28	-	172	-	64	-	-	-	2	-
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae															
Protanypus	-	4	1	6	-	4	16	6	4	-	1	-	-	2	2
S.F. Orthocladiinae															
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	2	102	76	204	128	396	99	78	138	896	76	32	76	140	94
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae															
Ablabesmyia	-	-	-	-	-	-	-	-	-	16	-	-	-	-	-
Procladius	-	-	-	-	-	4	-	6	6	16	-	-	-	-	-
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Planorbidae															
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	-	-	-	-	-	-	-	8	50	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS	165	284	238	326	390	712	348	905	706	1584	183	100	146	178	132
TOTAL NUMBER OF TAXA [a]	15	15	15	13	10	8	9	14	9	12	7	6	6	6	7

[a] Bold entries excluded from taxa count

Table E.33: Benthic macroinvertebrates collected from SRWMP lakes, 2009.

Station	RL-09					SL-09					SUL-09				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	-	1	-	1	-	-	16	4	56	20	2	-	-	-	-
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Naididae															
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Limnodrilus hoffmeisteri	-	17	-	-	-	2	-	-	-	-	1	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	29	-	-	-	8	-	-	-	-	-	-	-	8	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	-	-	2	-	-	4	-	-	8	20	9	2	4	6	6
HARPACTICOIDS															
O. Harpacticoida	46	22	22	20	96	76	-	-	8	4	-	-	72	46	2
SEED SHRIMPS															
Cl. Ostracoda	7	2	1	-	-	8	16	80	72	84	12	2	132	-	-
WATER SCUDS															
O. Amphipoda															
F. Hyalellidae															
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Dytiscidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES															
O. Ephemeroptera															
F. Caenidae															
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae															
Hexagenia	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
F. Leptophlebiidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES															
O. Trichoptera															
F. Leptoceridae															
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
immature	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
TRUE FLIES															
O. Diptera															
BITING-MIDGE															
F. Ceratopogonidae															
Bezzia	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-
Mallochohelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Probezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus flavicans	-	-	-	-	-	2	-	4	-	-	-	-	-	-	-
Chaoborus punctipennis	-	-	-	2	-	-	-	-	-	-	-	4	-	16	2
MIDGES															
F. Chironomidae															
chironomid pupae	-	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-	-
S.F. Chironominae															
Chironomus	10	33	6	1	36	2	8	8	-	-	9	-	4	16	6
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	-	1	-	-	350	184	164	64	424	16	2	196	72	114
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	1	-	-	-	-	-	-	8	-	-	-	-	-	-
Polypedilum halterale	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Polypedilum scalaenum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	28	22	61	3	20	48	16	52	16	8	140	160	96	94	100
Stempellina	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	28	8	-	-	-	-	-	-
Stictochironomus	-	-	-	-	-	34	48	16	72	28	56	18	48	-	16
Tanytarsus	-	-	-	-	-	-	-	8	8	-	-	-	-	-	-
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae															
Protanypus	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-
S.F. Orthocladiinae															
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	10	16	52	16	28	20	18	28	-	36
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae															
Ablabesmyia	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-
Procladius	2	-	3	2	-	42	24	36	56	52	5	20	16	8	38
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Planorbidae															
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	-	-	-	-	-	34	24	12	56	40	8	8	8	-	-
TOTAL NUMBER OF ORGANISMS	94	127	96	29	152	624	360	464	458	709	283	238	608	266	323
TOTAL NUMBER OF TAXA [a]	6	8	7	6	3	15	10	12	15	11	14	10	11	8	11

[a] Bold entries excluded from taxa count

Table E.33: Benthic macroinvertebrates collected from SRWMP lakes, 2009.

Station	TML-09				
Replicate	1	2	3	4	5
ROUNDWORMS					
P. Nemata	16	64	32	26	80
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Naididae					
Nais variabilis	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-
F. Tubificidae					
Limnodrilus hoffmeisteri	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-
immatures without hair chaetae	-	-	-	-	-
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
O. Acarina	8	8	2	4	16
HARPACTICOIDS					
O. Harpacticoida	248	424	128	64	176
SEED SHRIMPS					
Cl. Ostracoda	152	304	86	222	80
WATER SCUDS					
O. Amphipoda					
F. Hyalellidae					
Hyalella	-	-	-	-	-
F. Pontoporeiidae					
Diporeia	-	-	-	-	-
OPOSSUM SHRIMPS					
O. Mysidacea					
Mysis	-	-	-	-	-
INSECTS					
Cl. Insecta					
BEETLES					
O. Coleoptera					
F. Dytiscidae					
immature	-	-	-	-	-
MAYFLIES					
O. Ephemeroptera					
F. Caenidae					
Caenis	-	-	-	-	-
F. Ephemeridae					
Hexagenia	-	-	-	-	-
F. Leptophlebiidae					
immature	-	-	-	-	-
O. Megaloptera					
ALDERFLIES					
F. Sialidae					
Sialis	-	-	-	-	-
CADDISFLIES					
O. Trichoptera					
F. Leptoceridae					
Triaenodes	-	-	-	-	-
F. Phryganeidae					
Agrypnia	-	-	-	-	-
immature	-	-	-	-	-
TRUE FLIES					
O. Diptera					
BITING-MIDGE					
F. Ceratopogonidae					
Bezzia	-	-	-	-	-
Mallochohelea	-	-	-	-	-
Probezzia	-	-	-	-	-
PHANTOM MIDGE					
F. Chaoboridae					
Chaoborus flavicans	-	-	-	-	-
Chaoborus punctipennis	-	-	-	-	-
MIDGES					
F. Chironomidae					
chironomid pupae	-	-	-	**12**	**8**
S.F. Chironominae					
Chironomus	-	-	-	44	8
Cladopelma	-	-	-	-	-
Dicrotendipes	-	-	-	4	-
Micropsectra	120	16	28	58	160
Microtendipes	-	-	-	-	-
Nilothauma	-	-	-	-	-
Pagastiella	-	-	-	-	-
Paracladopelma	-	-	-	-	64
Polypedilum halterale	-	-	-	-	-
Polypedilum scalaenum	-	-	-	-	-
Polypedilum	-	-	-	-	-
Sergentia	8	-	4	12	24
Stempellina	-	-	-	-	-
Stempellinella	-	8	-	-	-
Stictochironomus	136	-	72	64	24
Tanytarsus	48	8	-	8	-
Tribelos	-	-	-	-	-
S.F. Diamesinae					
Protanypus	8	-	4	6	8
S.F. Orthocladiinae					
Cricotopus	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-
Heterotrissocladius	8	96	20	166	512
Paracladius	48	80	4	12	80
Parakiefferiella	-	-	-	-	-
Psectrocladius	-	-	-	-	-
S.F. Tanypodinae					
Ablabesmyia	-	-	-	-	-
Procladius	16	16	16	66	-
MOLLUSCS					
P. Mollusca					
SNAILS					
Cl. Gastropoda					
F. Planorbidae					
Menetus	-	-	-	-	-
CLAMS					
Cl. Bivalvia					
F. Sphaeriidae					
Cyclocalyx	-	-	-	14	-
TOTAL NUMBER OF ORGANISMS	816	1024	396	782	1240
TOTAL NUMBER OF TAXA [a]	12	10	11	15	12

[a] Bold entries excluded from taxa count

Appendix Table E.34: Supporting Habitat Measures for Benthic Community Stations, 1999, 2004, 2009.

Station	lake	Lake	Exposure Status	Year	Barium (mg/kg)	Cobalt (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Nickel (mg/kg)	Ra-226 (Bq/g)	Uranium (mg/kg)	TOC (%)	Depth (m)	Secchi Depth (m)	Water Temperature (°C)	DO (mg/L)	DO (% sat)	pH	Cond (µS/cm)	RedOx (mV)	Fines (%; silt + clay)	log10 (1 + Barium (mg/kg))	log10 (1 + Cobalt (mg/kg))	log10 (1 + Iron (mg/kg))	log10 (1 + Manganese (mg/kg))	log10 (1 + Nickel (mg/kg))	log10 (1 + Ra-226 (Bq/g))	log10 (1 + Uranium (mg/kg))
DUL1-99	DUL	Dunlop	Reference	1999	97	9	18000	670	22	0.0425	3.7	12	14	.	17	6.6	.	.	.	.	.	.	.	.	.	.	.	.
DUL2-99	DUL	Dunlop	Reference	1999	200	22	43000	7500	29	0.0998	4.8	9.4	17.7	6.6	8.7	7.62	.	.	.	.	.	.	.	.	.	.	.	.
DUL3-99	DUL	Dunlop	Reference	1999	86	10	16000	3600	16	0.0504	2.3	5.4	18	.	12.7	0.65	.	.	.	.	.	.	.	.	.	.	.	.
TML1-99	TML	Ten Mile	Reference	1999	90	8	11000	210	21	0.0435	5.1	9.4	17	.	10.4	11.8	.	.	.	.	.	.	.	.	.	.	.	.
TML2-99	TML	Ten Mile	Reference	1999	60	9	8100	270	15	0.0346	4.4	4.7	18	9.6	7.2	11.95	.	.	.	.	.	.	.	.	.	.	.	.
TML3-99	TML	Ten Mile	Reference	1999	110	8	12000	700	26	0.0596	4.5	13	17	.	8.7	11.37	100	7.9	28	-285	45	2.0453	0.9542	4.0792	2.8457	1.4314	0.0251	0.7404
RL1-99	RL	Rochester	Reference	1999	140	15	50000	630	25	0.0479	3.4	13	17	.	9.8	1.1	10	6.52	24.9	19	69	2.1492	1.2041	4.699	2.8	1.415	0.0203	0.6435
RL2-99	RL	Rochester	Reference	1999	170	14	24000	630	27	0.04	5.4	16	8	.	14.8	6.1	62	6.48	22.6	24	82	2.233	1.1761	4.3802	2.8	1.4472	0.017	0.8062
RL3-99	RL	Rochester	Reference	1999	180	19	34000	860	28	0.0594	6.3	17	17	4.25	6.6	3.7	32	6.47	29.7	19	85	2.2577	1.301	4.5315	2.935	1.4624	0.0251	0.8633
QL1-99	QL	Quirke	Exposure	1999	850	12	31000	440	18	2.5562	250	6.6	17	.	12.5	10.55	102	7.23	290	-116	71.3	2.9299	1.1139	4.4914	2.6444	1.2788	0.551	2.3997
QL2-99	QL	Quirke	Exposure	1999	460	28	61000	1800	21	1.9353	230	6.6	17	13.1	10.3	10.32	95	6.47	290	-37	50	2.6637	1.4624	4.7853	3.2555	1.3424	0.4677	2.3636
QL3-99	QL	Quirke	Exposure	1999	170	9	24000	510	13	0.8589	180	1.2	16	.	12.9	10.68	104	6.89	290	-221	42	2.233	1	4.3802	2.7084	1.1461	0.2693	2.2577
QL4-99	QL	Quirke	Exposure	1999	260	6	24000	280	16	1.3188	220	4.8	16.5	.	16.2	8.97	95	8.39	288	-172	44	2.4166	0.8451	4.3802	2.4487	1.2304	0.3653	2.3444
QL5-99	QL	Quirke	Exposure	1999	610	16	44000	1400	20	2.3641	290	7.8	16.5	.	12.1	10.85	112	6.7	288	-156	61	2.786	1.2304	4.6435	3.1464	1.3222	0.5269	2.4639
EL1-99	EL	Elliot	Exposure	1999	290	130	92000	19000	86	2.4791	220	7.9	17	.	6.7	1.15	9	6.61	56.1	-109	46	2.4639	2.1173	4.9638	4.2788	1.9395	0.5415	2.3444
EL2-99	EL	Elliot	Exposure	1999	200	99	40000	13000	67	1.0331	200	8.6	16	5.7	7.2	0.22	1	6.63	59.9	-87	73.1	2.3032	2	4.6021	4.114	1.8325	0.3082	2.3032
EL3-99	EL	Elliot	Exposure	1999	130	70	44000	5000	53	1.1754	220	7.5	17	.	7	5.77	49	6.69	56.4	-140	56	2.1173	1.8513	4.6435	3.6991	1.7324	0.3375	2.3444
HOL1-99	HOL	Hough	Exposure	1999	100	42	50000	9100	56	2.7571	89	7.9	17.5	.	6.4	4.1	34	.	625	-43	61	2.0043	1.6335	4.699	3.9591	1.7559	0.5749	1.9542
HOL2-99	HOL	Hough	Exposure	1999	74	36	49000	6300	49	2.4363	92	7.7	17	9.7	6.5	4.7	39	.	626	-83	51	1.8751	1.5682	4.6902	3.7994	1.699	0.5361	1.9685
HOL3-99	HOL	Hough	Exposure	1999	88	50	59000	9000	55	3.1716	95	6.6	17	.	5.1	2.3	18	.	646	-74	61	1.9494	1.7076	4.7709	3.9543	1.7482	0.6203	1.9823
ML1-99	ML	McCabe	Exposure	1999	370	270	100000	46000	66	11.1249	250	11	14	.	12.4	10.1	98	6.86	757	-177	0.3	2.5694	2.433	5	4.6628	1.8261	1.0837	2.3997
ML2-99	ML	McCabe	Exposure	1999	5100	320	110000	20000	96	11.3566	360	9.8	14	4.5	12.9	8.85	87	6.72	768	-99	33	3.7077	2.5065	5.0414	4.3011	1.9868	1.0919	2.5575
ML3-99	ML	McCabe	Exposure	1999	2600	120	65000	1000	70	9.4606	230	2.1	14	.	15.3	2.2	23	6.73	761	-222	48	3.4151	2.0828	4.8129	3.0004	1.8513	1.0196	2.3636
MCL1-99	MCL	McCarthy	Exposure	1999	270	47	30000	720	38	1.2998	88	7	13.5	.	6.1	0.05	0	.	135.3	-218	93.7	2.433	1.6812	4.4771	2.8579	1.5911	0.3617	1.9494
MCL2-99	MCL	McCarthy	Exposure	1999	150	140	45000	18000	52	1.106	110	4.8	14	5.38	7.3	0.28	2	6.01	125.2	72	83	2.179	2.1492	4.6532	4.2553	1.7243	0.3235	2.0453
MCL3-99	MCL	McCarthy	Exposure	1999	150	120	47000	26000	75	1.1255	130	5.2	16.5	.	5.7	0.6	5	5.87	133	104	78	2.179	2.0828	4.6721	4.415	1.8808	0.3275	2.1173
NL1-99	NL	Nordic	Exposure	1999	76	17	54000	1000	20	1.2087	55	3.6	12	.	7.8	9.54	82	7.13	548	-317	63	1.8865	1.2553	4.7324	3.0004	1.3222	0.3441	1.7482
NL2-99	NL	Nordic	Exposure	1999	340	250	100000	45000	79	4.922	170	7.8	16	6.5	4.5	2.3	18	6.75	505	-212	75.5	2.5328	2.3997	5	4.6532	1.9031	0.7725	2.233
NL3-99	NL	Nordic	Exposure	1999	370	270	100000	46000	63	5.1643	170	9.3	16.5	.	5.1	0.8	6	7.15	503	-124	80	2.5694	2.433	5	4.6628	1.8062	0.7899	2.233
PL1-99	PL	Pecors	Exposure	1999	94	32	30000	1000	43	0.9724	94	4.8	15	.	6.8	7.06	64	6.99	458	-77	86.6	1.9777	1.5185	4.4771	3.0004	1.6435	0.295	1.9777
PL2-99	PL	Pecors	Exposure	1999	110	68	43000	6000	48	0.9884	150	5.5	16	8.75	.	.	.	.	.	44	82.3	2.0453	1.8388	4.6335	3.7782	1.6902	0.2985	2.179
PL3-99	PL	Pecors	Exposure	1999	33	41	16000	2700	20	0.3425	130	2.1	17	.	.	.	.	.	.	-101	72	1.5315	1.6232	4.2041	3.4315	1.3222	0.1279	2.1173
DUL1-04	DUL	Dunlop	Reference	2004	121.4279	8.4997	16916.89	471.5818	23.8606	0.0572	4.9	12	13.6	7.59	12.22	10.67	100.5	6.8	26	176.5	88	2.0879	0.9777	4.2283	2.6745	1.3955	0.0242	0.7709
DUL2-04	DUL	Dunlop	Reference	2004	339.0671	20.7119	76964.6	5181.8893	30.9701	0.1399	3.7	9.8	19.5	8.71	8.13	9.31	78.6	5.88	26	58.3	90	2.5316	1.3367	4.8863	3.7146	1.5047	0.0569	0.6721
DUL3-04	DUL	Dunlop	Reference	2004	192.9242	19.2431	40314.587	5596.7477	36.5986	0.0921	4	8.9	14	7.26	11.65	10.91	99.7	6.51	25	23.1	94	2.2876	1.3063	4.6055	3.748	1.5752	0.0383	0.699
TML1-04	TML	Ten Mile	Reference	2004	111.12	10.3321	14784.9	601.835	22.3397	0.0513	6.1	12	17.5	8.5	7.45	13.01	109.2	6.29	21	136.1	67	2.0497	1.0543	4.1698	2.7802	1.3681	0.0217	0.8513
TML2-04	TML	Ten Mile	Reference	2004	62.6997	7.6378	10812.7	257.8275	17.1326	0.0369	3.6	2.2	17.5	10.01	8.64	14.23	121.7	7.23	21	240.1	52	1.8041	0.9364	4.034	2.413	1.2585	0.0157	0.6628
TML3-04	TML	Ten Mile	Reference	2004	97.1135	9.5086	16386.336	370.5453	27.0975	0.0456	4.8	7.5	15.4	9.04	18.49	10.11	107.9	6.55	27	107.7	78	1.9917	1.0215	4.2145	2.57	1.4487	0.0194	0.7634
RL1-04	RL	Rochester	Reference	2004	141.1251	14.0788	40486.159	574.5312	25.3101	0.0597	4.3	13	14.9	3.9	5.34	6.1	48.2	6.58	16	55.1	90	2.1527	1.1784	4.6073	2.7601	1.4201	0.0252	0.7243
RL2-04	RL	Rochester	Reference	2004	166.5335	23.1629	31833.067	772.5639	27.8754	0.0607	5.5	16	14.9	3.95	5.41	2.53	20	6.33	25	18.1	96	2.2241	1.3831	4.5029	2.8885	1.4605	0.0256	0.8129
RL3-04	RL	Rochester	Reference	2004	197.905	21.0495	31006.584	872.2167	33.4397	0.0713	7.9	16	14.9	4	4.42	4.92	38	7	32	39.9	90	2.2986	1.3434	4.4915	2.9411	1.5371	0.0299	0.9494
SUL1-04	SUL	Summers	Reference	2004	132.4446	18.544	24058.318	6763.3313	22.4186	0.0558	1.5	11	15	5.98	6.69	12.04	98.3	5.55	12	107.4	94	2.1253	1.291	4.3813	3.8302	1.3696	0.0236	0.3979
SUL2-04	SUL	Summers	Reference	2004	131.2128	23.3452	34624.455	5251.4863	23.4344	0.0612	2.1	9.6	14	6.25	5.46	9.66	76.5	5.22	12	55.7	97	2.1213	1.3864	4.5394	3.7204	1.388	0.0258	0.4914
SUL3-04	SUL	Summers	Reference	2004	95.0782	18.5185	23505.645	1596.0586	20.6675	0.0445	3.4	10	15	6.16	8.36	11.26	95.4	6.05	13	44.5	95	1.9826	1.2904	4.3712	3.2033	1.3358	0.0189	0.6435
SL1-04	SL	Semiwhite	Reference	2004	826.3287	11.2573	60822.029	8767.8713	26.2611	0.1277	3.6	6.95	14.4	6.82	8.87	11.25	94.9	6.56	23	125	94.5	2.9177	1.0884	4.7841	3.9429	1.4355	0.0522	0.6628
SL2-04	SL	Semiwhite	Reference	2004	914.1192	12.0367	58830.211	14519.729	28.4177	0.1235	1.6	8	15.5	6.47	6.92	8.48	69.7	5.68	21	46.6	96	2.9615	1.1152	4.7696	4.162	1.4686	0.0506	0.415
SL3-04	SL	Semiwhite	Reference	2004	1344.4345	15.3177	73234.413	22429.057	26.0392	0.1865	0.4	7.7	12.5	6.45	8.74	12.21	98.7	6.09	23	17.8	88	3.1289	1.2127	4.8647	4.3508	1.432	0.0743	0.1461
QL1-04	QL	Quirke	Exposure	2004	2449.8774	32.6297	59823.9	3471.0849	29.9895	5.1573	381.5	8.8	18.2	12.91	12.27	11.28	106	6.82	152	74.2	87	3.3893	1.5267	4.7769	3.5406	1.4912	0.7894	2.5826
QL2-04	QL	Quirke	Exposure	2004	390.9805	19.6002	41089.897	2154.9324	21.2908	1.4897	126.8	3.6	16	10.14	7.64	12.63	105.2	6.51	125	169.9	86	2.5933	1.3139	4.6137	3.3336	1.3481	0.3961	2.1065
QL3-04	QL	Quirke	Exposure	2004	115.6493	8.155	19635.145	782.98	9.4665	0.6319	74.2	1.6	18.5	9.88	7.31	5.43	104	6.72	136	227.9	57	2.0669	0.9617	4.2931	2.8943	1.0198	0.2127	1.8762
QL4-04	QL	Quirke	Exposure	2004	371.6757	21.3841	36887.79	2546.0208	19.5452	1.8186	171.1	4.5	.	.	.	.	.	.	.	.	67	2.5713	1.3499	4.5669	3.406	1.3127	0.45	2.2358
QL5-04	QL	Quirke	Exposure	2004	876.1043	84.6797	49262.833	8452.0493	36.4405	3.4959	203.1	3.1	.	.	.	.	.	.	.	.	66	2.9431	1.9329	4.6925	3.927	1.5733	0.6528	2.3098
EL1-04	EL	Elliot	Exposure	2004	226.3341	100.5553	66909.6	7038.7471	78.7511	2.0268	154.4	5.4	14.6	5.63	7.76	9.05	76.1	6.87	64	-13.5	85	2.3567	2.0067	4.8255	3.8476	1.9017	0.481	2.1915
EL2-04	EL	Elliot	Exposure	2004	263.7089	80.8674	85325.025	11886.341	64.0578	1.8519	109.1	6.5	14.9	5.25	7.55	7.53	63	6.68	62	80.6	87	2.4228	1.9131	4.9311	4.0751	1.8133	0.4551	2.0418
EL3-04	EL	Elliot	Exposure	2004	160.8886	51.4064	67948.514	7146.1087	41.9044	1.1776	127.7	6.05	14.9	5.63	7.7	8.21	69.2	6.94	62	88.6	90	2.2092	1.7194	4.8322	3.8541	1.6325	0.338	2.1096
HOL1-04	HOL	Hough	Exposure	2004	109.5407	39.5852	69324.444	7924.9383	47.4272	2.7379	50.9	6.1	15.9	7.63	7.23	12.01	96.7	6.76	171	67	77	2.0435	1.6084	4.8409	3.8991	1.6851	0.5726	1.7152
HOL2-04	HOL	Hough	Exposure	2004	95.2124	32.6008	62732.267	5994.3098	41.2047	2.4839	52.2	5.8	15.5	8.38	7.3	9.17	76.1	6.53	166	38	76	1.9832	1.5263	4.7975	3.7778	1.6254	0.5421	1.7259
HOL3-04	HOL	Hough	Exposure	2004	101.1774	31.1315	60640.591	4462.6821	42.3069	2.2897	65.3	5.5	15	7.25	10.58	11.31	100.4	7	182	103	75	2.0094	1.5069	4.7828	3.6497	1.6366	0.5172	1.8215
MAL1-04	MAL	May	Exposure	2004	118.9082	30.1836	138034.74	4402.4814	26.3027	3.404	55.3	8.4	14.6	8.88	7.38	11.42	95.8	6.66	127	37.1	81	2.0788	1.4939	5.14	3.6438	1.4362	0.6438	1.7505
MAL2-04	MAL	May	Exposure	2004	114.8681	29.1311	97068.042	6436.223	52.1424	2.7819	70.1	9.9	14.6	9.13	6.06	12.7	102.2	6.92	196	202.6	66	2.064	1.479	4.9871	3.8087	1.7254	0.5777	1.8519
MAL3-04	MAL	May	Exposure	2004	134.5019	44.4147	88938.404	9938.6017	48.2076	3.6453	52	7.8	14.6	10.9	7.2	14.37	118.3	7.14	206	274.8	82	2.1319	1.6572	4.9491	3.9974	1.692	0.667	1.7243
ML1-04	ML	McCabe	Exposure	2004	2037.1501	269.5743	112294.2	26134.788	103.1694	13.8287	107.1	10	14	6.75	11.06	9.01	78.9	6.89	27	-22.6	83	3.3092	2.4323	5.0504	4.4172	2.0177	1.1711	2.0338
ML2-04	ML	McCabe	Exposure	2004	6021.8541	210.5578	106117.15	19704.62	80.5409	11.5498	130	8.7	14.5	6.75	9.8	4.11	33	6.13	27	57.7	77	3.7798	2.3254	5.0258	4.2946	1.9114	1.0986	2.1173
ML3-04	ML	McCabe	Exposure	2004	709.9153	62.7304	48253.114	765.6502	61.2656	11.3135	207.7	12	14.5	8.35	11.15	7.58	66.9	6.33	27	48.1	88	2.8518	1.8043	4.6835	2.8846	1.7942	1.0904	2.3195
MCL1-04	MCL	McCarthy	Exposure	2004	246.5407	96.6992	70947	26127.842	49.5114	2.4042	45.4	6.7	15.2	5.6	6.84	10.22	84.4	6.87	85	223.7	86	2.3936	1.9899	4.8509	4.4171	1.7034	0.532	1.6665
MCL2-04	MCL	McCarthy	Exposure	2004	109.3775	53.1524	52527.933	5379.7885	31.5144	0.766	65.7	4.9	14.9	6.13	7.51	10.59	88.7	6.55	80	89.3	94	2.0429	1.7336	4.7204	3.7308	1.5121	0.247	1.8241
MCL3-04	MCL	McCarthy	Exposure	2004	139.1844	70.5199	60174.638	12079.778	36.9915	1.075	68.2	4.7	14.9	6.5	6.56	11.01	89.3	6.93	94	157.9	91	2.1467	1.8544	4.7794	4.0821	1.5797	0.317	1.8401
NL1-04	NL	Nordic	Exposure	2004	152.975	19.6704	59982	524.357	32.1756	2.1236	96.7	7.2	13.5	7.3	8.13	11.03	88.1	7.19	46	-24.5	93	2.1875	1.3153	4.778	2.7205	1.5208	0.4947	1.9899
NL2-04	NL	Nordic	Exposure	2004	313.4627	214.5075	114119.4	33717.413	43.3333	3.5086	38.5	6.6	15.5	8.37	6.48	8.44	68.6	6.48	42	-29.4	82	2.4976	2.3335	5.0574	4.5279	1.6467	0.654	1.5966
NL3-04	NL	Nordic	Exposure	2004	297.7248	168.2365	98868.356	27194.238	35.3701	5.8984	66.9	6.3	15.3	10.67	7.09	11.18	95.5	6.62	45	45.8	81	2.4753	2.2285	4.9951	4.4345	1.5607	0.8387	1.8319

Appendix Table E.34: Supporting Habitat Measures for Benthic Community Stations, 1999, 2004, 2009.

Station	lake	Lake	Exposure Status	Year	Barium (mg/kg)	Cobalt (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Nickel (mg/kg)	Ra-226 (Bq/g)	Uranium (mg/kg)	TOC (%)	Depth (m)	Secchi Depth (m)	Water Temperature (°C)	DO (mg/L)	DO (% sat)	pH	Cond (µS/cm)	RedOx (mV)	Fines (%; silt + clay)	log10 (1 + Barium (mg/kg))	log10 (1 + Cobalt (mg/kg))	log10 (1 + Iron (mg/kg))	log10 (1 + Manganese (mg/kg))	log10 (1 + Nickel (mg/kg))	log10 (1 + Ra-226 (Bq/g))	log10 (1 + Uranium (mg/kg))
PL1-04	PL	Pecors	Exposure	2004	108.4242	41.3963	43115	3410.9304	39.5018	0.2881	80.5	3.7	14.9	6.25	6.07	8.87	71.4	6.7	127	147.7	85	2.0391	1.6273	4.6346	3.533	1.6075	0.1099	1.9112
PL2-04	PL	Pecors	Exposure	2004	145.65	51.2981	49972.255	7028.042	45.2239	1.0954	68.2	4.6	14.9	7.8	5.77	9.09	72.7	6.68	125	129	88	2.1663	1.7185	4.6987	3.8469	1.6649	0.3213	1.8401
PL3-04	PL	Pecors	Exposure	2004	125.4195	47.6728	48903.316	8016.9796	38.1043	0.7256	72.2	4.3	14.9	8.85	9.46	9.38	82.1	6.63	114	213.8	87	2.1018	1.6873	4.6893	3.9041	1.5922	0.2369	1.8645
DUL1-09	DUL	Dunlop	Reference	2009	170	18	35000	5300	24	0.07	4.4	11	14.6	7	10.05	8.41	74.6	5.22	.	.	75	2.233	1.2788	4.5441	3.7244	1.3979	0.0294	0.7324
DUL2-09	DUL	Dunlop	Reference	2009	140	12	19000	1800	22	0.07	4.8	8.6	14.8	7.55	10.85	10.38	94	4.94	.	.	72	2.1492	1.1139	4.2788	3.2555	1.3617	0.0294	0.7634
DUL3-09	DUL	Dunlop	Reference	2009	150	16	35000	2300	23	0.14	3.5	6.2	14.5	7.55	9.92	10.1	89.5	4.9	.	.	70	2.179	1.2304	4.5441	3.3619	1.3802	0.0569	0.6532
DUL4-09	DUL	Dunlop	Reference	2009	52	6.8	11000	670	12	0.05	1.8	3.6	14.5	7.4	9.85	10.35	91.5	4.98	.	.	82.9	1.7243	0.8921	4.0414	2.8267	1.1139	0.0212	0.4472
DUL5-09	DUL	Dunlop	Reference	2009	170	19	42000	2600	26	0.11	4.6	9.2	14.6	7.2	9.57	9.24	80.9	5.21	.	.	73	2.233	1.301	4.6233	3.4151	1.4314	0.0453	0.7482
TML1-09	TML	Ten Mile	Reference	2009	110	7.2	10000	560	22	0.1	3.8	13	16.5	11	8.6	15.02	128.8	5.49	.	.	72	2.0453	0.9138	4	2.749	1.3617	0.0414	0.6812
TML2-09	TML	Ten Mile	Reference	2009	95	7.9	11000	660	21	0.06	4.3	10	17.8	10.6	8.69	15.51	132.5	5.99	.	.	77	1.9823	0.9494	4.0414	2.8202	1.3424	0.0253	0.7243
TML3-09	TML	Ten Mile	Reference	2009	51	5	8200	340	12	0.07	2.4	9	17.1	10	10.13	14.75	131.1	5.51	.	.	74	1.716	0.7782	3.9139	2.5328	1.1139	0.0294	0.5315
TML4-09	TML	Ten Mile	Reference	2009	61	6	9300	630	13	0.05	2.7	3.6	17.1	10.65	8.61	15.41	132.8	5.82	.	.	68	1.7924	0.8451	3.9685	2.8	1.1461	0.0212	0.5682
TML5-09	TML	Ten Mile	Reference	2009	91	8.2	10000	400	20	0.04	3.4	5.4	17.7	11.6	8.7	15.64	134.2	6.2	.	.	72	1.9638	0.9638	4	2.6031	1.3222	0.017	0.6435
RL1-09	RL	Rochester	Reference	2009	110	13	27000	590	18	0.1	3.1	9.8	14.7	4.72	6.6	5.65	46.6	5.24	15.2	.	78	2.0453	1.1461	4.4314	2.7716	1.2788	0.0414	0.6128
RL2-09	RL	Rochester	Reference	2009	130	18	50000	790	23	0.17	4.1	12	14.5	4.71	5.9	4.03	32.4	4.38	15.3	.	56	2.1173	1.2788	4.699	2.8982	1.3802	0.0682	0.7076
RL3-09	RL	Rochester	Reference	2009	160	21	28000	710	23	0.14	6.9	16	14.2	4.15	5.2	2.96	23.8	5.27	17	.	64	2.2068	1.3424	4.4472	2.8519	1.3802	0.0569	0.8976
RL4-09	RL	Rochester	Reference	2009	160	24	25000	850	27	0.24	7	18	14.4	4.15	5.1	2.2	17.6	5.21	17.7	.	58	2.2068	1.3979	4.398	2.9299	1.4472	0.0934	0.9031
RL5-09	RL	Rochester	Reference	2009	130	19	24000	610	23	0.12	4.1	15	14.6	4.43	6.4	3.9	32.5	5.29	15.5	.	68	2.1173	1.301	4.3802	2.786	1.3802	0.0492	0.7076
SUL1-09	SUL	Summers	Reference	2009	120	26	34000	2600	21	0.17	2.9	8.7	14.9	6.95	6.9	8.94	73.6	4.69	12	.	62	2.0828	1.4314	4.5315	3.4151	1.3424	0.0682	0.5911
SUL2-09	SUL	Summers	Reference	2009	99	15	21000	2200	17	0.11	2.5	9.3	15	7.46	6.7	8.85	72.3	4.73	12.1	.	64	2	1.2041	4.3222	3.3426	1.2553	0.0453	0.5441
SUL3-09	SUL	Summers	Reference	2009	100	30	46000	1100	20	0.28	2.9	11	14.7	7.16	8.2	7.71	65.9	5.38	12.4	.	65	2.0043	1.4914	4.6628	3.0418	1.3222	0.1072	0.5911
SUL4-09	SUL	Summers	Reference	2009	86	10	17000	290	18	0.14	2.8	11	14.9	6.88	9	4.85	42.4	4.78	13.7	.	56	1.9395	1.0414	4.2305	2.4639	1.2788	0.0569	0.5798
SUL5-09	SUL	Summers	Reference	2009	88	17	24000	730	17	0.09	2.4	9.6	14.6	6.8	7.9	6.84	58	4.1	12.6	.	76	1.9494	1.2553	4.3802	2.8639	1.2553	0.0374	0.5315
SL1-09	SL	Semiwhite	Reference	2009	390	14	34000	5200	25	0.16	4.8	6.6	14.5	6.8	8.33	9.2	78.4	5.06	.	.	75	2.5922	1.1761	4.5315	3.7161	1.415	0.0645	0.7634
SL2-09	SL	Semiwhite	Reference	2009	360	11	23000	2400	21	0.09	4.3	7.6	14.5	7.15	8.4	9.39	80.1	4.51	.	.	76	2.5575	1.0792	4.3617	3.3804	1.3424	0.0374	0.7243
SL3-09	SL	Semiwhite	Reference	2009	560	14	46000	7800	26	0.27	4	7	14.2	8.5	8.85	9.07	78.3	5.2	.	.	67	2.749	1.1761	4.6628	3.8922	1.4314	0.1038	0.699
SL4-09	SL	Semiwhite	Reference	2009	310	9.9	20000	1900	22	0.07	3.6	7	14.7	7.22	8.96	9.88	85.7	4.95	.	.	75	2.4928	1.0374	4.3011	3.279	1.3617	0.0294	0.6628
SL5-09	SL	Semiwhite	Reference	2009	540	14	49000	8400	24	0.18	4.1	6.7	14.5	7.54	8.42	9.46	82.2	5.12	.	.	72	2.7332	1.1761	4.6902	3.9243	1.3979	0.0719	0.7076
QL1-09	QL	Quirke	Exposure	2009	1400	40	64000	4800	30	7	470	9.6	20.5	11.5	7.42	14.72	122.6	5.75	.	.	55	3.1464	1.6128	4.8062	3.6813	1.4914	0.9031	2.673
QL2-09	QL	Quirke	Exposure	2009	530	26	49000	3100	24	2.2	300	7.2	17.7	7.75	7.02	12.33	101.7	5.19	.	.	73	2.7251	1.4314	4.6902	3.4915	1.3979	0.5051	2.4786
QL3-09	QL	Quirke	Exposure	2009	240	22	42000	2800	16	1.1	180	2.2	20.1	8.5	9.63	13.15	115.9	6.13	.	.	57.2	2.382	1.3617	4.6233	3.4473	1.2304	0.3222	2.2577
QL4-09	QL	Quirke	Exposure	2009	610	20	66000	2000	19	3.5	280	7.5	20.5	11.5	6.79	15.2	124.4	5.66	.	.	59	2.786	1.3222	4.8196	3.3012	1.301	0.6532	2.4487
QL5-09	QL	Quirke	Exposure	2009	750	84	68000	8000	38	4.4	530	5.8	22.7	9.85	10.51	13.52	123.1	5.62	.	.	53	2.8756	1.9294	4.8325	3.9031	1.5911	0.7324	2.7251
EL1-09	EL	Elliot	Exposure	2009	300	80	50000	18000	49	1.7	120	3.7	14.7	5.25	8.96	8.51	73.5	5.48	87	.	61	2.4786	1.9085	4.699	4.2553	1.699	0.4314	2.0828
EL2-09	EL	Elliot	Exposure	2009	200	59	63000	7800	55	1.7	200	6.6	14.6	5.68	9.76	8.52	75	5.15	.	.	71	2.3032	1.7782	4.7993	3.8922	1.7482	0.4314	2.3032
EL3-09	EL	Elliot	Exposure	2009	130	59	40000	3000	47	0.96	150	5	15	5.88	8.86	7.8	67.3	5	74	.	72	2.1173	1.7782	4.6021	3.4773	1.6812	0.2923	2.179
EL4-09	EL	Elliot	Exposure	2009	260	83	47000	16000	58	1.7	160	5.6	15.3	5.9	8.71	9.04	78.1	5.53	66	.	59	2.4166	1.9243	4.6721	4.2041	1.7709	0.4314	2.2068
EL5-09	EL	Elliot	Exposure	2009	200	89	60000	9000	59	1.9	220	6.6	14.8	5.65	10.48	9.1	81.5	6.27	59	.	76	2.3032	1.9542	4.7782	3.9543	1.7782	0.4624	2.3444
HOL1-09	HOL	Hough	Exposure	2009	86	29	55000	3300	41	1.7	89	5.4	14.3	7.63	8.2	7.44	63.6	6.83	110.4	.	63	1.9395	1.4771	4.7404	3.5186	1.6232	0.4314	1.9542
HOL2-09	HOL	Hough	Exposure	2009	72	25	46000	2500	39	1.6	91	6.7	14.5	8.91	8.3	6.84	57.7	.	110.7	.	69	1.8633	1.415	4.6628	3.3981	1.6021	0.415	1.9638
HOL3-09	HOL	Hough	Exposure	2009	84	28	57000	3200	39	2.5	90	6.2	15.5	7.55	7.8	7.36	62.7	6.28	109.2	.	65	1.9294	1.4624	4.7559	3.5053	1.6021	0.5441	1.959
HOL4-09	HOL	Hough	Exposure	2009	90	30	60000	3400	45	2	89	6.2	15.3	7.84	8.2	7.17	62.5	6.33	110.1	.	73	1.959	1.4914	4.7782	3.5316	1.6628	0.4771	1.9542
HOL5-09	HOL	Hough	Exposure	2009	70	22	39000	2000	37	1.7	78	5.5	14.2	7.95	8.5	7.61	65.3	6.28	111	.	74	1.8513	1.3617	4.5911	3.3012	1.5798	0.4314	1.8976
MAL1-09	MAL	May	Exposure	2009	100	25	100000	2400	21	3.3	75	8	14.5	7.85	8.7	7.98	70.7	6.32	125.8	.	62	2.0043	1.415	5	3.3804	1.3424	0.6335	1.8808
MAL2-09	MAL	May	Exposure	2009	260	49	75000	9100	59	1.2	110	9.4	14.3	6.61	7.6	8.67	72.5	.	136.8	.	55	2.4166	1.699	4.8751	3.9591	1.7782	0.3424	2.0453
MAL3-09	MAL	May	Exposure	2009	120	31	67000	5600	39	2.5	97	7.1	14.6	7.5	7.5	8.86	74.5	6.53	137.8	.	47.3	2.0828	1.5051	4.8261	3.7483	1.6021	0.5441	1.9912
MAL4-09	MAL	May	Exposure	2009	140	33	67000	6600	43	2.9	94	6.6	14.3	7.53	7.7	8.63	75.3	6.42	136.5	.	49	2.1492	1.5315	4.8261	3.8196	1.6435	0.5911	1.9777
MAL5-09	MAL	May	Exposure	2009	96	21	59000	3000	32	2.1	86	6.4	14.3	8.26	7.6	8.74	73	6.43	138.2	.	59.7	1.9868	1.3424	4.7709	3.4773	1.5185	0.4914	1.9395
ML1-09	ML	McCabe	Exposure	2009	470	290	100000	18000	160	15	590	8.6	14.6	6.4	10.15	9.17	81.6	6.29	.	.	54	2.673	2.4639	5	4.2553	2.2068	1.2041	2.7716
ML2-09	ML	McCabe	Exposure	2009	1400	220	75000	35000	110	13	280	8	14.7	6.65	10.76	8.51	75.8	6.45	.	.	54.7	3.1464	2.3444	4.8751	4.5441	2.0453	1.1461	2.4487
ML3-09	ML	McCabe	Exposure	2009	4200	76	51000	2000	68	12	230	9.7	14.06	6.63	12.15	6.44	60.1	6.58	.	.	59	3.6234	1.8865	4.7076	3.3012	1.8388	1.1139	2.3636
ML4-09	ML	McCabe	Exposure	2009	4000	150	74000	15000	85	15	270	8.3	15.1	6.66	11.1	8.93	81.3	6.62	.	.	53	3.6022	2.179	4.8692	4.1761	1.9345	1.2041	2.433
ML5-09	ML	McCabe	Exposure	2009	380	140	77000	14000	81	14	260	7	14.6	6.66	9.68	8.1	72.2	6.54	.	.	51.1	2.5809	2.1492	4.8865	4.1462	1.9138	1.1761	2.4166
MCL1-09	MCL	McCarthy	Exposure	2009	180	120	56000	16000	53	2.3	180	5.5	14.9	5.67	7	6.96	58.2	6.13	67.5	.	62	2.2577	2.0828	4.7482	4.2041	1.7324	0.5185	2.2577
MCL2-09	MCL	McCarthy	Exposure	2009	180	120	52000	14000	41	1.2	130	5.5	14.8	5.46	7.1	2.81	23.4	5.61	70.1	.	65	2.2577	2.0828	4.716	4.1462	1.6232	0.3424	2.1173
MCL3-09	MCL	McCarthy	Exposure	2009	130	71	43000	8000	44	0.86	120	3.8	14.5	5.39	8.1	6.11	52.4	6.96	80.4	.	76	2.1173	1.8573	4.6335	3.9031	1.6532	0.2695	2.0828
MCL4-09	MCL	McCarthy	Exposure	2009	190	120	65000	15000	45	2.2	150	5.3	14.4	5.88	8.2	5.14	44.9	5.91	70	.	70	2.281	2.0828	4.8129	4.1761	1.6628	0.5051	2.179
MCL5-09	MCL	McCarthy	Exposure	2009	120	74	33000	8800	33	1.2	110	3.7	14.6	5.86	8.3	6.21	53.1	5.82	80.1	.	74	2.0828	1.8751	4.5185	3.9445	1.5315	0.3424	2.0453
NL1-09	NL	Nordic	Exposure	2009	130	25	33000	300	37	2.3	110	7.6	12.5	7.45	8.6	4.74	41.1	6.63	435.6	.	82	2.1173	1.415	4.5185	2.4786	1.5798	0.5185	2.0453
NL2-09	NL	Nordic	Exposure	2009	330	130	75000	24000	50	5.3	150	5.7	14.8	6.88	7.3	6.51	54.4	6.37	424.1	.	58	2.5198	2.1173	4.8751	4.3802	1.7076	0.7993	2.179
NL3-09	NL	Nordic	Exposure	2009	320	110	59000	26000	38	4.1	130	6.2	14.2	7.58	7.9	7.3	61.9	6.58	427.4	.	55	2.5065	2.0453	4.7709	4.415	1.5911	0.7076	2.1173
NL4-09	NL	Nordic	Exposure	2009	390	130	68000	21000	52	6.8	220	6.8	14.3	7.3	8	6.7	57.3	6.61	428.8	.	57	2.5922	2.1173	4.8325	4.3222	1.7243	0.8921	2.3444
NL5-09	NL	Nordic	Exposure	2009	300	150	110000	26000	43	5.4	160	6.6	14.8	8.42	6.6	6.27	51.6	6.43	424.4	.	60	2.4786	2.179	5.0414	4.415	1.6435	0.8062	2.2068
PL1-09	PL	Pecors	Exposure	2009	96	43	41000	4300	32	0.58	120	4	13.7	6.75	10.8	8.07	72.9	.	89.6	.	75	1.9868	1.6435	4.6128	3.6336	1.5185	0.1987	2.0828
PL2-09	PL	Pecors	Exposure	2009	120	42	43000	4000	42	0.82	110	4.6	14.8	7.88	7.1	7.46	61.4	7	88.7	.	78	2.0828	1.6335	4.6335	3.6022	1.6335	0.2601	2.0453
PL3-09	PL	Pecors	Exposure	2009	89	33	28000	1600	37	0.66	100	3.5	13.5	8.36	7.5	7.51	63.3	6.85	88.2	.	72	1.9542	1.5315	4.4472	3.2044	1.5798	0.2201	2.0043
PL4-09	PL	Pecors	Exposure	2009	110	39	37000	1500	40	0.92	110	5	14.4	8.5	7.4	8.1	67.2	.	88.4	.	69	2.0453	1.6021	4.5682	3.1764	1.6128	0.2833	2.0453
PL5-09	PL	Pecors	Exposure	2009	75	43	18000	3900	26	0.38	130	2.7	14.5	6.775	9.5	8.16	71.6	.	87.7	.	49.1	1.8808	1.6435	4.2553	3.5912	1.4314	0.1399	2.1173

Appendix Table E.35: Univariate Statistics for Supporting Habitat Metrics at SRWMP Lakes, 2009.

						95% Confidence Interval for Mean			
		n	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Barium (mg/kg)	Dunlop	5	136.400	48.937	21.885	75.637	197.163	52.000	170.000
	Rochester	5	138.000	21.679	9.695	111.081	164.919	110.000	160.000
	Semiwhite	5	432.000	111.669	49.940	293.344	570.656	310.000	560.000
	Summers	5	98.600	13.520	6.046	81.812	115.388	86.000	120.000
	Ten Mile	5	81.600	24.674	11.034	50.963	112.237	51.000	110.000
	Quirke	5	706.000	430.384	192.473	171.608	1240.392	240.000	1400.000
	McCabe	5	2090.000	1879.149	840.381	-243.271	4423.271	380.000	4200.000
	May	5	143.200	67.611	30.236	59.250	227.150	96.000	260.000
	Hough	5	80.400	8.877	3.970	69.378	91.422	70.000	90.000
	Pecors	5	98.000	17.621	7.880	76.121	119.879	75.000	120.000
	Elliot	5	218.000	64.962	29.052	137.340	298.660	130.000	300.000
	Nordic	5	294.000	97.622	43.658	172.787	415.213	130.000	390.000
	McCarthy	5	160.000	32.404	14.491	119.765	200.235	120.000	190.000
Cobalt (mg/kg)	Dunlop	5	14.360	5.005	2.238	8.146	20.574	6.800	19.000
	Rochester	5	19.000	4.062	1.817	13.956	24.044	13.000	24.000
	Semiwhite	5	12.580	1.983	0.887	10.118	15.042	9.900	14.000
	Summers	5	19.600	8.204	3.669	9.414	29.786	10.000	30.000
	Ten Mile	5	6.860	1.341	0.600	5.195	8.525	5.000	8.200
	Quirke	5	38.400	26.661	11.923	5.296	71.504	20.000	84.000
	McCabe	5	175.200	82.007	36.675	73.374	277.026	76.000	290.000
	May	5	31.800	10.733	4.800	18.473	45.127	21.000	49.000
	Hough	5	26.800	3.271	1.463	22.738	30.862	22.000	30.000
	Pecors	5	40.000	4.243	1.897	34.732	45.268	33.000	43.000
	Elliot	5	74.000	14.071	6.293	56.528	91.472	59.000	89.000
	Nordic	5	109.000	49.041	21.932	48.108	169.892	25.000	150.000
	McCarthy	5	101.000	26.038	11.645	68.669	133.331	71.000	120.000
Iron (mg/kg)	Dunlop	5	28400.000	12876.335	5758.472	12411.919	44388.081	11000.000	42000.000
	Rochester	5	30800.000	10848.963	4851.804	17329.233	44270.767	24000.000	50000.000
	Semiwhite	5	34400.000	13088.163	5853.204	18148.900	50651.100	20000.000	49000.000
	Summers	5	28400.000	11674.759	5221.111	13903.872	42896.128	17000.000	46000.000
	Ten Mile	5	9700.000	1034.408	462.601	8415.613	10984.387	8200.000	11000.000
	Quirke	5	57800.000	11584.472	5180.734	43415.978	72184.022	42000.000	68000.000
	McCabe	5	75400.000	17357.995	7762.731	53847.202	96952.798	51000.000	100000.000
	May	5	73600.000	15805.062	7068.239	53975.423	93224.577	59000.000	100000.000
	Hough	5	51400.000	8677.557	3880.722	40625.390	62174.610	39000.000	60000.000
	Pecors	5	33400.000	10358.571	4632.494	20538.135	46261.865	18000.000	43000.000
	Elliot	5	52000.000	9460.444	4230.839	40253.307	63746.693	40000.000	63000.000
	Nordic	5	69000.000	27901.613	12477.981	34355.572	103644.428	33000.000	110000.000
	McCarthy	5	49800.000	12275.993	5489.991	34557.342	65042.658	33000.000	65000.000
Manganese (mg/kg)	Dunlop	5	2534.000	1711.952	765.608	408.331	4659.669	670.000	5300.000
	Rochester	5	710.000	112.250	50.200	570.624	849.376	590.000	850.000
	Semiwhite	5	5140.000	2987.976	1336.263	1429.938	8850.062	1900.000	8400.000
	Summers	5	1384.000	981.035	438.732	165.884	2602.116	290.000	2600.000
	Ten Mile	5	518.000	141.492	63.277	342.314	693.686	340.000	660.000
	Quirke	5	4140.000	2387.048	1067.520	1176.088	7103.912	2000.000	8000.000
	McCabe	5	16800.000	11861.703	5304.715	2071.750	31528.250	2000.000	35000.000
	May	5	5340.000	2734.593	1222.947	1944.554	8735.446	2400.000	9100.000
	Hough	5	2880.000	605.805	270.924	2127.793	3632.207	2000.000	3400.000
	Pecors	5	3060.000	1386.723	620.161	1338.156	4781.844	1500.000	4300.000
	Elliot	5	10760.000	6163.441	2756.374	3107.078	18412.922	3000.000	18000.000
	Nordic	5	19460.000	10904.494	4876.638	5920.282	32999.718	300.000	26000.000
	McCarthy	5	12360.000	3694.320	1652.150	7772.896	16947.104	8000.000	16000.000
Nickel (mg/kg)	Dunlop	5	21.400	5.459	2.441	14.622	28.178	12.000	26.000
	Rochester	5	22.800	3.194	1.428	18.834	26.766	18.000	27.000
	Semiwhite	5	23.600	2.074	0.927	21.025	26.175	21.000	26.000
	Summers	5	18.600	1.817	0.812	16.344	20.856	17.000	21.000
	Ten Mile	5	17.600	4.722	2.112	11.737	23.463	12.000	22.000
	Quirke	5	25.400	8.820	3.945	14.448	36.352	16.000	38.000
	McCabe	5	100.800	36.424	16.289	55.574	146.026	68.000	160.000
	May	5	38.800	14.043	6.280	21.364	56.236	21.000	59.000
	Hough	5	40.200	3.033	1.356	36.434	43.966	37.000	45.000
	Pecors	5	35.400	6.465	2.891	27.372	43.428	26.000	42.000
	Elliot	5	53.600	5.367	2.400	46.937	60.263	47.000	59.000
	Nordic	5	44.000	6.819	3.050	35.533	52.467	37.000	52.000
	McCarthy	5	43.200	7.225	3.231	34.229	52.171	33.000	53.000
Ra-226 (Bq/g)	Dunlop	5	0.088	0.036	0.016	0.043	0.133	0.050	0.140
	Rochester	5	0.154	0.055	0.024	0.086	0.222	0.100	0.240
	Semiwhite	5	0.154	0.080	0.036	0.055	0.253	0.070	0.270
	Summers	5	0.158	0.075	0.033	0.065	0.251	0.090	0.280
	Ten Mile	5	0.064	0.023	0.010	0.035	0.093	0.040	0.100
	Quirke	5	3.640	2.259	1.010	0.835	6.445	1.100	7.000
	McCabe	5	13.800	1.304	0.583	12.181	15.419	12.000	15.000
	May	5	2.400	0.806	0.361	1.399	3.401	1.200	3.300
	Hough	5	1.900	0.367	0.164	1.444	2.356	1.600	2.500
	Pecors	5	0.672	0.211	0.094	0.411	0.933	0.380	0.920
	Elliot	5	1.592	0.364	0.163	1.140	2.044	0.960	1.900
	Nordic	5	4.780	1.684	0.753	2.689	6.871	2.300	6.800
	McCarthy	5	1.552	0.653	0.292	0.741	2.363	0.860	2.300
Uranium (mg/kg)	Dunlop	5	3.820	1.234	0.552	2.288	5.352	1.800	4.800
	Rochester	5	5.040	1.791	0.801	2.816	7.264	3.100	7.000
	Semiwhite	5	4.160	0.439	0.196	3.615	4.705	3.600	4.800
	Summers	5	2.700	0.235	0.105	2.409	2.991	2.400	2.900
	Ten Mile	5	3.320	0.779	0.348	2.353	4.287	2.400	4.300
	Quirke	5	352.000	144.118	64.452	173.054	530.946	180.000	530.000
	McCabe	5	326.000	148.762	66.528	141.288	510.712	230.000	590.000
	May	5	92.400	13.012	5.819	76.244	108.556	75.000	110.000
	Hough	5	87.400	5.320	2.379	80.795	94.005	78.000	91.000
	Pecors	5	114.000	11.402	5.099	99.843	128.157	100.000	130.000
	Elliot	5	170.000	40.000	17.889	120.333	219.667	120.000	220.000
	Nordic	5	154.000	41.593	18.601	102.355	205.645	110.000	220.000
	McCarthy	5	138.000	27.749	12.410	103.545	172.455	110.000	180.000

Appendix Table E.35: Univariate Statistics for Supporting Habitat Metrics at SRWMP Lakes, 2009.

						95% Confidence Interval for Mean			
		n	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Sediment TOC (%)	Dunlop	5	7.720	2.873	1.285	4.153	11.287	3.600	11.000
	Rochester	5	14.160	3.260	1.458	10.112	18.208	9.800	18.000
	Semiwhite	5	6.980	0.390	0.174	6.496	7.464	6.600	7.600
	Summers	5	9.920	1.038	0.464	8.631	11.209	8.700	11.000
	Ten Mile	5	8.200	3.739	1.672	3.557	12.843	3.600	13.000
	Quirke	5	6.460	2.742	1.226	3.055	9.865	2.200	9.600
	McCabe	5	8.320	0.978	0.437	7.105	9.535	7.000	9.700
	May	5	7.500	1.229	0.550	5.974	9.026	6.400	9.400
	Hough	5	6.000	0.543	0.243	5.326	6.674	5.400	6.700
	Pecors	5	3.960	0.907	0.406	2.834	5.086	2.700	5.000
	Elliot	5	5.500	1.217	0.544	3.989	7.011	3.700	6.600
	Nordic	5	6.580	0.709	0.317	5.700	7.460	5.700	7.600
	McCarthy	5	4.760	0.926	0.414	3.610	5.910	3.700	5.500
Depth (m)	Dunlop	5	14.600	0.122	0.055	14.448	14.752	14.500	14.800
	Rochester	5	14.480	0.192	0.086	14.241	14.719	14.200	14.700
	Semiwhite	5	14.480	0.179	0.080	14.258	14.702	14.200	14.700
	Summers	5	14.820	0.164	0.073	14.616	15.024	14.600	15.000
	Ten Mile	5	17.240	0.527	0.236	16.585	17.895	16.500	17.800
	Quirke	5	20.300	1.778	0.795	18.093	22.507	17.700	22.700
	McCabe	5	14.612	0.371	0.166	14.151	15.073	14.060	15.100
	May	5	14.400	0.141	0.063	14.224	14.576	14.300	14.600
	Hough	5	14.760	0.598	0.268	14.017	15.503	14.200	15.500
	Pecors	5	14.180	0.554	0.248	13.492	14.868	13.500	14.800
	Elliot	5	14.880	0.277	0.124	14.535	15.225	14.600	15.300
	Nordic	5	14.120	0.947	0.424	12.944	15.296	12.500	14.800
	McCarthy	5	14.640	0.207	0.093	14.383	14.897	14.400	14.900
Secchi Depth (m)	Dunlop	5	7.340	0.238	0.107	7.044	7.636	7.000	7.550
	Rochester	5	4.432	0.283	0.126	4.081	4.783	4.150	4.720
	Semiwhite	5	7.442	0.647	0.289	6.638	8.246	6.800	8.500
	Summers	5	7.050	0.265	0.119	6.721	7.379	6.800	7.460
	Ten Mile	5	10.770	0.587	0.262	10.041	11.499	10.000	11.600
	Quirke	5	9.820	1.708	0.764	7.699	11.941	7.750	11.500
	McCabe	5	6.600	0.112	0.050	6.460	6.740	6.400	6.660
	May	5	7.550	0.608	0.272	6.795	8.305	6.610	8.260
	Hough	5	7.976	0.546	0.244	7.298	8.654	7.550	8.910
	Pecors	5	7.653	0.845	0.378	6.604	8.702	6.750	8.500
	Elliot	5	5.672	0.262	0.117	5.347	5.997	5.250	5.900
	Nordic	5	7.526	0.565	0.253	6.825	8.227	6.880	8.420
	McCarthy	5	5.652	0.224	0.100	5.374	5.930	5.390	5.880
DO (% sat)	Dunlop	5	86.100	8.100	3.622	76.043	96.157	74.600	94.000
	Rochester	5	30.580	10.933	4.889	17.005	44.155	17.600	46.600
	Semiwhite	5	80.940	3.097	1.385	77.094	84.786	78.300	85.700
	Summers	5	62.440	12.797	5.723	46.550	78.330	42.400	73.600
	Ten Mile	5	131.880	2.044	0.914	129.342	134.418	128.800	134.200
	Quirke	5	117.540	9.449	4.226	105.807	129.273	101.700	124.400
	McCabe	5	74.200	8.811	3.940	63.260	85.140	60.100	81.600
	May	5	73.200	1.794	0.802	70.972	75.428	70.700	75.300
	Hough	5	62.360	2.830	1.266	58.846	65.874	57.700	65.300
	Pecors	5	67.280	5.017	2.244	61.051	73.509	61.400	72.900
	Elliot	5	75.080	5.324	2.381	68.470	81.690	67.300	81.500
	Nordic	5	53.260	7.792	3.485	43.584	62.936	41.100	61.900
	McCarthy	5	46.400	13.706	6.129	29.382	63.418	23.400	58.200
pH	Dunlop	5	5.050	0.153	0.069	4.860	5.240	4.900	5.220
	Rochester	5	5.078	0.391	0.175	4.592	5.564	4.380	5.290
	Semiwhite	5	4.968	0.272	0.122	4.631	5.305	4.510	5.200
	Summers	5	4.736	0.454	0.203	4.173	5.299	4.100	5.380
	Ten Mile	5	5.802	0.307	0.137	5.421	6.183	5.490	6.200
	Quirke	5	5.670	0.336	0.150	5.253	6.087	5.190	6.130
	McCabe	5	6.496	0.131	0.059	6.333	6.659	6.290	6.620
	May	4	6.425	0.086	0.043	6.288	6.562	6.320	6.530
	Hough	4	6.430	0.268	0.134	6.004	6.856	6.280	6.830
	Pecors	2	6.925	0.106	0.075	5.972	7.878	6.850	7.000
	Elliot	5	5.486	0.491	0.220	4.876	6.096	5.000	6.270
	Nordic	5	6.524	0.117	0.052	6.379	6.669	6.370	6.630
	McCarthy	5	6.086	0.523	0.234	5.437	6.735	5.610	6.960
Fines (%; silt + clay)	Dunlop	5	74.580	4.988	2.231	68.386	80.774	70.000	82.900
	Rochester	5	64.800	8.786	3.929	53.890	75.710	56.000	78.000
	Semiwhite	5	73.000	3.674	1.643	68.438	77.562	67.000	76.000
	Summers	5	64.600	7.266	3.250	55.578	73.622	56.000	76.000
	Ten Mile	5	72.600	3.286	1.470	68.519	76.681	68.000	77.000
	Quirke	5	59.440	7.910	3.537	49.618	69.262	53.000	73.000
	McCabe	5	54.360	2.926	1.309	50.727	57.993	51.100	59.000
	May	5	54.600	6.434	2.877	46.611	62.589	47.300	62.000
	Hough	5	68.800	4.817	2.154	62.819	74.781	63.000	74.000
	Pecors	5	68.620	11.416	5.105	54.445	82.795	49.100	78.000
	Elliot	5	67.800	7.396	3.308	58.617	76.983	59.000	76.000
	Nordic	5	62.400	11.104	4.966	48.612	76.188	55.000	82.000
	McCarthy	5	69.400	5.899	2.638	62.075	76.725	62.000	76.000

Appendix Table E.36: Working file of benthic community abundance for all years, after re-attribution and taxon collapse, (organisms/m^2).

	DUL1-99	DUL2-99	DUL3-99	TML1-99	TML2-99	TML3-99	RL1-99	RL2-99	RL3-99	QL1-99	QL2-99	QL3-99	QL4-99	QL5-99	EL1-99	EL2-99	EL3-99	HOL1-99	HOL2-99	HOL3-99	ML1-99	ML2-99	ML3-99	MCL1-99	MCL2-99	MCL3-99	NL1-99	NL2-99	NL3-99	PL1-99	PL2-99	PL3-99	DUL1-04	DUL2-04	DUL3-04	TML1-04	TML2-04	TML3-04
Hydra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. Nemata	290	29	362	43	29	87	-	-	-	-	-	-	58	-	29	493	-	145	29	14	-	-	-	29	-	-	232	-	-	-	-	-	17	35	409	139	270	339
Cl. Turbellaria indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	17	-	-
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylaria lacustris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ilyodrilus templetoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	812	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	130	14	43	58	58	-	-	-	-	-	-	-	-	-	-	14	14	58	29	-	-	-	29	-	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	58	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	35	17	-	-	-	-
immatures without hair chaetae	-	-	-	-	-	-	-	1797	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Acarina	29	87	116	43	14	-	14	14	43	-	-	-	-	-	-	58	-	-	-	-	58	-	623	29	14	87	-	29	58	-	-	232	9	-	-	-	70	-
O. Harpacticoida	-	116	-	565	130	812	536	174	116	14	-	-	-	-	-	0	-	-	-	-	-	-	-	1884	29	-	-	-	174	-	-	116	96	174	330	1043	374	557
Cl. Ostracoda	1507	2783	406	348	159	188	449	130	58	14	29	-	-	-	14	232	696	754	377	420	8116	2565	-	-	870	1565	6348	812	2464	319	43	406	174	2487	2887	1322	617	661
Crangonyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diaporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monoporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Collembola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurylophella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenonema femoratum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pyralidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Coenagrionidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche (indeterminate)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mystacides	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oecetis	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ceraclea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chimarra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fabria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mallochohelea	-	-	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	-	-	-	-	-	-
Probezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaeromias	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	0	-	-	-	-	-	-	-	-	-	-
Chaoborus flavicans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus punctipennis	-	-	-	-	-	-	43	1348	14	-	-	-	-	-	14	-	72	-	-	-	-	-	-	493	72	14	-	-	-	-	-	-	35	-	-	-	-	-
Chironomus	29	522	-	58	72	-	-	739	58	754	290	14	-	-	-	-	-	-	14	-	43	333	116	-	29	-	-	-	-	58	43	-	104	70	43	-	70	-
Cladotanytarsus	-	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	43	-	14	14	-	-	-	-	-	-	-	-	-	-	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	3130	4232	1623	145	159	-	-	-	-	1899	1464	3913	623	493	101	87	145	145	58	246	-	-	-	1101	420	580	638	1014	72	-	928	-	104	826	8557	252	3061
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum (includes P. halterale, P. flavum, P. scalaenum, and genus ID)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	232	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	348	174	43	87	101	-	1246	-	159	-	-	-	-	-	58	377	826	159	-	72	681	43	-	14	551	29	1536	377	1188	-	-	-	17	730	-	70	304	-
Stempellina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	-	-	-	145	-	29	-	-	-	-	-	-	-	-	87	174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	348	600	139	157	417
Tanytarsus	1652	-	304	-	-	58	-	14	-	-	-	-	-	-	246	2783	275	-	29	-	333	406	-	-	-	87	-	-	58	-	-	174	-	70	1043	-	1043
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potthastia	-	-	14	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protanypus	-	29	29	-	14	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	14	87	-	-	29	58	-	-	-	-	61	139	9	35
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	-	116	232	28	29	58	-	246	-	14	14	29	174	-	29	87	72	72	43	58	87	-	-	-	29	188	29	232	-	29	43	841	-	-	104	766	495	347
Ablabesmyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-
Procladius	696	1478	159	174	130	72	101	58	58	-	-	-	-	-	246	319	101	-	-	-	29	87	116	-	-	-	-	-	-	-	-	-	200	174	435	696	200	104
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Simuliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclocalyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pisidium	174	1710	478	14	14	-	-	-	-	-	-	-	-	-	710	725	261	-	-	-	-	-	-	-	203	580	-	-	-	-	-	157	209	1000	70	35	52
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Table E.36: Working file of benthic community abundance for all years, after re-attribution and taxon collapse, (organisms/m^2).

	RL1-04	RL2-04	RL3-04	SUL1-04	SUL2-04	SUL3-04	SL1-04	SL2-04	SL3-04	QL1-04	QL2-04	QL3-04	QL4-04	QL5-04	EL1-04	EL2-04	EL3-04	HOL1-04	HOL2-04	HOL3-04	MAL1-04	MAL2-04	MAL3-04	ML1-04	ML2-04	ML3-04	MCL1-04	MCL2-04	MCL3-04	NL1-04	NL2-04	NL3-04	PL1-04	PL2-04	PL3-04	DUL1-09	DUL2-09	DUL3-09
Hydra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. Nemata	0	17	0	139	304	43	96	870	157	35	-	-	26	-	17	-	17	17	-	-	-	-	-	35	-	-	-	-	-	17	9	70	-	9	52	174	522	2748
Cl. Turbellaria indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	-
Stylaria lacustris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ilyodrilus templetoni	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	17	104	-	-	-	139	139	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	226	-	-	-	-	-	-
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	139	-	-	-	-	-	-	-	-	-	70	35	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	104	-	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	-
O. Acarina	-	17	17	104	17	52	278	-	52	-	-	9	-	35	-	-	52	17	9	35	9	113	52	-	35	183	104	9	52	-	9	17	52	17	87	0	35	104
O. Harpacticoida	1374	1913	504	157	-	452	174	70	-	-	-	-	-	139	26	17	-	-	-	-	17	9	-	-	-	-	9	35	9	-	9	122	35	-	35	70	104	35
Cl. Ostracoda	130	35	-	783	452	122	400	104	678	348	235	913	96	313	243	522	43	1861	1391	1339	652	461	1443	939	0	270	1113	774	2730	3391	3452	4209	1183	478	261	4626	8939	5461
Crangonyx	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35
Diaporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	157	235	313	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monoporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Collembola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caenis	-	-	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexagenia	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurylophella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenonema femoratum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pyralidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Coenagrionidae immature	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-
Hydropsyche (indeterminate)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	34	-	-	-	-	9	44	-	-	-	-	-	-	-	-
Mystacides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oecetis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ceraclea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chimarra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-
Agrypnia	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fabria	-	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	-	-	-	-	-	-	-	-	-	35	9	9	-	-	-	-	-	-	26	-	-	-	17	-	-	-	-	-	-	17	9	-	-	-	-	-	-	-
Mallochohelea	-	-	-	-	-	-	-	-	-	-	9	43	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	35
Probezzia	-	-	-	-	-	-	-	-	-	-	-	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaeromias	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus flavicans	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-
Chaoborus punctipennis	9	-	-	87	-	26	-	-	-	-	-	-	-	-	296	217	287	-	-	-	-	-	-	-	-	-	183	26	35	-	9	-	-	-	-	-	-	-
Chironomus	61	139	17	87	26	17	-	35	87	139	9	-	52	104	-	-	9	87	-	70	304	-	-	-	-	-	-	78	43	278	43	70	17	930	17	-	-	-
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	9	-	-	-	35	-	-	-	-	-	-	-	-	-	-	17	-	-	-
Micropsectra	-	-	-	1096	452	1087	1200	591	3670	974	470	2304	600	2609	835	226	374	800	1443	887	52	339	991	104	35	313	1183	339	2191	70	374	1113	1687	26	470	835	591	383
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-	-	9	9	-	9	-	-	17	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35
Paracladopelma	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	9	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum (includes P. halterale, P. flavum, P. scalaenum, and genus ID)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sergentia	374	574	96	2191	2104	2087	713	243	226	35	-	-	-	-	-	96	43	174	191	113	530	43	-	70	-	800	122	217	383	904	17	139	330	-	-	522	278	696
Stempellina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	70
Stempellinella	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	209	70
Stictochironomus	-	-	-	626	1026	26	470	383	835	-	-	-	-	-	113	1330	61	17	-	-	-	9	17	-	-	-	35	-	35	-	9	-	-	-	-	209	35	313
Tanytarsus	87	-	-	-	-	-	-	104	17	-	-	-	-	-	52	235	670	-	87	-	9	78	-	104	-	278	-	9	-	191	-	-	-	-	-	348	313	383
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protanypus	9	-	-	35	-	9	17	-	-	-	17	78	52	-	9	17	9	52	9	17	17	-	-	-	-	70	9	43	26	-	9	-	17	-	17	-	35	35
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	-	-	-	365	730	165	539	-	2713	870	348	1261	1217	1774	61	557	435	278	200	113	43	17	157	35	-	-	-	17	148	-	87	70	70	148	765	-	765	1008
Ablabesmyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	70
Procladius	9	35	9	52	70	296	365	174	417	-	-	-	-	35	43	43	70	17	17	-	-	-	-	104	313	139	-	-	-	-	-	-	17	-	17	209	1043	626
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Simuliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclocalyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3061	2435	1670
Pisidium	-	-	-	174	104	26	522	696	1148	-	-	-	-	-	452	609	539	-	-	-	-	-	-	1983	-	165	104	78	157	-	-	-	17	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Table E.36: Working file of benthic community abundance for all years, after re-attribution and taxon collapse, (organisms/m^2).

	DUL4-09	DUL5-09	TML1-09	TML2-09	TML3-09	TML4-09	TML5-09	RL1-09	RL2-09	RL3-09	RL4-09	RL5-09	SUL1-09	SUL2-09	SUL3-09	SUL4-09	SUL5-09	SL1-09	SL2-09	SL3-09	SL4-09	SL5-09	QL1-09	QL2-09	QL3-09	QL4-09	QL5-09	EL1-09	EL2-09	EL3-09	EL4-09	EL5-09	HOL1-09	HOL2-09	HOL3-09	HOL4-09	HOL5-09	MAL1-09
Hydra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
P. Nemata	3339	174	139	557	278	226	696	-	9	-	9	-	17	-	-	-	-	-	139	35	487	174	-	35	-	-	-	-	-	9	0	0	26	35	0	0	0	0
Cl. Turbellaria indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Stylaria lacustris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Ilyodrilus templetoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	148	-	-	-	9	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	9	0	0	0	0	0	0	0	0
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	9	-	17	-	87	-	-	0	0	9	0	0	0	0	0	0
Tubifex tubifex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
immatures with hair chaetae	174	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	52	0
immatures without hair chaetae	-	-	-	-	-	-	-	-	252	-	-	-	-	-	-	70	-	70	-	-	-	-	-	-	-	-	-	9	26	35	0	17	0	0	0	0	0	0
O. Acarina	35	104	70	70	17	35	139	-	-	17	-	-	78	17	35	52	52	35	-	-	70	174	9	-	-	-	-	9	-	9	70	0	26	0	26	9	0	130
O. Harpacticoida	1217	417	2157	3687	1113	557	1530	400	191	191	174	835	-	0	626	400	17	661	-	-	70	35	-	-	-	-	-	-	-	-	0	9	0	0	0	0	0	35
Cl. Ostracoda	4557	1148	1322	2643	748	1930	696	61	17	9	-	-	104	17	1148	-	-	70	139	696	626	730	304	35	17	-	52	104	304	183	643	583	661	1287	3522	539	1530	174
Crangonyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Diaporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	35	9	70	43	0	0	0	0	0	0	0
Monoporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Mysis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	17	-	-	0	0	0	0	0	0	0	0	0
O. Collembola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
F. Dytiscidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Hexagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	9	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Eurylophella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Stenonema femoratum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
F. Leptophlebiidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
F. Pyralidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	9	0	0	0	0
F. Coenagrionidae immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Hydropsyche (indeterminate)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Mystacides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Oecetis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Ceraclea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Triaenodes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Chimarra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	9	17	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Fabria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Bezzia	-	35	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	9	0	0	0	0	0
Mallochohelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	0	0	9	0	0	0	0	17	0
Probezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Sphaeromias	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Chaoborus flavicans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	35	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
Chaoborus punctipennis	-	-	-	-	-	-	-	-	-	-	17	-	-	35	-	139	17	-	-	-	-	-	-	-	-	-	9	61	43	0	17	0	0	0	0	0	0	0
Chironomus	-	-	-	-	-	383	70	87	287	52	9	313	78	-	35	139	52	17	70	70	-	-	496	348	278	174	52	-	-	-	-	-	-	-	35	17	-	609
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-
Dicrotendipes	-	-	-	-	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-
Micropsectra	1113	348	1043	139	243	504	1391	-	-	9	-	-	139	17	1704	626	991	3043	1600	1426	557	3687	9	35	87	17	35	270	374	243	852	313	435	1496	1670	296	1217	104
Microtendipes	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-	-	-	-
Paracladopelma	35	-	-	-	-	-	557	-	9	-	-	-	-	-	-	-	-	-	-	-	70	-	-	35	-	-	-	-	-	9	-	-	26	-	-	9	35	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum (includes P. halterale, P. flavum, P. scalaenum, and genus ID)	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	9	-	-	-
Sergentia	313	35	70	-	35	104	209	243	191	530	26	174	1217	1391	835	817	870	417	139	452	139	70	-	-	-	17	-	-	70	70	-	296	26	209	87	78	70	1922
Stempellina	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	243	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	174	1357	1183	-	626	557	209	-	-	-	-	-	487	157	417	-	139	296	417	139	626	243	-	-	-	-	-	261	965	939	470	1226	17	-	113	26	35	-
Tanytarsus	70	104	417	70	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	70	70	-	-	-	-	17	-	-	235	26	104	78	-	-	183	-	348	-
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protanypus	104	70	70	-	35	52	70	9	-	-	-	-	9	-	-	-	-	17	-	-	-	-	9	-	-	17	17	35	17	43	-	9	61	35	9	9	-	43
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	1113	800	487	1531	209	1547	5148	-	-	-	-	-	174	157	243	0	313	87	139	452	139	243	661	278	661	1217	817	348	913	1061	2209	965	287	591	948	426	591	183
Ablabesmyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	9	9	-	-	-	-	-
Procladius	348	522	139	139	139	574	-	17	0	26	17	0	43	174	139	70	330	365	209	313	487	452	-	-	-	-	-	-	70	9	104	17	17	-	26	-	-	17
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Simuliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclocalyx	1704	2852	-	-	-	122	-	-	-	-	-	-	70	70	70	-	-	296	209	104	487	348	-	-	-	-	-	174	1487	1165	1322	1157	-	-	-	-	-	-
Pisidium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Table E.36: Working file of benthic community abundance for all years, after re-attribution and taxon collapse, (organisms/m^2).

	MAL2-09	MAL3-09	MAL4-09	MAL5-09	ML1-09	ML2-09	ML3-09	ML4-09	ML5-09	MCL1-09	MCL2-09	MCL3-09	MCL4-09	MCL5-09	NL1-09	NL2-09	NL3-09	NL4-09	NL5-09	PL1-09	PL2-09	PL3-09	PL4-09	PL5-09
Hydra	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P. Nemata	0	0	35	-	35	70	70	417	9	-	-	-	-	-	9	-	35	35	-	-	-	17	-	-
Cl. Turbellaria indeterminate	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais variabilis	0	0	0	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylaria lacustris	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ilyodrilus templetoni	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	0	0	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	0	0	0	-	-	-	-	-	-	70	-	-	-	17	-	17	261	-	-	-	-	-	-	139
Tubifex tubifex	0	0	0	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	0	0	0	-	-	209	70	209	278	-	-	-	-	-	43	-	-	-	35	-	-	-	-	-
immatures without hair chaetae	0	0	43	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-
O. Acarina	209	17	26	-	-	-	35	-	52	35	-	104	9	122	9	35	113	35	87	35	35	52	87	139
O. Harpacticoida	0	0	0	-	-	-	-	-	-	-	-	-	-	261	9	43	78	52	-	-	-	-	-	139
Cl. Ostracoda	1374	2922	1061	783	2261	1670	3061	2157	1435	1270	417	1461	470	2278	278	496	287	417	835	1217	226	1826	957	1252
Crangonyx	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hyalella	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diaporeia	0	0	0	-	-	-	-	-	-	243	17	-	96	-	-	-	-	-	-	-	-	-	-	-
Monoporeia	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mysis	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Collembola	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae immature	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Optioservus larvae	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caenis	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	17	-	17	-	-	-	-	-	-
Hexagenia	0	17	0	-	-	17	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurylophella	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stenonema femoratum	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae immature	0	0	0	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pyralidae	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sialis	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Coenagrionidae immature	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cheumatopsyche	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche (indeterminate)	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mystacides	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oecetis	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ceraclea	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Triaenodes	0	0	0	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chimarra	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agrypnia	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-
Fabria	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	0	0	0	-	-	-	-	-	-	-	-	-	9	-	17	9	9	17	17	-	-	-	-	-
Mallochohelea	0	0	0	-	-	-	-	-	9	-	-	-	-	-	-	-	9	-	-	-	-	17	-	-
Probezzia	0	0	0	-	-	-	-	-	-	-	-	-	-	-	87	26	-	-	35	-	-	-	-	-
Sphaeromias	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaoborus flavicans	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-
Chaoborus punctipennis	0	0	0	-	-	-	-	-	-	70	35	52	52	52	-	-	-	-	-	-	35	52	-	-
Chironomus	35	87	43	-	-	-	-	70	-	-	17	313	-	-	791	96	122	17	17	-	17	-	-	-
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	-	-	-	-	-	70	70	70	17	-	-	-	-	-	-	-	-	-	-	35	9	-	-	-
Micropsectra	1757	2574	270	261	661	-	35	-	17	1583	383	226	1226	1061	52	365	322	191	1061	1078	1652	3374	3322	2643
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	17	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	-	-	557
Paracladopelma	-	-	-	-	35	-	-	70	-	-	-	-	-	17	-	9	9	-	-	-	-	-	35	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum (includes P. halterale, P. flavum, P. scalaenum, and genus ID)	-	-	26	-	-	0	70	279	17	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-
Sergentia	365	52	61	-	-	0	104	-	35	243	591	261	574	522	17	0	130	35	17	0	17	139	17	139
Stempellina	-	-	-	-	-	70	-	70	1113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	487	383	139	852	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139
Stictochironomus	70	122	113	87	-	-	-	-	-	17	-	17	-	-	-	200	9	17	-	-	-	-	-	-
Tanytarsus	-	-	78	-	174	139	104	70	670	504	-	174	104	400	43	104	-	104	139	243	-	1496	-	557
Tribelos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protanypus	-	35	35	104	35	0	35	-	9	35	35	174	-	104	-	35	9	52	-	35	139	52	35	-
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	313	487	191	435	939	974	174	835	2382	1565	17	1687	122	609	17	887	661	1774	1113	3443	861	678	1200	7791
Ablabesmyia	-	-	-	-	-	-	-	70	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	139
Procladius	-	-	-	-	70	487	696	487	513	70	-	-	-	35	-	-	-	-	-	35	-	52	52	139
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
Simuliidae	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
Menetus	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-
Cyclocalyx	-	-	-	-	1148	904	1913	974	443	243	52	330	148	678	-	-	-	-	-	-	-	70	435	-
Pisidium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sphaerium nitidum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix Table E.37a: Taxon scores from correspondence analysis of benthic abundance data at SRWMP stations: 1999, 2004, and 2009.

	CA Axis-1 (14.4%)	CA Axis-2 12.7%)	CA Axis-3 (9.1%)	CA Axis-4 (8.9%)	CA Axis-5 (7.6%)
P. Nemata	-0.206	0.116	-0.210	0.217	0.298
Rhyacodrilus montana	1.908	0.061	-0.296	-0.193	-0.640
immatures with hair chaetae	-0.958	1.150	-0.142	1.301	-0.573
immatures without hair chaetae	-0.772	-0.860	1.493	-0.693	-1.198
O. Acarina	0.026	-0.158	0.065	0.023	0.131
O. Harpacticoida	-0.183	-0.756	0.283	0.334	0.357
Cl. Ostracoda	0.117	0.102	-0.030	0.030	0.021
Bezzia	0.789	0.440	0.311	-0.034	0.383
Chaoborus punctipennis	-0.496	-0.828	0.210	-0.734	-0.925
Chironomus	0.481	-0.418	0.409	0.561	-0.051
Dicrotendipes	-0.093	1.087	0.602	1.149	-1.295
Micropsectra	0.326	0.095	-0.143	-0.149	-0.015
Paracladopelma	0.099	0.759	0.550	0.292	0.226
Sergentia	-0.094	-0.314	0.039	0.015	0.148
Stictochironomus	-0.311	0.018	-0.133	-0.474	0.382
Tanytarsus	-0.400	0.315	-0.217	0.004	-0.270
Protanypus	0.208	0.110	-0.056	-0.284	0.029
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	0.284	0.244	0.033	-0.132	-0.003
Procladius	-0.504	0.008	-0.099	0.225	0.083
Cyclocalyx	-0.628	0.913	0.598	-0.579	0.173
Pisidium	-0.475	-0.548	-1.298	0.069	-0.477

Organism contributing to positive load on CA axis.
Organism contributing to negative load on CA axis.

Appendix Table E.37b: Eigenvalues and inertia from correspondence analysis of benthic abundance data at SRWMP stations: 1999, 2004, and 2009.

	CA Axis-1 (14.4%)	CA Axis-2 12.7%)	CA Axis-3 (9.1%)	CA Axis-4 (8.9%)	CA Axis-5 (7.6%)
Eigenvalue	0.17458	0.15456	0.11053	0.10766	0.092305
Relative Inertia, percent	14.35	12.71	9.09	8.85	7.59
Cumulative Inertia, percent	14.35	27.06	36.15	45	52.59

Appendix Table E.38a: Taxon scores from correspondence analysis of benthic abundance data at SRWMP stations: 1999, 2004, and 2009. (Rochester Lake excluded)

	CA Axis-1 (16.2%)	CA Axis-2 (12.9%)	CA Axis-3 (9.7%)	CA Axis-4 (7.8%)
P. Nemata	-0.248	-0.023	0.234	-0.108
Rhyacodrilus montana	1.787	-0.108	0.142	1.459
immatures with hair chaetae	-1.090	-1.083	1.204	0.403
O. Acarina	0.048	0.125	-0.065	-0.193
O. Harpacticoida	-0.092	0.447	0.023	-0.167
Cl. Ostracoda	0.098	-0.092	0.023	-0.089
Bezzia	0.708	-0.514	-0.217	-0.925
Chaoborus punctipennis	-0.312	0.970	-0.566	0.651
Chironomus	0.642	-0.045	0.390	-0.495
Dicrotendipes	-0.188	-1.540	1.051	0.347
Micropsectra	0.282	0.016	-0.052	0.082
Paracladopelma	-0.009	-0.944	-0.053	-0.205
Sergentia	-0.062	0.229	-0.091	-0.116
Stictochironomus	-0.320	0.233	-0.388	-0.155
Tanytarsus	-0.452	-0.132	0.143	0.204
Protanypus	0.173	0.004	-0.254	-0.008
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	0.238	-0.180	-0.115	-0.031
Procladius	-0.539	-0.003	0.190	0.043
Cyclocalyx	-0.721	-0.777	-0.890	0.346
Pisidium	-0.449	1.063	0.792	0.346

Organism contributing to positive load on CA axis.
Organism contributing to negative load on CA axis.

Appendix Table E.38b: Eigenvalues and inertia from correspondence analysis of benthic abundance data at SRWMP stations: 1999, 2004, and 2009. (Rochester Lake excluded)

	CA Axis-1 (16.2%)	CA Axis-2 (12.9%)	CA Axis-3 (9.7%)	CA Axis-4 (7.8%)
Eigenvalue	0.17616	0.141	0.1062	0.085535
Relative Inertia, percent	16.15	12.93	9.74	7.84
Cumulative Inertia, percent	16.15	29.08	38.82	46.66

Appendix Table E.39a: Taxon scores from correspondence analysis of benthic abundance data at SRWMP stations: 2009. (Rochester Lake excluded)

	2009 CA Axis-1 (20.0%)	2009 CA Axis-2 (14.5%)	2009 CA Axis-3 (11.%)	2009 CA Axis-4 (8.6%)
P. Nemata	0.485	0.074	-0.595	0.049
Rhyacodrilus montana	-1.439	1.027	0.397	-1.837
immatures with hair chaetae	1.467	1.062	0.173	-0.114
O. Acarina	-0.175	-0.102	-0.121	-0.030
O. Harpacticoida	-0.079	-0.298	-0.853	-0.450
Cl. Ostracoda	0.020	0.119	0.049	0.046
Bezzia	-0.351	0.451	-0.555	-0.287
Chaoborus punctipennis	-0.410	-0.899	1.210	-0.037
Chironomus	-0.827	0.615	-0.099	0.394
Dicrotendipes	1.351	1.164	0.624	0.281
Micropsectra	-0.203	-0.057	0.046	0.092
Paracladopelma	0.179	0.601	-0.428	0.533
Sergentia	-0.146	-0.281	0.045	0.108
Stictochironomus	-0.051	-0.447	-0.203	0.154
Tanytarsus	0.367	0.113	0.229	-0.289
Protanypus	-0.236	0.006	0.170	0.195
S.F. Orthocladiinae (including Cricotopus, Heterotanytarsus, Heterotrissocladius, Paracladius, Parakiefferiella, Psectrocladius, Zalutschia, and indeterminate that could not be attributed)	-0.149	0.186	0.105	0.052
Procladius	0.424	-0.252	-0.090	-0.197
Cyclocalyx	0.506	-0.331	0.302	-0.112

Organism contributing to positive load on CA axis.
Organism contributing to negative load on CA axis.

Appendix Table E.39b: Eigenvalues and inertia from correspondence analysis of benthic abundance data at SRWMP stations: 2009. (Rochester Lake excluded)

	2009 CA Axis-1 (20.0%)	2009 CA Axis-2 (14.5%)	2009 CA Axis-3 (11.%)	2009 CA Axis-4 (8.6%)
Eigenvalue	0.16725	0.12146	0.0997	0.072146
Relative Inertia, percent	0.2001	0.1453	0.1193	0.0863
Cumulative Inertia, percent	0.2001	0.3455	0.4648	0.5511

Appendix Table E.40: Benthic community metrics by stations, 1999, 2004, 2009.

													CA-All Years, including RL					CA- All Years, excluding RL				CA, 2009 data only			
Station	lake	Lake	Exposure Status	Exposure	Lake Exposure	Replicate	Year	Lab calc. Density, before removal of non-aquatics	Lab calc. Number of Taxa	Density (Ind./m2)	Number of Taxa before Collapsing Taxa and Merging of Years	Number of Taxa	CA Axis-1 (14.4%)	CA Axis-2 12.7%)	CA Axis-3 (9.1%)	CA Axis-4 (8.9%)	CA Axis-5 (7.6%)	CA Axis-1, no RL (16.2%)	CA Axis-2, no RL (12.9%)	CA Axis-3, no RL (9.7%)	CA Axis-4, no RL (7.8%)	2009 CA Axis-1 (20.0%)	2009 CA Axis-2 (14.5%)	2009 CA Axis-3 (11.%)	2009 CA Axis-4 (8.6%)
DUL1-99	DUL	Dunlop	Reference	Ref.	DUL Ref.	1	1999	7855	9	7855	9	9	-0.2369	-0.0997	-0.5514	0.2417	-0.0656	-0.254	0.274	0.467	-0.003	.	.	.	.
DUL2-99	DUL	Dunlop	Reference	Ref.	DUL Ref.	2	1999	11392	12	11392	13	12	-0.1541	-0.1643	-0.3905	0.4925	-0.0686	-0.15	0.22	0.597	-0.07	.	.	.	.
DUL3-99	DUL	Dunlop	Reference	Ref.	DUL Ref.	3	1999	4069	15	4069	16	15	-0.3485	0.2532	-0.641	0.3527	-0.2145	-0.42	0.02	0.604	0.197	.	.	.	.
TML1-99	TML	Ten Mile	Reference	Ref.	TML Ref.	1	1999	1650	11	1650	12	11	-0.1192	-0.3864	-0.1442	0.2067	0.3604	-0.087	0.378	0.164	-0.315	.	.	.	.
TML2-99	TML	Ten Mile	Reference	Ref.	TML Ref.	2	1999	865	11	865	12	11	0.0079	-0.3654	-0.1469	0.3043	0.21	0.036	0.316	0.268	-0.264	.	.	.	.
TML3-99	TML	Ten Mile	Reference	Ref.	TML Ref.	3	1999	1304	6	1304	7	7	-0.3874	-0.1293	-0.0769	0.2079	0.4473	-0.405	0.159	0.088	-0.181	.	.	.	.
RL1-99	RL	Rochester	Reference	Ref.	RL Ref.	1	1999	2389	6	2389	6	6	-0.4092	-0.8215	0.2347	0.0714	0.0722	.	.	.	.	.	.	.	.
RL2-99	RL	Rochester	Reference	Ref.	RL Ref.	2	1999	5375	11	5375	11	11	-0.4017	-0.6431	1.1017	-0.0178	-1.2467	.	.	.	.	.	.	.	.
RL3-99	RL	Rochester	Reference	Ref.	RL Ref.	3	1999	506	7	506	7	7	-0.1849	-0.8278	0.369	0.3301	0.0763	.	.	.	.	.	.	.	.
QL1-99	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	1	1999	3027	7	3027	8	7	1.2249	0.0064	0.2609	0.5499	-0.668	1.216	-0.392	0.569	0.528	.	.	.	.
QL2-99	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	2	1999	1854	6	1854	7	6	1.0937	0.253	0.2571	0.5515	-0.7499	1.071	-0.587	0.605	0.32	.	.	.	.
QL3-99	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	3	1999	4041	6	4041	7	6	1.6058	0.1	-0.1794	-0.1497	-0.4885	1.527	-0.148	0.13	0.895	.	.	.	.
QL4-99	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	4	1999	999	6	999	7	5	1.1795	0.3274	-0.3968	-0.3135	-0.2092	1.038	-0.16	-0.012	0.891	.	.	.	.
QL5-99	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	5	1999	667	2	667	3	2	2.2825	0.2077	-0.6125	-0.507	-0.8657	2.094	-0.088	0.076	2.148	.	.	.	.
EL1-99	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	1	1999	1563	11	1563	11	11	-0.5083	-0.1965	-0.8031	-0.188	-0.2571	-0.521	0.618	0.258	0.31	.	.	.	.
EL2-99	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	2	1999	5451	12	5451	13	12	-0.4748	-0.1545	-0.4003	-0.1323	-0.1996	-0.431	0.363	0.299	0.057	.	.	.	.
EL3-99	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	3	1999	2693	10	2693	11	10	-0.3578	-0.2815	-0.6004	-0.1937	-0.5177	-0.347	0.598	0.176	0.399	.	.	.	.
HOL1-99	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	1	1999	1333	5	1333	6	5	0.1955	0.1157	-0.1875	0.0065	0.2902	0.14	-0.026	0.012	-0.189	.	.	.	.
HOL2-99	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	2	1999	709	6	709	7	6	0.2406	0.2454	-0.1268	0.176	0.0014	0.204	-0.206	0.24	-0.194	.	.	.	.
HOL3-99	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	3	1999	853	5	853	6	5	0.286	0.1239	-0.1643	-0.0699	0.2145	0.23	-0.033	-0.051	-0.151	.	.	.	.
ML1-99	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	1	1999	9434	9	9434	10	8	-0.0257	-0.0285	0.0281	0.2289	0.0179	-0.019	-0.041	0.147	-0.279	.	.	.	.
ML2-99	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	2	1999	3926	9	3926	10	8	-0.1256	0.2812	0.2815	0.8826	-0.6272	-0.121	-0.599	0.776	-0.126	.	.	.	.
ML3-99	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	3	1999	855	3	855	3	3	0.0088	-0.4741	0.3574	0.7422	0.2052	0.119	0.097	0.45	-0.727	.	.	.	.
MCL1-99	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	1	1999	2521	8	2521	8	8	-0.7136	-1.4082	0.9173	-0.4035	-0.6491	-0.357	1.186	-0.397	0.212	.	.	.	.
MCL2-99	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	2	1999	2969	11	2969	12	11	0.2796	-0.5415	-0.3302	-0.1371	-0.3975	0.329	0.642	0.098	0.351	.	.	.	.
MCL3-99	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	3	1999	3230	10	3230	11	10	0.2054	-0.1527	-0.6496	-0.2929	-0.5023	0.18	0.471	0.133	0.522	.	.	.	.
NL1-99	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	1	1999	9363	7	9363	8	7	0.6791	0.065	-0.2657	-0.0534	0.0168	0.602	-0.015	0.057	0.401	.	.	.	.
NL2-99	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	2	1999	2842	6	2842	7	6	0.7988	0.0349	-0.1438	-0.191	-0.0865	0.733	-0.006	-0.107	0.369	.	.	.	.
NL3-99	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	3	1999	5072	7	5072	8	7	0.0463	-0.2416	-0.023	0.0145	0.2126	0.046	0.229	-0.1	-0.159	.	.	.	.
PL1-99	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	1	1999	579	5	579	6	5	0.6478	0.0668	0.1065	0.0303	-0.0066	0.651	-0.152	0.01	-0.367	.	.	.	.
PL2-99	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	2	1999	129	3	129	3	3	0.704	-0.0619	0.4127	0.4663	-0.0363	0.777	-0.281	0.304	-0.701	.	.	.	.
PL3-99	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	3	1999	2842	7	2842	8	7	0.765	-0.1037	-0.0215	-0.061	0.0239	0.719	0.064	-0.07	0.302	.	.	.	.
DUL1-04	DUL	Dunlop	Reference	Ref.	DUL Ref.	1	2004	1009	11	1009	11	11	-0.58	-0.3457	-0.3508	0.5593	-0.401	-0.525	0.406	0.684	0.158	.	.	.	.
DUL2-04	DUL	Dunlop	Reference	Ref.	DUL Ref.	2	2004	4375	11	4375	11	11	-0.3776	-0.2329	-0.4004	0.4661	0.1158	-0.363	0.31	0.543	-0.12	.	.	.	.
DUL3-04	DUL	Dunlop	Reference	Ref.	DUL Ref.	3	2004	6809	15	6809	16	14	-0.2912	-0.046	-0.509	0.2513	0.0349	-0.312	0.243	0.444	-0.007	.	.	.	.
TML1-04	TML	Ten Mile	Reference	Ref.	TML Ref.	1	2004	13993	13	13993	13	12	-0.2018	-0.0865	-0.3976	-0.0228	0.1606	-0.236	0.281	0.105	0.004	.	.	.	.
TML2-04	TML	Ten Mile	Reference	Ref.	TML Ref.	2	2004	2949	16	2949	17	15	-0.0586	-0.2124	-0.132	0.165	0.3298	-0.053	0.229	0.129	-0.29	.	.	.	.
TML3-04	TML	Ten Mile	Reference	Ref.	TML Ref.	3	2004	6668	11	6668	12	10	-0.2264	-0.0307	-0.4537	-0.0487	0.1725	-0.267	0.272	0.124	0.014	.	.	.	.
RL1-04	RL	Rochester	Reference	Ref.	RL Ref.	1	2004	2053	8	2053	8	8	-0.2096	-0.6659	0.2667	0.2868	0.0271	.	.	.	.	.	.	.	.
RL2-04	RL	Rochester	Reference	Ref.	RL Ref.	2	2004	2730	7	2730	7	7	-0.1132	-0.7603	0.3337	0.6709	0.518	.	.	.	.	.	.	.	.
RL3-04	RL	Rochester	Reference	Ref.	RL Ref.	3	2004	677	7	677	7	7	-0.1599	-1.0496	0.4913	0.7026	0.5797	.	.	.	.	.	.	.	.
SUL1-04	SUL	Summers	Reference	Ref.	SUL Ref.	1	2004	5931	14	5931	15	13	-0.1224	-0.4173	-0.2314	-0.0969	0.0521	-0.079	0.535	0.001	-0.085	.	.	.	.
SUL2-04	SUL	Summers	Reference	Ref.	SUL Ref.	2	2004	5294	11	5294	12	10	-0.0955	-0.1478	-0.421	-0.0184	0.2336	-0.103	0.331	0.147	-0.203	.	.	.	.
SUL3-04	SUL	Summers	Reference	Ref.	SUL Ref.	3	2004	4408	13	4408	13	13	-0.1391	-0.4381	-0.1531	-0.0002	0.11	-0.101	0.494	0.016	-0.088	.	.	.	.
SL1-04	SL	Semiwhite	Reference	Ref.	SL Ref.	1	2004	4860	14	4860	15	14	0.0257	-0.2444	-0.4783	-0.0603	0.1516	0.002	0.433	0.123	0.121	.	.	.	.
SL2-04	SL	Semiwhite	Reference	Ref.	SL Ref.	2	2004	3488	13	3488	14	13	0.0461	-0.2743	-0.6094	0.1097	-0.0271	0.03	0.446	0.398	0.327	.	.	.	.
SL3-04	SL	Semiwhite	Reference	Ref.	SL Ref.	3	2004	10217	14	10217	15	14	-0.2375	-0.2593	-0.1828	-0.1256	-0.1934	-0.132	0.34	0.263	-0.11	.	.	.	.
QL1-04	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	1	2004	2575	8	2575	9	8	0.6109	0.123	0.1354	0.1509	0.2543	0.591	-0.224	0.057	-0.653	.	.	.	.
QL2-04	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	2	2004	1289	8	1289	9	8	0.751	0.2992	0.0777	-0.1381	0.1125	0.694	-0.291	-0.149	-0.473	.	.	.	.
QL3-04	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	3	2004	5304	11	5304	12	10	1.1804	0.3286	-0.1618	-0.3517	-0.1706	1.062	-0.239	-0.184	0.423	.	.	.	.
QL4-04	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	4	2004	2574	10	2574	11	10	1.0707	0.2792	-0.025	-0.0183	-0.1593	0.989	-0.33	0.07	0.4	.	.	.	.
QL5-04	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	5	2004	5149	9	5149	10	9	0.683	-0.1748	0.0778	0.1818	-0.0014	0.675	0.02	0.129	0.121	.	.	.	.
EL1-04	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	1	2004	2322	14	2322	14	14	-0.4472	-0.1853	-0.5687	-0.1448	-0.4057	-0.444	0.537	0.197	0.402	.	.	.	.
EL2-04	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	2	2004	4217	14	4217	15	14	-0.4257	-0.4049	-0.2365	-0.4868	-0.471	-0.327	0.645	-0.066	0.274	.	.	.	.
EL3-04	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	3	2004	3018	19	3018	20	18	-0.2892	-0.2522	-0.4941	-0.2554	-0.3524	-0.269	0.558	0.073	0.237	.	.	.	.
HOL1-04	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	1	2004	3719	14	3719	15	14	0.2277	-0.0186	-0.0182	-0.005	0.2396	0.219	0.022	-0.044	-0.329	.	.	.	.
HOL2-04	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	2	2004	3652	13	3652	14	12	0.2194	0.3785	0.021	0.0798	-0.1165	0.141	-0.365	0.061	-0.2	.	.	.	.
HOL3-04	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	3	2004	2776	12	2776	13	12	0.4143	0.214	0.2809	0.2848	-0.118	0.394	-0.396	0.144	-0.289	.	.	.	.
MAL1-04	MAL	May	Exposure	Exp. 3	MAL Exp. 3	1	2004	1651	11	1651	11	11	0.2943	-0.2716	0.1851	0.2177	0.1349	0.341	0.092	0.057	-0.412	.	.	.	.
MAL2-04	MAL	May	Exposure	Exp. 3	MAL Exp. 3	2	2004	1121	9	1121	10	9	0.024	-0.0296	-0.0993	-0.113	0.1767	0	0.12	-0.13	-0.144	.	.	.	.
MAL3-04	MAL	May	Exposure	Exp. 3	MAL Exp. 3	3	2004	2884	11	2884	12	10	0.4976	0.292	-0.0274	-0.2996	0.3138	0.426	-0.164	-0.295	-0.486	.	.	.	.
ML1-04	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	1	2004	3479	10	3479	11	10	-0.2849	0.2733	-0.5464	0.4305	-0.4592	-0.357	-0.1	0.724	0.223	.	.	.	.
ML2-04	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	2	2004	870	5	870	6	4	-0.8535	0.7834	-0.2603	1.2407	-0.3568	-0.975	-0.725	1.138	0.352	.	.	.	.
ML3-04	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	3	2004	2314	8	2314	9	8	-0.2354	-0.1369	-0.6249	-0.0135	-0.1306	-0.263	0.398	0.255	0.102	.	.	.	.
MCL1-04	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	1	2004	2888	9	2888	10	9	-0.1757	-0.5592	-0.4069	-0.421	-0.2707	-0.118	0.834	-0.158	0.21	.	.	.	.
MCL2-04	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	2	2004	1660	12	1660	13	12	0.0351	-0.4907	-0.2331	-0.0306	-0.2531	0.099	0.562	0.111	0.005	.	.	.	.
MCL3-04	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	3	2004	6019	17	6019	18	15	0.0546	-0.4086	-0.2862	-0.1992	-0.1388	0.101	0.558	-0.019	-0.029	.	.	.	.
NL1-04	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	1	2004	5094	8	5094	9	8	0.2666	0.0003	0.0723	0.291	0.1266	0.276	-0.12	0.2	-0.559	.	.	.	.
NL2-04	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	2	2004	4333	16	4333	17	16	0.6473	-0.126	0.0495	-0.1318	-0.0352	0.641	0.09	-0.12	0.043	.	.	.	.
NL3-04	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	3	2004	6505	11	6505	12	11	0.7631	-0.2228	-0.0083	0.1758	0.0333	0.751	0.078	0.148	0.23	.	.	.	.
PL1-04	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	1	2004	3582	10	3582	11	10	0.1385	-0.2995	-0.1825	0.1096	0.1118	0.153	0.31	0.127	-0.197	.	.	.	.
PL2-04	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	2	2004	1643	7	1643	8	6	0.5519	-0.0853	0.2279	0.3952	0.0968	0.601	-0.142	0.279	-0.596	.	.	.	.
PL3-04	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	3	2004	1773	10	1773	11	10	0.1972	0.1265	0.1521	0.3857	-0.0402	0.171	-0.261	0.273	-0.197	.	.	.	.
DUL1-09	DUL	Dunlop	Reference	Ref.	DUL Ref.	1	2009	10124	10	10124	10	10	-0.6042	0.474	0.0422	0.0761	0.2164	-0.679	-0.35	-0.085	0.166	0.595	-0.155	-0.147	-0.205
DUL2-09	DUL	Dunlop	Reference	Ref.	DUL Ref.	2	2009	15514	18	15514	19	17	-0.4598	0.2807	0.2491	-0.0763	0.0178	-0.463	-0.294	-0.119	0.081	0.411	-0.093	-0.125	-0.152
DUL3-09	DUL	Dunlop	Reference	Ref.	DUL Ref.	3	2009	13777	19	13777	19	18	-0.3001	0.2686	0.0236	-0.2069	0.3506	-0.359	-0.133	-0.316	-0.022	0.242	-0.265	-0.179	-0.081

Appendix Table E.40: Benthic community metrics by stations, 1999, 2004, 2009.

													CA-All Years, including RL					CA- All Years, excluding RL				CA, 2009 data only			
Station	lake	Lake	Exposure Status	Exposure	Lake Exposure	Replicate	Year	Lab calc. Density, before removal of non-aquatics	Lab calc. Number of Taxa	Density (Ind./m2)	Number of Taxa before Collapsing Taxa and Merging of Years	Number of Taxa	CA Axis-1 (14.4%)	CA Axis-2 12.7%)	CA Axis-3 (9.1%)	CA Axis-4 (8.9%)	CA Axis-5 (7.6%)	CA Axis-1, no RL (16.2%)	CA Axis-2, no RL (12.9%)	CA Axis-3, no RL (9.7%)	CA Axis-4, no RL (7.8%)	2009 CA Axis-1 (20.0%)	2009 CA Axis-2 (14.5%)	2009 CA Axis-3 (11.%)	2009 CA Axis-4 (8.6%)
DUL4-09	DUL	Dunlop	Reference	Ref.	DUL Ref.	4	2009	14331	14	14331	15	14	-0.3658	0.4246	0.1079	0.1326	0.2739	-0.439	-0.361	-0.064	0.016	0.42	0.011	-0.297	-0.048
DUL5-09	DUL	Dunlop	Reference	Ref.	DUL Ref.	5	2009	8071	15	8071	16	15	-0.2064	0.2801	0.1355	-0.2578	0.441	-0.266	-0.173	-0.424	-0.175	0.148	-0.253	-0.31	-0.181
TML1-09	TML	Ten Mile	Reference	Ref.	TML Ref.	1	2009	7097	12	7097	12	11	-0.1524	-0.072	-0.1131	-0.0603	0.3635	-0.178	0.168	-0.11	-0.165	0.045	-0.254	-0.411	-0.139
TML2-09	TML	Ten Mile	Reference	Ref.	TML Ref.	2	2009	8906	10	8906	10	9	-0.1127	-0.0902	-0.0523	0.2455	0.3219	-0.138	0.084	0.128	-0.164	0.173	-0.069	-0.617	-0.349
TML3-09	TML	Ten Mile	Reference	Ref.	TML Ref.	3	2009	3443	11	3443	11	10	-0.1096	-0.1571	-0.071	-0.0351	0.5179	-0.127	0.218	-0.135	-0.257	0.014	-0.312	-0.586	-0.056
TML4-09	TML	Ten Mile	Reference	Ref.	TML Ref.	4	2009	6800	15	6800	16	14	-0.1302	0.157	0.1987	0.1504	0.124	-0.15	-0.22	-0.004	-0.142	0.128	0.04	-0.188	0.058
TML5-09	TML	Ten Mile	Reference	Ref.	TML Ref.	5	2009	10785	12	10785	13	11	0.1578	-0.0086	0.2057	0.1167	0.4634	0.144	-0.077	-0.099	-0.412	-0.195	0.099	-0.591	0.311
RL1-09	RL	Rochester	Reference	Ref.	RL Ref.	1	2009	817	6	817	6	6	0.0046	-0.7478	0.3812	0.5684	0.4066	.	.	.	.	.	.	.	.
RL2-09	RL	Rochester	Reference	Ref.	RL Ref.	2	2009	1104	8	1104	8	8	-0.2384	-0.9095	1.3352	0.2547	-0.3374	.	.	.	.	.	.	.	.
RL3-09	RL	Rochester	Reference	Ref.	RL Ref.	3	2009	834	7	834	7	7	-0.0186	-0.7337	0.3228	0.5346	0.4097	.	.	.	.	.	.	.	.
RL4-09	RL	Rochester	Reference	Ref.	RL Ref.	4	2009	252	6	252	6	6	-0.4457	-1.0806	0.3784	0.3388	0.0822	.	.	.	.	.	.	.	.
RL5-09	RL	Rochester	Reference	Ref.	RL Ref.	5	2009	1322	3	1322	3	3	0.1427	-1.314	0.7598	0.9588	0.5367	.	.	.	.	.	.	.	.
SUL1-09	SUL	Summers	Reference	Ref.	SUL Ref.	1	2009	2460	14	2460	15	14	-0.0694	0.1055	0.1377	-0.1945	0.3786	-0.084	-0.066	-0.329	-0.25	-0.136	-0.196	-0.081	0.269
SUL2-09	SUL	Summers	Reference	Ref.	SUL Ref.	2	2009	2069	10	2069	11	10	-0.3995	0.0083	0.1739	-0.5595	0.1047	-0.403	0.151	-0.654	0.146	-0.014	-0.691	0.398	0.049
SUL3-09	SUL	Summers	Reference	Ref.	SUL Ref.	3	2009	5287	11	5287	11	11	0.0245	-0.0287	0.2576	-0.083	0.4693	0.017	-0.026	-0.319	-0.409	-0.189	-0.207	-0.38	-0.07
SUL4-09	SUL	Summers	Reference	Ref.	SUL Ref.	4	2009	2313	8	2313	8	8	-0.2903	-1.0074	0.746	-0.1184	-0.477	0.024	0.67	-0.093	-0.097	-0.509	-0.533	0.009	-0.057
SUL5-09	SUL	Summers	Reference	Ref.	SUL Ref.	5	2009	2807	11	2807	11	11	-0.0633	-0.3943	0.1061	-0.1082	0.1447	-0.013	0.375	-0.191	-0.175	-0.357	-0.413	-0.011	0.113
SL1-09	SL	Semiwhite	Reference	Ref.	SL Ref.	1	2009	5425	15	5425	15	15	-0.2741	-0.1814	0.5311	-0.3103	0.116	-0.162	0.021	-0.397	-0.15	-0.096	-0.371	-0.25	-0.028
SL2-09	SL	Semiwhite	Reference	Ref.	SL Ref.	2	2009	3131	10	3131	10	10	-0.1476	0.2474	0.1078	-0.178	0.3857	-0.184	-0.175	-0.291	-0.146	0.035	-0.186	-0.141	0.224
SL3-09	SL	Semiwhite	Reference	Ref.	SL Ref.	3	2009	4035	12	4035	12	12	-0.1543	0.2514	0.0466	-0.1226	0.2332	-0.193	-0.174	-0.192	-0.091	0.054	-0.11	-0.008	0.117
SL4-09	SL	Semiwhite	Reference	Ref.	SL Ref.	4	2009	3985	15	3985	15	15	-0.3135	0.3194	0.1441	-0.1147	0.4346	-0.378	-0.241	-0.303	-0.083	0.267	-0.211	-0.359	0.003
SL5-09	SL	Semiwhite	Reference	Ref.	SL Ref.	5	2009	6165	11	6165	11	11	-0.2326	0.1828	0.0758	-0.2104	0.4559	-0.282	-0.078	-0.358	-0.079	0.159	-0.359	-0.294	-0.048
QL1-09	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	1	2009	1593	7	1593	8	7	0.9688	-0.017	0.1732	0.1552	-0.1616	0.98	-0.181	0.141	-0.086	-0.948	0.801	0.17	-0.079
QL2-09	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	2	2009	870	6	870	7	6	0.5213	0.2724	0.3703	0.4652	0.2017	0.512	-0.517	0.259	-0.559	-0.374	0.81	-0.407	0.747
QL3-09	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	3	2009	1268	6	1268	7	6	1.269	0.014	0.1254	0.1584	-0.3182	1.264	-0.229	0.232	0.204	-1.161	0.991	0.229	-0.366
QL4-09	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	4	2009	1546	6	1546	7	6	0.4636	0.0177	0.1585	0.0974	-0.082	0.484	-0.131	0.059	-0.332	-0.611	0.465	0.219	0.424
QL5-09	QL	Quirke	Exposure	Exp. 1	QL Exp. 1	5	2009	1147	7	1147	8	7	1.3644	0.13	-0.0322	-0.0904	-0.3824	1.307	-0.225	0.069	0.571	-1.151	0.961	0.364	-0.761
EL1-09	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	1	2009	1228	10	1228	10	10	-0.1959	0.2311	0.4409	-0.9259	-0.1293	-0.14	-0.119	-0.875	0.177	-0.124	-0.423	0.42	0.198
EL2-09	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	2	2009	4618	13	4618	14	13	-0.4587	0.1823	0.3616	-0.7589	-0.2466	-0.419	-0.073	-0.687	0.299	0.094	-0.494	0.509	-0.01
EL3-09	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	3	2009	3914	16	3914	17	16	-0.3662	0.2091	0.4393	-0.6874	-0.1326	-0.322	-0.155	-0.671	0.165	0.062	-0.373	0.3	0.153
EL4-09	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	4	2009	5879	9	5879	10	9	-0.2692	0.5678	0.087	-0.493	0.2269	-0.358	-0.34	-0.552	0.114	0.198	-0.264	0.164	-0.072
EL5-09	EL	Elliot	Exposure	Exp. 6	EL Exp. 6	5	2009	4792	17	4792	18	17	-0.2045	0.1221	0.3191	-0.6593	-0.1594	-0.169	-0.059	-0.613	0.38	-0.091	-0.336	0.329	-0.31
HOL1-09	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	1	2009	2035	13	2035	14	13	0.2023	0.4426	0.1174	0.068	0.1461	0.116	-0.439	-0.03	-0.297	0.085	0.26	-0.167	0.324
HOL2-09	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	2	2009	3931	8	3931	8	7	0.3258	0.1611	-0.1616	-0.1708	0.196	0.263	-0.042	-0.139	-0.13	-0.159	0.035	0.007	0.311
HOL3-09	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	3	2009	6950	12	6950	13	12	0.0957	0.0922	-0.0878	-0.1078	0.1131	0.071	-0.009	-0.079	-0.195	-0.199	0.005	0.079	0.169
HOL4-09	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	4	2009	1574	9	1574	10	9	0.3396	0.1271	0.1187	-0.108	0.248	0.314	-0.136	-0.195	-0.353	-0.39	0.145	-0.038	0.509
HOL5-09	HOL	Hough	Exposure	Exp. 4	HOL Exp. 4	5	2009	4259	12	4259	13	12	-0.1375	0.7905	0.0364	0.4235	-0.3483	-0.25	-0.758	0.392	0.133	0.515	0.59	0.219	0.241
MAL1-09	MAL	May	Exposure	Exp. 3	MAL Exp. 3	1	2009	3269	9	3269	10	9	0.2593	-0.3377	0.2116	0.2327	0.2302	0.308	0.14	0.03	-0.444	-0.489	0.056	-0.182	0.227
MAL2-09	MAL	May	Exposure	Exp. 3	MAL Exp. 3	2	2009	4306	7	4306	8	7	0.2967	-0.0819	0.0291	-0.1116	0.2531	0.302	0.086	-0.158	-0.377	-0.445	-0.029	-0.024	0.364
MAL3-09	MAL	May	Exposure	Exp. 3	MAL Exp. 3	3	2009	6539	10	6539	11	9	0.3646	-0.0016	0.0128	-0.1755	0.2136	0.361	0.031	-0.186	-0.349	-0.482	0.059	0.032	0.442
MAL4-09	MAL	May	Exposure	Exp. 3	MAL Exp. 3	4	2009	2078	14	2078	15	13	-0.0234	-0.0963	0.2576	-0.2572	-0.1231	0.11	0.009	-0.077	-0.27	-0.207	0.062	-0.064	0.27
MAL5-09	MAL	May	Exposure	Exp. 3	MAL Exp. 3	5	2009	1809	6	1809	7	6	0.34	0.3043	-0.1807	-0.5412	0.2258	0.264	-0.053	-0.421	-0.132	-0.287	-0.039	0.127	0.371
ML1-09	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	1	2009	5358	9	5358	9	9	-0.1642	0.7741	0.1717	-0.2479	0.1507	-0.286	-0.632	-0.378	0.153	0.335	0.085	0.083	0.075
ML2-09	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	2	2009	5167	13	5167	13	12	-0.6718	1.1873	0.2155	0.6324	-0.4863	-0.816	-1.174	0.473	0.439	1.203	0.613	0.327	-0.154
ML3-09	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	3	2009	6959	14	6959	15	14	-0.4492	0.8132	0.1781	0.337	-0.2587	-0.557	-0.791	0.185	0.27	0.769	0.297	0.269	-0.031
ML4-09	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	4	2009	6265	17	6265	18	15	-0.4547	1.0476	0.3873	0.7398	-0.3143	-0.567	-1.169	0.484	0.16	0.901	0.774	0.075	0.154
ML5-09	ML	McCabe	Exposure	Exp. 2	ML Exp. 2	5	2009	8294	21	8294	22	18	-0.4776	0.839	0.103	0.3874	-0.301	-0.589	-0.784	0.267	0.29	0.768	0.37	0.306	-0.116
MCL1-09	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	1	2009	5983	14	5983	15	13	0.1035	0.21	-0.0006	-0.5031	-0.2408	0.049	-0.038	-0.438	0.568	-0.232	-0.14	0.555	-0.494
MCL2-09	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	2	2009	1634	9	1634	10	9	0.0497	-0.0199	0.2915	-0.4587	-0.1581	0.071	0.057	-0.559	0.133	-0.356	-0.294	0.63	0.309
MCL3-09	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	3	2009	4834	11	4834	12	11	-0.0166	0.1047	0.2356	-0.3733	-0.0899	-0.008	-0.043	-0.449	0.019	-0.273	-0.133	0.457	0.196
MCL4-09	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	4	2009	2958	11	2958	12	11	-0.0723	0.231	0.2034	-0.5161	-0.1485	-0.103	-0.088	-0.579	0.148	-0.089	-0.3	0.538	-0.079
MCL5-09	MCL	McCarthy	Exposure	Exp. 8	MCL Exp. 8	5	2009	6260	15	6260	16	15	0.0006	0.1318	0.2058	-0.2893	-0.0643	-0.037	-0.088	-0.41	0.346	-0.134	-0.144	0.225	-0.372
NL1-09	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	1	2009	1433	15	1433	16	15	-0.0119	0.0269	0.4529	0.5147	-0.2797	0.121	-0.367	0.533	-0.465	-0.038	0.675	-0.279	0.035
NL2-09	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	2	2009	2470	15	2470	16	15	0.5064	0.1176	0.0917	-0.0677	0.1292	0.471	-0.143	-0.108	-0.142	-0.507	0.362	-0.204	-0.244
NL3-09	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	3	2009	2072	15	2072	16	15	0.7504	-0.0498	0.113	0.0745	0.1508	0.721	-0.079	-0.009	-0.004	-0.675	0.456	-0.322	-0.489
NL4-09	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	4	2009	2833	13	2833	14	13	0.2156	0.0339	0.031	-0.0181	0.2876	0.193	-0.02	-0.096	-0.413	-0.22	0.105	-0.325	0.001
NL5-09	NL	Nordic	Exposure	Exp. 7	NL Exp. 7	5	2009	3391	10	3391	11	10	0.1784	0.4309	-0.0045	0.3302	-0.1082	0.118	-0.42	0.286	-0.25	0.008	0.534	0.062	-0.003
PL1-09	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	1	2009	6191	8	6191	9	8	0.1093	0.5353	-0.0213	0.1529	-0.4094	0.018	-0.493	0.215	0.121	0.257	0.375	0.367	0.062
PL2-09	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	2	2009	3026	9	3026	10	9	0.3139	0.0191	0.1809	-0.1127	-0.4485	0.322	-0.044	-0.098	0.047	-0.329	0.113	0.584	0.384
PL3-09	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	3	2009	7868	14	7868	15	14	-0.1802	0.2062	-0.0076	-0.352	-0.1334	-0.221	-0.027	-0.336	0.228	0.063	-0.253	0.415	-0.049
PL4-09	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	4	2009	6140	9	6140	9	9	0.0302	0.5603	0.2765	-0.2864	0.2338	-0.064	-0.494	-0.487	0.011	0.041	-0.027	0.108	0.22
PL5-09	PL	Pecors	Exposure	Exp. 5	PL Exp. 5	5	2009	13773	12	13773	12	12	0.3969	-0.0037	-0.1342	-0.0066	-0.078	0.34	0.021	0.034	0.379	-0.331	0.169	0.002	-0.825

Appendix Table E.41: Summary statistics for benthic metrics at SRWMP lakes, 2009.

						95% Confidence Interval for Mean			
		n	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Density (Ind./m2)	Dunlop	5	12363.400	3131.917	1400.636	8474.612	16252.188	8071.000	15514.000
	Rochester	5	865.800	401.560	179.583	367.198	1364.402	252.000	1322.000
	Semiwhite	5	4548.200	1221.868	546.436	3031.051	6065.349	3131.000	6165.000
	Summers	5	2987.200	1313.119	587.245	1356.747	4617.653	2069.000	5287.000
	Ten Mile	5	7406.200	2731.104	1221.387	4015.086	10797.314	3443.000	10785.000
	mean of 4 Ref. Lakes (no RL)	4	6826.250	4120.040	2060.020	270.347	13382.153	2987.200	12363.400
	Quirke	5	1284.800	297.717	133.143	915.135	1654.465	870.000	1593.000
	McCabe	5	6408.600	1277.069	571.123	4822.909	7994.291	5167.000	8294.000
	May	5	3600.200	1921.580	859.357	1214.243	5986.157	1809.000	6539.000
	Hough	5	3749.800	2133.544	954.150	1100.655	6398.945	1574.000	6950.000
	Pecors	5	7399.600	3969.109	1775.040	2471.300	12327.900	3026.000	13773.000
	Elliot	5	4086.200	1745.999	780.835	1918.255	6254.145	1228.000	5879.000
	Nordic	5	2439.800	743.173	332.357	1517.029	3362.571	1433.000	3391.000
	McCarthy	5	4333.800	1991.360	890.563	1861.200	6806.400	1634.000	6260.000
Number of Taxa	Dunlop	5	14.800	3.114	1.393	10.930	18.670	10.000	18.000
	Rochester	5	6.000	1.871	0.837	3.680	8.320	3.000	8.000
	Semiwhite	5	12.600	2.302	1.030	9.740	15.460	10.000	15.000
	Summers	5	10.800	2.168	0.970	8.110	13.490	8.000	14.000
	Ten Mile	5	11.000	1.871	0.837	8.680	13.320	9.000	14.000
	mean of 4 Ref. Lakes (no RL)	4	12.300	1.851	0.926	9.350	15.250	11.000	15.000
	Quirke	5	6.400	0.548	0.245	5.720	7.080	6.000	7.000
	McCabe	5	13.600	3.362	1.503	9.430	17.770	9.000	18.000
	May	5	8.800	2.683	1.200	5.470	12.130	6.000	13.000
	Hough	5	10.600	2.510	1.122	7.480	13.720	7.000	13.000
	Pecors	5	10.400	2.510	1.122	7.280	13.520	8.000	14.000
	Elliot	5	13.000	3.536	1.581	8.610	17.390	9.000	17.000
	Nordic	5	13.600	2.191	0.980	10.880	16.320	10.000	15.000
	McCarthy	5	11.800	2.280	1.020	8.970	14.630	9.000	15.000
CA Axis-1 (14.4%)	Dunlop	5	-0.387	0.153	0.068	-0.577	-0.198	-0.604	-0.206
	Rochester	5	-0.111	0.232	0.104	-0.399	0.176	-0.446	0.143
	Semiwhite	5	-0.224	0.073	0.033	-0.315	-0.134	-0.314	-0.148
	Summers	5	-0.160	0.177	0.079	-0.380	0.061	-0.400	0.025
	Ten Mile	5	-0.069	0.128	0.057	-0.229	0.090	-0.152	0.158
	mean of 4 Ref. Lakes (no RL)	4	-0.210	0.134	0.067	-0.424	0.003	-0.387	-0.069
	Quirke	5	0.917	0.415	0.186	0.402	1.433	0.464	1.364
	McCabe	5	-0.443	0.181	0.081	-0.669	-0.218	-0.672	-0.164
	May	5	0.247	0.157	0.070	0.053	0.442	-0.023	0.365
	Hough	5	0.165	0.196	0.088	-0.079	0.409	-0.138	0.340
	Pecors	5	0.134	0.230	0.103	-0.152	0.420	-0.180	0.397
	Elliot	5	-0.299	0.112	0.050	-0.438	-0.159	-0.459	-0.196
	Nordic	5	0.328	0.300	0.134	-0.045	0.701	-0.012	0.750
	McCarthy	5	0.013	0.067	0.030	-0.070	0.096	-0.072	0.104
CA Axis-2 12.7%)	Dunlop	5	0.346	0.096	0.043	0.226	0.465	0.269	0.474
	Rochester	5	-0.957	0.244	0.109	-1.260	-0.654	-1.314	-0.734
	Semiwhite	5	0.164	0.199	0.089	-0.083	0.411	-0.181	0.319
	Summers	5	-0.263	0.457	0.204	-0.831	0.304	-1.007	0.106
	Ten Mile	5	-0.034	0.119	0.053	-0.182	0.114	-0.157	0.157
	mean of 4 Ref. Lakes (no RL)	4	0.053	0.262	0.131	-0.364	0.470	-0.263	0.346
	Quirke	5	0.083	0.119	0.053	-0.065	0.232	-0.017	0.272
	McCabe	5	0.932	0.178	0.079	0.712	1.153	0.774	1.187
	May	5	-0.043	0.231	0.103	-0.330	0.244	-0.338	0.304
	Hough	5	0.323	0.296	0.132	-0.045	0.690	0.092	0.791
	Pecors	5	0.263	0.272	0.122	-0.075	0.601	-0.004	0.560
	Elliot	5	0.262	0.175	0.078	0.045	0.480	0.122	0.568
	Nordic	5	0.112	0.188	0.084	-0.121	0.345	-0.050	0.431
	McCarthy	5	0.132	0.100	0.045	0.008	0.255	-0.020	0.231
CA Axis-3 (9.1%)	Dunlop	5	0.112	0.090	0.040	0.001	0.223	0.024	0.249
	Rochester	5	0.635	0.428	0.192	0.104	1.167	0.323	1.335
	Semiwhite	5	0.181	0.199	0.089	-0.066	0.428	0.047	0.531
	Summers	5	0.284	0.264	0.118	-0.044	0.612	0.106	0.746
	Ten Mile	5	0.034	0.156	0.070	-0.159	0.227	-0.113	0.206
	mean of 4 Ref. Lakes (no RL)	4	0.153	0.106	0.053	-0.017	0.322	0.034	0.284
	Quirke	5	0.159	0.144	0.064	-0.019	0.337	-0.032	0.370
	McCabe	5	0.211	0.107	0.048	0.079	0.343	0.103	0.387
	May	5	0.066	0.175	0.078	-0.152	0.284	-0.181	0.258
	Hough	5	0.005	0.125	0.056	-0.151	0.160	-0.162	0.119
	Pecors	5	0.059	0.166	0.074	-0.147	0.265	-0.134	0.277
	Elliot	5	0.330	0.145	0.065	0.149	0.510	0.087	0.441
	Nordic	5	0.137	0.183	0.082	-0.090	0.364	-0.005	0.453
	McCarthy	5	0.187	0.111	0.050	0.050	0.325	-0.001	0.292
CA Axis-1, no RL (16.2%)	Dunlop	5	-0.441	0.154	0.069	-0.632	-0.250	-0.679	-0.266
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	-0.240	0.090	0.040	-0.351	-0.128	-0.378	-0.162
	Summers	5	-0.092	0.179	0.080	-0.314	0.131	-0.403	0.024
	Ten Mile	5	-0.090	0.132	0.059	-0.254	0.074	-0.178	0.144
	mean of 4 Ref. Lakes (no RL)	4	-0.216	0.166	0.083	-0.480	0.048	-0.441	-0.090
	Quirke	5	0.909	0.396	0.177	0.418	1.401	0.484	1.307
	McCabe	5	-0.563	0.188	0.084	-0.797	-0.329	-0.816	-0.286
	May	5	0.269	0.095	0.043	0.151	0.387	0.110	0.361
	Hough	5	0.103	0.221	0.099	-0.172	0.378	-0.250	0.314
	Pecors	5	0.079	0.246	0.110	-0.226	0.384	-0.221	0.340
	Elliot	5	-0.282	0.122	0.054	-0.432	-0.131	-0.419	-0.140
	Nordic	5	0.325	0.265	0.118	-0.004	0.653	0.118	0.721
	McCarthy	5	-0.006	0.070	0.031	-0.092	0.081	-0.103	0.071

Appendix Table E.41: Summary statistics for benthic metrics at SRWMP lakes, 2009.

						95% Confidence Interval for Mean			
		n	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
CA Axis-2, no RL (12.9%)	Dunlop	5	-0.262	0.104	0.046	-0.391	-0.133	-0.361	-0.133
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	-0.129	0.102	0.046	-0.256	-0.002	-0.241	0.021
	Summers	5	0.221	0.306	0.137	-0.159	0.600	-0.066	0.670
	Ten Mile	5	0.035	0.181	0.081	-0.190	0.259	-0.220	0.218
	mean of 4 Ref. Lakes (no RL)	4	-0.034	0.209	0.104	-0.366	0.298	-0.262	0.221
	Quirke	5	-0.257	0.151	0.067	-0.444	-0.069	-0.517	-0.131
	McCabe	5	-0.910	0.247	0.110	-1.217	-0.603	-1.174	-0.632
	May	5	0.043	0.074	0.033	-0.049	0.134	-0.053	0.140
	Hough	5	-0.277	0.318	0.142	-0.672	0.118	-0.758	-0.009
	Pecors	5	-0.207	0.262	0.117	-0.533	0.118	-0.494	0.021
	Elliot	5	-0.149	0.113	0.051	-0.290	-0.009	-0.340	-0.059
	Nordic	5	-0.206	0.178	0.080	-0.427	0.015	-0.420	-0.020
	McCarthy	5	-0.040	0.059	0.026	-0.114	0.034	-0.088	0.057
CA Axis-3, no RL (9.7%)	Dunlop	5	-0.202	0.160	0.071	-0.400	-0.003	-0.424	-0.064
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	-0.308	0.078	0.035	-0.405	-0.212	-0.397	-0.192
	Summers	5	-0.317	0.212	0.095	-0.580	-0.054	-0.654	-0.093
	Ten Mile	5	-0.044	0.108	0.048	-0.178	0.090	-0.135	0.128
	mean of 4 Ref. Lakes (no RL)	4	-0.218	0.127	0.064	-0.420	-0.015	-0.317	-0.044
	Quirke	5	0.152	0.092	0.041	0.038	0.266	0.059	0.259
	McCabe	5	0.206	0.351	0.157	-0.230	0.642	-0.378	0.484
	May	5	-0.162	0.167	0.075	-0.370	0.045	-0.421	0.030
	Hough	5	-0.010	0.233	0.104	-0.300	0.279	-0.195	0.392
	Pecors	5	-0.134	0.281	0.126	-0.484	0.215	-0.487	0.215
	Elliot	5	-0.680	0.121	0.054	-0.830	-0.529	-0.875	-0.552
	Nordic	5	0.121	0.280	0.125	-0.226	0.469	-0.108	0.533
	McCarthy	5	-0.487	0.077	0.034	-0.582	-0.392	-0.579	-0.410
2009 CA Axis-1 (20.0%)	Dunlop	5	0.363	0.173	0.078	0.148	0.578	0.148	0.595
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	0.084	0.137	0.061	-0.086	0.254	-0.096	0.267
	Summers	5	-0.241	0.194	0.087	-0.482	0.000	-0.509	-0.014
	Ten Mile	5	0.033	0.142	0.064	-0.144	0.210	-0.195	0.173
	mean of 4 Ref. Lakes (no RL)	4	0.060	0.247	0.124	-0.334	0.454	-0.241	0.363
	Quirke	5	-0.849	0.347	0.155	-1.279	-0.419	-1.161	-0.374
	McCabe	5	0.795	0.313	0.140	0.407	1.183	0.335	1.203
	May	5	-0.382	0.128	0.057	-0.540	-0.224	-0.489	-0.207
	Hough	5	-0.030	0.348	0.156	-0.462	0.403	-0.390	0.515
	Pecors	5	-0.060	0.261	0.117	-0.383	0.264	-0.331	0.257
	Elliot	5	0.028	0.134	0.060	-0.138	0.194	-0.124	0.198
	Nordic	5	-0.286	0.297	0.133	-0.655	0.082	-0.675	0.008
	McCarthy	5	-0.217	0.107	0.048	-0.350	-0.084	-0.356	-0.089
2009 CA Axis-2 (14.5%)	Dunlop	5	-0.151	0.115	0.051	-0.294	-0.008	-0.265	0.011
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	-0.247	0.114	0.051	-0.389	-0.106	-0.371	-0.110
	Summers	5	-0.408	0.213	0.095	-0.672	-0.144	-0.691	-0.196
	Ten Mile	5	-0.099	0.179	0.080	-0.322	0.124	-0.312	0.099
	mean of 4 Ref. Lakes (no RL)	4	-0.226	0.136	0.068	-0.442	-0.010	-0.408	-0.099
	Quirke	5	0.806	0.209	0.093	0.546	1.065	0.465	0.991
	McCabe	5	0.428	0.270	0.121	0.092	0.763	0.085	0.774
	May	5	0.022	0.051	0.023	-0.042	0.085	-0.039	0.062
	Hough	5	0.207	0.237	0.106	-0.087	0.501	0.005	0.590
	Pecors	5	0.075	0.234	0.104	-0.215	0.365	-0.253	0.375
	Elliot	5	-0.378	0.087	0.039	-0.486	-0.270	-0.494	-0.264
	Nordic	5	0.426	0.213	0.095	0.162	0.691	0.105	0.675
	McCarthy	5	-0.202	0.087	0.039	-0.310	-0.095	-0.300	-0.133
2009 CA Axis-3 (11.%)	Dunlop	5	-0.212	0.086	0.039	-0.319	-0.105	-0.310	-0.125
	Rochester	0	.	.	.	.	.	.	.
	Semiwhite	5	-0.210	0.138	0.062	-0.382	-0.039	-0.359	-0.008
	Summers	5	-0.013	0.278	0.124	-0.358	0.332	-0.380	0.398
	Ten Mile	5	-0.479	0.182	0.081	-0.704	-0.253	-0.617	-0.188
	mean of 4 Ref. Lakes (no RL)	4	-0.229	0.191	0.096	-0.533	0.076	-0.479	-0.013
	Quirke	5	0.115	0.301	0.134	-0.258	0.488	-0.407	0.364
	McCabe	5	0.212	0.123	0.055	0.059	0.365	0.075	0.327
	May	5	-0.022	0.115	0.051	-0.164	0.120	-0.182	0.127
	Hough	5	0.020	0.143	0.064	-0.157	0.197	-0.167	0.219
	Pecors	5	0.295	0.237	0.106	0.001	0.589	0.002	0.584
	Elliot	5	0.344	0.130	0.058	0.183	0.506	0.164	0.509
	Nordic	5	-0.214	0.162	0.072	-0.414	-0.013	-0.325	0.062
	McCarthy	5	0.481	0.156	0.070	0.288	0.674	0.225	0.630

Appendix Table E.42: Levene's homogeneity of variance tests for user-defined contrast tests between reference lake means and each exposure Lake, 2009.

	Levene Statistic	df1	df2	Sig.
Density (Ind./m2)	2.345	8	35	0.039
Number of Taxa	1.333	8	35	0.260
CA Axis-1, no RL (16.2%)	3.532	8	35	0.004
CA Axis-2, no RL (12.9%)	4.854	8	35	0.000
CA Axis-3, no RL (9.7%)	1.800	8	35	0.110
Barium (mg/kg)	30.136	8	35	0.000
Cobalt (mg/kg)	5.707	8	35	0.000
Iron (mg/kg)	0.755	8	35	0.643
Manganese (mg/kg)	2.667	8	35	0.021
Nickel (mg/kg)	4.889	8	35	0.000
Ra-226 (Bq/g)	4.004	8	35	0.002
Uranium (mg/kg)	6.604	8	35	0.000
TOC (%)	1.837	8	35	0.103
Depth (m)	2.209	8	35	0.051
Secchi Depth (m)	5.311	8	35	0.000
Water Temperature (°C)	5.105	8	35	0.000
DO (% sat)	3.352	8	35	0.006
pH	1.424	8	30	0.227
Fines (%; silt + clay)	1.031	8	35	0.432

Significant at p-value = 0.05

Table E.43: User-defined contrast tests between reference lake means and each exposure lake, 2009.

		Contrast	Sig. (2-tailed)	Effect Size (# ref. SDs)	Variation from ref. Mean (%)
Density (Ind./m2)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.07410	-1.34	-81.2
		Ref. Means(-RL) vs. ML	0.85602	-0.10	-6.1
		Ref. Means(-RL) vs. MAL	0.22116	-0.78	-47.3
		Ref. Means(-RL) vs. HOL	0.24253	-0.75	-45.1
		Ref. Means(-RL) vs. PL	0.83952	0.14	8.4
		Ref. Means(-RL) vs. EL	0.28371	-0.67	-40.1
		Ref. Means(-RL) vs. NL	0.12180	-1.06	-64.3
		Ref. Means(-RL) vs. MCL	0.32735	-0.60	-36.5
Number of Taxa	Assume equal variances	Ref. Means(-RL) vs. QL	0.00143	-3.19	-48.0
		Ref. Means(-RL) vs. ML	0.45067	0.70	10.6
		Ref. Means(-RL) vs. MAL	0.04753	-1.89	-28.5
		Ref. Means(-RL) vs. HOL	0.32534	-0.92	-13.8
		Ref. Means(-RL) vs. PL	0.27248	-1.03	-15.4
		Ref. Means(-RL) vs. EL	0.68375	0.38	5.7
		Ref. Means(-RL) vs. NL	0.45067	0.70	10.6
		Ref. Means(-RL) vs. MCL	0.77095	-0.27	-4.1
2009 CA Axis-1 (20.0%)	Assume equal variances	Ref. Means(-RL) vs. QL	0.00001	-3.67	-1520.9
		Ref. Means(-RL) vs. ML	0.00016	2.97	1230.9
		Ref. Means(-RL) vs. MAL	0.01556	-1.79	-739.3
		Ref. Means(-RL) vs. HOL	0.61022	-0.36	-149.5
		Ref. Means(-RL) vs. PL	0.49585	-0.48	-200.1
		Ref. Means(-RL) vs. EL	0.85513	-0.13	-53.5
		Ref. Means(-RL) vs. NL	0.05414	-1.40	-579.3
		Ref. Means(-RL) vs. MCL	0.12037	-1.12	-462.8
2009 CA Axis-2 (14.5%)	Assume equal variances	Ref. Means(-RL) vs. QL	0.00000	7.60	456.1
		Ref. Means(-RL) vs. ML	0.00001	4.82	289.1
		Ref. Means(-RL) vs. MAL	0.05521	1.83	109.6
		Ref. Means(-RL) vs. HOL	0.00142	3.19	191.5
		Ref. Means(-RL) vs. PL	0.02124	2.22	133.3
		Ref. Means(-RL) vs. EL	0.23310	-1.12	-67.1
		Ref. Means(-RL) vs. NL	0.00001	4.81	288.5
		Ref. Means(-RL) vs. MCL	0.84861	0.18	10.6
2009 CA Axis-3 (11.%)	Assume equal variances	Ref. Means(-RL) vs. QL	0.00798	1.80	150.3
		Ref. Means(-RL) vs. ML	0.00095	2.30	192.8
		Ref. Means(-RL) vs. MAL	0.09991	1.08	90.3
		Ref. Means(-RL) vs. HOL	0.04940	1.30	108.8
		Ref. Means(-RL) vs. PL	0.00013	2.74	229.2
		Ref. Means(-RL) vs. EL	0.00004	2.99	250.7
		Ref. Means(-RL) vs. NL	0.90355	0.08	6.5
		Ref. Means(-RL) vs. MCL	0.00000	3.71	310.5
Barium (mg/kg)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.05270	3.15	277.2
		Ref. Means(-RL) vs. ML	0.08605	11.54	1016.8
		Ref. Means(-RL) vs. MAL	0.64415	-0.27	-23.5
		Ref. Means(-RL) vs. HOL	0.28598	-0.65	-57.0
		Ref. Means(-RL) vs. PL	0.35917	-0.54	-47.6
		Ref. Means(-RL) vs. EL	0.74302	0.19	16.5
		Ref. Means(-RL) vs. NL	0.30750	0.65	57.1
		Ref. Means(-RL) vs. MCL	0.76574	-0.16	-14.5
Cobalt (mg/kg)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.10333	4.77	187.6
		Ref. Means(-RL) vs. ML	0.01141	30.81	1212.4
		Ref. Means(-RL) vs. MAL	0.01488	3.51	138.2
		Ref. Means(-RL) vs. HOL	0.00722	2.56	100.7
		Ref. Means(-RL) vs. PL	0.00021	5.07	199.6
		Ref. Means(-RL) vs. EL	0.00022	11.54	454.3
		Ref. Means(-RL) vs. NL	0.01161	18.21	716.5
		Ref. Means(-RL) vs. MCL	0.00125	16.68	656.6
Iron (mg/kg)	Assume equal variances	Ref. Means(-RL) vs. QL	0.00267	3.04	129.1
		Ref. Means(-RL) vs. ML	0.00002	4.68	198.9
		Ref. Means(-RL) vs. MAL	0.00003	4.51	191.8
		Ref. Means(-RL) vs. HOL	0.01361	2.44	103.8
		Ref. Means(-RL) vs. PL	0.42252	0.76	32.4
		Ref. Means(-RL) vs. EL	0.01177	2.50	106.1
		Ref. Means(-RL) vs. NL	0.00011	4.08	173.5
		Ref. Means(-RL) vs. MCL	0.01991	2.29	97.4
Manganese (mg/kg)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.27260	0.87	72.9
		Ref. Means(-RL) vs. ML	0.05205	7.17	601.8
		Ref. Means(-RL) vs. MAL	0.10506	1.47	123.1
		Ref. Means(-RL) vs. HOL	0.66834	0.24	20.3
		Ref. Means(-RL) vs. PL	0.59619	0.33	27.8
		Ref. Means(-RL) vs. EL	0.03563	4.17	349.5
		Ref. Means(-RL) vs. NL	0.02341	8.50	712.9
		Ref. Means(-RL) vs. MCL	0.00178	4.96	416.3

Significant at p-value = 0.1

Effect size more than 2.0 ref. SDs

Table E.43: User-defined contrast tests between reference lake means and each exposure lake, 2009.

		Contrast	Sig. (2-tailed)	Effect Size (# ref. SDs)	Variation from ref. Mean (%)
Nickel (mg/kg)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.27701	1.87	25.1
		Ref. Means(-RL) vs. ML	0.00763	29.54	396.6
		Ref. Means(-RL) vs. MAL	0.04054	6.79	91.1
		Ref. Means(-RL) vs. HOL	0.00002	7.30	98.0
		Ref. Means(-RL) vs. PL	0.00388	5.54	74.4
		Ref. Means(-RL) vs. EL	0.00002	12.22	164.0
		Ref. Means(-RL) vs. NL	0.00059	8.70	116.7
		Ref. Means(-RL) vs. MCL	0.00099	8.40	112.8
Ra-226 (Bq/g)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.02514	74.59	3037.9
		Ref. Means(-RL) vs. ML	0.00002	289.65	11796.6
		Ref. Means(-RL) vs. MAL	0.00311	48.34	1969.0
		Ref. Means(-RL) vs. HOL	0.00034	37.76	1537.9
		Ref. Means(-RL) vs. PL	0.00320	11.77	479.3
		Ref. Means(-RL) vs. EL	0.00070	31.24	1272.4
		Ref. Means(-RL) vs. NL	0.00344	98.72	4020.7
		Ref. Means(-RL) vs. MCL	0.00778	30.40	1237.9
Uranium (mg/kg)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.00567	548.65	9957.1
		Ref. Means(-RL) vs. ML	0.00835	507.72	9214.3
		Ref. Means(-RL) vs. MAL	0.00010	139.96	2540.0
		Ref. Means(-RL) vs. HOL	0.00000	132.09	2397.1
		Ref. Means(-RL) vs. PL	0.00003	173.96	3157.1
		Ref. Means(-RL) vs. EL	0.00074	262.13	4757.1
		Ref. Means(-RL) vs. NL	0.00127	236.94	4300.0
		Ref. Means(-RL) vs. MCL	0.00041	211.75	3842.9
TOC (%)	Assume equal variances	Ref. Means(-RL) vs. QL	0.05568	-1.40	-21.3
		Ref. Means(-RL) vs. ML	0.89696	0.09	1.4
		Ref. Means(-RL) vs. MAL	0.42928	-0.56	-8.6
		Ref. Means(-RL) vs. HOL	0.01721	-1.77	-26.9
		Ref. Means(-RL) vs. PL	0.00003	-3.40	-51.7
		Ref. Means(-RL) vs. EL	0.00414	-2.17	-33.0
		Ref. Means(-RL) vs. NL	0.07377	-1.30	-19.8
		Ref. Means(-RL) vs. MCL	0.00041	-2.76	-42.0
Depth (m)	Assume equal variances	Ref. Means(-RL) vs. QL	0.00000	3.83	32.8
		Ref. Means(-RL) vs. ML	0.24462	-0.51	-4.4
		Ref. Means(-RL) vs. MAL	0.12866	-0.68	-5.8
		Ref. Means(-RL) vs. HOL	0.36224	-0.40	-3.4
		Ref. Means(-RL) vs. PL	0.06009	-0.84	-7.2
		Ref. Means(-RL) vs. EL	0.48109	-0.31	-2.6
		Ref. Means(-RL) vs. NL	0.04806	-0.89	-7.6
		Ref. Means(-RL) vs. MCL	0.26443	-0.49	-4.2
Secchi Depth (m)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.19765	0.95	20.5
		Ref. Means(-RL) vs. ML	0.17518	-0.88	-19.0
		Ref. Means(-RL) vs. MAL	0.55278	-0.34	-7.4
		Ref. Means(-RL) vs. HOL	0.85870	-0.10	-2.1
		Ref. Means(-RL) vs. PL	0.62922	-0.28	-6.1
		Ref. Means(-RL) vs. EL	0.06513	-1.41	-30.4
		Ref. Means(-RL) vs. NL	0.53644	-0.36	-7.7
		Ref. Means(-RL) vs. MCL	0.06422	-1.42	-30.7
Water Temperature (°C)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.55334	-0.58	-6.3
		Ref. Means(-RL) vs. ML	0.02070	2.03	21.9
		Ref. Means(-RL) vs. MAL	0.12266	-1.06	-11.5
		Ref. Means(-RL) vs. HOL	0.28056	-0.66	-7.2
		Ref. Means(-RL) vs. PL	0.68184	-0.39	-4.2
		Ref. Means(-RL) vs. EL	0.40729	0.55	5.9
		Ref. Means(-RL) vs. NL	0.09969	-1.20	-13.0
		Ref. Means(-RL) vs. MCL	0.10659	-1.14	-12.4
DO (% sat)	Does not assume equal variances	Ref. Means(-RL) vs. QL	0.16120	0.92	30.1
		Ref. Means(-RL) vs. ML	0.35910	-0.55	-17.9
		Ref. Means(-RL) vs. MAL	0.32939	-0.58	-19.0
		Ref. Means(-RL) vs. HOL	0.15379	-0.95	-31.0
		Ref. Means(-RL) vs. PL	0.21592	-0.78	-25.5
		Ref. Means(-RL) vs. EL	0.37884	-0.52	-16.9
		Ref. Means(-RL) vs. NL	0.08334	-1.26	-41.0
		Ref. Means(-RL) vs. MCL	0.05082	-1.49	-48.6
pH	Assume equal variances	Ref. Means(-RL) vs. QL	0.02793	1.15	10.3
		Ref. Means(-RL) vs. ML	0.00000	2.94	26.4
		Ref. Means(-RL) vs. MAL	0.00001	2.79	25.0
		Ref. Means(-RL) vs. HOL	0.00001	2.80	25.1
		Ref. Means(-RL) vs. PL	0.00000	3.87	34.8
		Ref. Means(-RL) vs. EL	0.14156	0.75	6.8
		Ref. Means(-RL) vs. NL	0.00000	3.00	27.0
		Ref. Means(-RL) vs. MCL	0.00027	2.05	18.4
Fines (%; silt + clay)	Assume equal variances	Ref. Means(-RL) vs. QL	0.02556	-2.62	-16.5
		Ref. Means(-RL) vs. ML	0.00200	-3.76	-23.6
		Ref. Means(-RL) vs. MAL	0.00227	-3.71	-23.3
		Ref. Means(-RL) vs. HOL	0.63759	-0.53	-3.4
		Ref. Means(-RL) vs. PL	0.61261	-0.57	-3.6
		Ref. Means(-RL) vs. EL	0.50497	-0.76	-4.8
		Ref. Means(-RL) vs. NL	0.08975	-1.96	-12.4
		Ref. Means(-RL) vs. MCL	0.72386	-0.40	-2.5

Significant at p-value = 0.1

Effect size more than 2.0 ref. SDs

Appendix Table E.44: Benthic Analyses - ANOVA results testing differences between 3 sample years, SRWMP.

Dependent Variable	Mean Square	F (ANOVA)	p-value	Observed Power
Density (Ind./m2)	34604219.4160	3.6080	0.030000	0.6580
Number of Taxa	152.5830	16.1100	0.000000	1.0000
CA Axis-1, no RL (16.2%)	0.8730	3.6830	0.028000	0.6680
CA Axis-2, no RL (12.9%)	1.5230	12.7560	0.000000	0.9960
CA Axis-3, no RL (9.7%)	1.7330	20.3480	0.000000	1.0000

Significant at p-value = 0.1

Appendix Table E.45: Post-hoc pairwise comparisons between 3 study years, SRWMP.

						post-hoc multiple comparison test		
Dependent Variable	Levene's Test[1]	(I) YEAR	(J) YEAR	Mean Difference (I-J)	Std. Error	p-value adjusted for all possible pairwise comparisons	Lower 95% CL	Upper 95% CL
Density (Ind./m2)	Bonferroni	1999	2004	-766.463	763.659	0.952475	-2619.782	1086.856
		1999	2009	-1806.271	700.444	0.033252	-3506.173	-106.369
		2004	2009	-1039.808	642.094	0.323705	-2598.101	518.485
Number of Taxa	Bonferroni	1999	2004	-3.570	0.759	0.000020	-5.415	-1.732
		1999	2009	-3.760	0.696	0.000001	-5.450	-2.071
		2004	2009	-0.190	0.638	1.000000	-1.735	1.362
CA Axis-1, no RL (16.2%)	Tamhane	1999	2004	0.206	0.140	0.381478	-0.141	0.553
		1999	2009	0.299	0.132	0.084308	-0.030	0.628
		2004	2009	0.093	0.090	0.667440	-0.127	0.313
CA Axis-2, no RL (12.9%)	Bonferroni	1999	2004	-0.052	0.085	1.000000	-0.259	0.155
		1999	2009	0.278	0.078	0.001575	0.089	0.468
		2004	2009	0.331	0.072	0.000029	0.157	0.504
CA Axis-3, no RL (9.7%)	Bonferroni	1999	2004	0.046	0.072	1.000000	-0.129	0.220
		1999	2009	0.355	0.066	0.000001	0.195	0.515
		2004	2009	0.310	0.061	0.000003	0.163	0.456

[1] if variances found to be significantly heterogenous, post-hoc test was Tamhane's T2, and contrast test was t-test for unequal variances. Otherwise, Bonferroni post-hoc and t-test for equal variances were used.

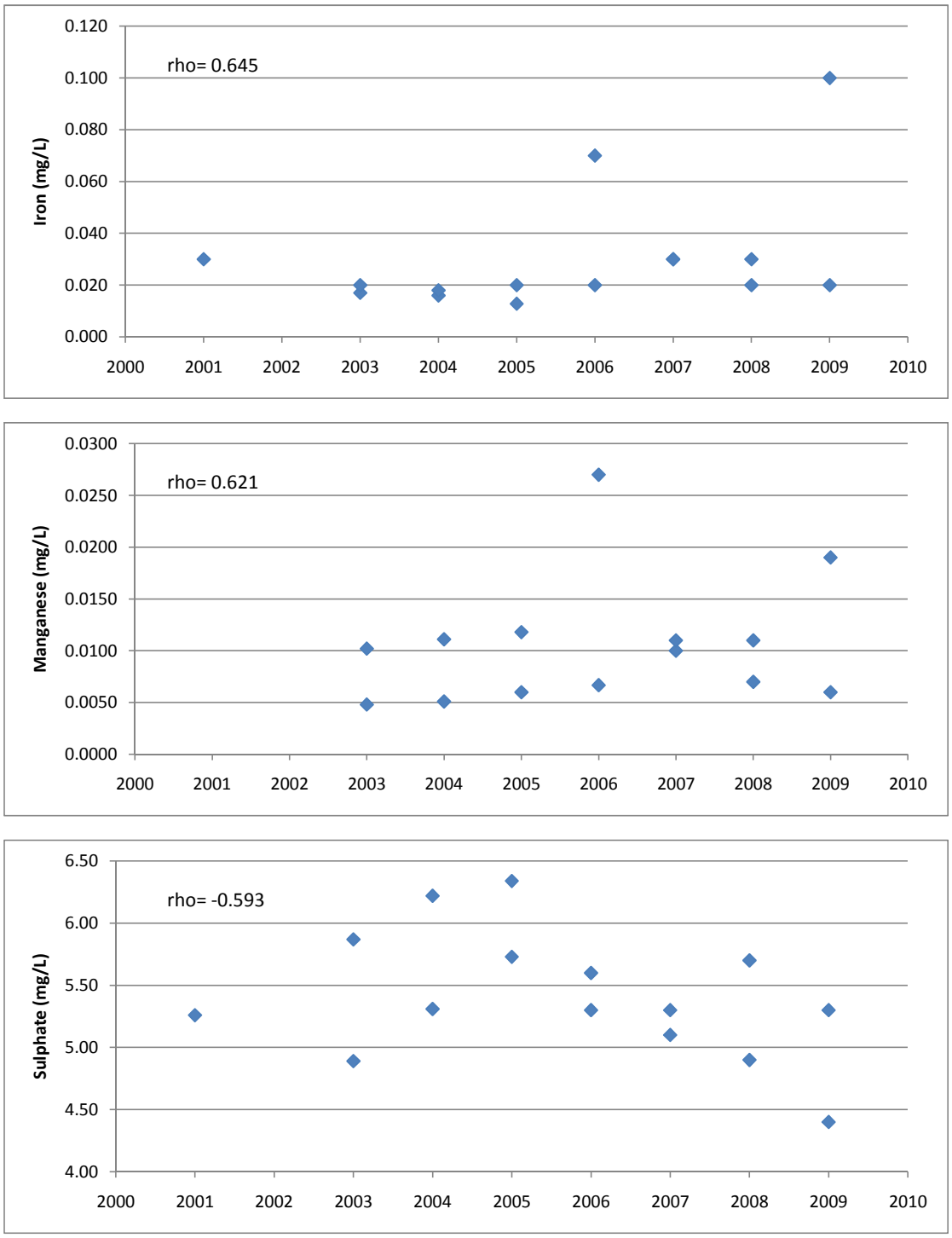
Significant at p-value 0.05

Significant at p-value = 0.1

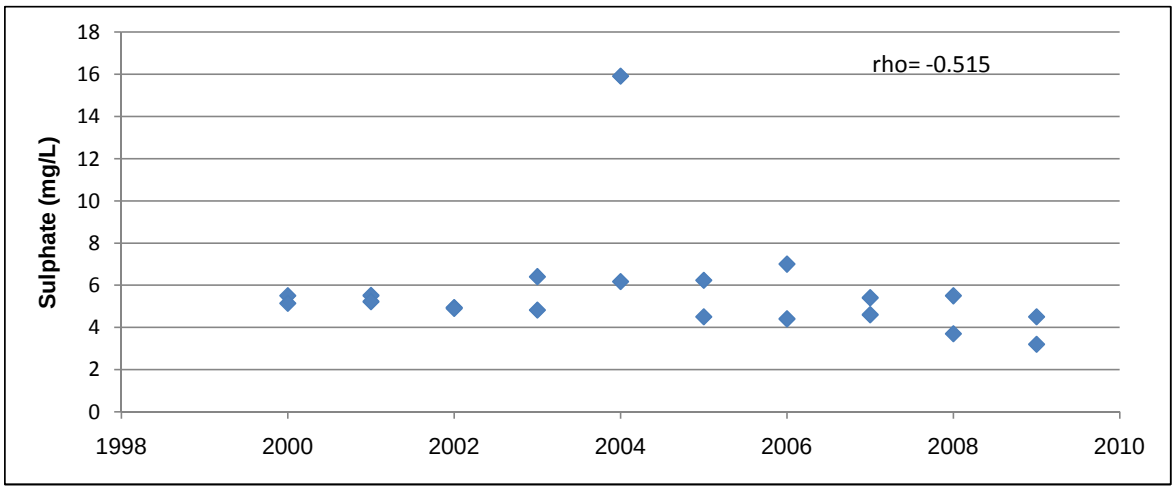
Appendix Table E.46: Exposure lake mean benthic community metrics expressed as percentages of reference lake means for 1999, 2004, and 2009 surveys.

Lake	Code	Density			Number of Taxa			CA-Axis 1*			CA Axis 2*			CA Axis 3*		
		1999	2004	2009	1999	2004	2009	1999	2004	2009	1999	2004	2009	1999	2004	2009
Quirke	QL	-53	-42	-81	-52	-28	-48	751	550	522	-221	-159	-654	-25	-106	170
McCabe	ML	5	-62	-6	-42	-41	11	97	-198	-161	-179	-140	-2573	26	184	195
May	MAL		-68	-47		-20	-28		243	225		-96	225		-149	25
Hough	HOL	-79	-42	-45	-51	1	-14	190	241	148	-139	-168	-713	-82	-78	95
Pecors	PL	-74	-60	8	-54	-31	-15	435	273	137	-154	-109	-509	-78	-9	38
Elliot	EL	-28	-45	-40	1	23	6	-103	-94	-31	131	61	-338	-33	-73	-212
Nordic	NL	27	-9	-64	-38	-7	11	316	412	251	-70	-96	-504	-114	-69	156
McCarthy	MCL	-36	-40	-37	-11	-4	-4	124	115	97	236	81	-17	-115	-109	-124
MEAN		**-36**	**-46**	**-39**	**-37**	**-14**	**-10**	**301**	**220**	**148**	**-71**	**-84**	**-635**	**-57**	**-55**	**43**

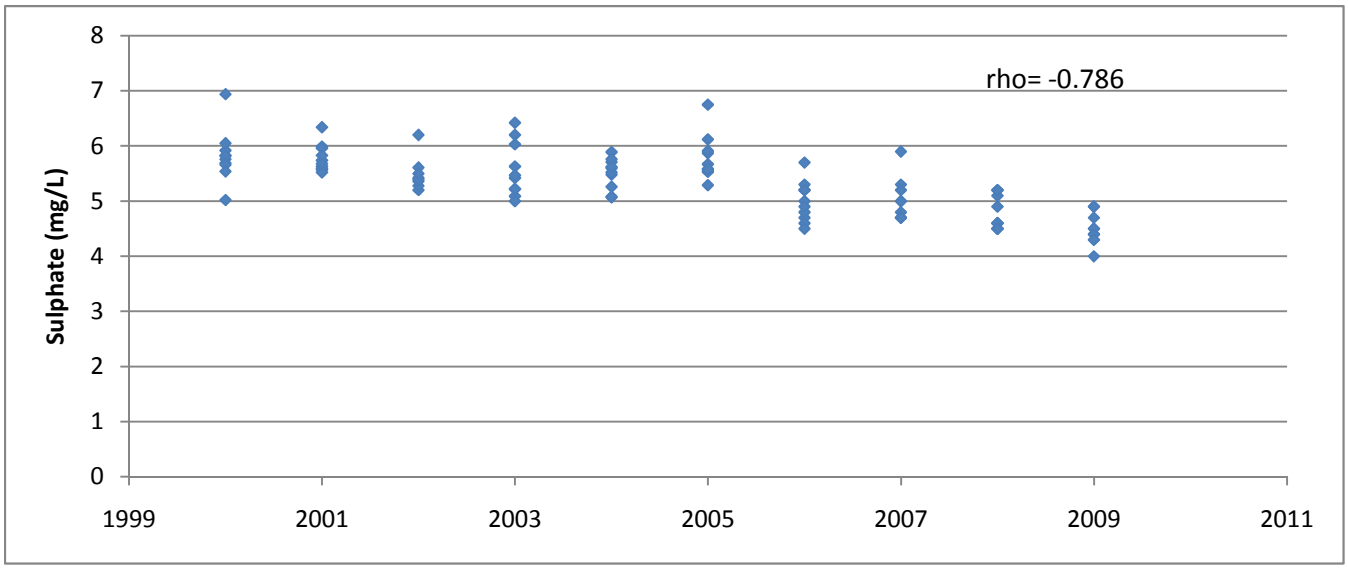
* CA for all years and areas combined.



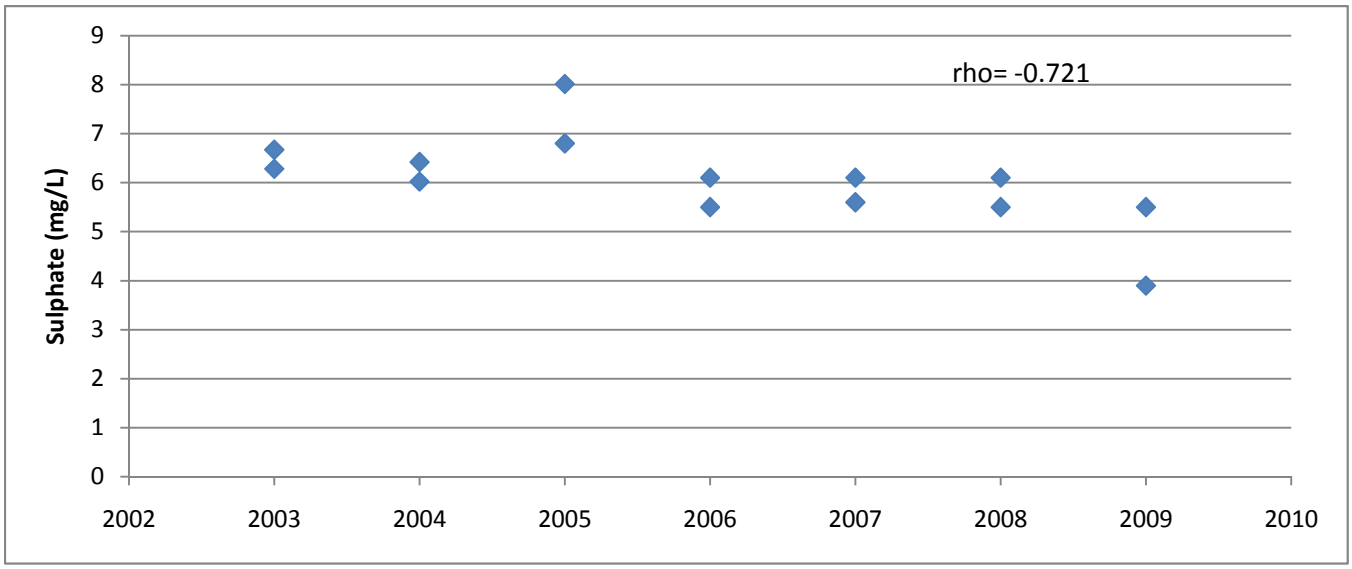
Appendix Figure E.1: Significant common (average) trends observed for iron, manganese and sulphate, over all seasons at Station D-4, 2001 to 2009.



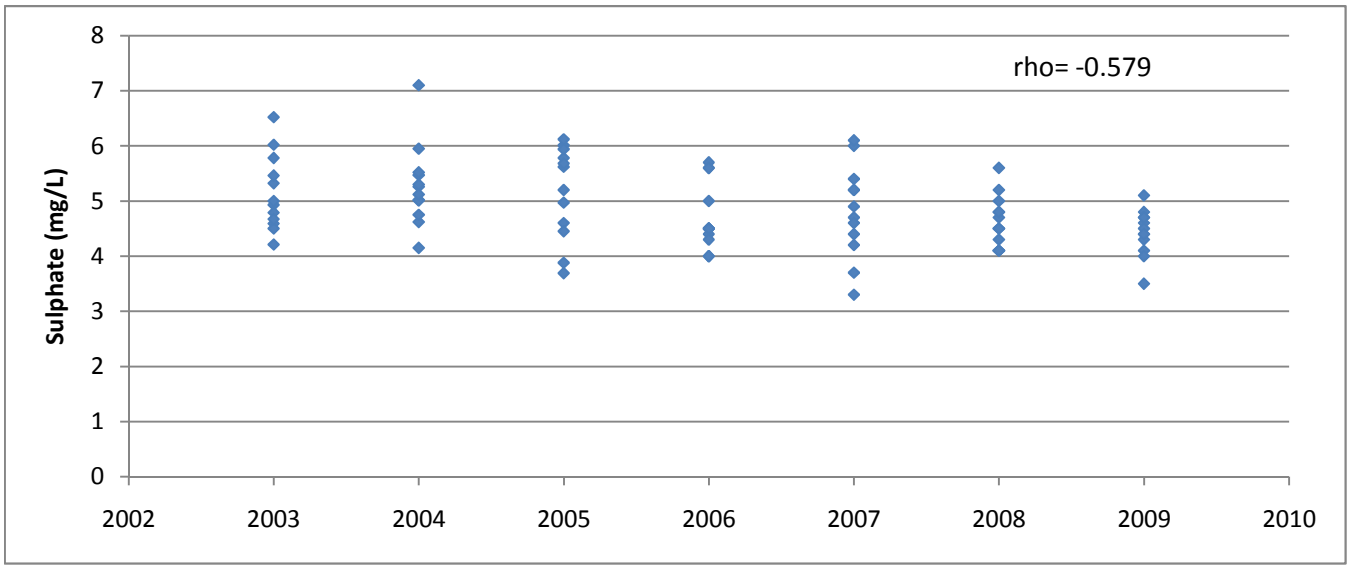
Appendix Figure E.2: Significant common (average) trends observed for sulphate over all seasons at Station P-22, 2000-2009.



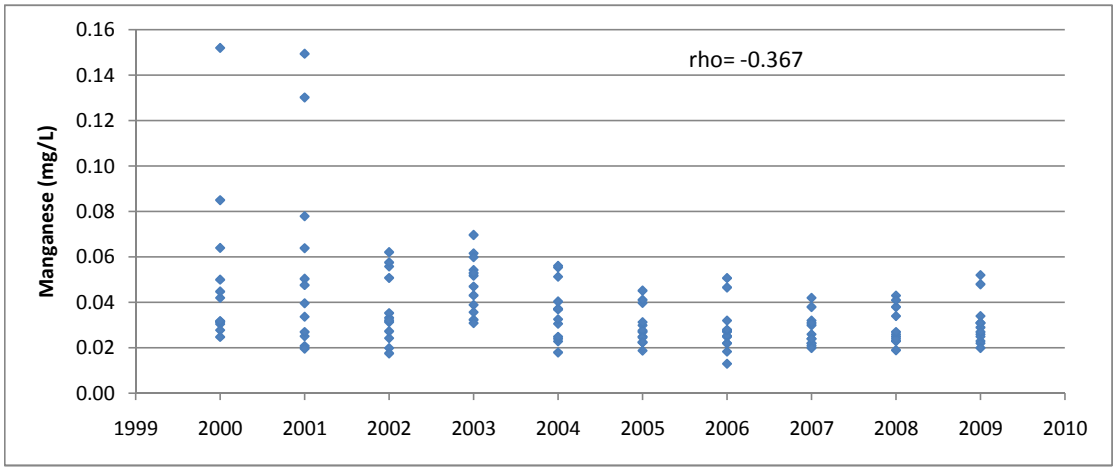
Appendix Figure E.3: Significant common (average) trends observed for sulphate over all seasons at Station SR-05, 2000 to 2009.

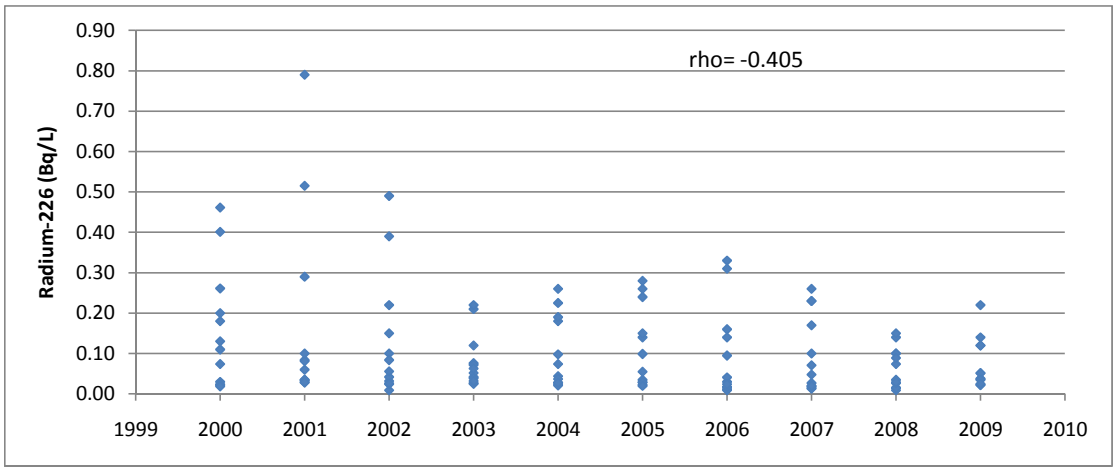


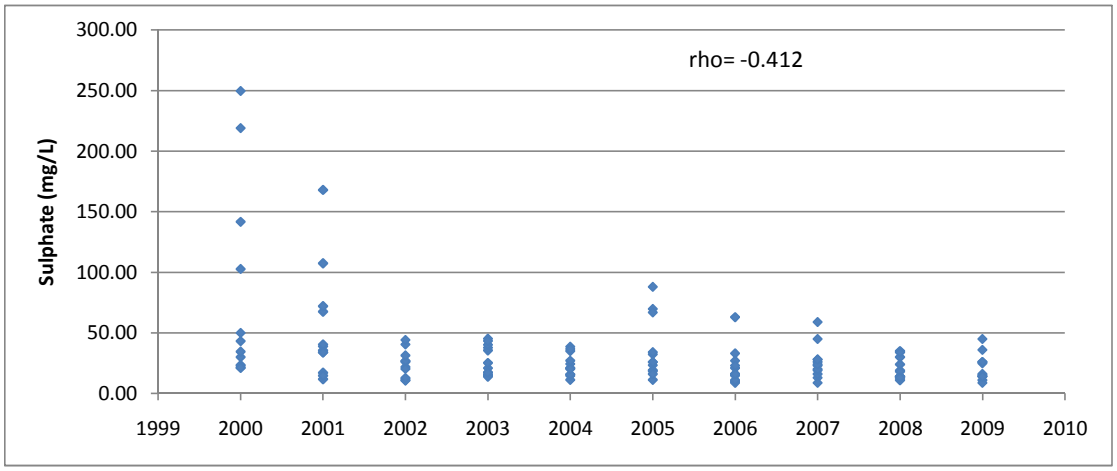
Appendix Figure E.4: Significant common (average) trends observed for sulphate over all seasons at Station SR-18, 2003 to 2009.



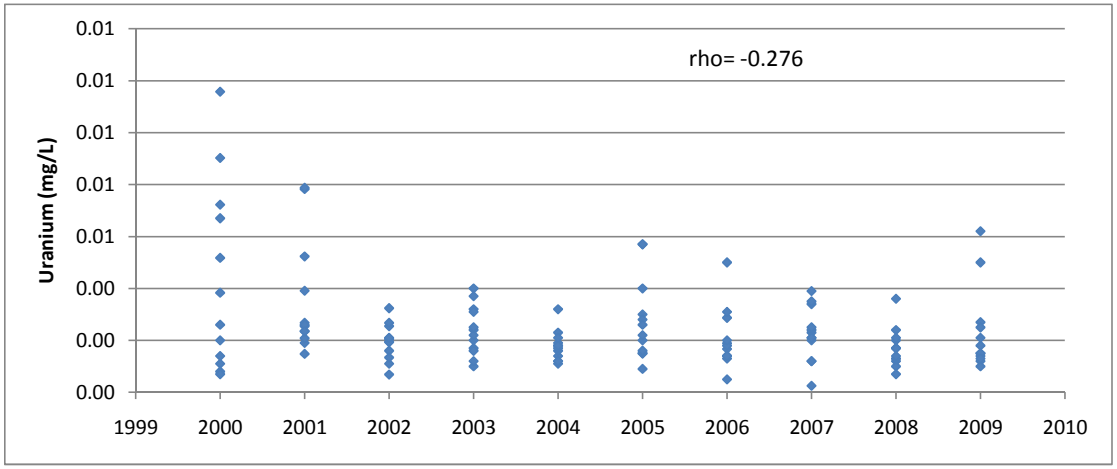
Appendix Figure E.5: Significant common (average) trends observed for sulphate over all seasons at Station SR-19, 2003 to 2009.



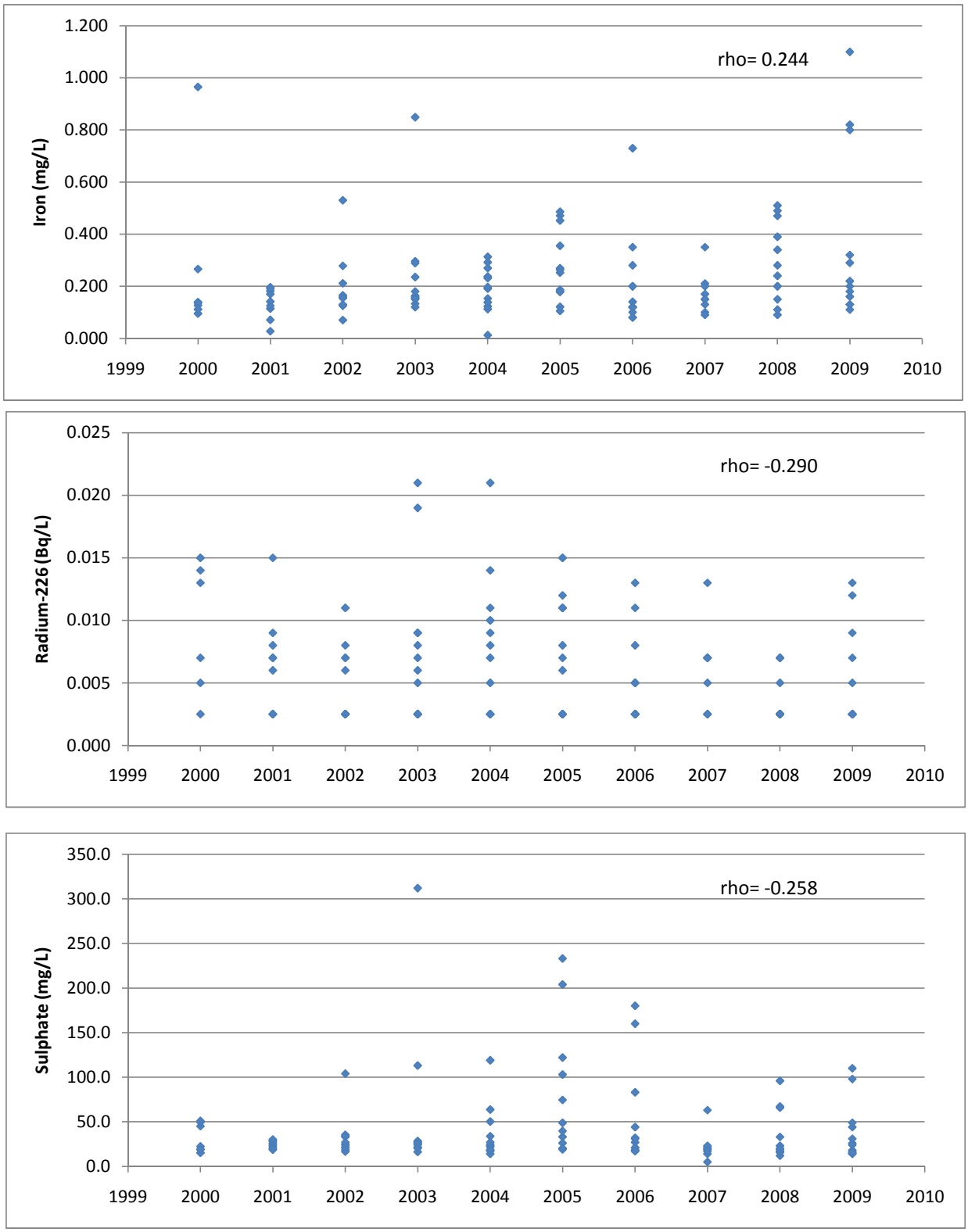




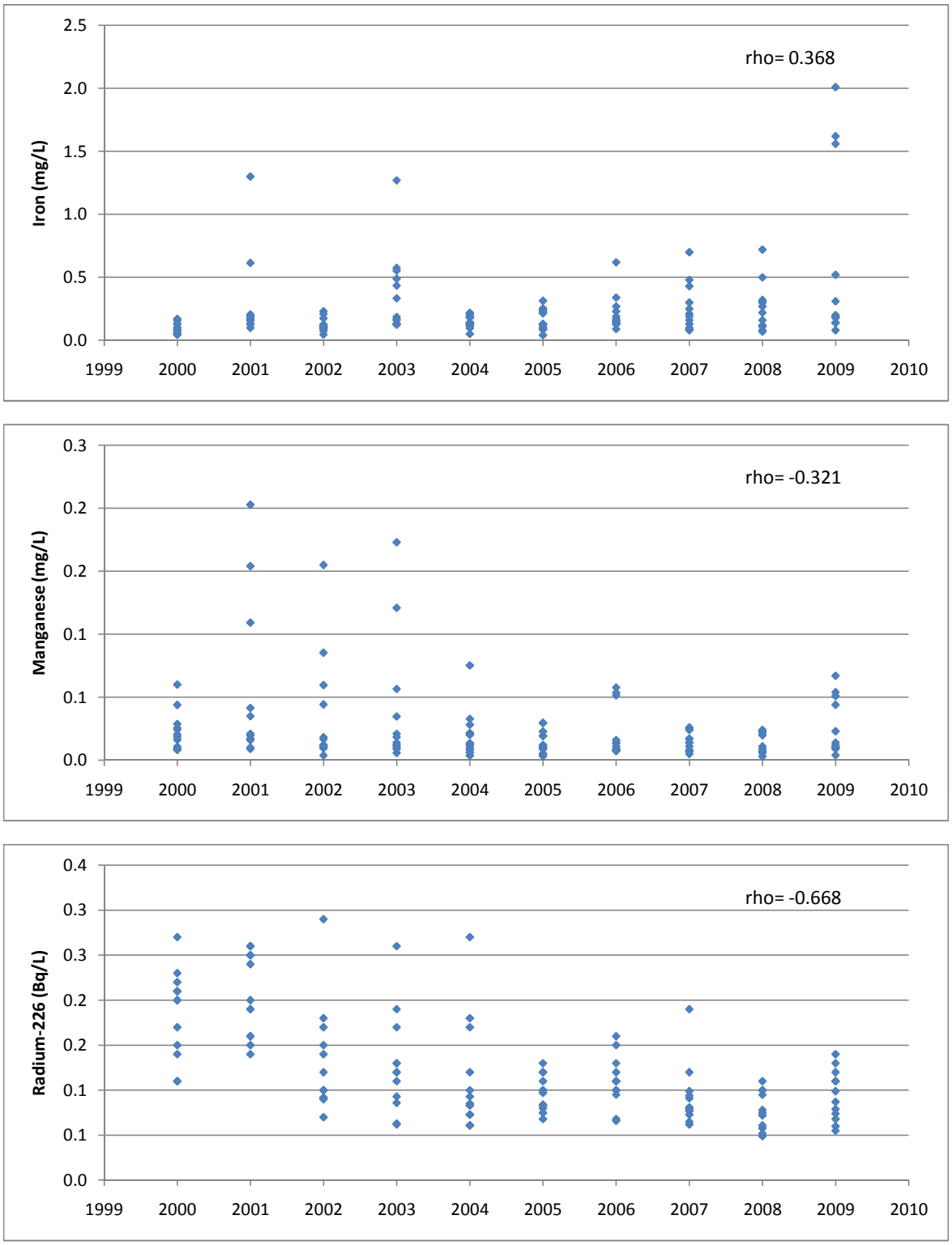
Appendix Figure E.6: Significant common (average) trends observed for manganese, radium-226, sulphate and uranium over all seasons at Station D-5, 2000 to 2009.



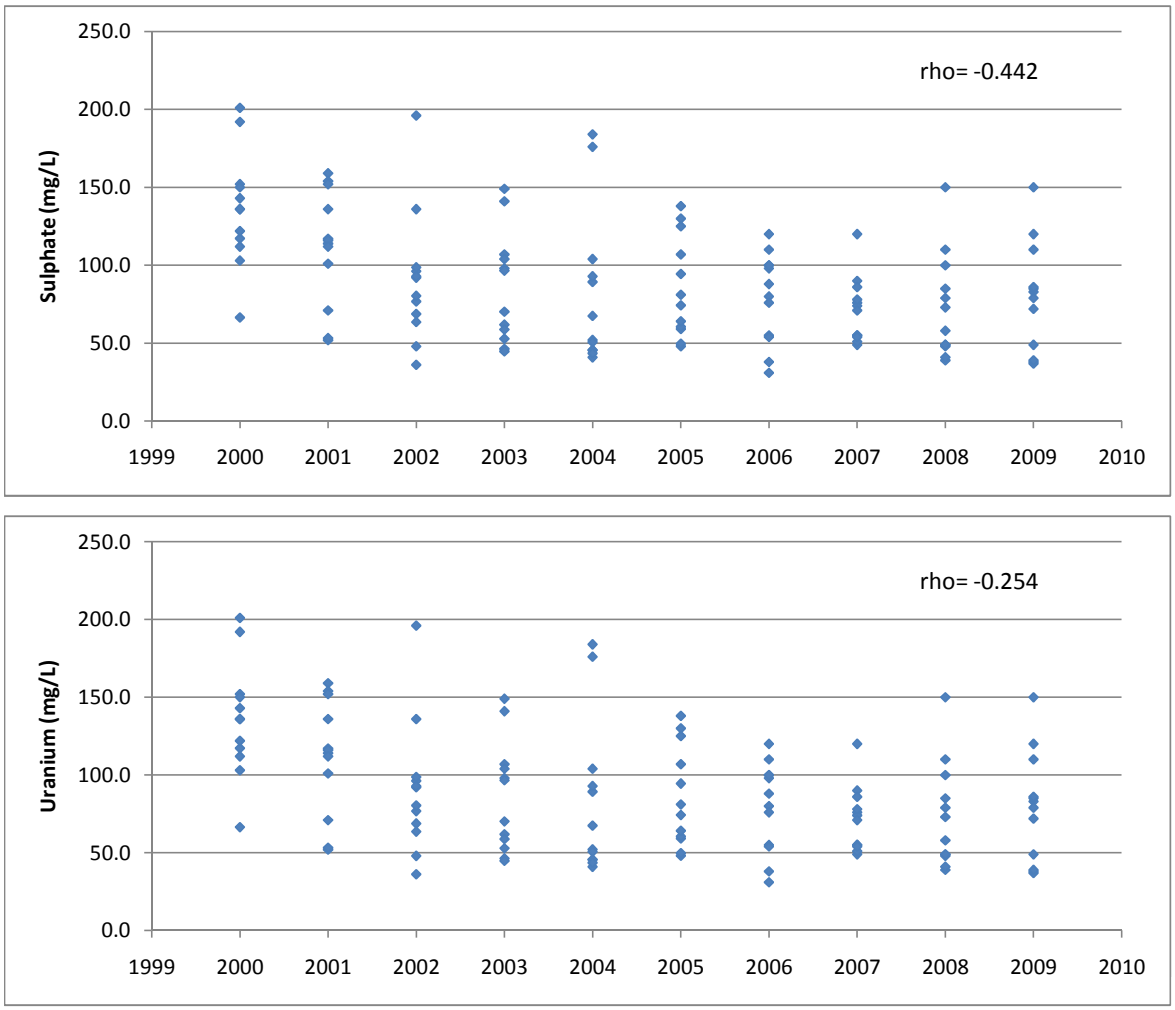
Appendix Figure E.6: Significant common (average) trends observed for manganese, radium-226, sulphate and uranium over all seasons at Station D-5, 2000 to 2009.



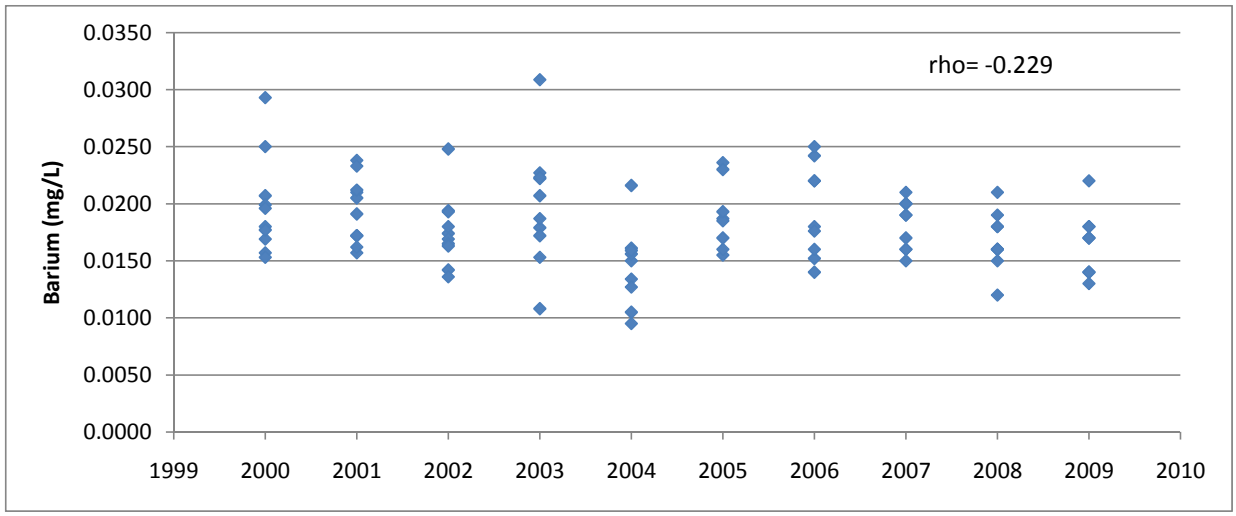
Appendix Figure E.7: Significant common (average) trends observed for iron, radium-226 and sulphate over all seasons at Station D-6, 2000 to 2009.

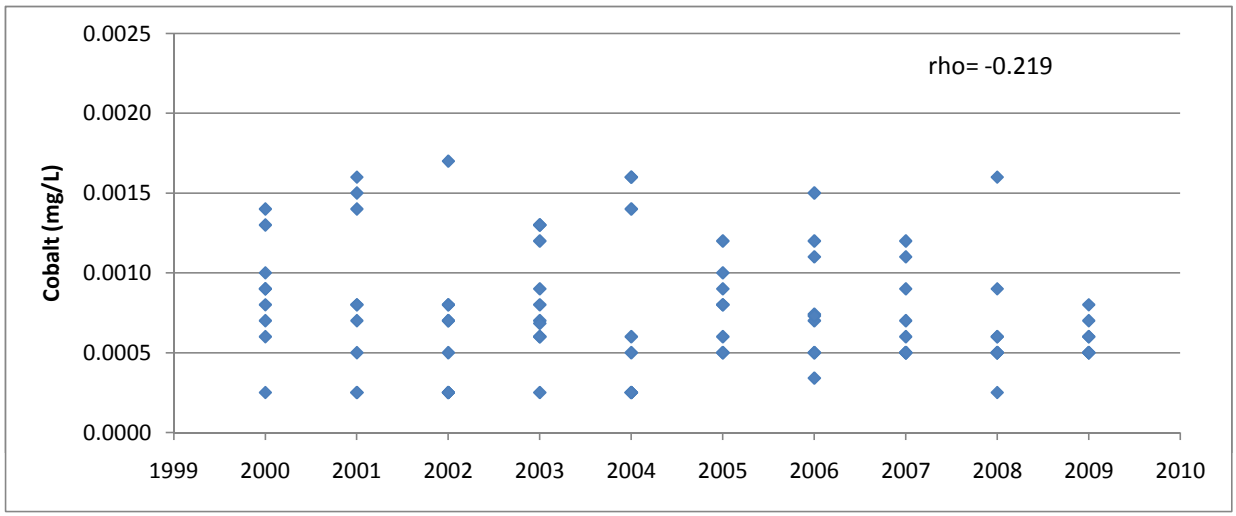


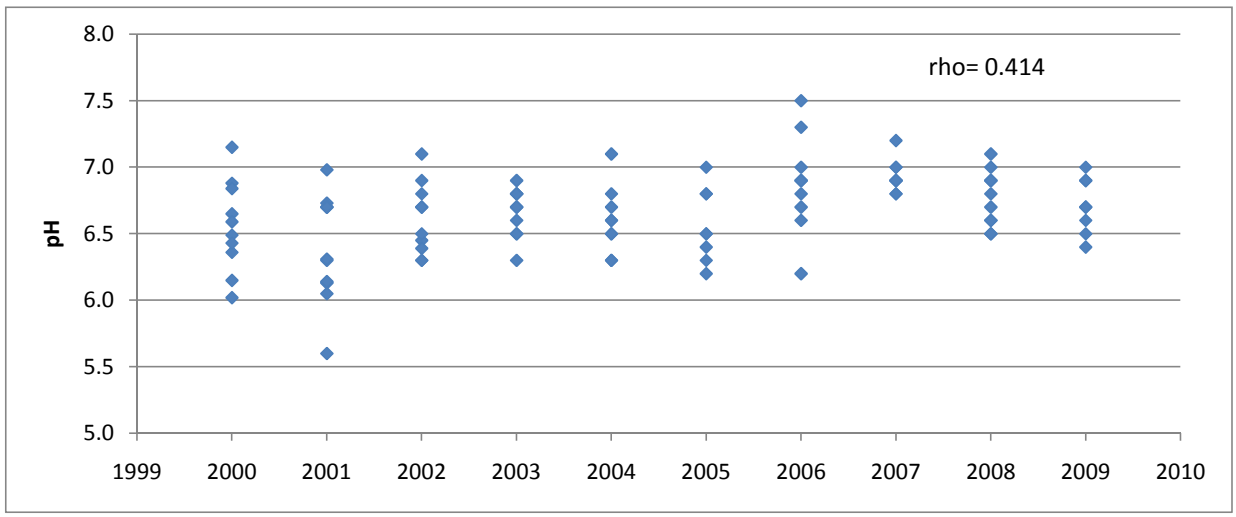
Appendix Figure E.8: Significant common (average) trends observed for iron, manganese, radium-226, sulphate and uranium over all seasons at Station DS-18, 2000 to 2009.



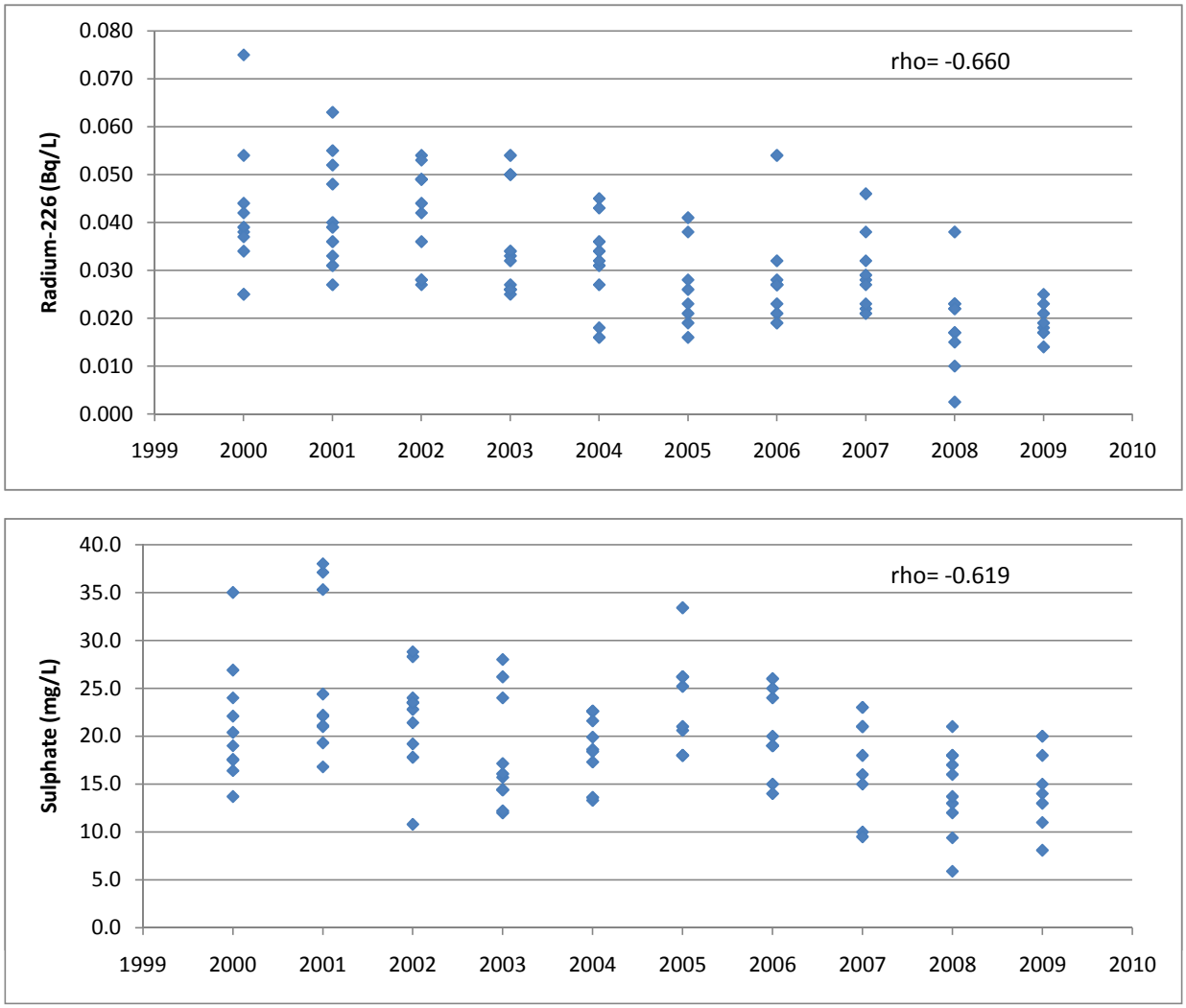
Appendix Figure E.8: Significant common (average) trends observed for iron, manganese, radium-226, sulphate and uranium over all seasons at Station DS-18, 2000 to 2009.



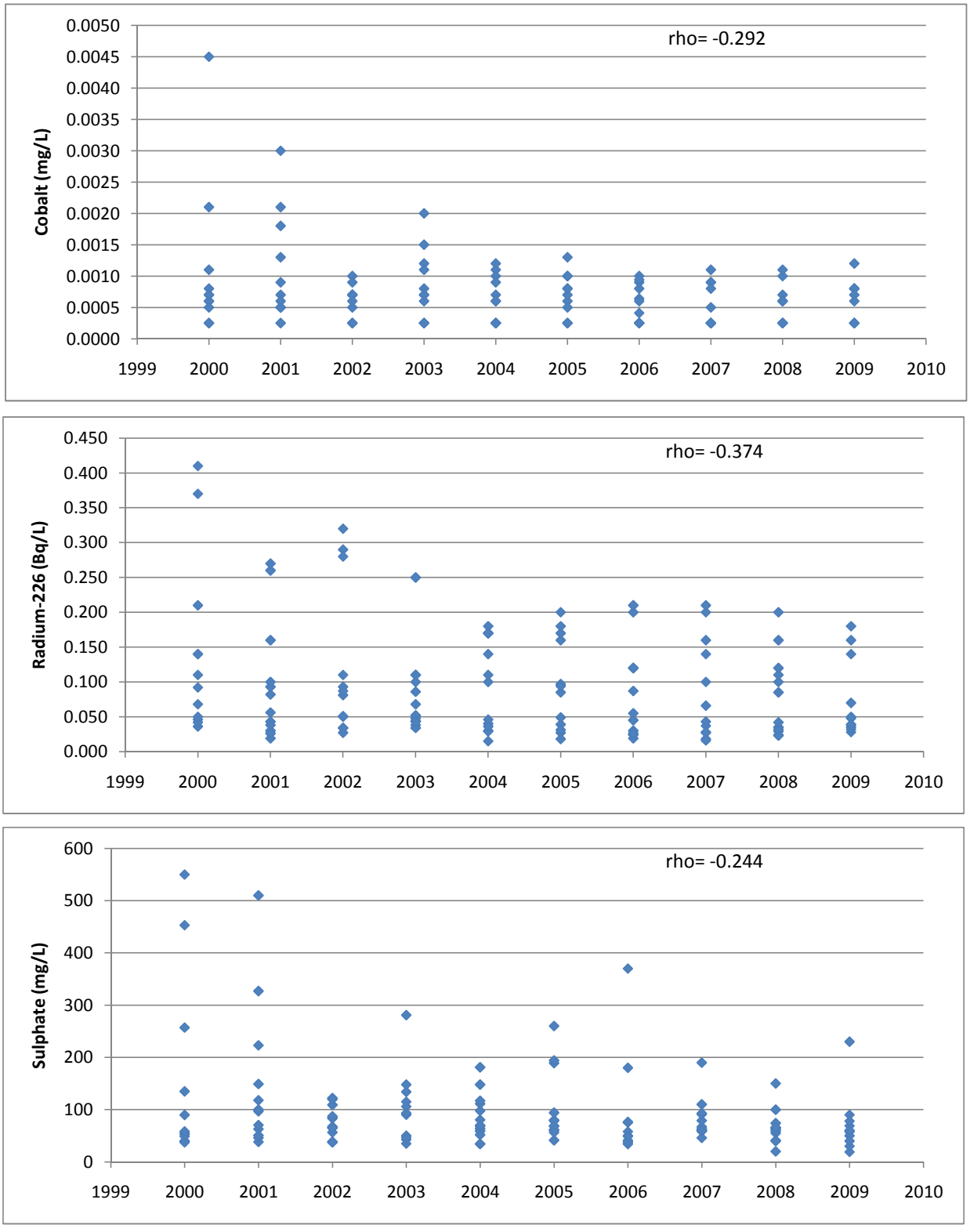




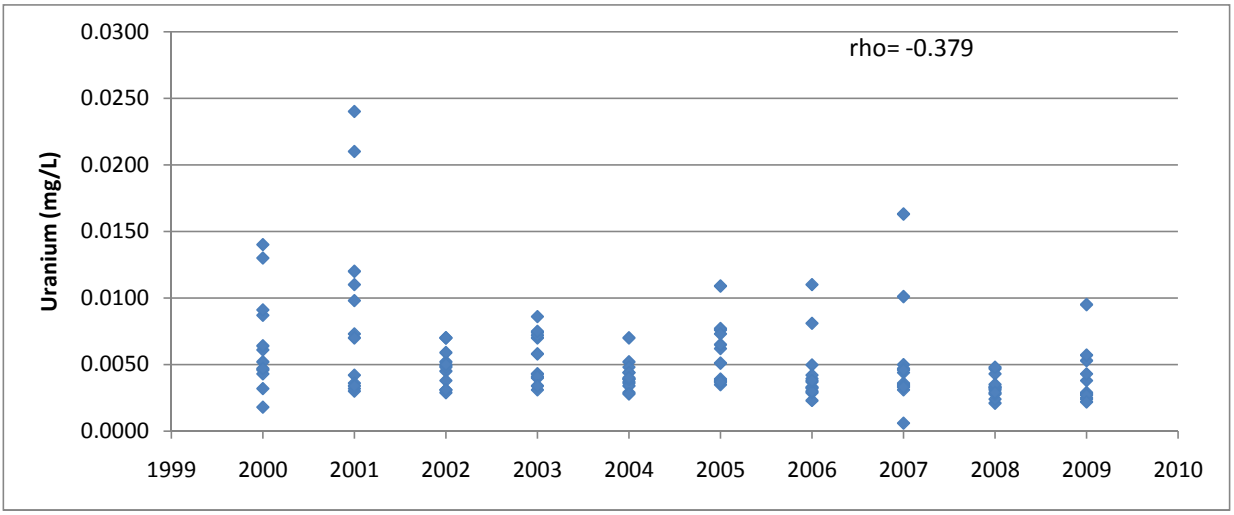
Appendix Figure E.9: Significant common (average) trends observed for barium, cobalt, pH, radium-226 and sulphate over all seasons at Station M01, 2000 to 2009.



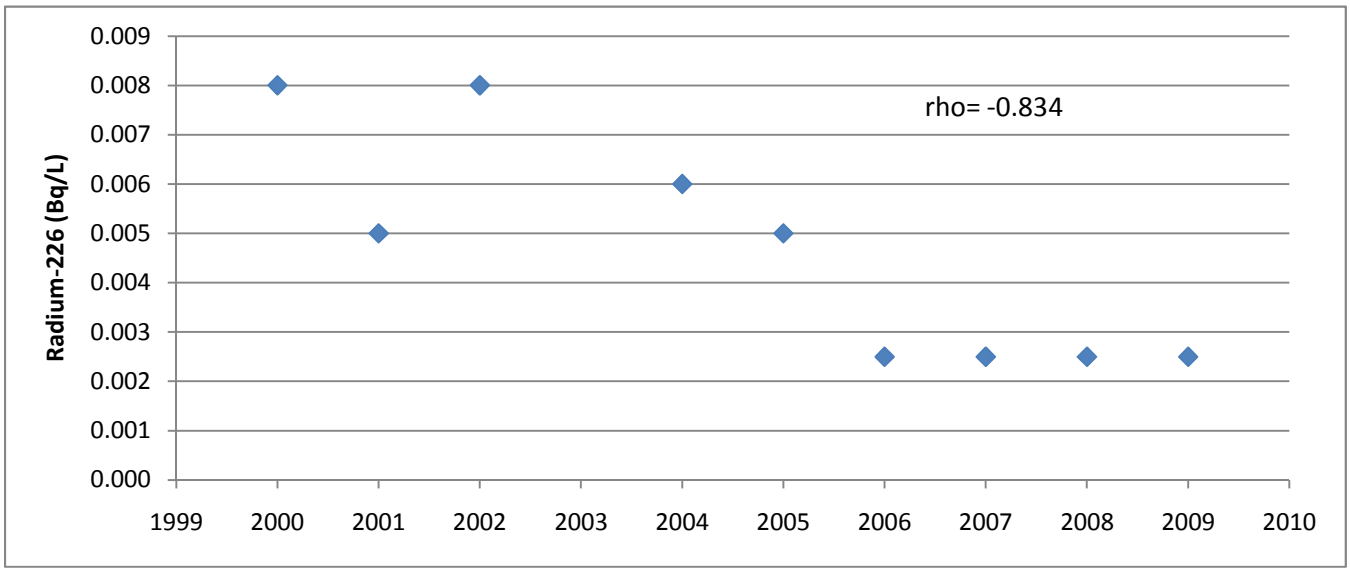
Appendix Figure E.9: Significant common (average) trends observed for barium, cobalt, pH, radium-226 and sulphate over all seasons at Station M01, 2000 to 2009.



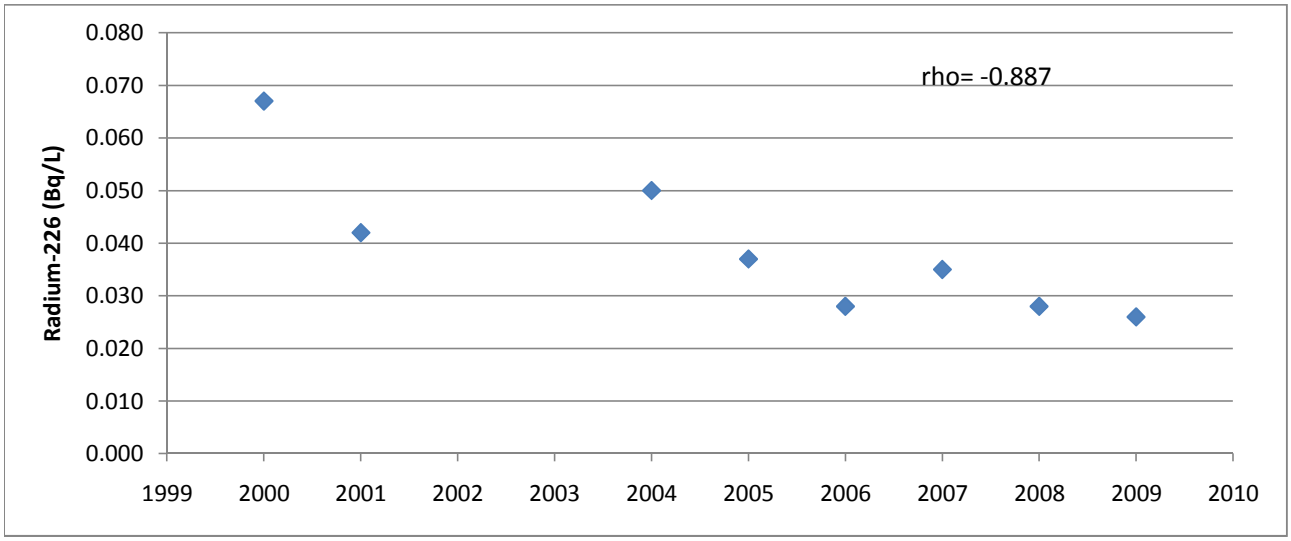
Appendix Figure E.10: Significant common (average) trends observed for cobalt, radium-226, sulphate and uranium over all seasons at Station Q-09, 2000 to 2009.

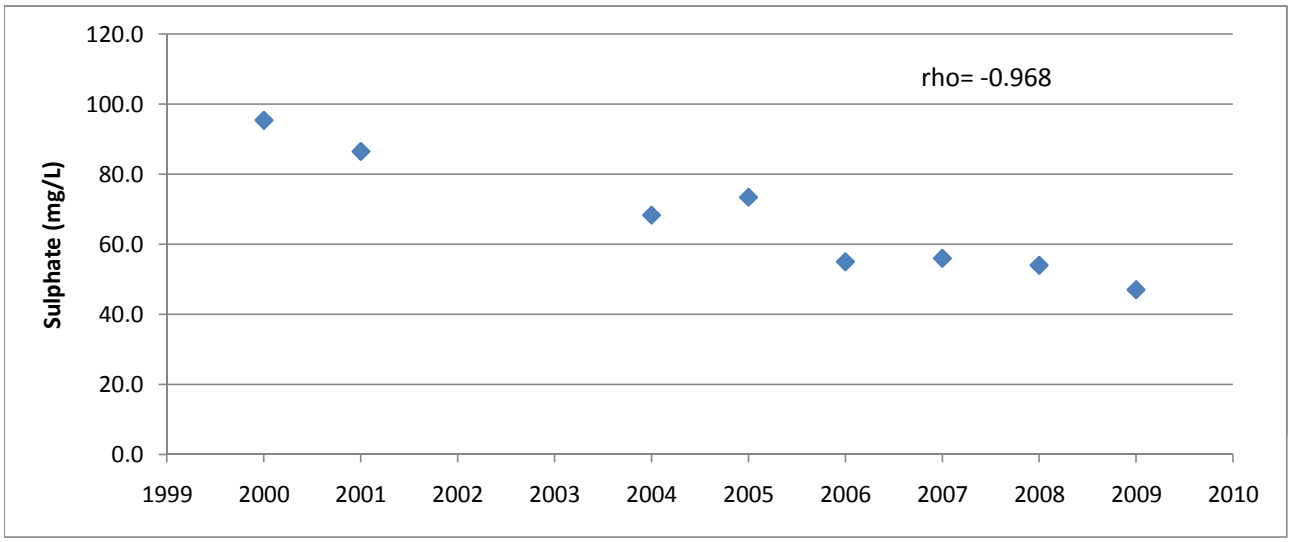


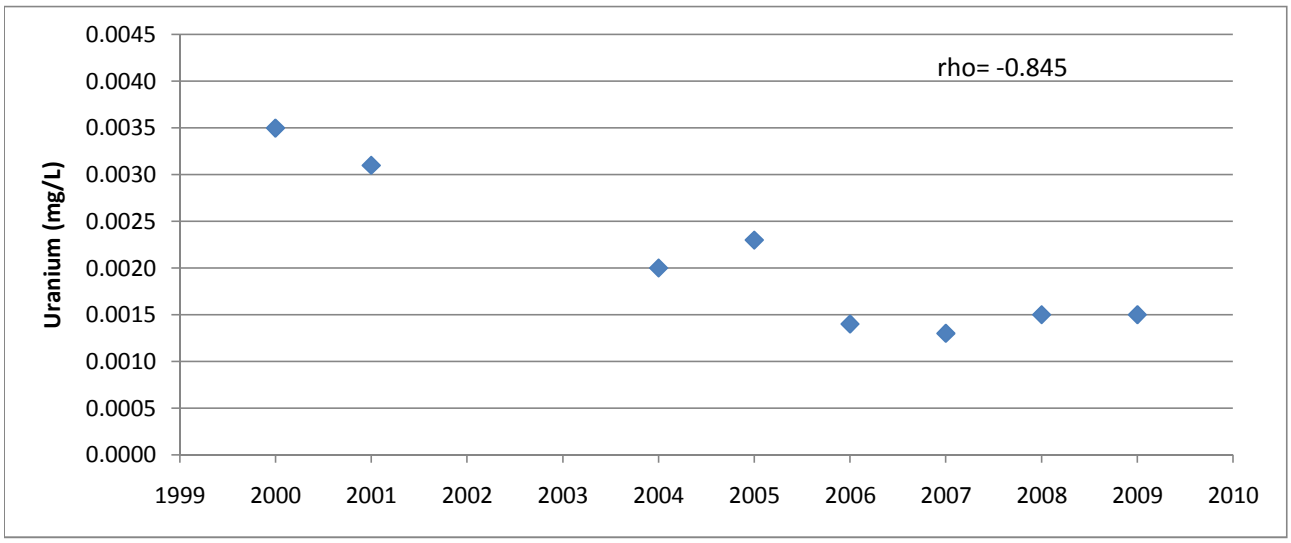
Appendix Figure E.10: Significant common (average) trends observed for cobalt, radium-226, sulphate and uranium over all seasons at Station Q-09, 2000 to 2009.



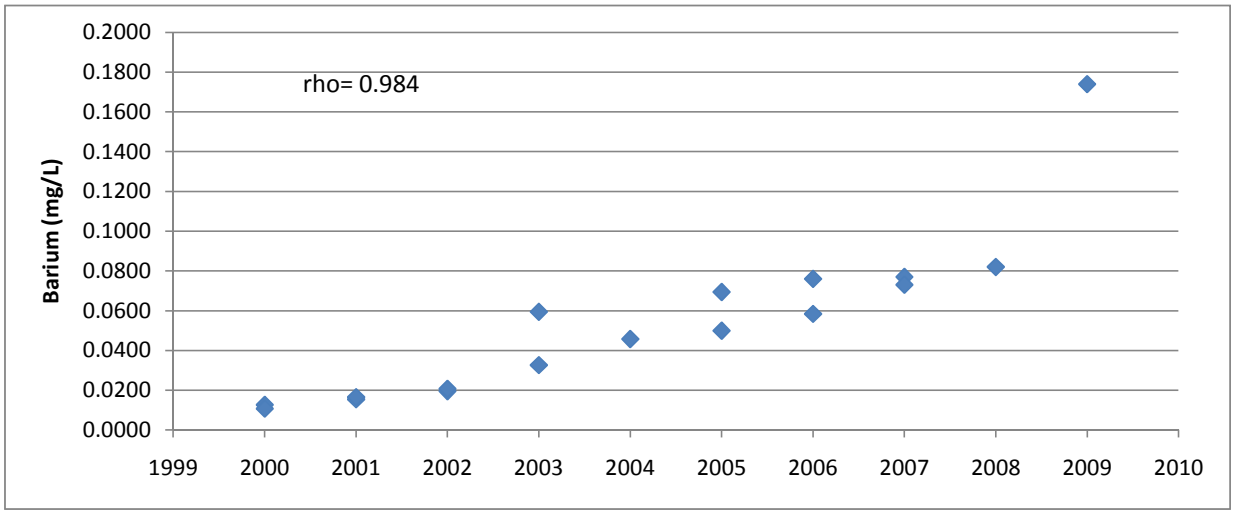
Appendix Figure E.11: Significant trends observed for radium-226 at Station Q-20, 2000 to 2009.

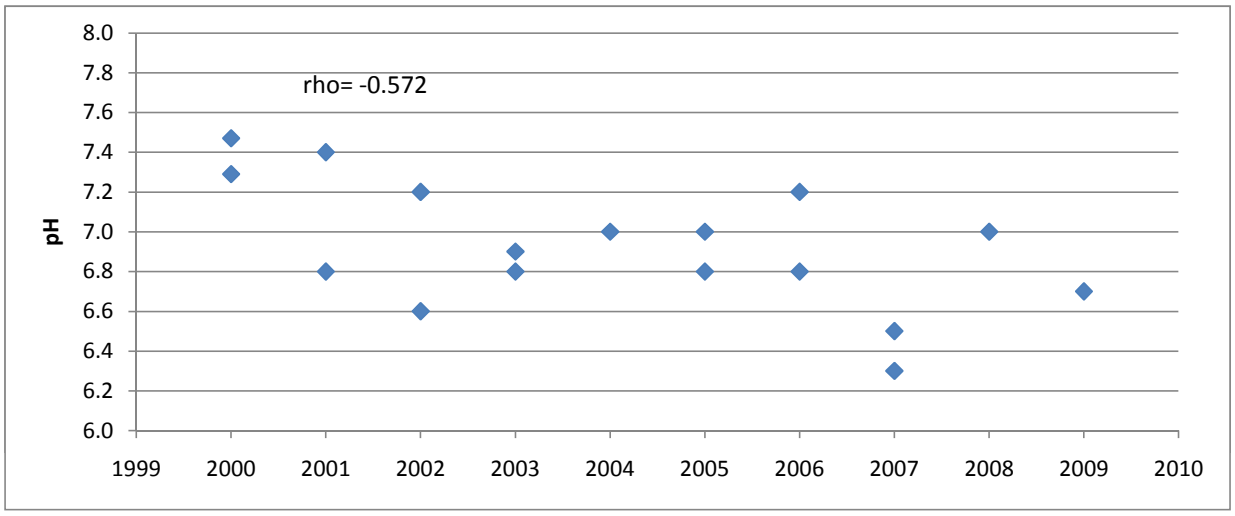


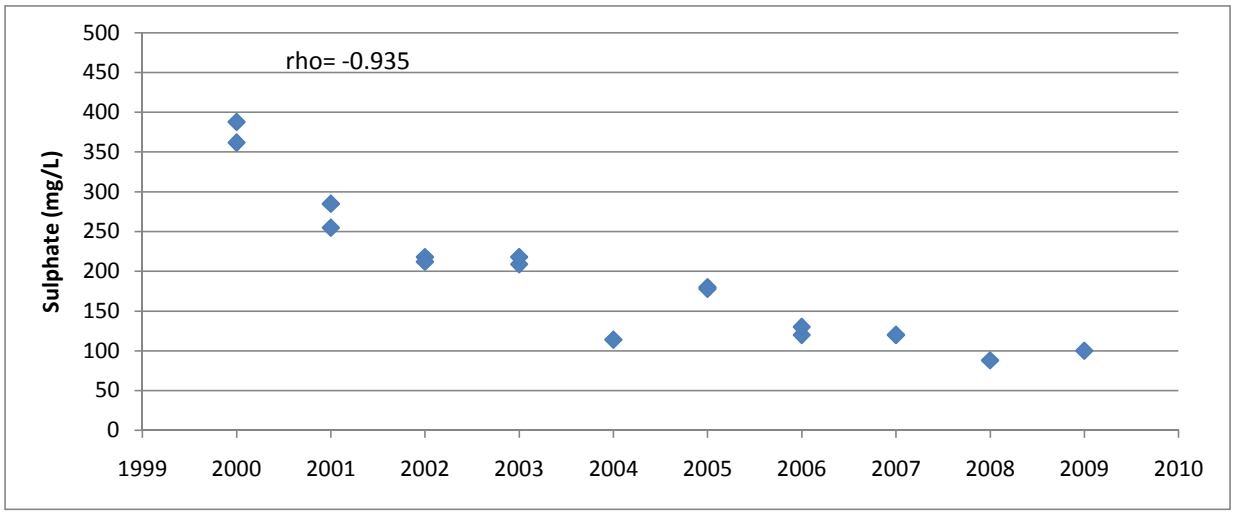




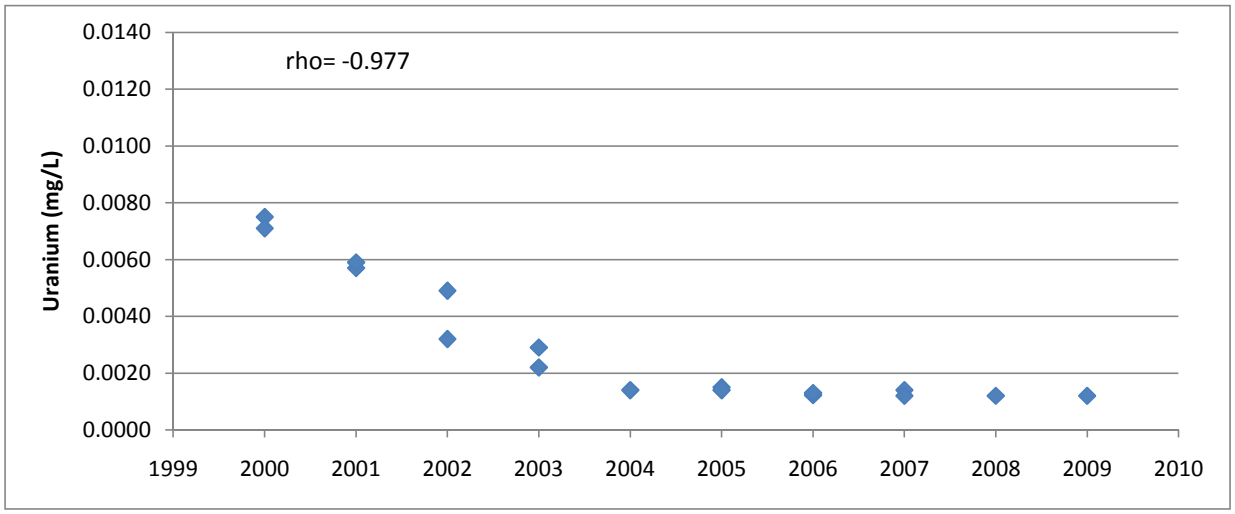
Appendix Figure E.12: Significant trends observed for radium-226, sulphate and uranium at Station SR-01, 2000 to 2009.



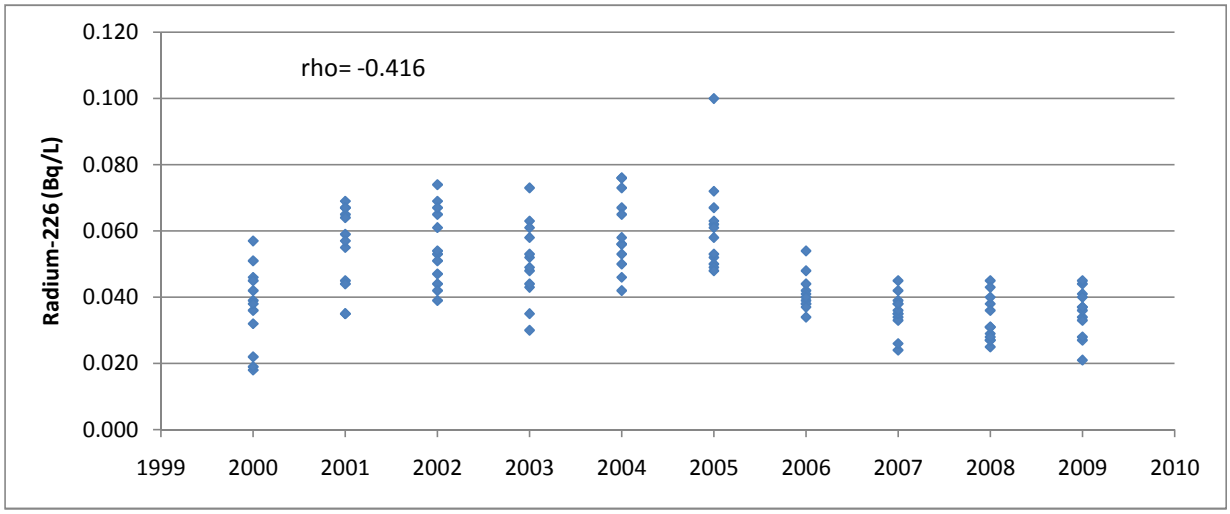


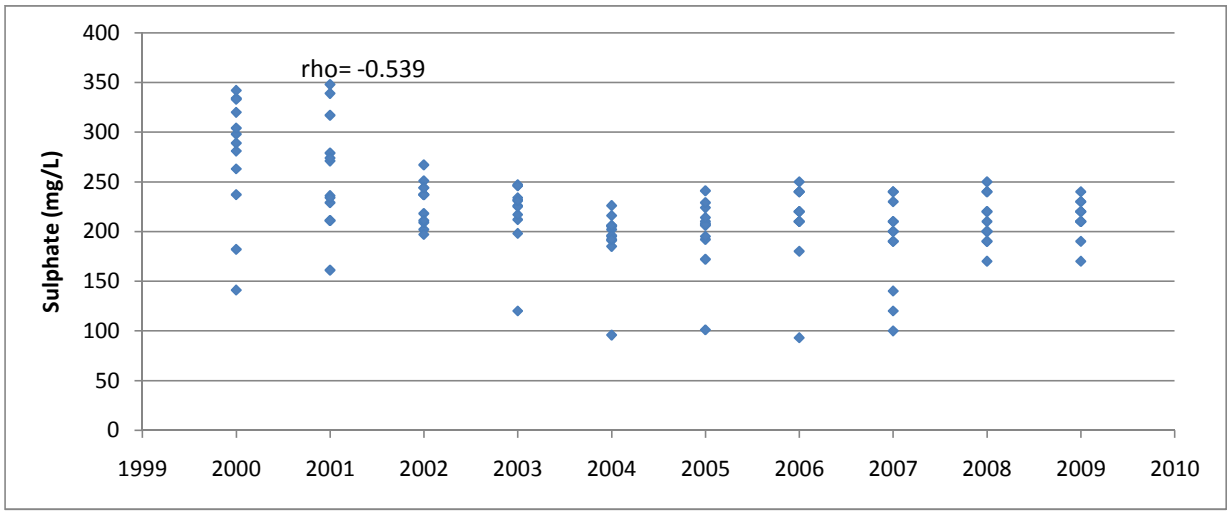


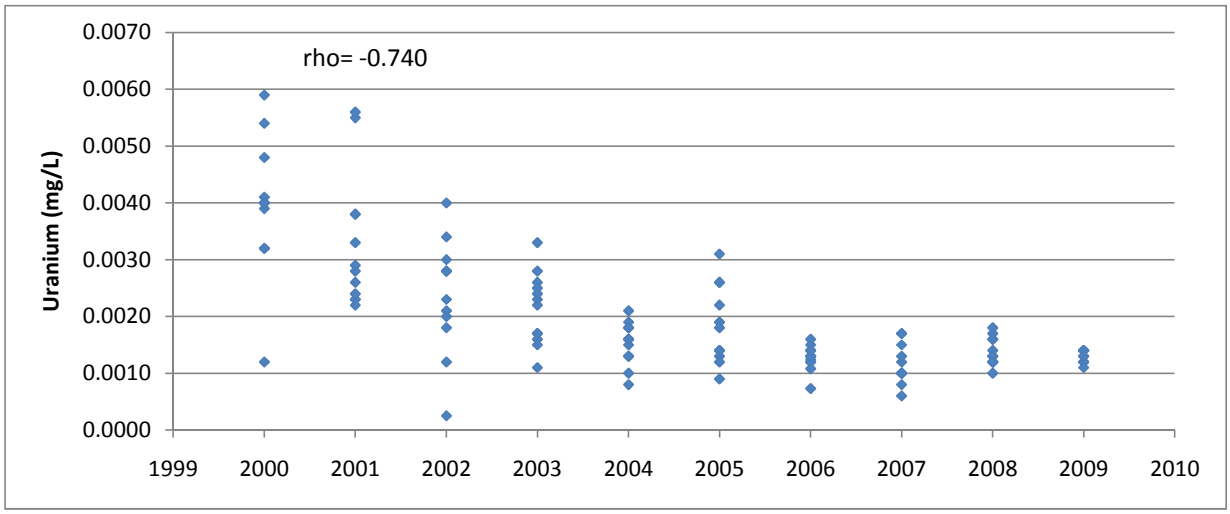
Appendix Figure E.13: Significant common (average) trends observed for barium, pH, sulphate and uranium over all seasons at Station SR-06, 2000 to 2009.



Appendix Figure E.13: Significant common (average) trends observed for barium, pH, sulphate and uranium over all seasons at Station SR-06, 2000 to 2009.

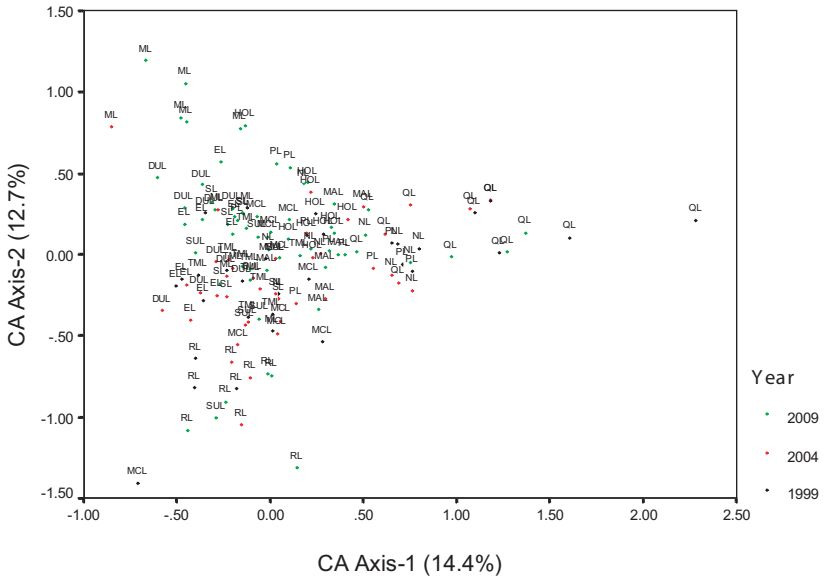




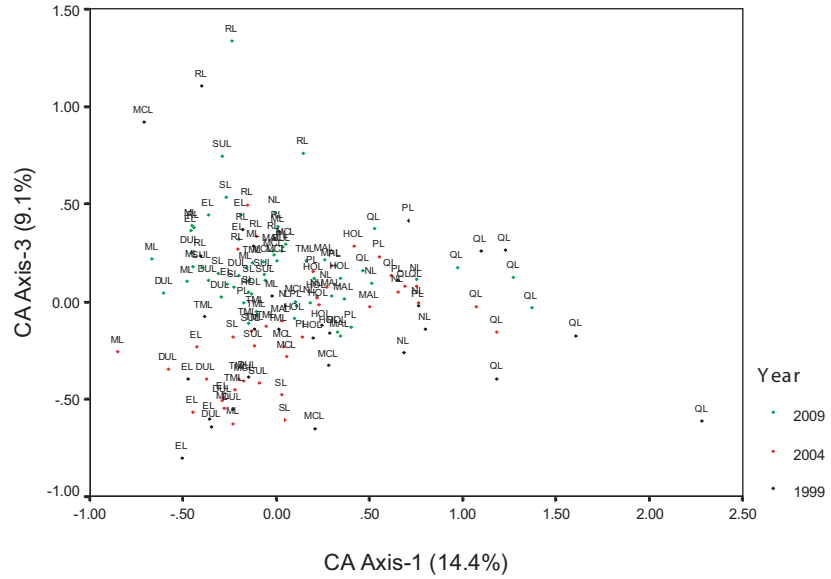


Appendix Figure E.14: Significant common (average) trends observed for radium-226, sulphate, and uranium over all seasons at Station SR-08, 2000 to 2009.

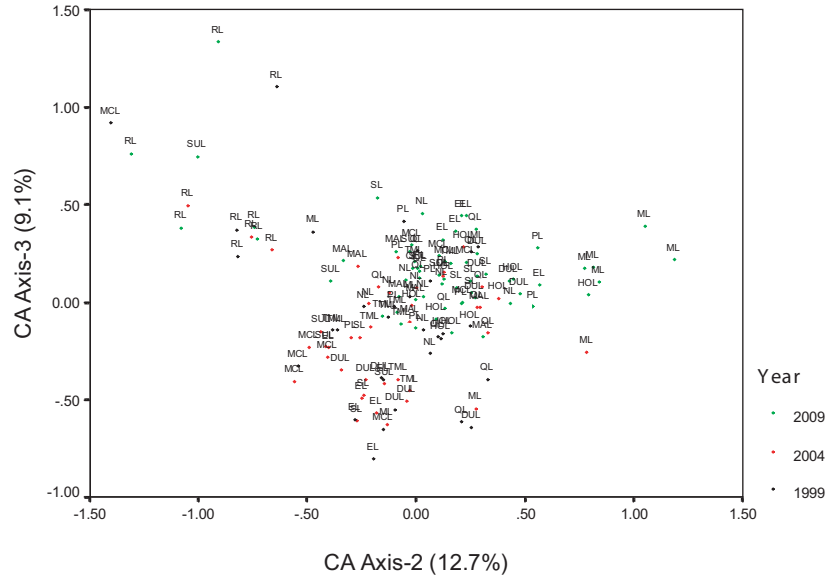
a)



b)

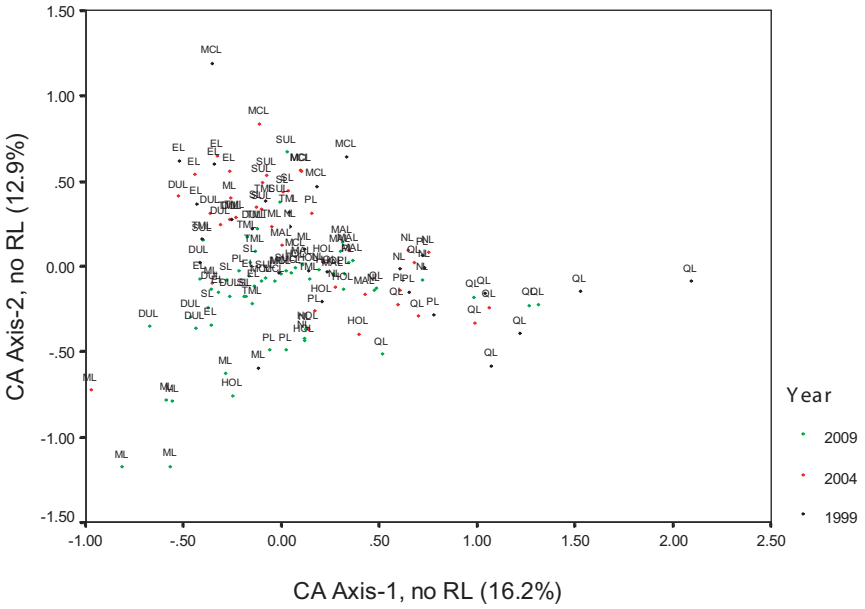


c)

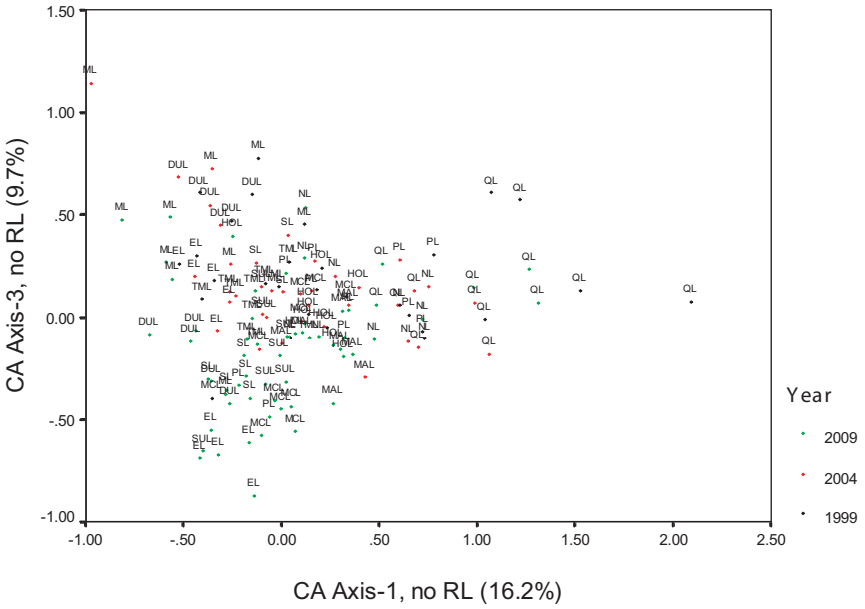


Appendix Figure E.15: Correspondence analysis at SRWMP stations including RL: 1999, 2004, 2009.

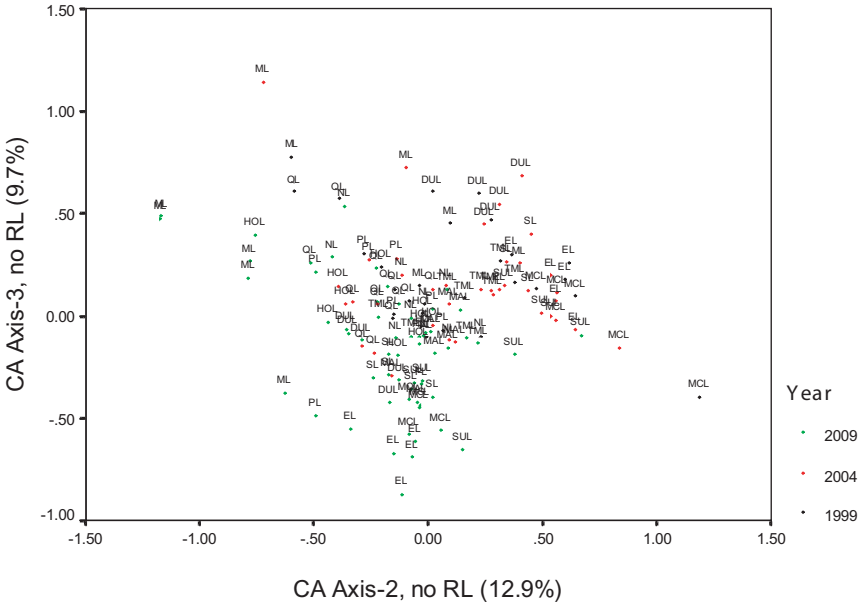
a)



b)

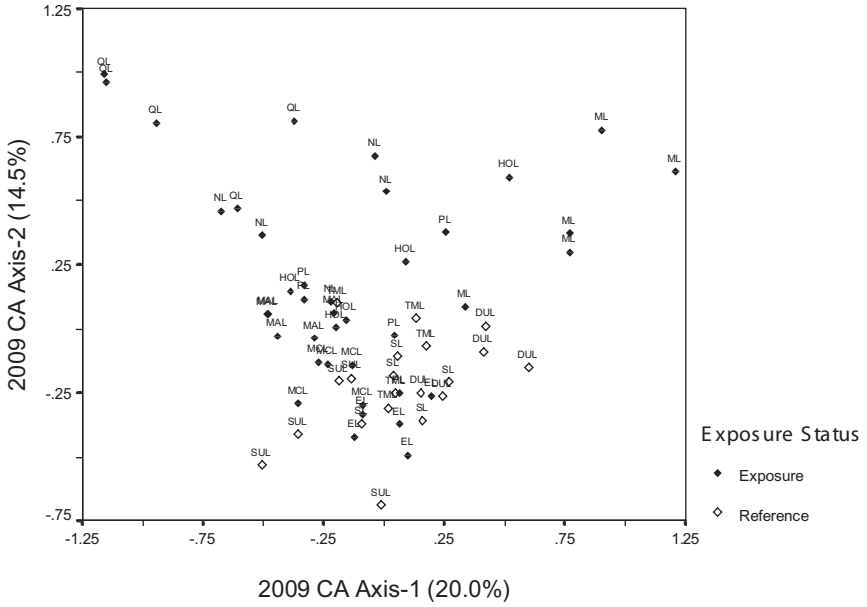


c)

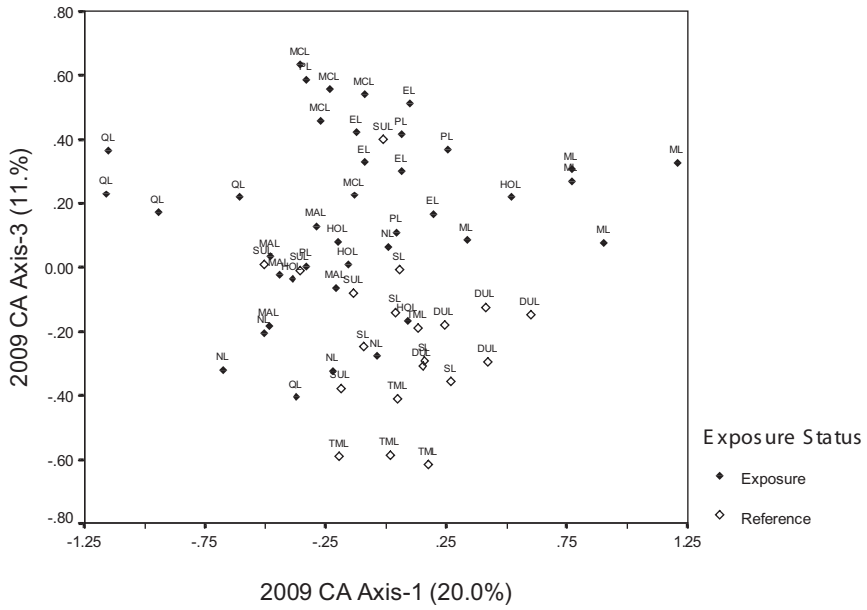


Appendix Figure E.16: Correspondence analysis at SRWMP stations excluding RL: 1999, 2004, 2009.

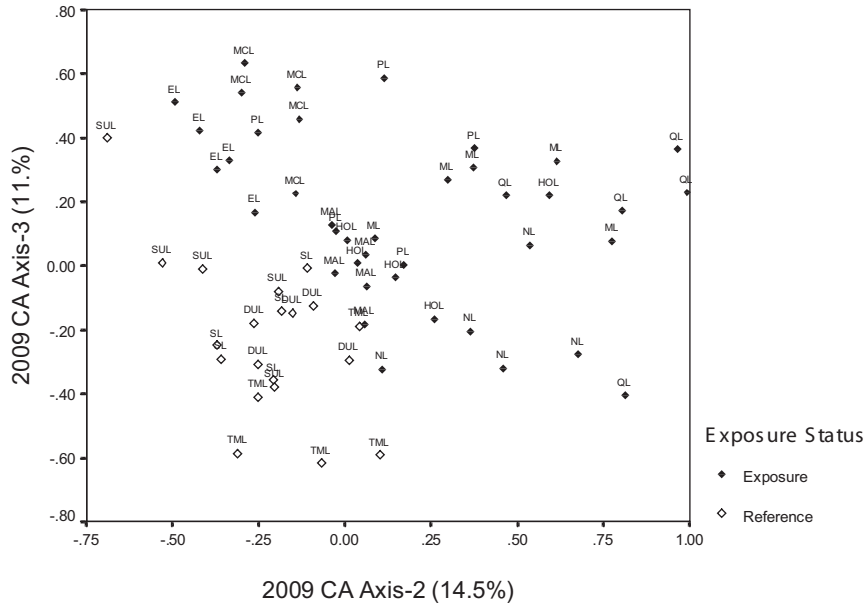
a)



b)



c)



Appendix Figure E.17: Correspondence analysis at SRWMP stations, 2009 only, excluding RL.

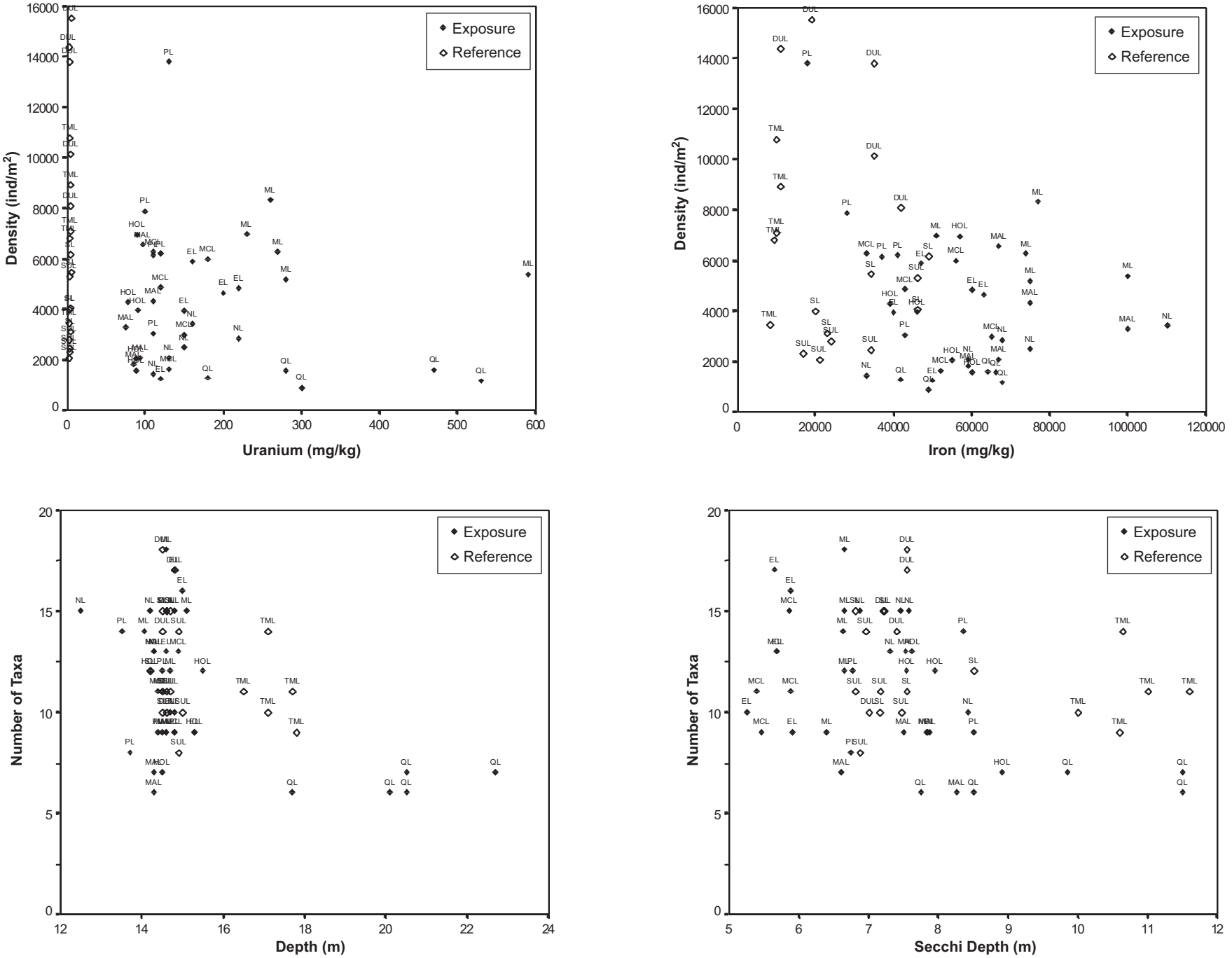
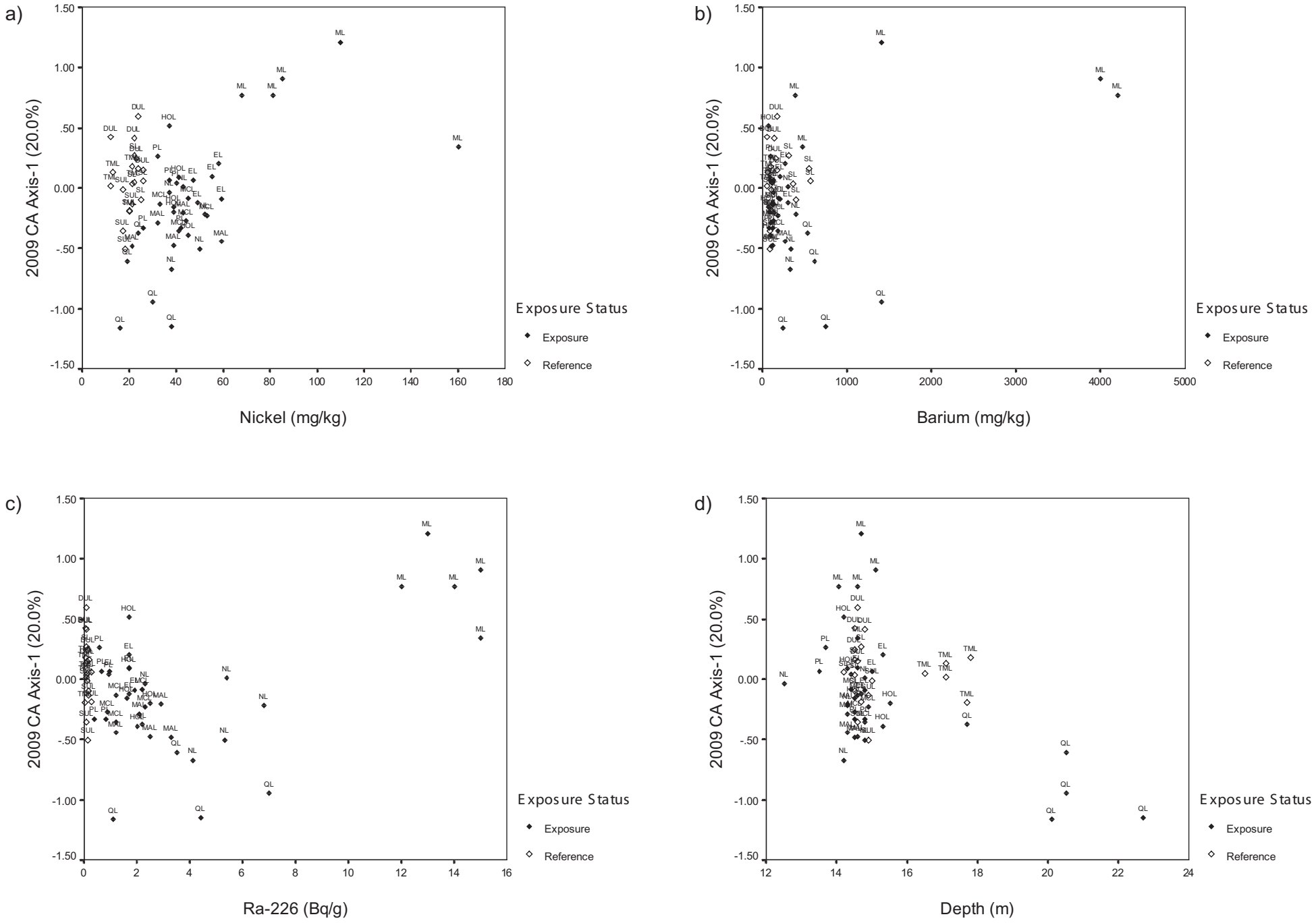
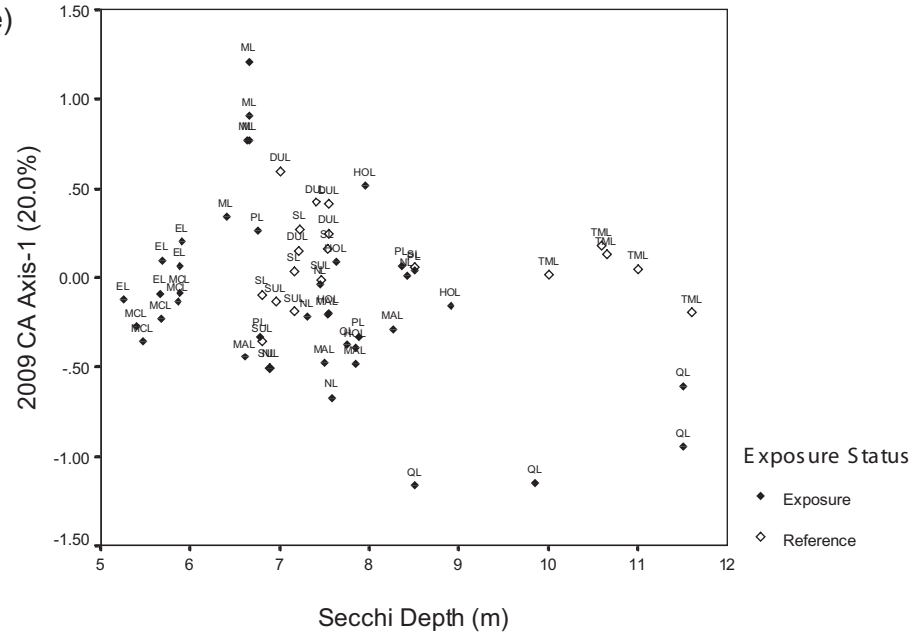


Figure E.18: Significant correlations between benthic community metrics and supporting habitat data.

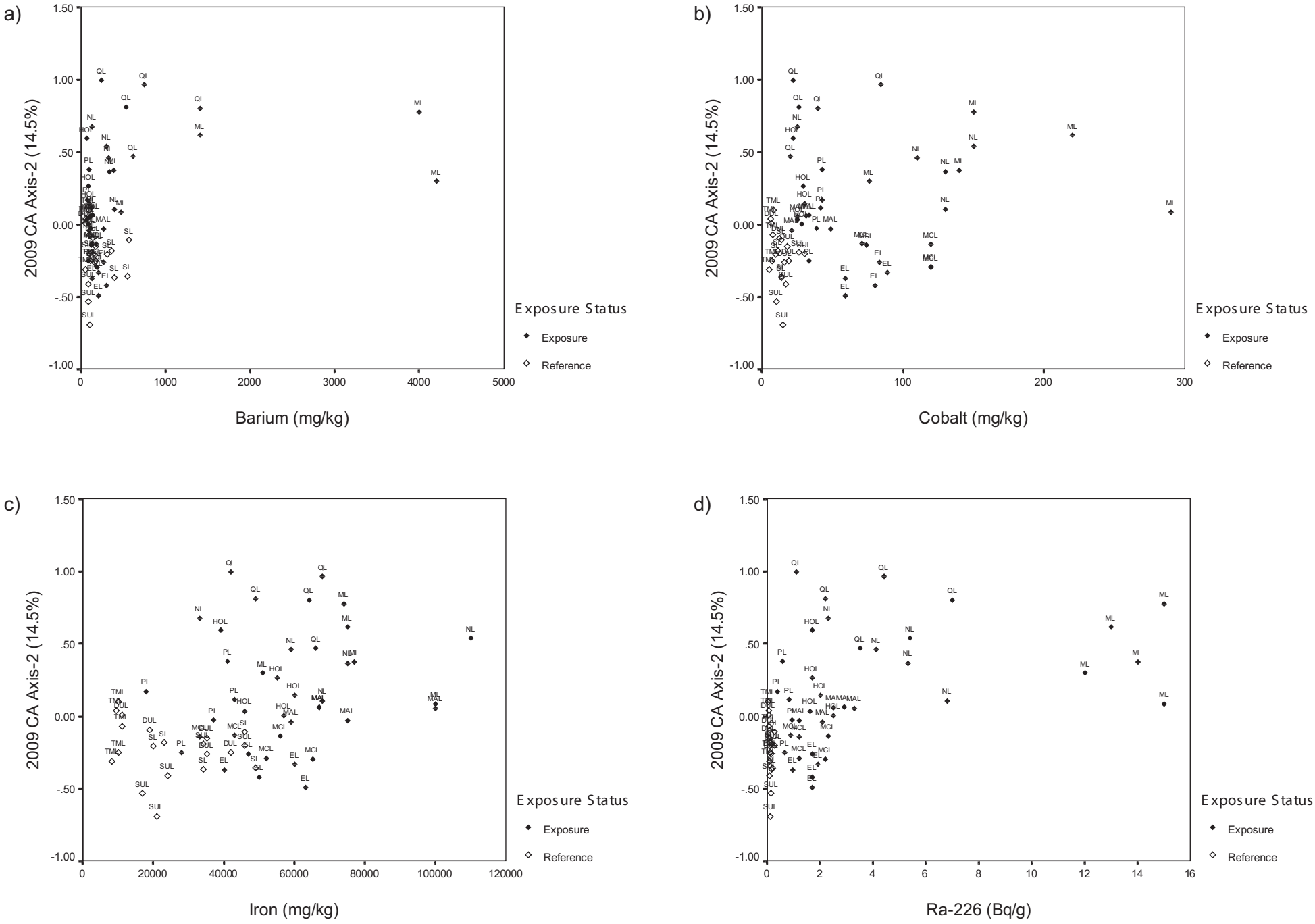


Appendix Figure E.19: Correlations at SRWMP, excluding RL, 2009.

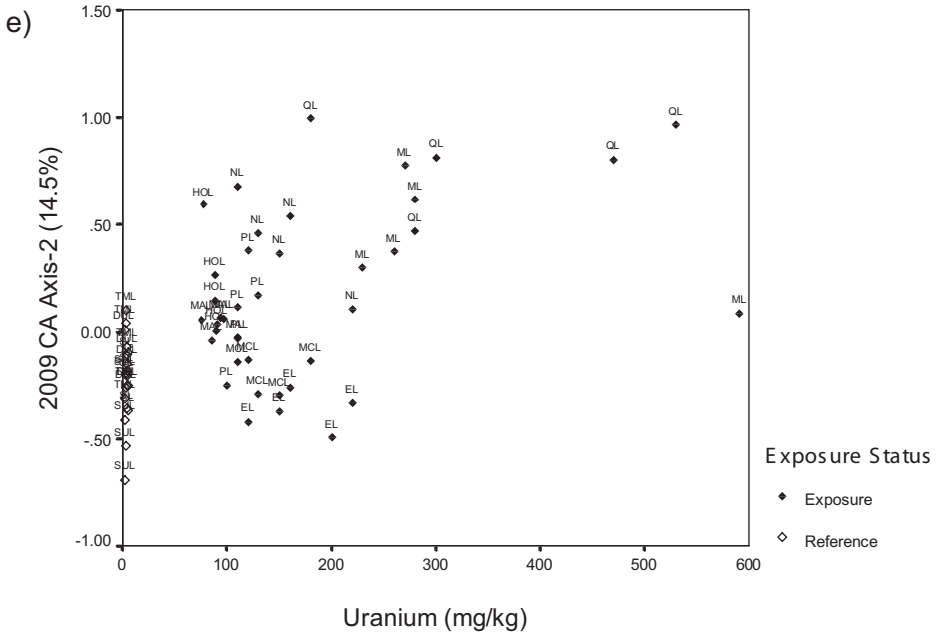
e)

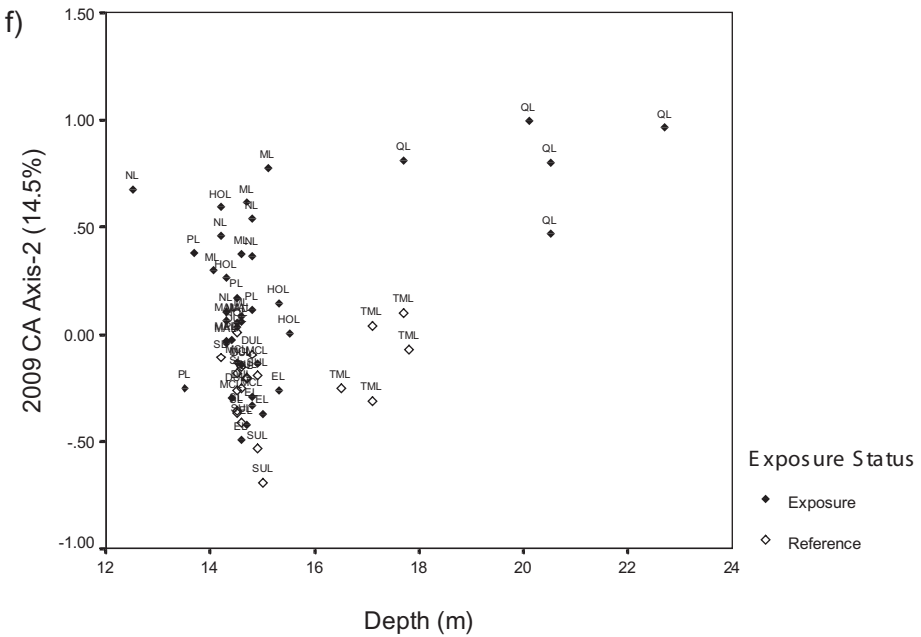


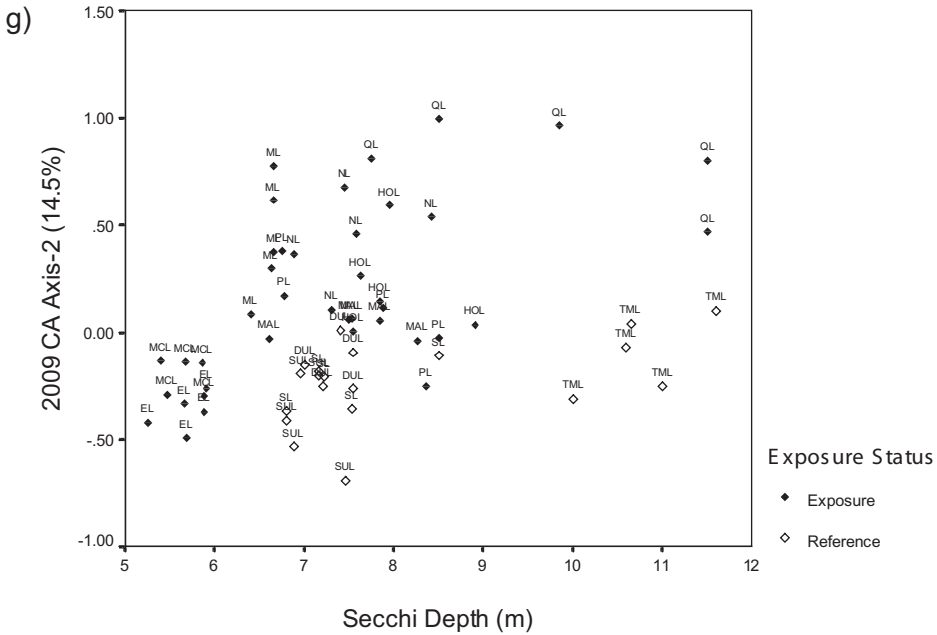
Appendix Figure E.19: Correlations at SRWMP, excluding RL, 2009.

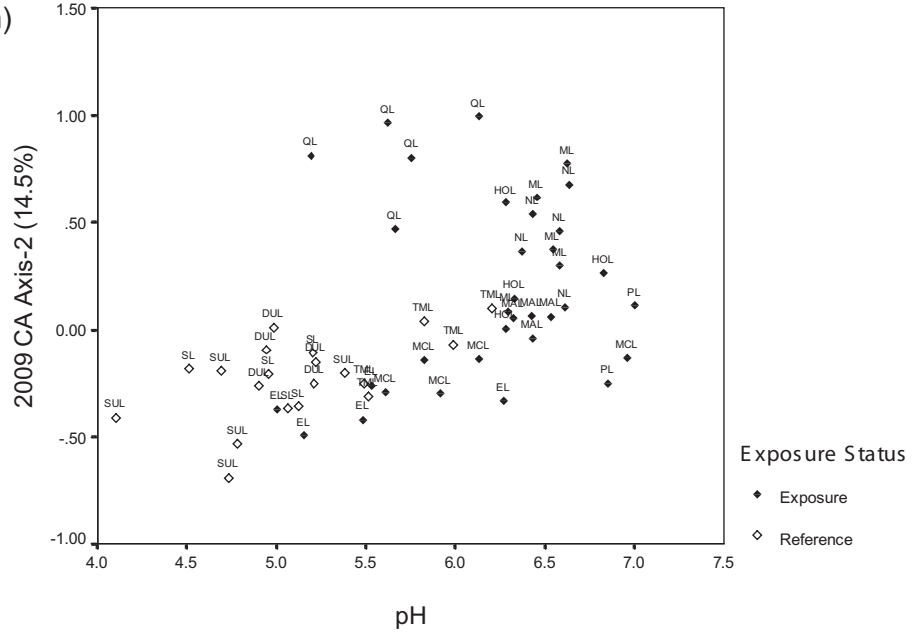


Appendix Figure E.20: Correlations at SRWMP, excluding RL, 2009.



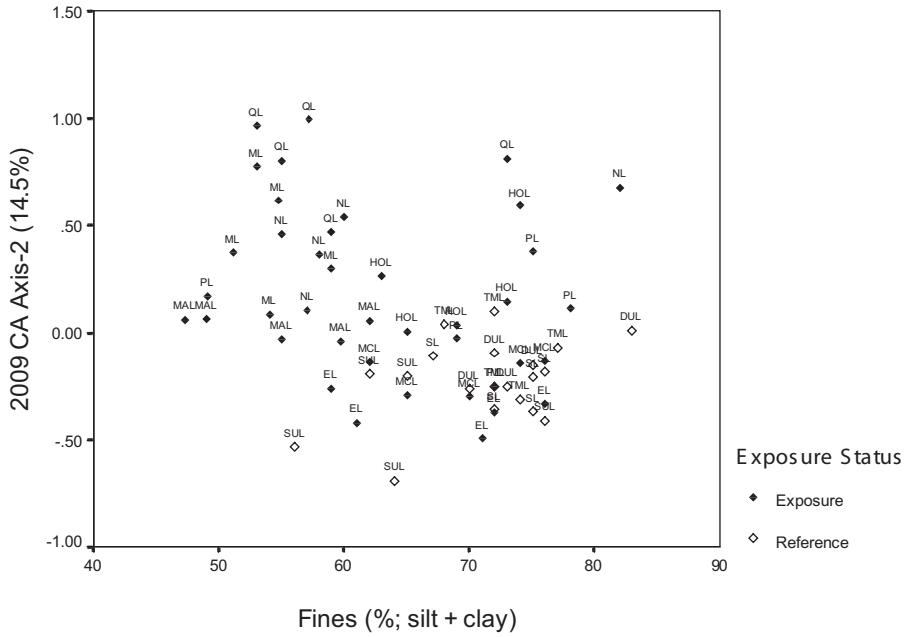




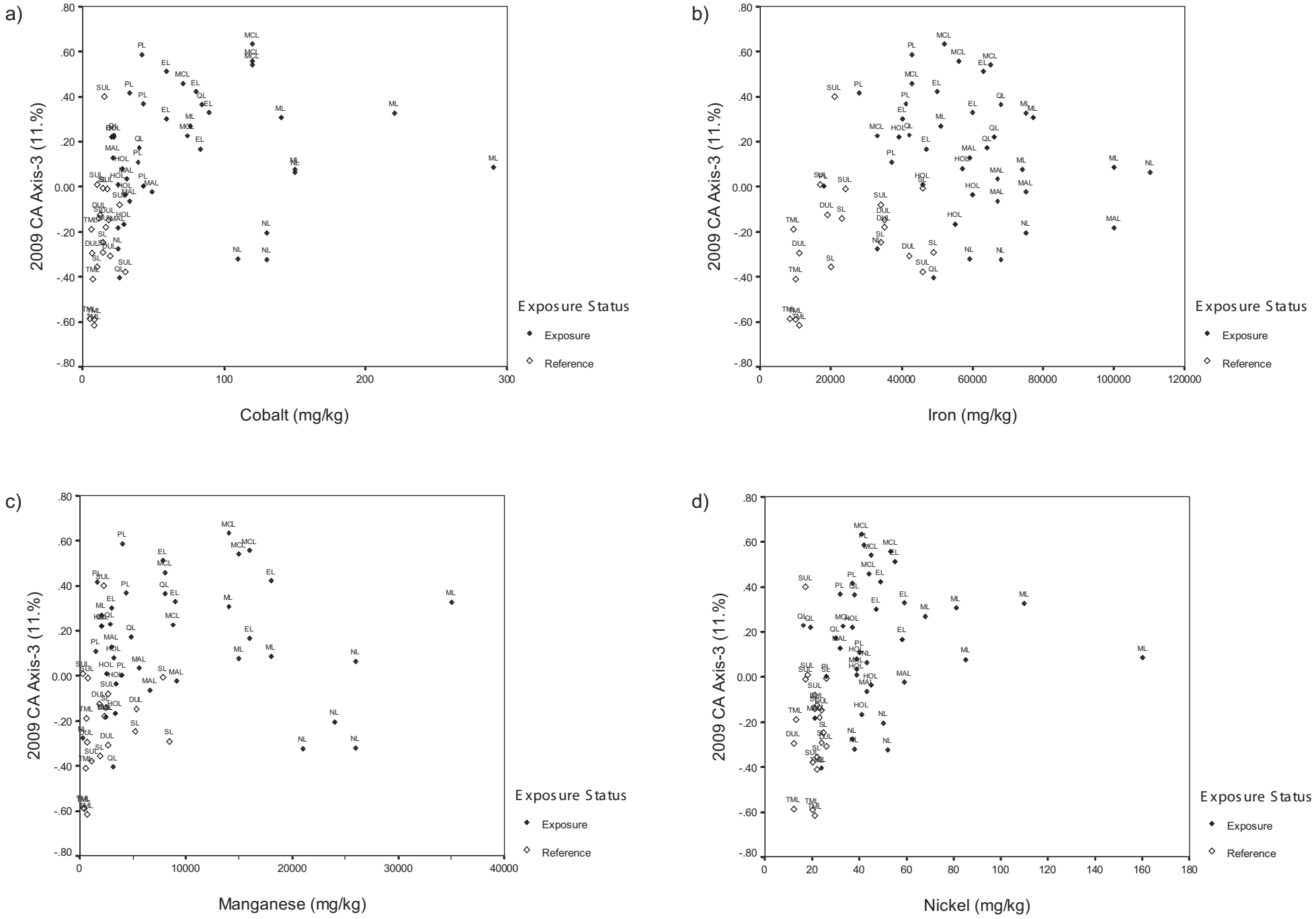


Appendix Figure E.20: Correlations at SRWMP, excluding RL, 2009.

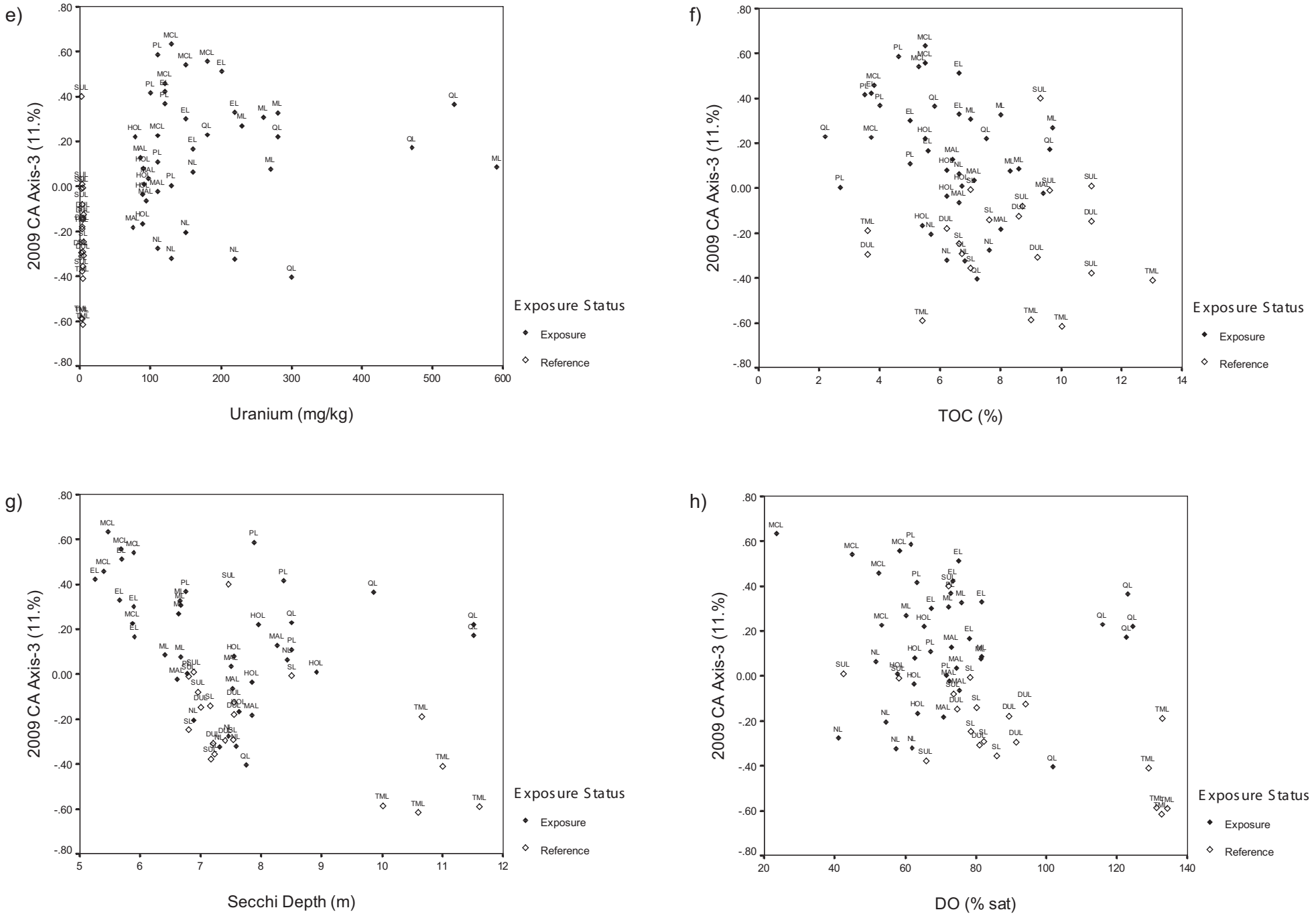
i)



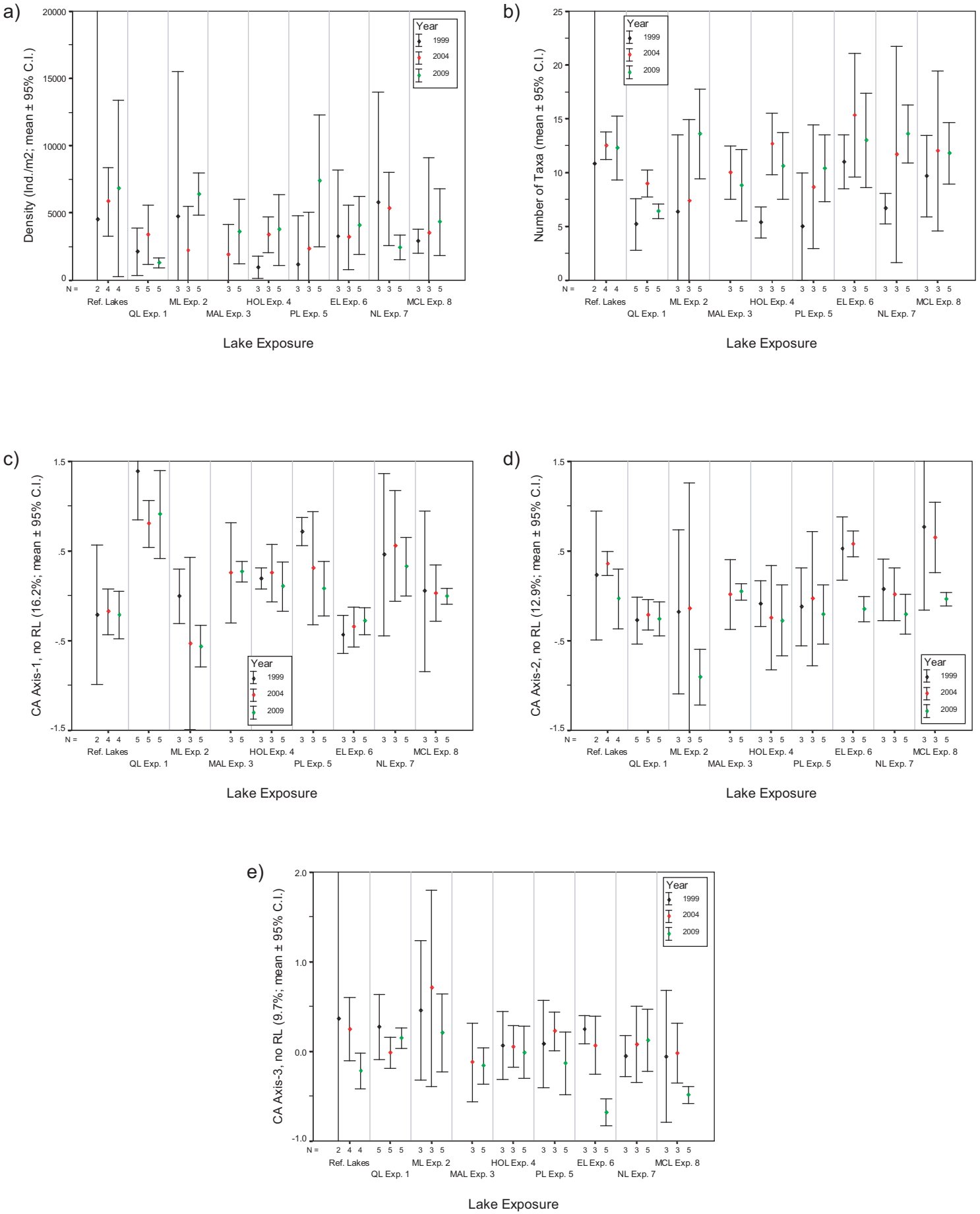
Appendix Figure E.20: Correlations at SRWMP, excluding RL, 2009.



Appendix Figure E.21: Correlations at SRWMP, excluding RL, 2009.



Appendix Figure E.21: Correlations at SRWMP, excluding RL, 2009.



Appendix Figure E.22: Lake benthic community characteristics over time: 1999, 2004, 2009.

LABORATORY REPORTS

AQUATOX
AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

SAMPLE IDENTIFICATION

Work Order:	215904	Shipped By:	Rabbex/Rd
Company :	Minnow Environmental Inc. (BMS Corp.)	Date Received :	2009-09-25
Location :	Georgetown ON	Time Received :	10:25
Sampling Method :	P. Ponar	Date Tested :	2009-10-01
Sampled By :	C. R	Lab Storage:	4±2 °C
Sample Volume:	1 x 5 L pail		

Test Method : Test for Survival and Growth in Sediment Using the Freshwater Amphipod *Hyalella azteca*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/33, December, 1997.

SAMPLE SUMMARY

Sample Number	Sample Name	Description	Sample Date	Sample Time	Temp. on Arrival
-	Control	Fine brown organic sediment; no odour.	2009-05-25	12:00	-
25651	QL-09-01	Black colour, no odour.	2009-09-22	Not given	8.0 °C
25652	SL-09-01	Black colour, no odour.	2009-09-17	Not given	8.0 °C
25653	ML-09-01	Black colour, low odour.	2009-09-18	Not given	8.0 °C
25654	TML-09-01	Black colour, low odour.	2009-09-19	Not given	8.0 °C
25655	EL-09-01	Black colour, low odour.	2009-09-14	Not given	8.0 °C
25656	DUL-09-01	Black colour, low odour.	2009-09-15	Not given	8.0 °C
25657	MCL-09-01	Black colour, low odour.	2009-09-22	Not given	8.0 °C
25658	RL-09-01	Black colour, low odour.	2009-09-21	Not given	8.0 °C
25659	MAL-09-03	Black colour, low odour.	2009-09-20	Not given	8.0 °C
25660	HOL-09-01	Light black colour, low odour.	2009-09-17	Not given	8.0 °C
25661	PL-09-02	Grey colour, no odour.	2009-09-16	Not given	8.0 °C
25662	SUL-09-02	Black colour, low odour.	2009-09-19	Not given	8.0 °C
25663	NL-09-03	Black colour, low odour.	2009-09-18	Not given	8.0 °C

RESULTS

Survival Data (Treatment Average Survival, %)[1]

NL-09-03	PL-09-02	MCL-09-01	HOL-09-01	Control	QL-09-01	SL-09-01	ML-09-01	TML-09-01	EL-09-01	DUL-09-01	RL-09-01	MAL-09-03	SUL-09-02
32	54	82	98	100	100	100	100	100	100	100	100	100	100

[1] **Tukey-Kramer Test (CETIS)[a]**: Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). The data sets did not meet the assumptions for normality and/or homogeneity of variance. Under these conditions a non-parametric test should be employed. However, the statistical analyses required by Environment Canada did not yield results that could be considered logical or meaningful. As an alternative, analyses were performed using the parametric test (Tukey-Kramer), recognizing that statistical assumptions have not been met.

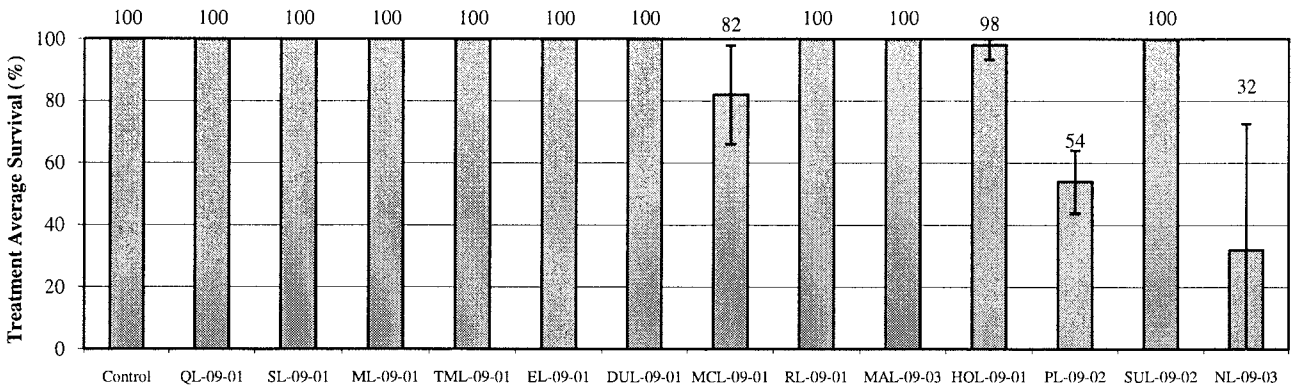
Growth Data (Treatment Average Weight, mg)[2]

PL-09-02	NL-09-03	MCL-09-01	QL-09-01	ML-09-01	HOL-09-01	MAL-09-03	SL-09-01	SUL-09-02	EL-09-01	RL-09-01	TML-09-01	Control	DUL-09-01
0.098	0.102	0.112	0.139	0.174	0.198	0.211	0.212	0.222	0.233	0.262	0.276	0.284	0.291

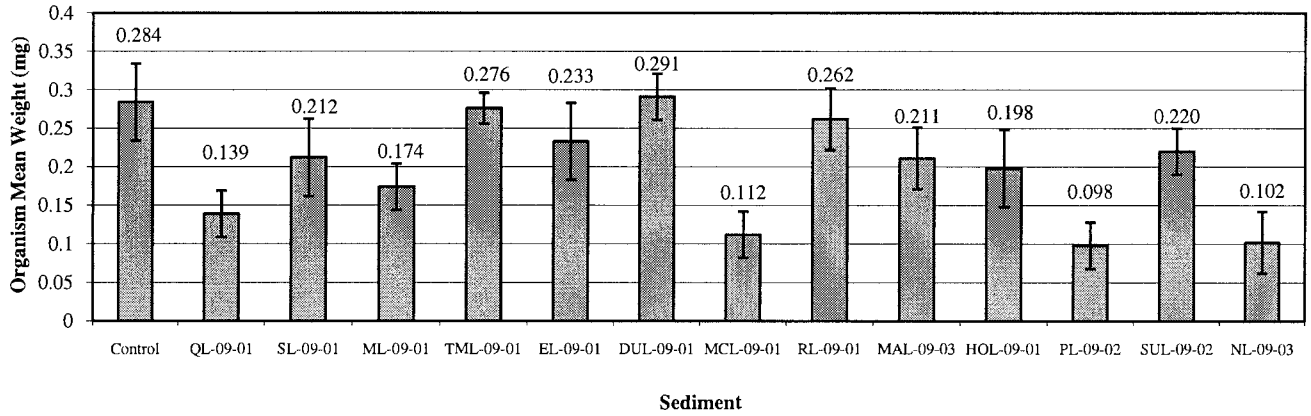
[2] **Tukey-Kramer Test (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). All data sets met the assumptions for normality and homogeneity of variance.

Work Order : 215904

***Hyalella azteca* Survival**



***Hyalella azteca* Growth**



SEDIMENT CHARACTERISTICS

Sample Number	Sample Name	TOC (mg/kg)	Moisture Content (%)	Particle Size (%) Gravel	Sand	Silt	Clay
–	Control	89000	72	0	0.9	98.2	1
25651	QL-09-01	96000	89	ND	45	39	16
25652	SL-09-01	66000	86	ND	24	62	13
25653	ML-09-01	86000	91	ND	46	42	12
25654	TML-09-01	130000	90	ND	28	48	24
25655	EL-09-01	37000	79	ND	39	46	15
25656	DUL-09-01	110000	92	ND	25	56	19
25657	MCL-09-01	55000	82	ND	38	51	11
25658	RL-09-01	98000	88	ND	22	65	13
25659	MAL-09-03	71000	83	ND	52	39	8
25660	HOL-09-01	54000	80	ND	38	51	12
25661	PL-09-02	46000	79	ND	22	61	17
25662	SUL-09-02	93000	87	ND	36	45	19
25663	NL-09-03	62000	79	ND	45	43	12

ND = Not Detected

Work Order : 215904

TEST CONDITIONS

Test Organism:	*Hyalella azteca*	Test Type:	Static
Organism Batch :	Ha09-09	Test Vessel:	300 mL pyrex beaker
Source:	In-house culture	Sediment Depth:	Approx. 3.5 cm
Life Stage on Test Day 0 :	2-9 days old	Sediment Volume:	100 mL per replicate
Organism Mortality Rate :	0% (in 48 h preceding test)	Overlying Water Volume:	175 mL per replicate
Samples per Treatment :	1	Control/Test Water:	Well water (no additional chemicals)
Number of Replicates:	5	Control Sediment:	Long Point, Lake Erie
Organisms per Replicate:	10	Test Aeration :	Yes (all replicates)
Organisms per Treatment:	50	Test Aeration Rate :	2-3 bubbles per second
Feed Type:	YCT (Batch 09-07)	Photoperiod (light/dark) :	16 h / 8 h
Feeding Rate (per replicate):	~2.7 mg dry solids daily	Light Intensity :	965 - 994 lux
Test Duration :	14 days	Test Method Deviations :	None

COPPER (as COPPER SULPHAtE) REFERENCE TOXICANT DATA

Test Date :	2009-10-22	Historical Mean LC50 :	148 µg/L
Test Duration :	96 hours	Warning Limits (± 2 SD) :	93 - 233 µg/L
LC50 (95% conf. limits):	134 µg/L (108 - 166)	Statistical Method :	Spearman-Kärber(CETIS)[a]
		Test Conducted By :	JGG/AS

The reference toxicant test was conducted as a water only test, as specified in the test method.

COMMENTS

The results reported relate only to the samples tested.
All test validity criteria as specified in the test method cited in this report were satisfied.
No organisms exhibiting unusual appearance, behavior, or undergoing unusual treatment were used in the test.

REFERENCES

[a] CETIS, © 2001-2007. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, McKinleyville, Calif. 95519 [Program on disk and printed User's Guide].

[d] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Date: _____ ***Approved by:*** _____

yyyy-mm-dd *Project Manager*

Work Order : 215904

Hyalella azteca Survival Data

Sample	Replicate	Number of Survivors (n=10)	Surviving Organisms (%)	Treatment Average Survival (%)	Standard Deviation	CV (%)
	A	10	100	100	0.0	0.0
Control 2	B	10	100			
	C	10	100			
	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
Control 3	B	10	100			
	C	10	100			
	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25651	C	10	100			
QL-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25652	C	10	100			
SL-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25653	C	10	100			
ML-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25654	C	10	100			
TML-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25655	C	10	100			
EL-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25656	C	10	100			
DUL-09-01	D	10	100			
	E	10	100			
	A	7	70	82	13.0	15.9
	B	7	70			
25657	C	10	100			
MCL-09-01	D	9	90			
	E	8	80			
	A	10	100	100	0.0	0.0
	B	10	100			
25658	C	10	100			
RL-09-01	D	10	100			
	E	10	100			
	A	10	100	100	0.0	0.0
	B	10	100			
25659	C	10	100			
MAL-09-03	D	10	100			
	E	10	100			
	A	10	100	98	4.5	4.6
	B	10	100			
25660	C	10	100			
HOL-09-01	D	9	90			
	E	10	100			
	A	6	60	54	5.5	10.1
	B	6	60			
25661	C	5	50			
PL-09-02	D	5	50			
	E	5	50			
	A	10	100	100	0.0	0.0
	B	10	100			
25662	C	10	100			
SUL-09-02	D	10	100			
	E	10	100			
	A	2	20	32	13.0	40.7
	B	2	20			
25663	C	4	40			
NL-09-03	D	5	50			
	E	3	30			

Data Reviewed By: KEH
Date: 2009-11-05

Work Order : 215904

Hyalella azteca **Weight Data**

Sample	Replicate	Foil Weight (mg)	Dry Weigt of Foil + Organisms (mg)	Number of Organisms Weighed	Mean Dry Weight of Organisms (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation	CV (%)
	A	422.51	424.89	11	0.216	0.284	0.05	17.5
Control	B	416.57	419.68	10	0.311			
	C	414.74	417.22	10	0.248			
	D	418.67	421.82	10	0.315			
	E	421.40	424.72	10	0.332			
	A	425.46	427.10	10	0.164	0.139	0.03	21.3
	B	425.74	426.77	10	0.103			
25651	C	416.86	418.37	10	0.151			
QL-09-01	D	426.15	427.27	10	0.112			
	E	426.66	428.32	10	0.166			
	A	412.12	413.98	10	0.186	0.212	0.05	22.3
	B	424.96	426.62	10	0.166			
25652	C	421.01	423.39	10	0.238			
SL-09-01	D	414.35	416.23	10	0.188			
	E	423.48	426.30	10	0.282			
	A	425.16	426.82	10	0.166	0.174	0.03	17.2
	B	419.20	420.68	10	0.148			
25653	C	430.37	432.07	10	0.170			
ML-09-01	D	415.61	417.23	10	0.162			
	E	415.82	418.08	10	0.226			
	A	417.69	420.67	10	0.298	0.276	0.02	8.9
	B	412.26	414.60	10	0.234			
25654	C	424.51	427.31	10	0.280			
TML-09-01	D	408.75	411.57	10	0.282			
	E	415.89	418.75	10	0.286			
	A	420.92	423.49	10	0.257	0.233	0.05	22.1
	B	417.44	419.73	10	0.229			
25655	C	413.22	414.86	10	0.164			
EL-09-01	D	414.44	417.47	10	0.303			
	E	428.39	430.53	10	0.214			
	A	419.22	422.34	10	0.312	0.291	0.03	9.0
	B	424.42	427.28	10	0.286			
25656	C	421.05	424.21	10	0.316			
DUL-09-01	D	421.99	424.49	10	0.250			
	E	412.65	415.58	10	0.293			
	A	418.61	419.45	7	0.120	0.112	0.03	25.5
	B	425.32	426.42	7	0.157			
25657	C	422.57	423.45	10	0.088			
MCL-09-01	D	420.59	421.39	9	0.089			
	E	422.04	422.88	8	0.105			
	A	417.34	419.28	10	0.194	0.262	0.04	16.2
	B	408.18	411.16	10	0.298			
25658	C	418.35	421.11	10	0.276			
RL-09-01	D	415.68	418.16	10	0.248			
	E	418.62	421.54	10	0.292			
	A	412.70	414.42	10	0.172	0.211	0.04	20.1
	B	422.73	424.75	10	0.202			
25659	C	422.16	424.97	10	0.281			
MAL-09-03	D	417.77	419.93	10	0.216			
	E	414.48	416.33	10	0.185			
	A	420.84	422.78	10	0.194	0.198	0.05	26.9
	B	421.19	422.32	10	0.113			
25660	C	414.15	416.73	10	0.258			
HOL-09-01	D	415.28	417.24	9	0.218			
	E	418.12	420.20	10	0.208			
	A	409.43	410.09	6	0.110	0.098	0.03	34.3
	B	414.25	414.78	6	0.088			
25661	C	420.98	421.20	5	0.044			
PL-09-02	D	423.48	424.06	5	0.116			
	E	415.30	415.95	5	0.130			
	A	417.69	420.12	10	0.243	0.222	0.03	15.3
	B	413.90	416.10	10	0.220			
25662	C	426.59	428.65	10	0.206			
SUL-09-02	D	421.36	424.00	10	0.264			
	E	417.62	419.38	10	0.176			
	A	426.62	426.94	2	0.160	0.102	0.04	36.9
	B	418.85	419.04	2	0.095			
25663	C	424.24	424.57	4	0.082			
NL-09-03	D	419.81	420.37	5	0.112			
	E	423.88	424.06	3	0.060			

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order :	215904
Sample Number :	**Control**
Species:	*Hyalella azteca*
Organism Batch :	Ha09-09
Sediment pH:	6.7
Pore Water pH:	7.2
Pore Water Ammonia (mg/L) :	0.8
Sample Treatment:	Dry sieved (2 mm)
Time Start:	10:55

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.4	Y	JGG/NK	803	8.3	400	0.20	0.02
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.0	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.9	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	8.1	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.1	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	7.7	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.3	N	JGG/LB	1005	8.3	500	0.40	0.04

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-20

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25651**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.7
Pore Water pH: 7.0
Pore Water Ammonia (mg/L) : 0.8
Sample Treatment: Hand homogenized
Time Start: 10:35

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.4	Y	JGG/NK	461	8.4	230	0.55	0.06
1	Fri	2009-10-02	23.0	A	7.5	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	7.8	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.9	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.9	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	7.5	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	7.7	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	7.7	N	JGG/LB	458	7.9	160	0.70	0.03

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25652**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.0
Pore Water pH: 5.7
Pore Water Ammonia (mg/L) : 1.1
Sample Treatment: Hand homogenized
Time Start: 10:40

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.5	Y	JGG/NK	449	8.3	220	0.55	0.05
1	Fri	2009-10-02	23.0	A	7.7	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.1	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	8.2	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.8	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.2	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.2	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	398	7.9	140	6.70	0.25

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25653**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.5
Pore Water pH: 7.0
Pore Water Ammonia (mg/L) : 0.7
Sample Treatment: Hand homogenized
Time Start: 10:45

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.5	Y	JGG/NK	532	8.4	340	0.35	0.04
1	Fri	2009-10-02	23.0	A	7.7	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.2	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.8	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.5	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.2	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	7.5	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	7.7	N	JGG/LB	527	8.0	250	0.50	0.02

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order :	215904
Sample Number :	**25654**
Species:	*Hyalella azteca*
Organism Batch :	Ha09-09
Sediment pH:	6.2
Pore Water pH:	6.9
Pore Water Ammonia (mg/L) :	0.3
Sample Treatment:	Hand homogenized
Time Start:	10:50

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.5	Y	JGG/NK	413	8.3	230	0.35	0.03
1	Fri	2009-10-02	23.0	A	7.3	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.2	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	8.0	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.6	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	7.8	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.0	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	391	8.3	170	4.30	0.38

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25655**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.2
Pore Water pH: 5.6
Pore Water Ammonia (mg/L) : 0.6
Sample Treatment: Hand homogenized
Time Start: 11:00

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.6	Y	JGG/NK	487	8.3	210	0.50	0.04
1	Fri	2009-10-02	23.0	A	7.5	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.1	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.9	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.9	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.1	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	7.6	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	447	7.6	160	1.90	0.04

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25656**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.1
Pore Water pH: 5.6
Pore Water Ammonia (mg/L) : 0.3
Sample Treatment: Hand homogenized
Time Start: 11:05

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.6	Y	JGG/NK	392	8.2	200	0.45	0.03
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	7.7	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.5	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.4	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.3	Y	JGG	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.0	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	382	7.9	150	3.70	0.14

"–" = not measured/not required

Data Reviewed By: KH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25657**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.2
Pore Water pH: 6.6
Pore Water Ammonia (mg/L) : 2.8
Sample Treatment: Hand homogenized
Time Start: 11:10

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.5	Y	JGG/NK	473	8.3	270	0.85	0.08
1	Fri	2009-10-02	23.0	A	7.7	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	7.7	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.2	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.9	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.3	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.3	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.0	N	JGG/LB	409	7.5	170	0.70	0.01

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25658**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.1
Pore Water pH: 5.9
Pore Water Ammonia (mg/L) : 4.5
Sample Treatment: Hand homogenized
Time Start: 11:15

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.4	Y	JGG/NK	385	8.2	170	0.30	0.02
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.0	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.6	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	8.0	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.0	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.1	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	281	7.5	130	1.55	0.02

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25659**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.4
Pore Water pH: 7.0
Pore Water Ammonia (mg/L) : 2.3
Sample Treatment: Hand homogenized
Time Start: 11:25

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.4	Y	JGG/NK	482	8.4	220	0.75	0.08
1	Fri	2009-10-02	23.0	A	7.7	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.2	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	8.0	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.9	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.2	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.2	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	7.8	N	JGG/LB	314	7.8	200	0.60	0.02

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25660**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.7
Pore Water pH: 6.9
Pore Water Ammonia (mg/L) : 2.0
Sample Treatment: Hand homogenized
Time Start: 11:30

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.3	Y	JGG/NK	488	8.4	210	0.50	0.06
1	Fri	2009-10-02	23.0	A	7.7	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.3	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.9	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	8.0	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.3	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	6.8	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.0	N	JGG/LB	433	7.9	200	0.45	0.02

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25661**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.3
Pore Water pH: 6.6
Pore Water Ammonia (mg/L) : 1.8
Sample Treatment: Hand homogenized
Time Start: 11:35

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.4	Y	JGG/NK	487	8.4	230	0.50	0.06
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	7.7	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.7	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.8	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	7.3	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	7.6	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	484	8.0	230	0.55	0.03

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25662**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 5.5
Pore Water pH: 5.9
Pore Water Ammonia (mg/L) : 2.3
Sample Treatment: Hand homogenized
Time Start: 11:40

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.3	Y	JGG/NK	410	8.3	240	0.75	0.07
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.1	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	7.9	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.9	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.0	Y	LB	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	8.0	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.2	N	JGG/LB	347	8.0	160	5.35	0.25

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

Hyalella azteca Sediment Test Data

Work Order : 215904
Sample Number : **25663**
Species: *Hyalella azteca*
Organism Batch : Ha09-09
Sediment pH: 6.9
Pore Water pH: 6.8
Pore Water Ammonia (mg/L) : 2.0
Sample Treatment: Hand homogenized
Time Start: 11:45

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Thurs	2009-10-01	23.0	Composite	8.3	Y	JGG/NK	609	8.4	370	0.50	0.06
1	Fri	2009-10-02	23.0	A	7.6	Y	JGG	–	–	–	–	–
2	Sat	2009-10-03	24.0	–	–	Y	KEH	–	–	–	–	–
3	Sun	2009-10-04	24.0	–	–	Y	KEH	–	–	–	–	–
4	Mon	2009-10-05	23.0	B	8.2	Y	JGG	–	–	–	–	–
5	Tues	2009-10-06	23.0	–	–	Y	KEH	–	–	–	–	–
6	Wed	2009-10-07	23.0	C	8.1	Y	JGG	–	–	–	–	–
7	Thurs	2009-10-08	23.0	–	–	Y	JGG	–	–	–	–	–
8	Fri	2009-10-09	23.0	D	7.8	Y	JGG	–	–	–	–	–
9	Sat	2009-10-10	23.0	–	–	Y	JGG	–	–	–	–	–
10	Sun	2009-10-11	23.0	–	–	Y	JGG	–	–	–	–	–
11	Mon	2009-10-12	23.0	E	8.0	Y	JGG	–	–	–	–	–
12	Tues	2009-10-13	23.0	–	–	Y	JGG	–	–	–	–	–
13	Wed	2009-10-14	23.0	A	6.3	Y	JGG	–	–	–	–	–
14	Thurs	2009-10-15	23.0	Composite	8.1	N	JGG/LB	686	8.1	330	0.80	0.05

"–" = not measured/not required

Data Reviewed By: KEH
Date: 2009-11-05

AQUATOX
AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

SAMPLE IDENTIFICATION

Work Order:	215904	Shipped By:	Rabbex/Rd
Company :	Minnow Environmental Inc. (BMS Corp.)	Date Received :	2009-09-25
Location :	Georgetown ON	Time Received :	10:25
Sampling Method :	P. Ponar	Date Tested :	2009-10-06
Sampled By :	C. R	Lab Storage:	4±2 °C
Sample Volume:	1 x 5L pail		

Test Method : Test for Survival and Growth in Sediment Using the larvae of Freshwater Midges (*Chironomus tentans* or *Chironomus riparius*). Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/32, December, 1997.

SAMPLE SUMMARY

Sample Number	Sample Name	Description	Sample Date	Sample Time	Temp. on Arrival
-	Control	Fine brown organic sediment; no odour.	2009-05-25	12:00	-
25652	SL-09-01	Black colour, no odour.	2009-09-17	Not given	8.0 °C
25653	ML-09-01	Black colour, low odour.	2009-09-18	Not given	8.0 °C
25655	EL-09-01	Black colour, low odour.	2009-09-14	Not given	8.0 °C
25656	DUL-09-01	Black colour, low odour.	2009-09-15	Not given	8.0 °C

RESULTS

Survival Data (Treatment Average Survival, %)[1]

ML-09-01	Control	SL-09-01	EL-09-01	DUL-09-01
80	84	84	92	98

[1] **Tukey-Kramer Test (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). All data sets met the assumptions for normality and homogeneity of variance.

Growth Data (Treatment Average Weight, mg)[2]

ML-09-01	DUL-09-01	SL-09-01	EL-09-01	Control
1.423	1.576	1.718	2.163	2.344

[2] **Tukey-Kramer Test (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). All data sets met the assumptions for normality and homogeneity of variance.

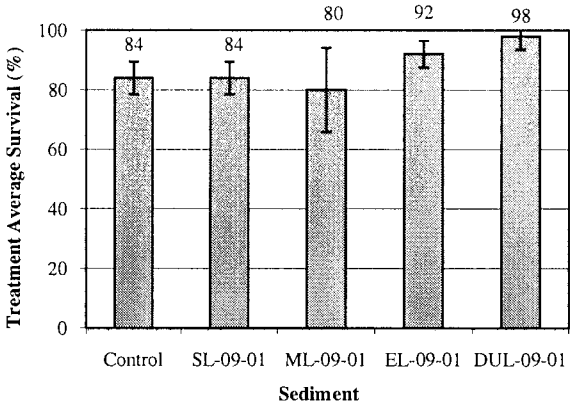
POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Test Date :	2009-10-09	Historical Mean LC50 :	3685 mg/L
Test Duration :	96 hours	Warning Limits (± 2 SD) :	1127 - 6803 mg/L
LC50 (95% confidence limits):	4665 mg/L (3764 - 5783)	Statistical Method :	Spearman-Kärber (CETIS) a
		Test Conducted By :	JGG

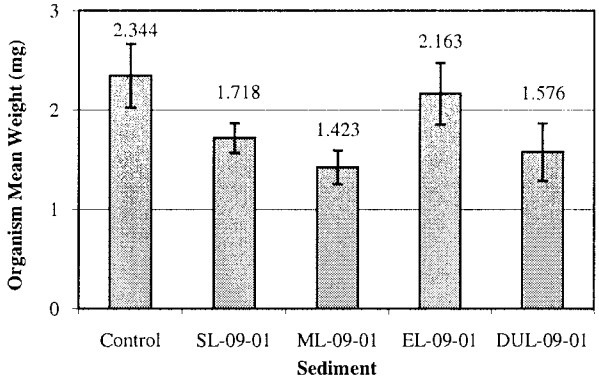
The reference toxicant test was conducted as a water only test, as specified in the test method.

Work Order : 215904

Chironomus dilutus **Survival**



Chironomus dilutus **Growth**



SEDIMENT CHARACTERISTICS

Sample Number	Sample Name	TOC (mg/kg)	Moisture Content (%)	Particle Size (%)			
				Gravel	Sand	Silt	Clay
–	Control	89000	72	0	0.9	98.2	1
25652	SL-09-01	66000	86	ND	24	62	13
25653	ML-09-01	86000	91	ND	46	42	12
25655	EL-09-01	37000	79	ND	39	46	15
25656	DUL-09-01	110000	92	ND	25	56	19

ND = Not Detected

TEST CONDITIONS

Test Organism:	*Chironomus dilutus*	Test Type:	Static
Organism Batch :	Ct09-09	Test Vessel:	300 mL pyrex beaker
Source:	In-house culture	Sediment Depth:	Approx. 3.5 cm
Source Location :	Guelph ON	Sediment Volume:	100 mL per replicate
Mean Head Capsule Width :	0.37 mm	Overlying Water Volume:	175 mL per replicate
Range of Head Capsule Widths :	0.28 - 0.51 mm	Control/Test Water:	Well water (no additional chemicals)
Life Stage on Test Day 0 :	3rd Instar	Control Sediment:	Long Point, Lake Erie
Samples per Treatment :	1	Test Aeration :	Yes (all replicates)
Number of Replicates:	5	Test Aeration Rate :	2-3 bubbles per second
Organisms per Replicate:	10	Photoperiod (light/dark) :	16 h / 8 h
Organisms per Treatment:	50	Light Intensity :	893 - 945 lux
Feed Type:	Tetramin flakes in R.O. water	Test Duration :	10 days
Feeding Rate (per replicate):	~6 mg dry solids daily	Test Method Deviations :	None

COMMENTS

The results reported relate only to the samples tested.
All test validity criteria as specified in the test method cited in this report were satisfied.
No organisms exhibiting unusual appearance, behavior, or undergoing unusual treatment were used in the test.

REFERENCES

[a] CETIS, © 2001-2007. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, McKinleyville, Calif. 95519 [Program on disk and printed User's Guide].

[b] Stephan, C. E. 1977. Methods for calculating an LC50. P. 65-84 In: P.L. Mayer and J. L. Hamelink (eds.), Aquatic Toxicology and Hazard Evaluation. Amer. Soc. Testing and Materials, Philadelphia PA. ASTM STP 634.

Date: _____ ***Approved by:*** _____

yyyy-mm-dd *Project Manager*

Work Order : 215904

Chironomus dilutus Survival Data

Sample	Replicate	Number of Survivors (n=10)	Surviving Organisms (%)	Treatment Average Survival (%)	Standard Deviation	CV (%)
	A	8	80	84	5.5	6.5
Control	B	9	90			
	C	8	80			
	D	8	80			
	E	9	90			
	A	8	80	84	5.5	6.5
25652	B	8	80			
SL-09-01	C	8	80			
	D	9	90			
	E	9	90			
	A	7	70	80	14.1	17.7
25653	B	9	90			
ML-09-01	C	7	70			
	D	7	70			
	E	10	100			
	A	9	90	92	4.5	4.9
25655	B	9	90			
EL-09-01	C	9	90			
	D	9	90			
	E	10	100			
	A	10	100	98	4.5	4.6
25656	B	9	90			
DUL-09-01	C	10	100			
	D	10	100			
	E	10	100			

Data Reviewed By: KEH
Date: 2009-11-13

Work Order : 215904

Chironomus dilutus Weight Data

Sample	Replicate	Foil Weight (mg)	Dry Weigt of Foil + Organisms (mg)	Number of Organisms Weighed	Mean Dry Weight of Organisms (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation	CV (%)
	A	808.52	830.75	8	2.779	2.344	0.32	13.6
Control	B	801.95	821.05	9	2.122			
	C	809.06	829.65	8	2.574			
	D	806.20	823.85	8	2.206			
	E	811.85	830.18	9	2.037			
	A	808.72	821.09	8	1.546	1.718	0.15	8.6
25652	B	797.04	810.02	8	1.623			
SL-09-01	C	801.04	816.39	8	1.919			
	D	800.97	816.27	9	1.700			
	E	808.54	824.78	9	1.804			
	A	796.97	807.12	7	1.450	1.423	0.17	11.8
25653	B	800.77	813.66	9	1.432			
ML-09-01	C	796.15	804.77	7	1.231			
	D	808.03	819.78	7	1.679			
	E	813.45	826.70	10	1.325			
	A	803.72	825.95	9	2.470	2.163	0.31	14.3
25655	B	802.29	824.31	9	2.447			
EL-09-01	C	804.85	823.64	9	2.088			
	D	796.73	815.61	9	2.098			
	E	803.07	820.22	10	1.715			
	A	793.61	806.21	10	1.260	1.576	0.29	18.2
25656	B	803.42	820.54	9	1.902			
DUL-09-01	C	824.12	840.19	10	1.607			
	D	816.36	834.36	10	1.800			
	E	819.10	832.20	10	1.310			

Data Reviewed By: [signature]
Date: 2009-11-13

Chironomus dilutus Sediment Test Data

Work Order : 215904
Sample Number : **Control**
Species: *Chironomus dilutus*
Organism Batch : Ct09-09
Sediment pH: 6.7
Pore Water pH: 7.2
Pore Water Ammonia (mg/L) : 0.8
Sample Treatment: Dry sieved (2 mm)
Time Start: 10:00

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2009-10-06	24.0	Composite	8.1	Y	JGG	774	8.4	360	0.20	0.02
1	Wed	2009-10-07	24.0	A	8.0	Y	JGG	–	–	–	–	–
2	Thurs	2009-10-08	24.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2009-10-09	24.0	B	8.0	Y	JGG	–	–	–	–	–
4	Sat	2009-10-10	24.0	–	–	Y	JGG	–	–	–	–	–
5	Sun	2009-10-11	24.0	–	–	Y	JGG	–	–	–	–	–
6	Mon	2009-10-12	24.0	C	8.0	Y	LB	–	–	–	–	–
7	Tues	2009-10-13	24.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2009-10-14	24.0	D	7.9	Y	JGG	–	–	–	–	–
9	Thurs	2009-10-15	24.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2009-10-16	24.0	Composite	8.0	N	LB	1005	8.2	580	0.35	0.03

"–" = not measured/not required

Data Reviewed By: KH
Date: 2009-11-13

Chironomus dilutus Sediment Test Data

Work Order :	215904
Sample Number :	**25652**
Species:	*Chironomus dilutus*
Organism Batch :	Ct09-09
Sediment pH:	6.0
Pore Water pH:	5.7
Pore Water Ammonia (mg/L) :	1.1
Sample Treatment:	Hand homogenization
Time Start:	10:25

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2009-10-06	24.0	Composite	8.2	Y	JGG	475	8.3	220	0.45	0.04
1	Wed	2009-10-07	24.0	A	8.0	Y	JGG	–	–	–	–	–
2	Thurs	2009-10-08	24.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2009-10-09	24.0	B	7.9	Y	JGG	–	–	–	–	–
4	Sat	2009-10-10	24.0	–	–	Y	JGG	–	–	–	–	–
5	Sun	2009-10-11	24.0	–	–	Y	JGG	–	–	–	–	–
6	Mon	2009-10-12	24.0	C	7.7	Y	JGG	–	–	–	–	–
7	Tues	2009-10-13	24.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2009-10-14	24.0	D	7.9	Y	JGG	–	–	–	–	–
9	Thurs	2009-10-15	24.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2009-10-16	24.0	Composite	8.0	N	LB	361	7.6	120	8.55	0.17

"–" = not measured/not required

Data Reviewed By: VEH
Date: 2009-11-13

Chironomus dilutus Sediment Test Data

Work Order : 215904
Sample Number : **25653**
Species: *Chironomus dilutus*
Organism Batch : Ct09-09
Sediment pH: 6.5
Pore Water pH: 7.0
Pore Water Ammonia (mg/L) : 0.7
Sample Treatment: Hand homogenization
Time Start: 10:35

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2009-10-06	24.0	Composite	8.3	Y	JGG	556	8.3	180	0.30	0.03
1	Wed	2009-10-07	24.0	A	8.0	Y	JGG	–	–	–	–	–
2	Thurs	2009-10-08	24.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2009-10-09	24.0	B	7.9	Y	JGG	–	–	–	–	–
4	Sat	2009-10-10	24.0	–	–	Y	JGG	–	–	–	–	–
5	Sun	2009-10-11	24.0	–	–	Y	JGG	–	–	–	–	–
6	Mon	2009-10-12	24.0	C	8.0	Y	LB	–	–	–	–	–
7	Tues	2009-10-13	24.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2009-10-14	24.0	D	7.9	Y	JGG	–	–	–	–	–
9	Thurs	2009-10-15	24.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2009-10-16	24.0	Composite	7.9	N	LB	627	8.0	130	3.70	0.19

"–" = not measured/not required

Data Reviewed By: [signature]
Date: 2009-11-13

Chironomus dilutus Sediment Test Data

Work Order : 215904
Sample Number : **25655**
Species: *Chironomus dilutus*
Organism Batch : Ct09-09
Sediment pH: 6.2
Pore Water pH: 5.6
Pore Water Ammonia (mg/L) : 0.6
Sample Treatment: Hand homogenization
Time Start: 11:15

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2009-10-06	24.0	Composite	8.3	Y	JGG	494	8.3	210	0.50	0.05
1	Wed	2009-10-07	24.0	A	8.0	Y	JGG	–	–	–	–	–
2	Thurs	2009-10-08	24.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2009-10-09	24.0	B	8.0	Y	JGG	–	–	–	–	–
4	Sat	2009-10-10	24.0	–	–	Y	JGG	–	–	–	–	–
5	Sun	2009-10-11	24.0	–	–	Y	JGG	–	–	–	–	–
6	Mon	2009-10-12	24.0	C	7.7	Y	JGG	–	–	–	–	–
7	Tues	2009-10-13	24.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2009-10-14	24.0	D	7.8	Y	JGG	–	–	–	–	–
9	Thurs	2009-10-15	24.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2009-10-16	24.0	Composite	7.8	N	LB	476	7.7	180	4.20	0.11

"–" = not measured/not required

Data Reviewed By: KH
Date: 2009-11-13

Chironomus dilutus Sediment Test Data

Work Order : 215904
Sample Number : **25656**
Species: *Chironomus dilutus*
Organism Batch : Ct09-09
Sediment pH: 6.1
Pore Water pH: 5.6
Pore Water Ammonia (mg/L) : 0.3
Sample Treatment: Hand homogenization
Time Start: 11:35

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2009-10-06	24.0	Composite	8.3	Y	JGG	399	8.1	170	0.40	0.02
1	Wed	2009-10-07	24.0	A	8.0	Y	JGG	–	–	–	–	–
2	Thurs	2009-10-08	24.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2009-10-09	24.0	B	7.9	Y	JGG	–	–	–	–	–
4	Sat	2009-10-10	24.0	–	–	Y	JGG	–	–	–	–	–
5	Sun	2009-10-11	24.0	–	–	Y	JGG	–	–	–	–	–
6	Mon	2009-10-12	24.0	C	7.8	Y	LB	–	–	–	–	–
7	Tues	2009-10-13	24.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2009-10-14	24.0	D	7.6	Y	JGG	–	–	–	–	–
9	Thurs	2009-10-15	24.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2009-10-16	24.0	Composite	7.9	N	LB	355	7.6	150	8.25	0.17

"–" = not measured/not required

Data Reviewed By: VEH
Date: 2009-11-13

CHAIN OF CUSTODY RECORD

AQUATOX

Project / Work Order No. 25904

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	2295
Field Sampler Name (print):	Cynthia Russel
Signature:	Cynthia Russel
Affiliation:	Minnow Environmental
Sample Storage (prior to shipping):	Refridgerated
Custody Relinquished by:	
Date/Time Shipped:	

Client:	Minnow Environmental Inc. 2 Lamb Street Georgetown, ON L7G 3M9
Phone:	(905) 873-3371 x22
Fax:	(905) 873-6370
Contact:	Cynthia Russel

Sample Identification					Analyses Requested						Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temperature (°C)	*Hyallella azteca* 14-d Survival and Growth	*Chironomus sp.* 10-d Survival and Growth	*Hexagenia limbata* 21-d Survival and Growth	Fathead Minnow 21-d Survival and Bioaccumulation	Microtox Solid Phase	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. one 6 L pail; one 20 L pail etc.)
2009/09/22		QL-09-01	25651	8.6	X								
09/09/17		SL-09-01	25652		X	X							
09/09/18		ML-09-01	25653		X	X							
09/09/19		TML-09-01	25654		X								
09/09/14		EL-09-01	25655		X	X							
09/09/15		DUL-09-01	25656		X	X							
09/09/22		MCL-09-01	25657		X								
09/09/21		RL-09-01	25658		X								
09/09/20		MAL-09-03	25659		X								
09/09/17		HOL-09-01	25660		X								

For Lab Use Only
Received By: JT
Date: 2009-09-25
Time: 10:05
Storage Temp (°C):

9-2009-09-28

Please list any special requests or instructions:
sample type = D. pongr
from container label(s)

APPENDIX F

SPECIAL INVESTIGATION STUDIES
DOSE AND RISK

SPECIAL INVESTIGATIONS 2009 – IMPLICATIONS FOR RADIOLOGICAL DOSE AND RISK CALCULATIONS

Report prepared for:

DENISON MINES INC.
8 Kilborn Way
Elliot Lake, Ontario
P5A 2T1

and

RIO ALGOM LIMITED
P.O. Box 38
Elliot Lake, Ontario
P5A 2J6

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

Ref. 10-1705
February 2011

SPECIAL INVESTIGATIONS 2009 – IMPLICATIONS FOR RADIOLOGICAL DOSE AND RISK CALCULATIONS

Donald R. Hart, Ph.D.
Senior Ecotoxicologist

Rina Parker
Risk Assessment Specialist

EXECUTIVE SUMMARY

A number of special investigation studies were undertaken in the Serpent River Watershed in 2009, in order to clarify several issues pertinent to estimation of radiological dose and risk to natural biota and humans utilizing the watershed lakes.

Studies were undertaken by Minnow Environmental Inc. (Minnow, 2011) to:

- Measure radionuclides in tissues of aquatic plants and forage fish of six key lakes in the watershed downstream of former uranium mining areas,
- Measure radionuclides in water and sediments at the plant and fish collection locations, and
- Survey the presence of waterfowl species in the six key lakes.

The six lakes studied were McCabe, May, Elliot, Nordic, Quirke and McCarthy Lake.

Studies were undertaken by the Serpent River First Nation (SRFN, 2010) to determine the amounts of local fish and wildlife consumption by the SRFN community, and the harvest locations, with specific reference to the six key lakes.

The present study makes use of the special investigation data to address several previously identified questions, and to estimate radiological doses associated with the measured radionuclide concentrations in the six key lakes. The specific questions were:

- Are Pb-210 and Po-210 at secular equilibrium in the lake sediments, as assumed in previous lake studies?
- Are radionuclides of the Th-232 decay chain elevated in lake sediments, and do they contribute appreciably to dose?
- Are bioaccumulation factors (BAFs) derived from the flooded basins for aquatic plants and forage fish representative for the watershed lakes?

The questions were resolved, as follows:

- Pb-210 and Po-210 are at secular equilibrium in the lake sediments, as would be expected from their half-lives. The average Po/Pb ratio in sediments was 1.01, with a range from 0.87 to 1.18, and no upstream-downstream pattern.
- Radionuclides of the Th-232 decay chain are clearly elevated above background in May and Quirke Lake sediments, although the Th-232 concentration is only about 1/10th of the Th-230 concentration. The contribution of the Th-232 decay chain to

total dose was usually 10% or less, except for May Lake where 4 of 8 receptors had Th-232 decay chain contributions greater than 10%, and for aquatic plants where contributions exceeded 10% in most lakes and reached 25% in May Lake.

- Bioaccumulation factors (BAFs) derived from the flooded basins were generally similar to those derived from the watershed lakes for aquatic plants, although the U value was slightly lower in the basins, and the Pb value was slightly higher. Fish BAFs derived from the basins were consistently lower than those derived from the watershed lakes. Po-210 BAFs were not determined in either case due to non-detection of Po-210 in water; however, Po-210 in fish tissue was consistently higher than Pb-210, by a factor of 22 on average.

The high observed Po/Pb ratio in fish indicates that fish to duck transfer factors for Po-210, previously determined in the flooded basins using a Pb BAF to estimate Po-210 in fish, were most likely overestimated by at least a factor of 10. Correction for this error produces a transfer factor of 5.45 d/kg for fish-eating ducks, which is more in line with the Health Canada (2007) generic value of 2.5 for birds.

A survey of fish and wildlife consumption by SRFN fishers and hunters and their families (SRFN, 2010) produced more realistic values for fish and wildlife intake rates than those used previously, and also indicated the fraction of harvest likely to come from the six watershed lakes and from Lake Huron. These data were utilized, along with measured radionuclide concentrations in the six lakes and Lake Huron, to estimate the dose received by SRFN members.

Using the special investigations data, radiation doses to ecological receptors and human receptors using the watershed were calculated.

Ecological Dose and Risk

The calculated doses to fish, aquatic plants and benthos were well below the UNSCEAR (1996) benchmark dose of 10 mGy/d. The largest doses to aquatic biota occurred at Quirke Lake, where the doses to fish, aquatic plants and benthos were 0.92, 2.61 and 0.256 mGy/d, respectively. For all aquatic biota, the largest component of dose was internal. The largest contributor to dose was generally Po-210 for fish and benthic invertebrates, while the dose was more evenly distributed for aquatic macrophytes, with Ra-226 and short-lived radon daughters usually making the largest contribution.

The radiation doses to riparian wildlife were less than the UNSCEAR (1996) benchmark dose of 1 mGy/d. The largest doses to riparian wildlife occurred at Quirke Lake, where the doses to mallard, scaup, merganser, muskrat and mink, were 0.263, 0.094, 0.793, 0.407 and 0.124 mGy/d, respectively. For all riparian biota, the largest component of dose was usually internal. The largest contributor to dose was Po-210 for waterfowl, and Ra-226 with

short-lived radon daughters for muskrat. For mink, one or the other of these contributors (Ra-226 or Po-210) was predominant.

Human Dose and Risk

The radionuclide concentrations from the special investigation studies were utilized to calculate radiation doses received by generic human receptors at the six watershed lakes (receptor assumed to reside there and take all fish and game from there). The calculated doses ranged from 0.036 to 0.301 mSv/a, all less than the public dose limit of 1 mSv/a, before background correction. Background dose from the same pathways was estimated at 0.013 mSv/a. Therefore, incremental doses ranged from 0.023 to 0.288 mSv/a. The smallest doses were at McCarthy, Elliot and Nordic lakes, whereas the largest dose was at Quirke Lake. The dose at Quirke Lake was dominated by consumption of mallard ducks, and was driven by the high concentration of Po-210 in aquatic macrophytes at Quirke Lake.

Macrophytes were collected in Quirke Lake from a former tailings deposition area near Panel Mine and likely over-estimate typical macrophyte uptake within the lake. Moreover, cottage residents at Quirke Lake do not use the lake for duck hunting. The estimated dose at Quirke Lake without the waterfowl component is 0.072 mSv/a (total) or 0.064 mSv/a (incremental).

The calculated dose to a Serpent River First Nation member was based on realistic use of the six watershed lakes, and of Lake Huron, as determined from the survey of households (SRFN, 2010). Most of the harvest comes from Lake Huron. For an actual use scenario the dose was 0.062 mSv/a (total) or 0.049 mSv/a (incremental). For a future use scenario the dose was 0.060 mSv/a (total) or 0.047 mSv/a (incremental). All these doses are less than the public dose limit of 1 mSv/a (incremental). The use of Serpent Harbour water and sediment data to represent Lake Huron may overestimate the Lake Huron component of dose.

The contributions of water, fish, moose and waterfowl to dose are approximately 28%, 37%, 25% and 10%, respectively, with slight variations between actual use and future use scenarios.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1-1

2.0 METHODS 2-1

2.1 Media Sampling and Analysis 2-1
2.1.1 Water 2-1
2.1.2 Sediment 2-1
2.1.3 Macrophytes 2-2
2.1.4 Fish 2-2
2.1.5 Waterfowl 2-2
2.2 Survey of Fish and Wildlife Consumption 2-3
2.3 Use of Special Investigations Data 2-3
2.3.1 Radiochemical Data 2-3
2.3.2 Fish and Wildlife Consumption Data 2-4
2.4 Dose Calculations for Natural Biota and Humans 2-5
2.4.1 Radionuclide Concentrations in Benthic Invertebrates 2-5
2.4.2 Radionuclide Concentrations in Sport Fish 2-5
2.4.3 Radionuclide Concentrations in Riparian Wildlife 2-6
2.4.4 Dose to Aquatic Biota 2-7
2.4.5 Dose to Riparian Wildlife 2-8
2.4.6 Dose to Human Receptors 2-9
2.4.7 Dose Limits and Benchmarks 2-10

3.0 RESULTS 3-1

3.1 Secular Equilibrium of Pb-210 and Po-210 in Sediment 3-1
3.2 Th-232 Decay Chain Radionuclides 3-1
3.3 Bioaccumulation Factors for Aquatic Biota 3-1
3.4 Doses to Aquatic Biota 3-2
3.5 Doses to Riparian Wildlife 3-2
3.6 Doses to Generic Humans 3-3
3.7 Doses to SRFN Members 3-3
3.8 Comparison to EIS Dose Predictions 3-4

4.0 SUMMARY 4-1

4.1 Ecological Dose and Risk 4-1
4.2 Human Dose and Risk 4-2

5.0 REFERENCES.....5-1

APPENDICES

A: Field Sheets
B: Radionuclide Analysis Results
C: Fish Collections
D: Detailed Dose Calculations

LIST OF TABLES

Tables

2.1: UTM coordinates (Zone 17) for Special Investigation, September 2009
2.2: Characteristics of Macrophyte and Fish Samples collected from lakes, September 14-22
2.3: Observations of waterfowl and other birds, September 14-22
2.4: Bioaccumulation Factors used for Benthic Invertebrates from Flooded Basin Studies
2.5: Intake Rates of Water, Food and Sediment, and Occupancy Factors used for Riparian Wildlife Species
2.6: Transfer Factors used for Calculations Radionuclide Concentrations in Riparian Wildlife Tissues
2.7: Dose Coefficients used for Aquatic Biota and Riparian Wildlife
2.8: Dose Coefficients used for Human Receptors
3.1: Po/Pb Ratio in Lake Sediments
3.2: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Lake Sediments
3.3: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Lake Water
3.4: Average Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Whole Forage Fish (fresh weight)
3.5: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Aquatic Macrophytes (dry weight)
3.6: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Aquatic Macrophytes (fresh weight)
3.7: Bioaccumulation Factors for Whole Forage Fish in Watershed Lakes (fresh weight)
3.8: Bioaccumulation Factors for Aquatic macrophytes in Watershed lakes (fresh weight)
3.9: Comparison of Basin and Lake Bioaccumulation Factors for Forage Fish and Aquatic Macrophytes
3.10: Radiation Doses to Aquatic Biota at Six Lakes in the Serpent River Watershed
3.11: Radiation Doses to Riparian Wildlife at Six lakes in the Serpent River Watershed
3.12: Radiation Doses to Generic Human at Six Lakes in the Serpent River Watershed
3.13: Radiation Doses to Serpent River First Nations Member
3.14 Comparison of EIS Dose Predictions for Riparian Wildlife Near McCabe Lake with Current Dose Estimates
3.15 Comparison of EIS Dose Predictions for Humans at Selected Locations with Current Dose Estimates

LIST OF FIGURES

Figures

1: Elliot Lake Sample Locations, September 2009
2: May Lake Sample Locations, September 2009
3: McCarthy Lake Sample Locations, September 2009
4: Nordic Lake Sample Locations, September 2009
5: Quirke Lake Sample Locations, September 2009
6: McCabe Lake Sample Locations, September 2009

1.0 INTRODUCTION

A number of special investigation studies were undertaken in the Serpent River Watershed in 2009, in order to clarify several issues pertinent to estimation of radiological dose and risk to natural biota and humans utilizing the watershed lakes.

Studies were undertaken by Minnow Environmental Inc. (Minnow, 2010) to:

- Measure radionuclides in tissues of aquatic plants and forage fish of six key lakes in the watershed downstream of former uranium mining areas,
- Measure radionuclides in water and sediments at the plant and fish collection locations, and
- Survey the presence of waterfowl species in the six key lakes.

The six lakes studied were McCabe, May, Elliot, Nordic, Quirke and McCarthy Lake.

Studies were undertaken by the Serpent River First Nation (SRFN, 2010) to determine the amounts of local fish and wildlife consumption by the SRFN community, and the harvest locations, with specific reference to the six key lakes.

The present study makes use of the special investigation data to address several previously identified questions, and to estimate radiological doses associated with the measured radionuclide concentrations in the six key lakes. The specific questions were:

- Are Pb-210 and Po-210 at secular equilibrium in the lake sediments, as assumed in previous lake studies?
- Are radionuclides of the Th-232 decay chain elevated in lake sediments, and do they contribute appreciably to dose?
- Are bioaccumulation factors (BAFs) derived from the flooded basins for aquatic plants and forage fish representative for the watershed lakes?

Special investigation methods are outlined in Section 2, including the media sampling and analysis methods, SRFN survey methods, and use of the data in dose calculations. The analysis results are presented and answers to the specific questions posed, and dose calculations based on the special investigations data are presented in Section 3. A summary of study findings is presented in Section 4.

2.0 METHODS

2.1 Media Sampling and Analysis

Field sample collection and assessment of waterfowl was conducted by Minnow personnel at all six lakes from September 14 – 22, 2009. Sample locations within each lake were recorded by GPS (**Table 2.1**) and noted on maps (see **Figures 1 – 6**). All water, sediment, macrophyte and fish samples collected were analyzed for radionuclides by Becquerel Laboratories in Mississauga. Analysis request forms and all raw data files are appended with field sheets (Appendices A and B). In addition to sample data, standard laboratory quality assurance/quality control data were collected and reported by Becquerel.

Areas selected for sampling were located in close proximity, whenever possible, to tailings management areas (TMAs) or effluent pathways. A few exceptions should be noted. McCabe Lake had macrophytes located in the most eastern end of the lake but none in close proximity to the TMA; therefore, samples from McCabe lake were mostly collected in the east end except for one fish sample which was obtained in close proximity to the TMA. For May Lake, macrophytes, water and sediment samples were collected near the inflow from McCabe Lake while fish were sampled within the central basin (to capture the influence of Stanleigh and Stanrock).

The sampling area in Quirke Lake was in an area of historical tailings deposition associated with the Panel TMA and is probably not representative of the lake as a whole.

2.1.1 Water

One water sample per lake (**Figures 1 – 6**) was collected into a 1 liter amber glass bottle containing 10 mL of concentrated nitric acid as preservative. Water samples were collected approximately 30 cm below the surface of the water. Following collection, samples were refrigerated until submission to the laboratory.

2.1.2 Sediment

In the original study design, sediment samples were to be collected by core at locations previously showing highest Ra-226 concentrations in each lake, methods which are consistent with the sediment component of the Serpent River Watershed Monitoring Program. Prior to the initiation of field sampling for the Special Investigation, Minnow in conjunction with the CNSC modified the study design so that sediment sampling would take place in close proximity to macrophyte collection locations. The change in sampling design was considered beneficial since the sediment data would be more amenable to an assessment of possible links between measures of radioactivity in sediment and in macrophytes.

Sediment samples for radionuclide analyses were collected at depths ranging from 0.8 to 1.8 meters using a 15.24 cm x 15.24 cm stainless steel petite ponar grab (0.023 m^2 total sampling area). Although the original study design involved sediment sampling by core, sediments in the vicinity of the macrophytes tended to be too compact for effective coring, therefore collection by ponar was used instead. A composite sediment sample was created by collecting the top 3 cm of sediment from each of two acceptable grabs (i.e., ponar half to completely full) with a spoon. Samples were collected into labelled plastic Ziploc bags. Following collection, all sediment samples were placed into a cooler and stored in a refrigerator until submission to the laboratory. They were dried and weighed prior to analysis and results were reported on a dry weight basis.

2.1.3 Macrophytes

The dominant macrophyte species in each lake were sampled for analysis of radionuclides. At least five samples were collected from each lake with the exception of Quirke Lake where four samples were collected (**Table 2.2**). At each lake, an effort was made to collect a variety of plant parts (leaves and stems, roots, seedheads) from emergent, submergent and floating macrophytes. Samples consisted of composites of identified plant parts (e.g., stems, roots, etc.) from individual species with the exception of one sample from McCabe Lake which was a composite of one to two species collected as whole plants. For laboratory analyses of radionuclides, a minimum of approximately 5 grams wet weight was required per sample. Each plant was identified and individual samples placed in labelled Ziplock bags. Samples were kept frozen until submission to the laboratory. They were dried and weighed prior to analysis and results were reported on a dry weight basis.

2.1.4 Fish

As part of the Special Investigation, fish were collected in each lake by either minnow trapping (2 traps per set) or seine netting (≥ 1 hauls per area). Three composite samples of 4 to 25 fish (depending on fish size) per lake were submitted for radionuclide analyses (**Table 2.2**; Appendix Table C.1). Samples consisted of a composite of one species of small-bodied forage fish with the exception of a sample collected from Elliot Lake which was a composite of two species and a sample from McCarthy Lake which consisted of smallmouth bass. All sampled fish were identified and placed in labelled Ziplock bags. Samples were frozen until submission to the laboratory. They were weighed fresh and homogenized prior to analysis and results were reported on a fresh weight basis.

2.1.5 Waterfowl

The assessment of waterfowl within the six lakes was undertaken in the fall, a time of year when waterfowl are normally staging. Observations by field crew on the species and number of waterfowl present took place over one or two days per lake; the time required for completion of water, sediment, macrophyte, and fish collection (**Table 2.2**). At Quirke Lake however, three days were spent collecting samples and therefore waterfowl observation

was extended to three days. Field crews generally surveyed most of the area within each lake with the exception of McCarthy where access to a western portion of the lake was difficult due to the presence of a beaver dam (**Table 2.3**).

2.2 Survey of Fish and Wildlife Consumption

The survey of fish and wildlife consumption by SRFN fishers and hunters and their families was conducted by a survey team of SRFN members working with a Rio Algom representative (SRFN, 2010). Interviews were conducted with 21 fisher/hunter respondents selected to be representative of the community. Each respondent reported: number of household residents, annual household consumption of fish, waterfowl and other game (by species), and harvest distribution by species and location. Household consumption was divided by the number of household residents to estimate the annual consumption per person in each household.

Consumption was sometimes reported in meals per unit time. A meal was assumed to be 0.227 kg, using the size for a meal of fish from the Guide to Eating Ontario Sport Fish (MOE, 2009). Consumption was sometimes reported in animals per unit time. The corresponding mass consumed was calculated using a typical mass of consumable tissue for each animal species as determined by the Harvester Elder for the project (SRFN, 2010).

All 21 respondents reported fish consumption. They also provided a breakdown of their harvest by species and location (the six watershed lakes, Lake Huron and other). Three (3) respondents reported waterfowl consumption. They too provided a breakdown by species and location. Fifteen (15) respondents reported moose consumption, and provided a breakdown by location. These harvest taxa are of particular interest due to their aquatic or riparian habits. Smaller amounts of deer and upland game are also consumed and were included in the survey.

In addition to the current distribution of harvest among lakes, an estimate of the potential future distribution of harvest was made by the SRFN Land and Resources Committee. This estimate considered the potential for future increased usage of the six watershed lakes for fish and game harvesting.

2.3 Use of Special Investigations Data

2.3.1 Radiochemical Data

The water and sediment data consisted of one sample result for each medium at each lake location (samples coincident with macrophyte nearshore sampling locations). The sediment values were consistently above detection limit (except for several Ra-228 values) and were used directly in dose calculations. The missing Ra-228 values in sediment were assumed to be equal to the parent Th-232 concentrations, based on the average Ra/Th ratio of 0.99 when both isotopes were detectable in sediment.

The water values were always less than detection limit for Th-230, Po-210, Th-232, Ra-228 and Th-228, and occasionally less than detection limit for Ra-226 and Pb-210. Therefore, in these situations, either the detection limit value was used as a water concentration, or a lower water concentration was estimated from the sediment concentration using a sediment/water partition coefficient (PC). The PC values for Ra and Pb were taken from the average of lake PC values where the radionuclide was detected in both water and sediment. The PC value for Th was taken as 1/5th of the previously determined PC for Th in flooded basins (i.e. 1/5th of 246000 L/kg, Minnow and BEAK 2001). The flooded basin PC value was similar in magnitude to PCs measured in lake depositional basins for other radionuclides (Minnow, 2005a); however, the nearshore sediments of the 2009 study were coarser and had lower PCs, by an average factor of 0.21. The PC value used for Po was twice the Pb value, based on flooded basin studies.

The macrophyte data consisted of 4 to 6 samples from each lake. The average dry weight concentration for each radionuclide in each lake was determined, using detection limits as concentrations for non-detect samples. These concentrations were converted to a fresh weight basis assuming a dry/fresh weight ratio of 0.25. Unat, Ra-226, Pb-210 and Po-210 were detectable in all samples. Other radionuclides were usually detectable in at least some samples from each lake; however, there were some lakes in which all samples were non-detect for these other radionuclides. In these situations, either the detection limit value was used as a macrophyte concentration, or a lower macrophyte concentration was estimated using a water to plant bioaccumulation factor (BAF). The BAF values for Ra and Th were taken from the average of lake BAFs (on a fresh weight basis) where the radionuclide was detected in both water and macrophyte.

The forage fish data consisted of 2 to 3 whole fish samples from each lake. The average fresh weight concentration for each radionuclide in each lake was determined, using detection limits as concentrations for non-detect samples. Unat, Ra-226 and Po-210 were detectable in all samples. Th-232 was not detectable in any sample. Other radionuclides were detectable in at least some samples from some lakes; however, there were some lakes in which all samples were non-detect for these other radionuclides. In these situations, either the detection limit value was used as a fish concentration, or a lower fish concentration was estimated using a water to fish BAF. The BAF values for Ra, Th and Pb were taken from the average of lake BAFs (on a fresh weight basis) where the radionuclide was detected in both water and fish.

2.3.2 Fish and Wildlife Consumption Data

The dose calculations for SRFN members included contributions from fish, waterfowl and moose consumption, since these aquatic or riparian taxa are potentially associated with the watershed lakes of interest. Average per-person consumption rates for these taxa (12.7, 0.37 and 12.1 kg/a, respectively) were taken from the SRFN (2010) report. Fish were modelled as generic sport fish. Waterfowl were modelled as mallard ducks, since this species accounts for most of the waterfowl consumption.

The fish, waterfowl and moose consumption was apportioned to harvest locations as reported in the SRFN survey. At present, fish are taken mainly from Lake Huron (73%) and also from Elliot Lake (1%) and McCarthy Lake (0.2%). Waterfowl are taken entirely from Lake Huron (100%). Moose are taken from the vicinity of Lake Huron (20%), and from Elliot Lake, McCarthy Lake, Nordic Lake and Quirke Lake (5% each).

In a "future use" scenario, fish harvest was apportioned to Lake Huron (66%), Elliot Lake (3%), McCarthy Lake (2%) and Quirke Lake (2.5%), as estimated by the SRFN Land and Resources Committee. Waterfowl harvest was apportioned to Lake Huron (65%), Elliot Lake (2.5%), McCarthy Lake (5%), May Lake (2.5%), and Nordic Lake (5%). Moose harvest was apportioned to Lake Huron (20%), Elliot Lake (5%), McCarthy Lake (10%), McCabe Lake (2.5%), May Lake (5%), Nordic Lake (5%) and Quirke Lake (2.5%).

Total water consumption (1.5 L/day, Health Canada, 1995) was apportioned to watershed lakes using the fish consumption percentages, and the remainder (i.e. most of the water consumed) was assumed to be taken from Lake Huron.

2.4 Dose Calculations for Natural Biota and Humans

Concentrations of radionuclides in water, sediment, forage fish and aquatic macrophytes were measured (or estimated if necessary) as described in Section 2.3.1. The Unat [1] measurements in ug/L or ug/g were converted to Bq/L or Bq/kg assuming equal activity of U-238 and U-234. Th-234 was assumed to have the same activity concentration in sediment as U-238, and partitioned to water and biota as Th. Rn-222 (with short-lived progeny) was assumed to have the same concentration in sediment and water as Ra-226, but with activity equal 10% of Ra-226 in fish, plants and invertebrates. This percentage is for fish bone (Lucas et al., 1979) and is considered to be conservative for soft tissues, which lose ingrown Rn more rapidly.

2.4.1 Radionuclide Concentrations in Benthic Invertebrates

Since radionuclide concentrations in benthic invertebrates were not measured in the 2009 lake studies, these concentrations were estimated from the concentrations in water using BAFs derived from the flooded basin studies (Minnow and BEAK 2001b). The BAF for Th was estimated as the Unat value. The BAF for Po was taken as 20,000 L/kg (fresh weight), a generic value from Health Canada (2007, draft). The values used are listed in **Table 2.4**.

2.4.2 Radionuclide Concentrations in Sport Fish

Concentrations of U_{nat} and Ra-226 in sportfish were estimated using BAFs from Quirke Lake, Elliot Lake and McCarthy Lake (Minnow, 2005a). Average values for U_{nat} and Ra-226

[1] U_{nat} is primarily U-238 by mass, but contains 12.3 Bq/mg of U-238 and an equal activity of U-234.

were 11.4 and 19.1 L/kg, respectively. For other radionuclides, which were not measured in sport fish, the sport fish BAFs were assumed to be proportional to the forage fish BAFs. For example, from the sportfish BAF_u of 11.4 L/kg for U_{nat} (Minnow, 2005a), the BAF_{Th}:BAF_u ratio for forage fish (218/478) was applied, to estimate a sportfish BAF_{Th} of 5.2. This method provided sportfish BAFs for all radionuclides except Po-210, and the BAFs were used to estimate fish flesh concentrations from water concentrations in each lake. For Po-210, a Po/Pb ratio of 9 for fish flesh (IAEA, 2010) was used to estimate Po-210 from Pb-210 in sportfish at each lake.

2.4.3 Radionuclide Concentrations in Riparian Wildlife

Radionuclide concentrations in riparian wildlife (ducks, muskrat, mink, moose) were estimated using transfer factors (d/kg), which represent the fraction of daily activity intake (Bq/d) transferred to body tissue activity. The daily activity intake was computed as a sum of intakes via water, sediment and food pathways. The overall equation for activity transfer from these media to riparian wildlife tissue is as follows:

$$C_{rw} = (C_w I_w + C_f I_f + C_s I_s) * F_{ing} * OF$$

where:
- C_{rw} = activity concentration in riparian wildlife (Bq/kg)
- C_w = activity concentration in water (Bq/L)
- I_w = water intake rate (L/d)
- C_f = activity concentration in food (Bq/kg fw)
- I_f = food intake rate (kg fw/d)
- C_s = activity concentration in sediment (Bq/kg dw)
- I_s = incidental ingestion of sediment (kg dw/d)
- F_{ing} = ingestion transfer factor (d/kg)
- OF = occupancy factor

Intake rates of water, food and sediment are listed in **Table 2.5**. Water and food intakes are body weight dependent, and are calculated using allometric equations (U.S. EPA, 1993). Sediment intake is 2% of dry weight food intake for dabbler ducks, and negligible for fish ducks (U.S. EPA, 1993). We have assumed 0.2% for the latter. For muskrat and moose, we assume a generic 7% of dry weight food intake (CCME, 1996). For mink, sediment intake is negligible (Sample and Suter, 1994), but is conservatively assumed here to be 1% of dry weight food intake.

The predominant food type was assumed to represent 100% of the dietary intake, as a simplifying assumption. Thus, mallards and muskrats consume aquatic plants, scaup consume benthic invertebrates, and merganser and mink consume fish. Moose consume aquatic plants mainly in the summer months when they are readily available, and woody browse is the dominant food in all seasons (MacCracken *et al.*, 1997). As an annual

average, 12% of the moose diet was considered to be aquatic plants from the watershed lakes.

The occupancy factor was considered to be 0.5 for waterfowl, since they are migratory and spend half the year far away from the Serpent River Watershed. For mammalian wildlife, an occupancy factor of 1.0 was assumed.

Transfer factors (F_{ing}) were whole body values, appropriate for obtaining whole body concentrations and whole body doses. Transfer factors tend to vary among species as an inverse ¾ power of body weight (Beresford *et al.*, 2004). Hart and Burt (2006) gathered U, Ra, Pb and Po transfer factors from the literature for small and large mammalian herbivores, and found body weight relationships that were consistent with the ¾ power rule. Based on these relationships, transfer factors were calculated for muskrat, moose and mink, as outlined in **Table 2.5**.

For waterfowl, transfer factors (F_{ing}) were derived from whole body concentrations of young-of-year ducks that were collected at the TMA basins (Minnow, 2005b), and assumed to be feeding there, on fish or aquatic plants from the basins (**Table 2.6**). The transfer factors were higher for the piscivores, because radionuclide concentrations in the fish were much lower than those in aquatic plants. The duck tissue concentrations did not vary substantially according to feeding habits.

The Po-210 value for herbivorous ducks was 4.62 d/kg, similar to the Health Canada (2007) generic bird value of 2.5 d/kg. However, the Po-210 value estimated for piscivorous ducks was much larger (54.5 d/kg). Since the Po-210 was not actually measured in the fish, but was estimated using the Pb BAF, it is likely (based on Po/Pb ratios from the present study) that the Po-210 in basin fish was at least 10 times higher, and the duck transfer factor at least 10 times lower, or about 5.45 d/kg. This value was used in the present study.

While whole body concentrations are appropriate for calculating dose to biota, concentrations in meat are needed for calculating dose to human consumers of ducks and moose. The meat concentrations are two to three times lower, depending on the radionuclide. An average meat to whole body ratio for each radionuclide was obtained from the data for ducks in TMA basins (Minnow, 2005b), and this was used to estimate meat concentrations from whole body concentrations.

Concentrations of short-lived Rn daughters in riparian wildlife were assumed to be one-third of the Ra-226 concentrations. This ratio applies to mammalian bone, and is conservative for soft tissues such as meat, which lose ingrown Rn more rapidly.

2.4.4 Dose to Aquatic Biota

The radiation dose to aquatic biota was calculated for both external and internal pathways. Sediment exposure was assumed to be the dominant external dose pathway. Water

immersion was considered to be trivial in comparison. The combined external and internal dose was calculated as follows:

$$D_{ab} = C_s \bullet DCF_s \bullet OF_s + C_i \bullet DCF_i$$

where: D_{ab} = radiation dose to aquatic biota (Gy/a)
C_s = activity concentration in sediment (Bq/kg ww)
DCF_s = dose coefficient for sediment exposure (Gy/a per Bq/kg ww)
C_i = activity concentration in body (Bq/kg fw)
DCF_i = internal dose coefficient (Gy/a per Bq/kg fw)
OF_s = occupancy factor for sediment

Concentration in sediment (C_s) was determined as described in Section 2.3.1. The concentration in the body (C_i) was determined for aquatic biota using bioaccumulation factors as described in Sections 2.4.1 and 3.3.

The external dose coefficient (DCF_s) was half Amiro's (1997) value for full immersion in sediment, in order to represent a half immersion (or semi-infinite) exposure situation (**Table 2.7**). Short-lived daughters were included in each coefficient, assuming that daughters were in secular equilibrium with the parent. The occupancy factor for sediment was 0.5 for fish and plants, assuming half of the fish's time on sediment, and only the root portion of the plant on sediment. Benthic invertebrates were assumed to reside full-time on or in sediment.

The internal dose coefficient (**Table 2.7**) was also taken from Amiro (1997), and also included short-lived daughter contributions to dose. However, Amiro provides no adjustment for radiation quality (greater effectiveness of alpha radiation). UNSCEAR (1996) indicates that a quality factor of 5 to 10 may be appropriate for the non-stochastic endpoints relevant to protection of plant and animal populations. We have applied a factor of 10 to the internal absorbed dose from alpha emitters, to produce a "gamma-equivalent" dose estimate.

2.4.5 Dose to Riparian Wildlife

The radiation dose to riparian wildlife (ducks, muskrat, mink) was calculated for both external and internal pathways, using methods similar to those described above for aquatic biota, except for consideration of seasonal occupancy by waterfowl. Thus,

$$D_{rw} = C_s \bullet DCF_s \bullet OF_s + C_i \bullet DCF_i$$

where: D_{rw} = radiation dose to riparian wildlife (Gy/a), and
other terms are as defined above.

Radionuclide concentration in the body (C_i) was determined for riparian wildlife using intake rates and transfer factors as described in Section 2.4.3. The occupancy factor for sediment was 0.5 for waterfowl, assuming they spend half their time on sediment, and 1 for muskrat and mink. The assumption is conservative for waterfowl, which spend considerable time on water or in air, well away from sediment.

2.4.6 Dose to Human Receptors

The radiation dose was calculated for three human receptors: 1) a generic human residing at each lake, 2) a SRFN member with present day usage of multiple watershed lakes as described in Section 2.3.2, and 3) a SRFN member under a "future use" scenario as described in Section 2.3.2. The dose was calculated for ingestion pathways, assuming consumption of drinking water and sportfish from the lake, and of waterfowl (mallard) and moose that feed on aquatic plants in the lake.

For the generic human, the adult water intake of 1.5 L/d (Health Canada, 1995) was assumed to occur 365 days per year. This was assumed to all come from the lake under assessment, as would occur for example for an Elliot Lake resident. The generic adult was assigned a fish consumption rate of 8 g/d, which is the U.S. EPA (1997) recommended value for non-aboriginal fishermen. This is an annual average consumption rate, and was assumed to occur 365 days per year (2.92 kg/a). Based on information from a local sportsman, the average duck hunter would consume approximately 2 kg of duck meat each year. 50% was assumed to come from the lake under assessment. This is conservative for the watershed lakes considered since they contain very little marshy habitat that would be favoured by waterfowl. The same intake rate and local fraction was assumed for moose meat. The 50% fraction is conservative since moose home ranges are on the order of 25 km^2 (Leptich and Gilbert, 1989) and since there are many small lakes in the area that are not mine influenced.

For the SRFN members, the adult water intake of 1.5 L/d (Health Canada, 1995) was assumed to occur 365 days per year. This was apportioned across lakes as described in Section 2.3.2, with most of the water coming from Lake Huron. The duck and moose meat consumption rates were taken from the SRFN (2010) survey and apportioned across lakes as described in Section 2.3.2.

Using these ingestion rates, the dose to human receptors was calculated as follows:

$$D_h = (C_w \bullet I_w + C_f \bullet I_f + C_d \bullet I_d + C_m \bullet I_m) \bullet DCF_i$$

where:
- D_h = human radiation dose (Sv/a)
- C_w = activity concentration in water (Bq/L)
- I_w = water intake rate (L/a)
- C_f = activity concentration in sportfish flesh (Bq/kg fw)

C_d = activity concentration in duck meat (Bq/kg fw)
I_d = local duck meat intake rate (kg fw/a)
C_m = activity concentration in moose meat (Bq/kg fw)
I_m = local moose meat intake rate (kg fw/a)
DCF_i = ingestion dose coefficient (Sv/Bq)

Ingestion dose coefficients were taken from ICRP Publication 72 (ICRP, 1996) (**Table 2.8**). They include dose contributions from short-lived daughters that may grow in over a lifetime following radionuclide ingestion.

2.4.7 Dose Limits and Benchmarks

The dose limit for people (members of the public) is 1 mSv/a, as recommended in ICRP Publication 60 (ICRP, 1991). This is an incremental dose. Background radiation exposure, including natural and anthropogenic sources, is typically about 2 mSv/a.

The human doses calculated for lakes in the Serpent River Watershed include a natural background component. Therefore, the background component must be removed before comparison to the public dose limit.

There is no regulatory dose limit for non-human biota; however, UNSCEAR (1996) recommends a radiation dose benchmark of 1 mGy/d for terrestrial animals, and 10 mGy/d for plants and aquatic biota. These dose rates are considered to be protective of natural populations. They are based on consideration of radiation effects on population relevant endpoints, such as reproductive endpoints. Since the supporting literature generally involves exposure to gamma radiation, the dose benchmarks may be considered to be gamma-equivalent values.

For this assessment, human dose estimates in excess of the ICRP dose limit, and natural biota dose estimates in excess of UNSCEAR dose benchmarks, were considered to be indicators of human or ecological concern that should trigger further investigative action.

Table 2.1: UTM coordinates (Zone 17) for Special Investigation, September 2009

Date sampled	Sample Type	Sample ID	Map ID	Northing	Easting	NAD
16-Sep	water	EL-09-SI	see map	5139752	372526	83
16-Sep	sediment	EL-09-SI	see map	5139752	372526	83
16-Sep	macrophytes	EL-09-E1 to EL-09-E5	see map	5139704	372538	83
14-Sep		n/a	MT1	5139720	372538	83
14-Sep	fish	EL-F1	MT2	5139600	372494	83
14-Sep		EL-F1	MT3	5138857	370356	83
16-Sep		n/a	MT4	5139752	372526	83
16-Sep		n/a	MT5	5139704	372538	83
16-Sep		EL-F2, EL-F3	MT6	5139604	372498	83
20-Sep	water	MAL-09-SI	see map	5143150	384049	83
20-Sep	sediment	MAL-09-SI	see map	5143168	384082	83
20-Sep	macrophytes	MAL-09-M1 to MAL-09-M5	see map	5143124	384002	83
20-Sep	fish	n/a	MT1	5144194	385074	83
20-Sep		n/a	MT2	5144041	386259	83
20-Sep		MAL-F1 to MAL-F3	MT3	5144080	385969	83
22-Sep	water	MCL-09-SI	see map	5131422	386108	83
22-Sep	sediment	MCL-09-SI	see map	5131376	385960	83
22-Sep		MCL-09-M1 to MCL-09-M3 & MCL-09-M6	MCL-09-M1 to MCL-09-M3 & MCL-09-M6	5131381	385958	83
22-Sep	macrophytes	MCL-09-M4, MCL-09-M5	MCL-09-M4, MCL-09-M5	5131422	386108	83
20-Sep	fish[a]	MCL-F1, MCL-F2	SN	5131422	386108	83
18-Sep	water	NL-09-SI	see map	5135858	376211	27
18-Sep	sediment	NL-09-SI	see map	5135853	376224	27
18-Sep	macrophytes	NL-09-N1 to NL-09-N5	see map	5135858	376211	27
18-Sep	fish	NL-F1 to NL-F3	SN	5135878	376212	27
18-Sep		n/a	MT1	5135884	376232	27
18-Sep		n/a	MT2	5135217	376176	27
18-Sep		n/a	MT3	5135217	376584	27

Table 2.1: UTM coordinates (Zone 17) for Special Investigation, September 2009 (Con't)

Date sampled	Sample Type	Sample ID	Map ID	Northing	Easting	NAD
22-Sep	water	QL-09-SI	see map	5150766	380616	83
22-Sep	sediment	QL-09-SI	see map	5150768	380613	83
22-Sep	macrophytes	QL-09-01, QL-09-03	QL-09-01, QL-09-03	5151899	377825	83
22-Sep		QL-09-02, QL-09-04	QL-09-02, QL-09-04	5150768	380613	83
22-Sep		n/a	MT1	5150926	380964	83
22-Sep	fish	QL-F1 to QL-F3	MT2	5150768	380613	83
22-Sep		n/a	MT3	5150756	380564	83
18-Sep	water	ML-09-SI	see map	5142144	379486	83
26-Sep	sediment	ML-09-SI	see map	5143319	379965	83
19-Sep	macrophytes	ML-09-ML1, ML-09-ML2	ML-09-ML1, ML-09-ML2	5143091	379906	83
19-Sep		ML-09-ML3 & ML-09-ML5	ML-09-ML3 & ML-09-ML5	5143318	379898	83
19-Sep		ML-09-ML4	ML-09-ML4	5141280	379074	83
19-Sep	fish	ML-F2[b], ML-F3	MT1	5142121	378826	83
19-Sep		ML-F3	MT2	5141727	378204	83
19-Sep		ML-F1, ML-F2, ML-F3	MT3	5142780	380542	83
19-Sep		ML-F2	MT4	5142101	379893	83

NAD – North American Datum
[a] fish tissue sample MCL-F3 lost during processing at the laboratory
[b] sample a composite of 12 fish from minnow traps MT1, MT3 and/or MT4
n/a – not applicable; any fish captured from these locations were not retained for radionuclide analyses

Table 2.2: Characteristics of macrophyte and fish samples collected from lakes, September 14 -22

Lake	Sample type	Macrophyte						Fish		
	Sample No.	1	2	3	4	5	6	1	2	3
Elliot Lake	Species	sedge	arum	tape grass	pond lily	arum	-	yellow perch	yellow perch	2 yellow perch, 3 pumpkinseed sunfish
	Macrophyte structure/ No. of fish[a]	roots	leaves and stems	leaves	leaves and stems	seed heads	-	5	4	5
May Lake	Species	quillwort	floating leaf pondweed	white water lily	soft-stem bulrush	chara	-	common shiner	common shiner	common shiner
	Macrophyte structure/ Number of organisms	leaves and stems	leaves and stems	leaves and stems	roots	leaves	-	10	10	10
McCarthy Lake	Species	white water lily	tape grass	large leaf pondweed	burreed	water shield	fern pondweed	smallmouth bass	pumpkinseed sunfish	yellow perch
	Macrophyte structure/ Number of organisms	leaves and stems	leaves and stems	leaves and stems	leaves and stems	leaves and stems	leaves and stems	5	20	8
Nordic Lake	Species	floating leaf pondweed	burreed (stiff leaf)	white water lily	burreed (soft leaf)	arum	-	golden shiner	common shiner	golden shiner
	Macrophyte structure/ Number of organisms	leaves and stems	seed head	leaves and stems	leaves and stems	leaves and stems	-	6	6	6
Quirke Lake	Species	pond lily	broad leaf arrowhead	floating pondweed	cattail	-	-	common shiner	mimic shiner	mimic shiner
	Macrophyte structure/ Number of organisms	leaves and stems	leaves, stems, roots	leaves, stems, seeds	roots	-	-	~15	~25	~25
McCabe Lake	Species	sedge	sedge	quilwort and/or lobelia	white water lily	bulrush	-	lake chub	northern redbelly dace	pumpkinseed sunfish
	Macrophyte structure/ Number of organisms	roots	seeds	whole plant	leaves and stems	whole plant	-	10	12	8

[a] - number in composite sample

Table 2 3: Observations of waterfowl and other birds, September 14 - 22.

Lake	Species/Number Observed	Waterfowl and Other Birds					
Elliot Lake	Species	Cormorant	Seagull	Canada goose	Common merganser		
	Number observed	2	>10	>10	6		
May Lake	Species	Common merganser	Hooded merganser	Loon			
	Number observed	8	1	1			
McCabe Lake	Species	Seagull	Common merganser				
	Number observed	10	6 – 9				
McCarthy Lake	Species	Canada goose	black mallard	eagle	gull	loon	hooded merganser
	Number observed	14	10	1	1	1	1
Nordic Lake	Species	Cormorant	gull				
	Number observed	12	2				
Quirke Lake	Species	Common merganser	Seagull				
	Number observed	~7	6				

Table 2.4: Bioaccumulation Factors Used for Benthic Invertebrates from Flooded Basin Studies

	U	Th	Ra	Pb	Po
Benthic Invertebrate BAF (L/kg) (fresh weight)[1]	276	276	486	3,643	20,000

[1] Based on flooded basin studies (Minnow and BEAK, 2001); Po value from Health Canada (2007)

Table 2.5: Intake Rates Of Water, Food and Sediment, and Occupancy Factors Used For Riparian Wildlife Species

Parameter	Units	Mallard	Scaup	Merganser	Muskrat	Mink	Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354	400
Intake of water[1]	L/d	0.065	0.051	0.085	0.135	0.142	21.8
Intake of sediment[2]	kg/d	1.26E-3	1.02E-3	0.17E-3	7.44E-3	0.48E-3	0.057
Intake of plant[3]	kg/d	0.252	-	-	0.425	-	3.3
Intake of invertebrates[3]	kg/d	-	0.204	-	-	-	-
Intake of fish[3]	kg/d	-	-	0.331	-	0.19	-
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0	1.0

[1] Based on allometric equations from U.S. EPA (1993).
[2] Calculated as a percentage of dry food intake (U.S. EPA, 1993; Sample and Suter, 1994; CCME, 1996) on a dry weight of sediment basis.
[3] Based on allometric equations from U.S. EPA (1993), converted to a fresh weight basis; moose value is the aquatic plant portion (12%) of total dietary intake (MacCracken *et al.*, 1997).

Table 2.6: Transfer Factors Used for Calculating Radionuclide Concentrations in Riparian Wildlife Tissues

F_{ing} (d/kg) for	U	Th	Ra	Pb	Po
Mallard[1]	0.008	0.05	0.046	0.162	4.62
Scaup[1]	0.008	0.496	0.423	0.162	4.62
Merganser[1]	0.163	4.89	3.91	1.99	5.45*
Muskrat[2]	0.077	0.031	0.694	0.462	0.540
Mink[2]	0.080	0.032	0.717	0.478	0.558
Moose[2]	0.0011	0.0004	0.0101	0.0067	0.0078
Meat:Whole Body Ratio[3]	0.50	0.63	0.37	0.38	0.59

[1] Based on in-basin plant, fish and duck tissue data (Minnow, 2005b), and adult feed intake rates. * Po value of 54.5 was based on estimated Po in fish using a Pb BAF; based on Po/Pb ratio in present study, Po in fish was at least 10 times higher; therefore, Po F_{ing} for merganser was reduced 10-fold.

[2] Based on allometric equations using ¾ power rule (Hart and Burt, 2006).

[3] Based on meat:whole body ratio for in-basin ducks (Minnow, 2005b).

Table 2.7: Dose Coefficients Used for Aquatic Biota and Riparian Wildlife

Dose Coefficient	Units	U-238/234	Th-234$^+$	Th-230	Ra-226	Rn-222$^+$	Pb-210$^+$	Po-210
External - sediment[1]	Gy/a per Bq/kg ww	5.40E-8	1.53E-5	5.35E-8	2.40E-7	6.70E-5	4.56E-6	2.58E-10
Internal - ingestion[2]	Gy/a per Bq/kg fw	2.31E-5	4.56E-6	2.41E-5	2.46E-5	1.12E-4	2.19E-6	2.73E-5

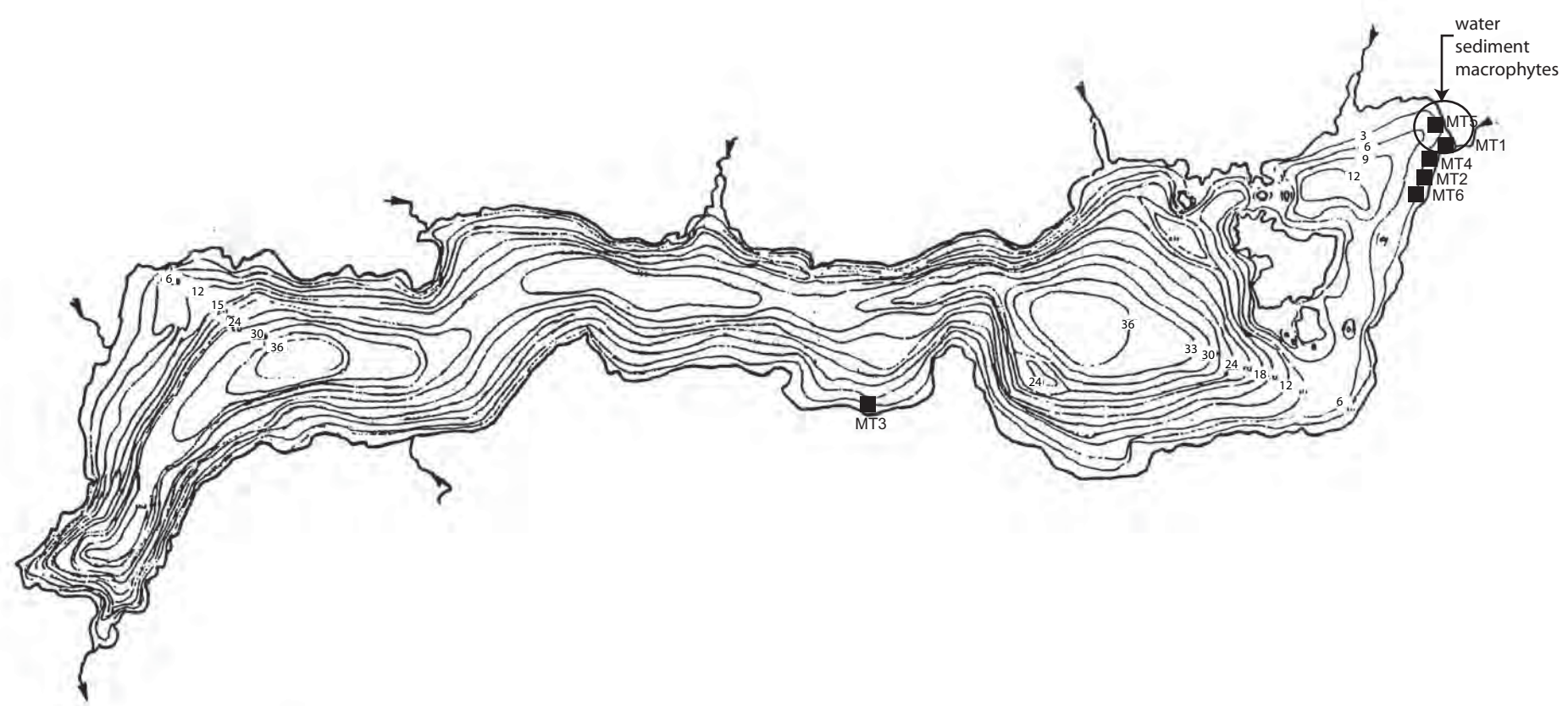
[1] Values from Amiro (1997) converted to wet weight sediment and divided by 2 to represent a semi-infinite exposure situation; "+" indicates daughters are included.

[2] Values from Amiro (1997) assuming complete absorption of all energy released in tissues; "+" indicates daughters are included.

Table 2.8: Dose Coefficients Used for Human Receptors

Dose Coefficient	Units	U-238/234	Th-234$^+$	Th-230	Ra-226	Rn-222$^+$	Pb-210$^+$	Po-210
Internal - ingestion[1]	Sv/Bq	4.7E-8	3.4E-9	2.1E-7	2.8E-7	2.5E-10	6.91E-7	1.2E-6

[1] Values from ICRP Publication 72 (ICRP, 1996); "+" indicates daughters are included.



minnow trap

0 2 kilometers

depth contours in metres

Figure 1

Elliot Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

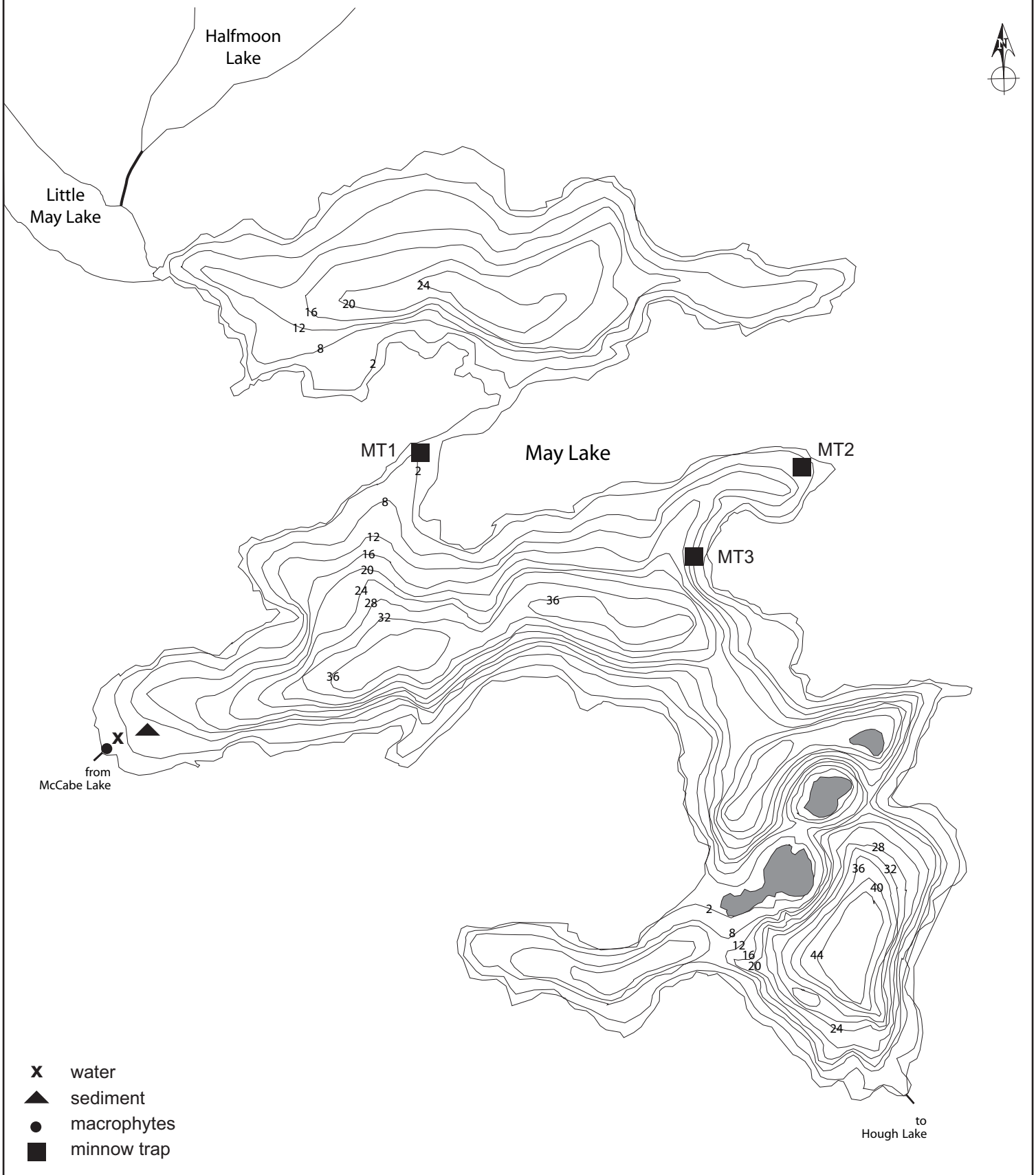


Figure 2

May Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

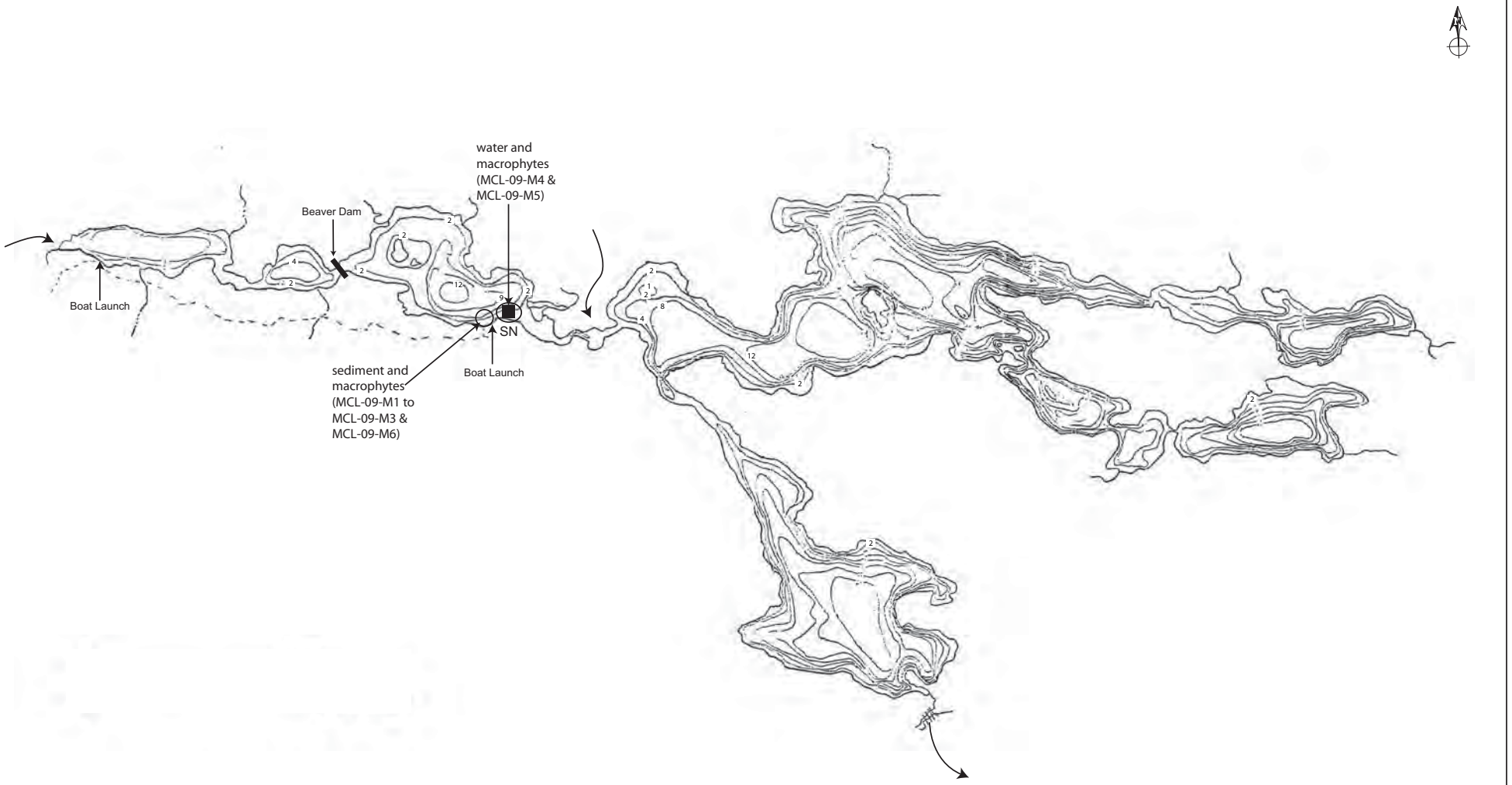


Figure 3

McCarthy Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

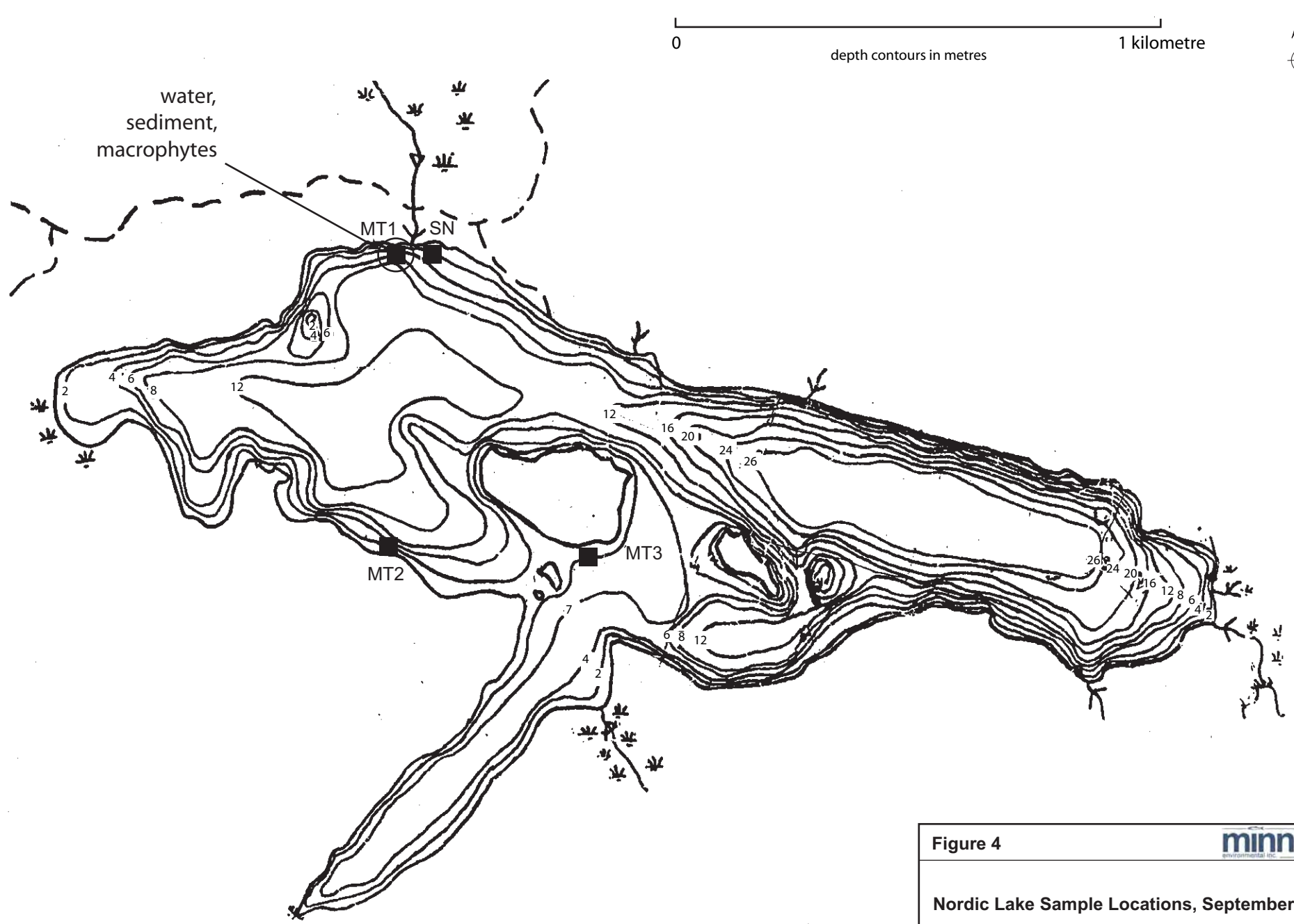


Figure 4

Nordic Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

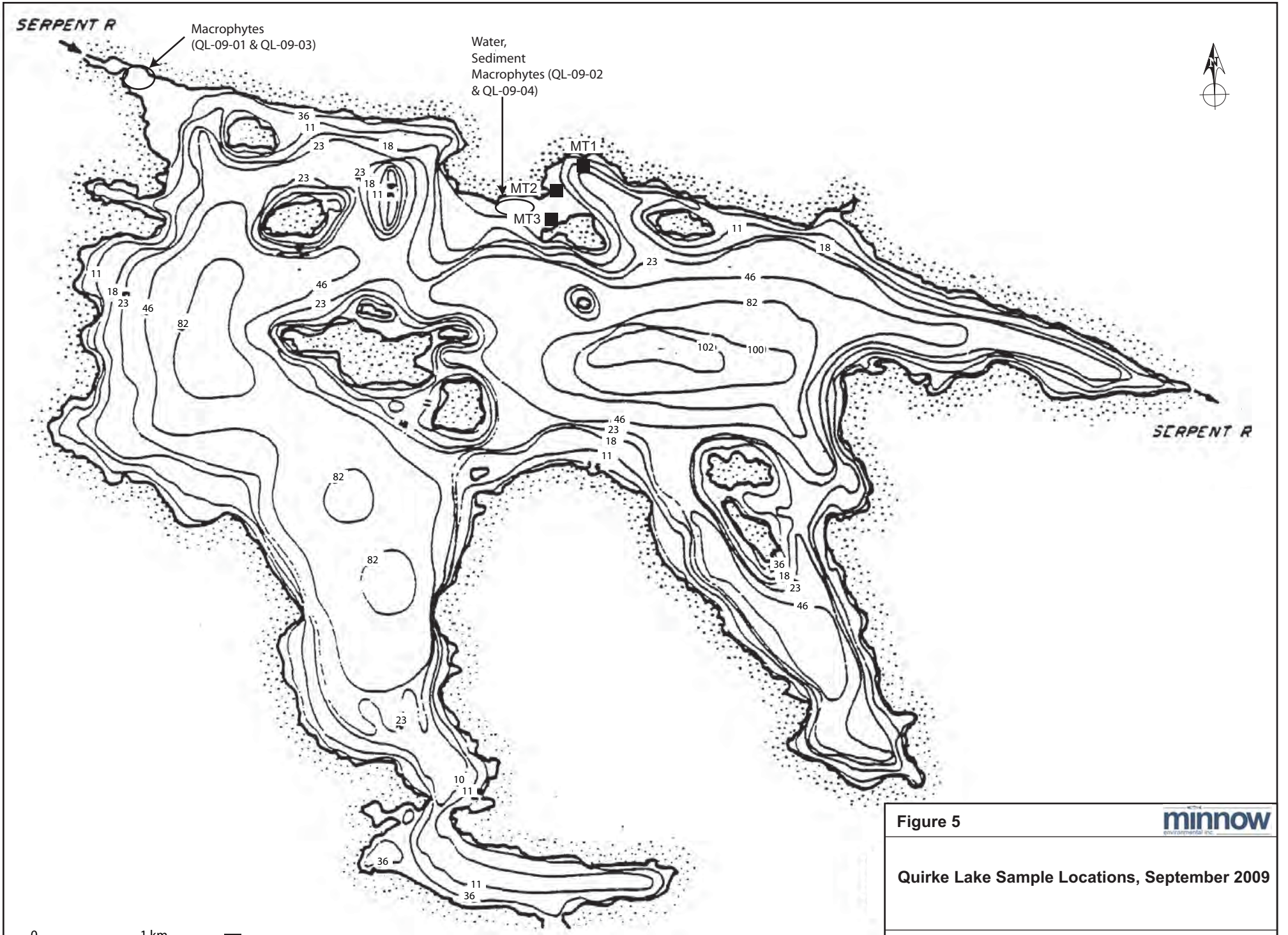


Figure 5

Quirke Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

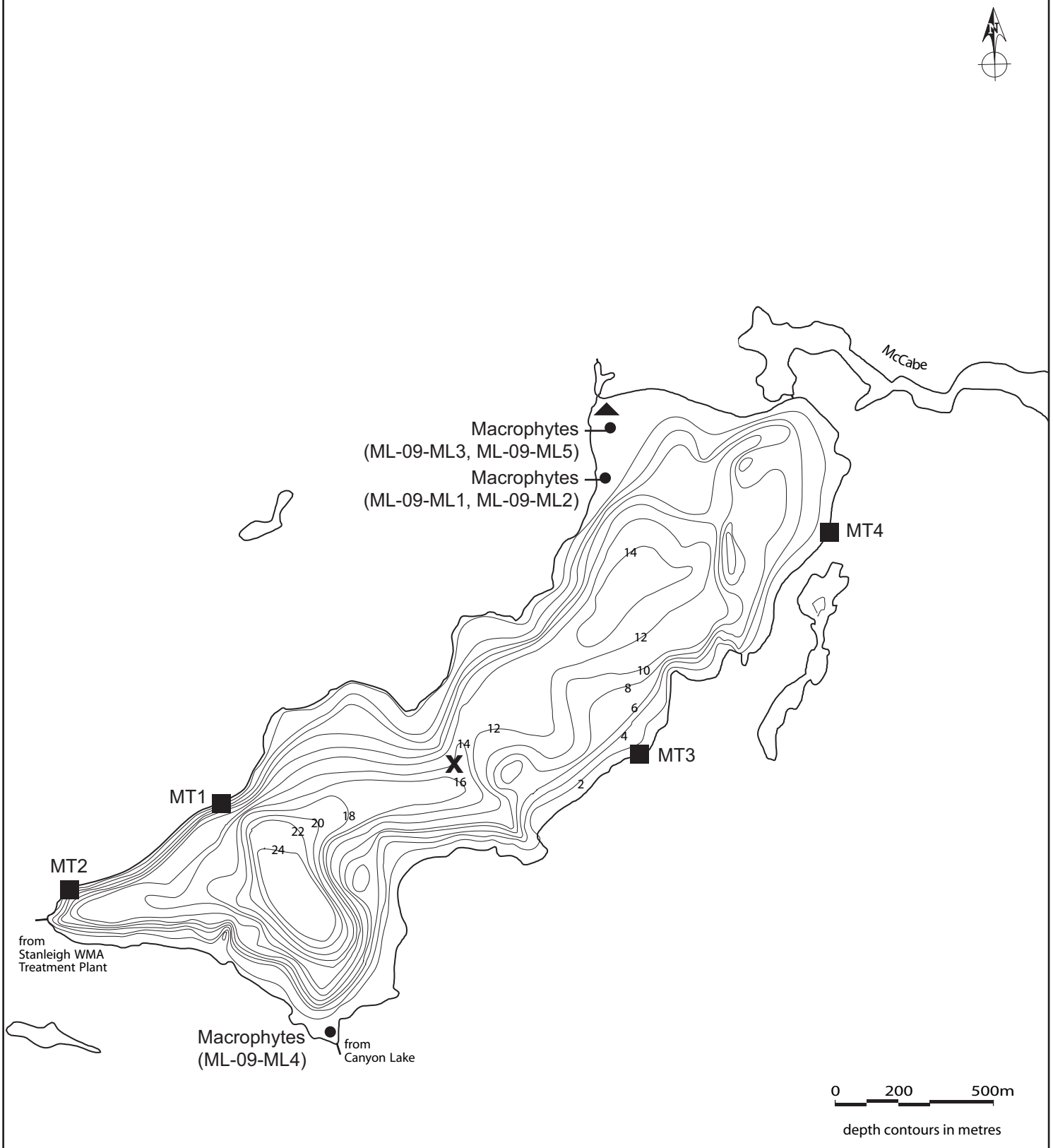


Figure 6

McCabe Lake Sample Locations, September 2009

Ref: 2308
Date: February 2010

3.0 RESULTS

3.1 Secular Equilibrium of Pb-210 and Po-210 in Sediment

The measured activity concentrations of Pb-210 and Po-210 in lake sediments, and the Po/Pb ratios, are presented for each watershed lake in **Table 3.1**. The average ratio is 1.01. The ratios vary from 0.87 to 1.18, with no upstream-downstream pattern. This supports the notion of secular equilibrium between these radionuclides in lake sediments.

Secular equilibrium is expected based on the half lives of parent (Pb-210, 22.3 years) and daughter (Po-210, 138.4 days). Following Brodsky (1982), these half lives dictate that secular equilibrium is reached after about 2 years in undisturbed sediment. Any process acting to disturb secular equilibrium would have to act on a shorter timeframe.

3.2 Th-232 Decay Chain Radionuclides

The measured activity concentrations of U-238 and Th-232 decay chain radionuclides in lake sediments are shown in **Table 3.2**. Concentrations are generally quite low for the Th-232 decay chain relative to the U-238 decay chain, with the exception of May Lake, which had the highest concentrations of Th-232, Ra-228 and Th-228. May Lake also had the highest concentration of Th-230 (elevated at least 6-fold relative to other U-238 series radionuclides). In contrast, the McCabe Lake sediment was depleted in Th-230. This suggests the possibility that thorium was selectively deposited further downstream. McKee et al. (1996) also found higher levels of Th-230 and Th-232 in May Lake as compared to McCabe Lake. This may be due to preferential flushing of Th from McCabe Lake during the historical period of depressed pH, with deposition further downstream.

In Quirke, Elliot, McCabe and May lakes the Th-232 concentrations were approximately $1/10^{th}$ of the Th-230 concentrations. They were clearly elevated (relative to background) in both Quirke and May lakes. Natural background for Th-232 in soil is in the range of 11 to 64 Bq/kg (mean 30 Bq/kg) (UNSCEAR, 2000). EcoMetrix (2005) found background levels of about 27 Bq/kg in Lake Ontario nearshore sediments.

The Th-232 decay chain generally makes a minor contribution to dose as compared to the U-238 chain. It usually accounts for 10% or less of the estimated total dose for a given receptor at any lake. Exceptions are May Lake, where the Th-232 chain accounts for more than 10% for 4 out of 8 aquatic/riparian receptors; and aquatic plants in general, where the contribution usually exceeds 10% and ranges up to 25% in May Lake. Dose estimates are presented in detail in subsequent sections.

3.3 Bioaccumulation Factors for Aquatic Biota

Bioaccumulation factors (BAFs) for aquatic biota were calculated from the lake water concentrations and the lake average whole fish or aquatic macrophyte tissue

concentrations, where both were available. The lake water concentrations from the 2009 studies are shown in **Table 3.3**. Whole fish concentrations on a fresh weight basis are shown in **Table 3.4**. Aquatic macrophyte concentrations on a dry weight basis are shown in **Table 3.5**. These were converted to a fresh weight basis (**Table 3.6**) assuming a 75% water content in tissue. This value is in the range given by the U.S. EPA (1993) for emergent macrophytes, while submerged macrophytes typically have about 85% moisture. The 75% value is consistent with the assumption used to convert dry weight food intakes by wildlife to fresh weight intakes.

The BAFs computed from these data are shown by lake in **Table 3.7** for whole forage fish, and in **Table 3.8** for aquatic macrophytes. The average value across lakes was used where needed to estimate tissue concentrations. No BAFs were computed for Po-210, Th-232, Ra-228 or Th-228 due to non-detection in water. A BAF is not needed for Po-210 since this radionuclide was always detected in tissue. For Th and Ra isotopes the BAFs computed from Th-230 and Ra-226 data were utilized.

Table 3.9 compares the average BAFs from studies in the flooded basins (Minnow and BEAK 2001b) with those from the present study of watershed lakes. The comparison indicates that BAFs for forage fish are consistently higher in the lakes, while BAFs for aquatic macrophytes are generally similar, but 3 times higher in the lakes for U, and 5 times lower in the lakes for Pb. The higher forage fish BAFs in the lakes may be related to lower hardness in the lakes, higher productivity in the lakes, lower contaminant concentrations in the lakes, or a combination of factors.

3.4 Doses to Aquatic Biota

The calculated doses to aquatic biota (fish, aquatic plants, benthos) for the six watershed lakes considered are summarized in **Table 3.10**. The detailed dose calculations are presented in Appendix D.

All of the calculated doses to fish, aquatic plants and benthos were well below the UNSCEAR (1996) benchmark dose of 10 mGy/d. The largest doses to aquatic biota occurred at Quirke Lake, where the doses to fish, aquatic plants and benthos were 0.92, 2.61 and 0.256 mGy/d, respectively. For all aquatic biota, the largest component of dose was internal. The largest contributor to dose was generally Po-210 for fish and benthic invertebrates, while the dose was more evenly distributed for aquatic macrophytes, with Ra-226 and short-lived radon daughters usually making the largest contribution.

3.5 Doses to Riparian Wildlife

The calculated doses to waterfowl (scaup, mallard, merganser), muskrat and mink for the six watershed lakes considered are summarized in **Table 3.11**. The detailed dose calculations are presented in Appendix D.

All of the calculated doses were less than the UNSCEAR (1996) benchmark dose of 1 mGy/d. The largest doses to riparian wildlife occurred at Quirke Lake, where the doses to mallard, scaup, merganser, muskrat and mink, were 0.263, 0.094, 0.793, 0.407 and 0.124 mGy/d, respectively. For all riparian biota, the largest component of dose was usually internal. The largest contributor to dose was Po-210 for waterfowl, and Ra-226 with short-lived radon daughters for muskrat. For mink, one or the other of these contributors was predominant.

3.6 Doses to Generic Humans

The calculated doses to generic human receptors from consuming water, fish and game at the six watershed lakes considered, are summarized in **Table 3.12**. The detailed dose calculations are presented in Appendix D.

Total doses to generic human receptors at the six lakes ranged from 0.036 to 0.301 mSv/a, all less than the public dose limit of 1 mSv/a, before background correction. Background dose from the same pathways was estimated at 0.013 mSv/a. Therefore, incremental doses ranged from 0.023 to 0.288 mSv/a. The smallest doses were at McCarthy, Elliot and Nordic lakes, whereas the largest dose was at Quirke Lake. The dose at Quirke Lake was dominated by consumption of mallard ducks, and was driven by the high concentration of Po-210 in aquatic macrophytes at Quirke Lake.

It should be noted that the generic human as modeled here (resident on the lake, taking fish and game only from that lake) may exist as such at Elliot Lake, but not at Quirke Lake. The estimated dose at Elliot Lake is 0.036 mSv/a (total) or 0.023 mSv/a (incremental), and the largest dose contribution is from drinking water. There are full-time cottage residents on the south shore of Quirke Lake who use the lake for drinking water and fishing, but not for duck hunting. A more realistic dose for these residents (without the waterfowl component) is 0.072 mSv/a (total) or 0.064 mSv/a (incremental)..

3.7 Doses to SRFN Members

The calculated dose to a Serpent River First Nation member was based on realistic use of the six watershed lakes, and of Lake Huron, as determined from the survey of households (SRFN, 2010). The doses for “actual use” and “future use” scenarios are summarized in **Table 3.13**. The detailed dose calculations are presented in Appendix D.

The dose for the actual use scenario was 0.062 mSv/a (total) or 0.049 mSv/a (incremental). The dose for the future use scenario was 0.060 mSv/a (total) or 0.047 mSv/a (incremental). All these doses are less than the public dose limit of 1 mSv/a (incremental).

The future use scenario involves slightly more use of some watershed lakes, and slightly less use of Lake Huron. However, moose harvest from Quirke Lake was lower in the future use scenario than at present. The use of Serpent Harbour water and sediment data to

represent Lake Huron may overestimate the Lake Huron component of dose; sediment concentrations in the Harbour are slightly higher than those in McCarthy Lake, while many areas in Lake Huron probably have lower concentrations.

The contributions of water, fish, moose and waterfowl to dose are approximately 28%, 37%, 25% and 10%, respectively, with slight variations between actual use and future use scenarios.

3.8 Comparison to EIS Dose Predictions

The EIS documents supporting mine decommissioning have predicted human doses, and in some cases ecological doses, that were expected to arise from watershed concentrations of radionuclides ten years after site closure. These dose predictions are incremental values. Predictions cited as cumulative effects (reflecting releases from all upstream closed mines) for this timeframe are approximately comparable to dose estimates made in the current assessment using concentration data from the special investigations.

Table 3.14 shows EIS dose predictions for riparian wildlife near McCabe Lake, as compared to doses calculated in the present study, after correction for background. **Table 3.15** shows EIS dose predictions for humans near each lake, as compared to the generic human doses calculated in the present study, after background correction.

Table 3.1: Po/Pb Ratio in Lake Sediments

Lake	Pb-210 Bq/kg	Po-210 Bq/kg	Po/Pb Ratio
Quirke	2300	2600	1.13
Elliot	760	740	0.97
Nordic	310	270	0.87
McCabe	2500	2400	0.96
May	660	780	1.18
McCarthy	490	450	0.92
Average			1.01

Table 3.2: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Lake Sediments

Lake	U Bq/kg	Th-230 Bq/kg	Ra-226 Bq/kg	Pb-210 Bq/kg	Po-210 Bq/kg	Th-232 Bq/kg	Ra-228 Bq/kg	Th-228 Bq/kg
Quirke	2189.4	2700	2200	2300	2600	260	350	370
Elliot	3321	1040	630	760	740	80	< 100	170
Nordic	393.6	50	370	310	270	20	< 100	60
McCabe	738	430	2000	2500	2400	40	< 100	80
May	393.6	5100	220	660	780	780	500	660
McCarthy	639.6	50	440	490	450	14	< 100	60

Table 3.3: Measured Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Lake Water

Lake	U Bq/L	Th-230 Bq/L	Ra-226 Bq/L	Pb-210 Bq/L	Po-210 Bq/L	Th-232 Bq/L	Ra-228 Bq/L	Th-228 Bq/L
Quirke	0.0640	< 0.01	0.05	0.06	< 0.01	< 0.01	< 0.1	< 0.01
Elliot	0.0418	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.1	< 0.01
Nordic	0.0394	< 0.01	0.03	0.03	< 0.01	< 0.01	< 0.1	< 0.01
McCabe	0.0295	< 0.01	0.06	0.03	< 0.01	< 0.01	< 0.1	< 0.01
May	0.0369	< 0.01	0.05	< 0.02	< 0.01	< 0.01	< 0.1	< 0.01
McCarthy	0.0123	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.1	< 0.01

Table 3.4: Average Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Whole Forage Fish (fresh weight)

Lake	U Bq/kg	Th-230 Bq/kg	Ra-226 Bq/kg	Pb-210 Bq/kg	Po-210 Bq/kg	Th-232 Bq/kg	Ra-228 Bq/kg	Th-228 Bq/kg
Quirke	63.55	22.000	59.667	30.000	1006.67	< 5	*106.667*	*4.667*
Elliot	14.92	*4.333*	11.000	< 20	29.000	< 5	*116.667*	< 5
Nordic	4.51	< 5	10.333	< 20	396.667	< 5	< 100	< 5
McCabe	11.40	< 5	21.667	*36.667*	503.333	< 5	*223.333*	< 5
May	5.41	*5.000*	13.000	*23.333*	453.333	< 5	*143.333*	*5.667*
McCarthy	10.70	< 5	9.000	< 20	56.000	< 5	< 100	< 5

Note: values in italics contain some detects and some non-detects taken at face value

Table 3.5: Average Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Aquatic Macrophytes (dry weight)

Lake	U	Th-230	Ra-226	Pb-210	Po-210	Th-232	Ra-228	Th-228
	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg
Quirke	5864.03	2435.25	1850.00	1927.50	2137.50	310.250	515.000	282.750
Elliot	85.02	*16.000*	108.000	46.000	19.200	*5.000*	< 100	*7.400*
Nordic	61.35	< 5	134.800	59.200	35.800	< 5	< 100	*6.200*
McCabe	160.88	437.600	584.000	339.400	318.600	*70.400*	*346.000*	*137.000*
May	247.82	*126.000*	437.400	335.400	340.200	*24.200*	*212.000*	*55.400*
McCarthy	181.14	< 5	171.333	91.000	49.167	*5.333*	*111.667*	< 5

Note: values in italics contain some detects and some non-detects taken at face value

Table 3.6: Average Activity Concentrations of U-238 and Th-232 Decay Chain Radionuclides in Aquatic Macrophytes (fresh weight 75% moisture assumed)

Lake	U	Th-230	Ra-226	Pb-210	Po-210	Th-232	Ra-228	Th-228
	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg	Bq/kg
Quirke	1466.01	608.81	462.50	481.88	534.38	77.56	128.75	70.69
Elliot	21.25	*4.00*	27.00	11.50	4.80	*1.25*	< 25	*1.85*
Nordic	15.34	< 1.25	33.70	14.80	8.95	< 1.25	< 25	*1.55*
McCabe	40.22	109.40	146.00	84.85	79.65	*17.60*	*86.50*	*34.25*
May	61.96	*31.50*	109.35	83.85	85.05	*6.05*	*53.00*	*13.85*
McCarthy	45.28	< 1.25	42.83	22.75	12.29	*1.33*	*27.92*	< 1.25

Note: values in italics contain some detects and some non-detects taken at face value

Table 3.7: Bioaccumulation Factors for Whole Forage Fish in Watershed Lakes (fresh weight)

Lake	U	Th-230	Ra-226	Pb-210
	L/kg	L/kg	L/kg	L/kg
Quirke	994	401	1193	500
Elliot	357	205		
Nordic	115		344	
McCabe	386		361	1222
May	147	48	260	
McCarthy	870			
Average	478	218	540	861

Note: Th-230 in water estimated from sediment

Table 3.8: Bioaccumulation Factors for Aquatic Macrophytes in Watershed Lakes (fresh weight)

Lake	U	Th-230	Ra-226	Pb-210
	L/kg	L/kg	L/kg	L/kg
Quirke	22921	11094	9250	8031
Elliot	508	946		383
Nordic	390		1123	493
McCabe	1363	12517	2433	2828
May	1679	304	2187	
McCarthy	3682			758
Average	5090	6215	3748	2499

Note: Th-230 in water estimated from sediment

Table 3.9: Comparison of Basin and Lake Bioaccumulation Factors for Forage Fish and Aquatic Macrophytes

	U	Th	Ra	Pb	Po
Forage Fish					
Basin average	31.3	80	112	227	227 *
Lake average	478	218	540	861	-
Lake/basin	15.3	2.7	4.8	3.8	-
Macrophyte					
Basin average	1602	6445	2812	11411	11411 *
Lake average	5090	6215	3748	2499	-
Lake/basin	3.2	1.0	1.3	0.2	-

* Po BAF was assumed equal to Pb value

Table 3.10: Radiation Doses to Aquatic Biota at Six Lakes in the Serpent River Watershed

Location	Receptor	Dose by Radionuclide (mGy/d)										
		U-238/U-234	Th-234+	Th-230	Ra-226	Rn-222+	Pb-210+	Po-210	Th-232	Ra-228+	Th-228+	Total
Quirke Lake	Forage Fish	4.02E-02	2.35E-03	1.45E-02	4.03E-02	3.85E-02	1.62E-03	7.53E-01	6.52E-04	3.78E-03	2.56E-02	9.20E-01
	Aquatic Plant	9.28E-01	4.02E-03	4.02E-01	3.12E-01	1.62E-01	4.32E-03	4.00E-01	4.38E-02	4.21E-03	3.46E-01	2.61E+00
	Benthic Invertebrate	1.12E-02	4.67E-03	1.86E-03	1.65E-02	4.78E-02	4.18E-03	1.50E-01	8.26E-04	3.48E-03	1.60E-02	2.56E-01
Elliot Lake	Forage Fish	9.47E-03	3.57E-03	2.87E-03	7.43E-03	9.16E-03	5.95E-04	2.17E-02	2.01E-04	2.67E-03	5.00E-03	6.27E-02
	Aquatic Plant	1.35E-02	6.10E-03	2.65E-03	1.82E-02	1.41E-02	5.44E-04	3.55E-03	7.06E-04	6.38E-04	9.83E-03	6.98E-02
	Benthic Invertebrate	7.35E-03	7.08E-03	1.84E-03	3.32E-03	1.31E-02	1.60E-03	1.50E-01	2.54E-04	8.10E-04	7.33E-03	1.92E-01
Nordic Lake	Forage Fish	2.86E-03	4.23E-04	1.47E-04	6.98E-03	6.57E-03	3.14E-04	2.97E-01	5.01E-05	1.14E-04	1.77E-03	3.16E-01
	Aquatic Plant	9.71E-03	7.23E-04	4.17E-03	2.27E-02	1.37E-02	2.82E-04	6.69E-03	1.43E-03	2.16E-04	7.99E-03	6.77E-02
	Benthic Invertebrate	6.88E-03	8.39E-04	1.86E-04	9.85E-03	1.13E-02	1.04E-03	1.50E-01	6.36E-05	2.10E-04	2.59E-03	1.83E-01
McCabe Lake	Forage Fish	7.22E-03	7.94E-04	1.26E-03	1.47E-02	2.50E-02	1.78E-03	3.76E-01	1.00E-04	4.55E-03	2.35E-03	4.27E-01
	Aquatic Plant	2.55E-02	1.36E-03	7.22E-02	9.85E-02	6.32E-02	2.07E-03	5.96E-02	3.97E-03	8.69E-04	6.70E-02	3.22E-01
	Benthic Invertebrate	5.17E-03	1.57E-03	1.60E-03	1.98E-02	4.57E-02	3.78E-03	1.50E-01	1.27E-04	4.00E-04	3.45E-03	2.27E-01
May Lake	Forage Fish	3.43E-03	4.23E-04	3.34E-03	8.77E-03	6.01E-03	5.52E-04	3.39E-01	1.24E-03	5.23E-03	3.27E-02	4.01E-01
	Aquatic Plant	3.92E-02	7.23E-04	2.08E-02	7.37E-02	3.56E-02	9.15E-04	6.36E-02	3.42E-03	3.47E-03	7.25E-02	3.14E-01
	Benthic Invertebrate	6.45E-03	8.39E-04	1.90E-03	1.64E-02	1.15E-02	1.24E-03	1.50E-01	1.57E-03	5.81E-03	2.39E-02	2.19E-01
McCarthy Lake	Forage Fish	6.78E-03	6.88E-04	1.47E-04	6.08E-03	6.80E-03	4.26E-04	4.19E-02	3.51E-05	7.44E-05	1.77E-03	6.47E-02
	Aquatic Plant	2.87E-02	1.17E-03	4.17E-03	2.89E-02	1.72E-02	4.42E-04	9.19E-03	7.53E-04	6.13E-04	3.72E-02	1.28E-01
	Benthic Invertebrate	2.16E-03	1.36E-03	1.86E-04	3.30E-03	9.57E-03	1.27E-03	1.50E-01	4.45E-05	1.42E-04	2.59E-03	1.70E-01
Background	Forage Fish	5.21E-03	4.23E-04	5.77E-04	2.19E-03	2.60E-03	1.35E-04	7.12E-02	3.51E-05	7.31E-05	4.12E-04	8.29E-02
	Aquatic Plant	5.55E-02	7.23E-04	1.64E-02	1.52E-02	8.50E-03	1.84E-04	7.70E-03	9.98E-04	1.03E-04	8.68E-03	1.14E-01
	Benthic Invertebrate	3.01E-03	8.39E-04	7.32E-04	1.98E-03	4.10E-03	3.28E-04	3.76E-02	4.45E-05	1.41E-04	6.04E-04	4.94E-02

Table 3.11: Radiation Doses to Riparian Wildlife at Six Lakes in the Serpent River Watershed

		Dose by Radionuclide (mGy/d)										
Location	Receptor	U-238/U-234	Th-234+	Th-230	Ra-226	Rn-222+	Pb-210+	Po-210	Th-232	Ra-228	Th-228	Total
Quirke Lake	Mallard	8.96E-04	1.16E-03	2.61E-03	1.88E-03	1.26E-02	7.79E-04	2.38E-01	2.82E-04	8.66E-04	3.70E-03	2.63E-01
	Scaup	2.20E-05	1.15E-03	5.53E-04	1.06E-03	1.15E-02	7.41E-04	7.51E-02	7.96E-05	8.56E-04	2.44E-03	9.35E-02
	Merganser	1.12E-03	1.20E-03	1.25E-02	2.66E-02	4.64E-02	7.80E-04	6.81E-01	5.88E-04	2.20E-03	2.06E-02	7.93E-01
	Muskrat	3.12E-02	2.32E-03	5.70E-03	9.96E-02	1.56E-01	2.05E-03	9.95E-02	6.09E-04	2.48E-03	7.85E-03	4.07E-01
	Mink	6.78E-04	2.29E-03	1.35E-04	6.06E-03	2.84E-02	1.46E-03	8.03E-02	7.83E-06	1.99E-03	3.11E-03	1.24E-01
Elliot Lake	Mallard	3.51E-05	1.76E-03	4.22E-05	1.28E-04	3.05E-03	2.39E-04	3.68E-03	6.15E-06	1.96E-04	7.56E-04	9.89E-03
	Scaup	2.60E-05	1.75E-03	2.70E-04	2.44E-04	3.21E-03	2.49E-04	7.18E-02	2.45E-05	1.96E-04	1.12E-03	7.89E-02
	Merganser	2.97E-04	1.82E-03	2.60E-03	4.95E-03	9.64E-03	2.78E-04	1.98E-02	1.81E-04	1.67E-03	3.98E-03	4.53E-02
	Muskrat	1.67E-03	3.52E-03	2.00E-04	7.58E-03	1.61E-02	5.04E-04	3.04E-03	2.01E-05	4.70E-04	1.65E-03	3.48E-02
	Mink	2.47E-04	3.48E-03	3.54E-05	1.18E-03	7.36E-03	4.87E-04	2.45E-03	2.41E-06	7.00E-04	1.39E-03	1.73E-02
Nordic Lake	Mallard	1.19E-05	2.08E-04	2.76E-05	1.44E-04	1.89E-03	9.88E-05	4.49E-03	9.44E-06	4.93E-05	2.96E-04	6.87E-03
	Scaup	7.71E-06	2.08E-04	1.79E-05	4.84E-04	2.35E-03	1.08E-04	7.10E-02	6.12E-06	4.94E-05	3.95E-04	7.42E-02
	Merganser	8.23E-05	2.16E-04	1.32E-04	4.60E-03	7.98E-03	1.37E-04	2.68E-01	4.53E-05	5.98E-05	1.40E-03	2.81E-01
	Muskrat	4.64E-04	4.17E-04	6.26E-05	8.00E-03	1.43E-02	2.18E-04	2.35E-03	2.14E-05	1.34E-04	6.43E-04	2.58E-02
	Mink	5.58E-05	4.13E-04	1.75E-06	1.05E-03	4.81E-03	2.05E-04	3.15E-02	6.03E-07	9.97E-05	4.90E-04	3.80E-02
McCabe Lake	Mallard	2.91E-05	3.91E-04	4.67E-04	6.40E-04	1.00E-02	7.93E-04	3.99E-02	2.60E-05	1.01E-04	7.51E-04	5.31E-02
	Scaup	8.49E-06	3.89E-04	1.54E-04	1.17E-03	1.07E-02	7.93E-04	7.47E-02	1.22E-05	9.79E-05	5.26E-04	8.86E-02
	Merganser	2.05E-04	4.05E-04	1.14E-03	9.94E-03	2.27E-02	8.56E-04	3.41E-01	9.05E-05	2.92E-03	1.87E-03	3.81E-01
	Muskrat	1.11E-03	7.82E-04	1.01E-03	3.60E-02	6.75E-02	1.71E-03	2.09E-02	5.75E-05	3.98E-04	1.60E-03	1.31E-01
	Mink	1.33E-04	7.74E-04	1.51E-05	2.52E-03	2.17E-02	1.59E-03	4.04E-02	1.21E-06	7.88E-04	6.53E-04	6.85E-02
May Lake	Mallard	3.99E-05	2.08E-04	2.57E-04	4.34E-04	1.60E-03	2.17E-04	3.87E-02	3.80E-05	1.22E-03	3.15E-03	4.59E-02
	Scaup	7.37E-06	2.08E-04	9.62E-04	7.43E-04	2.02E-03	2.13E-04	7.19E-02	1.93E-04	1.26E-03	4.11E-03	8.16E-02
	Merganser	9.78E-05	2.16E-04	4.06E-03	5.74E-03	8.84E-03	2.53E-04	3.06E-01	1.18E-03	3.03E-03	2.62E-02	3.56E-01
	Muskrat	1.43E-03	4.17E-04	1.08E-03	2.25E-02	3.27E-02	5.25E-04	1.69E-02	1.51E-04	2.79E-03	6.87E-03	8.54E-02
	Mink	6.44E-05	4.13E-04	1.08E-04	1.25E-03	3.72E-03	4.26E-04	3.61E-02	1.91E-05	2.82E-03	5.47E-03	5.04E-02
McCarthy Lake	Mallard	3.15E-05	3.38E-04	2.76E-05	1.83E-04	2.26E-03	1.56E-04	6.33E-03	5.05E-06	3.72E-05	4.80E-04	9.85E-03
	Scaup	5.57E-06	3.37E-04	1.79E-05	2.13E-04	2.30E-03	1.64E-04	7.13E-02	4.29E-06	3.43E-05	3.95E-04	7.48E-02
	Merganser	1.91E-04	3.51E-04	1.32E-04	4.04E-03	7.52E-03	1.93E-04	3.80E-02	3.17E-05	3.82E-05	1.40E-03	5.19E-02
	Muskrat	1.18E-03	6.78E-04	6.26E-05	1.01E-02	1.78E-02	3.43E-04	3.46E-03	1.18E-05	2.30E-04	1.03E-03	3.48E-02
	Mink	1.23E-04	6.70E-04	1.75E-06	9.43E-04	5.31E-03	3.18E-04	4.53E-03	4.22E-07	6.90E-05	4.90E-04	1.24E-02
Background	Mallard	5.40E-05	2.08E-04	1.09E-04	9.38E-05	9.25E-04	5.62E-05	4.87E-03	6.61E-06	3.43E-05	1.12E-04	6.47E-03
	Scaup	3.52E-06	2.08E-04	7.05E-05	1.13E-04	9.52E-04	5.64E-05	1.80E-02	4.29E-06	3.43E-05	9.21E-05	1.96E-02
	Merganser	1.44E-04	2.16E-04	5.21E-04	1.46E-03	2.79E-03	6.33E-05	6.44E-02	3.17E-05	3.74E-05	3.27E-04	7.00E-02
	Muskrat	1.89E-03	4.17E-04	2.46E-04	5.08E-03	8.54E-03	1.27E-04	2.29E-03	1.50E-05	7.99E-05	2.39E-04	1.89E-02
	Mink	8.51E-05	4.13E-04	6.91E-06	3.44E-04	2.06E-03	1.12E-04	7.58E-03	4.22E-07	6.89E-05	1.14E-04	1.08E-02

Table 3.12: Radiation Doses to Generic Human at Six Lakes in the Serpent River Watershed

Location	Dose Component (mSv/a)					Dose Component (%)				
	Water	Fish	Moose	Mallard	Total	Water	Fish	Moose	Mallard	Total
Quirke Lake	4.38E-02	1.10E-02	1.70E-02	2.29E-01	3.01E-01	14.53%	3.64%	5.63%	76.19%	100.00%
Elliot Lake	2.34E-02	8.26E-03	7.28E-04	3.62E-03	3.60E-02	64.96%	22.96%	2.02%	10.05%	100.00%
Nordic Lake	2.44E-02	8.47E-03	5.65E-04	4.37E-03	3.78E-02	64.52%	22.41%	1.50%	11.58%	100.00%
McCabe Lake	2.95E-02	8.93E-03	3.91E-03	3.86E-02	8.09E-02	36.49%	11.04%	4.83%	47.65%	100.00%
May Lake	6.30E-02	1.20E-02	3.30E-03	3.74E-02	1.16E-01	54.48%	10.34%	2.86%	32.31%	100.00%
McCarthy Lake	2.02E-02	8.07E-03	9.70E-04	6.21E-03	3.55E-02	56.99%	22.76%	2.74%	17.51%	100.00%
Background	5.61E-03	1.98E-03	4.53E-04	4.72E-03	1.28E-02	43.98%	15.48%	3.55%	36.99%	100.00%

Table 3.13: Radiation Doses to Serpent River First Nations Harvester

Scenario	Dose Component (mSv/a)					Dose Component (%)				
	Water	Fish	Moose	Mallard	Total	Water	Fish	Moose	Mallard	Total
Actual Lake Use	1.67E-02	2.20E-02	1.56E-02	7.41E-03	6.17E-02	27.14%	35.59%	25.25%	12.02%	100.00%
Future Lake Use	1.76E-02	2.24E-02	1.42E-02	5.39E-03	5.97E-02	29.53%	37.61%	23.82%	9.04%	100.00%

Table 3.14: Comparison of EIS Dose Predictions for Riparian Wildlife Near McCabe Lake with Current Dose Estimates

Receptor	EIS Prediction [1]	Current Assessment [2]
Scaup	0.0025 mGy/d	0.069 mGy/d
Merganser	0.013 mGy/d	0.311 mGy/d
Mallard	0.05 mGy/d	0.047 mGy/d
Muskrat	0.38 mGy/d	0.112 mGy/d

[1] EIS prediction assumes biota resident on TMA; doses do not include a radiation quality factor, but are mainly from external sediment exposure; scaup and merganser exposures reduced by use of lower site and sediment occupancy factors relative to mallard

[2] for wildlife receptor as described in this report; doses corrected for background

Table 3.15: Comparison of EIS Dose Predictions for Humans at Selected Locations with Current Dose Estimates

Receptor	EIS Prediction [1]	Current Assessment [2]
Quirke Lake	0.079 mSv/a (no duck consumption)	0.288 mSv/a 0.064 mSv/a w/o ducks
McCabe Lake	0.121 mSv/a	0.068 mSv/a
May Lake	0.147 mSv/a	0.024 mSv/a
Elliot Lake	0.0131 mSv/a	0.023 mSv/a
Nordic Lake	0.0503 mSv/a	0.025 mSv/a
McCarthy Lake	0.0563 mSv/a	0.023 mSv/a

[1] from Senes (1995) (Quirke), CNSC (2002) (Nordic), Senes (1996) (others); pathways assumptions vary; doses are incremental

[2] for generic human receptor as described in this report; doses corrected for background

4.0 SUMMARY

A number of special investigation studies were undertaken in six lakes of the Serpent River Watershed in 2009, in order to clarify several issues pertinent to estimation of radiological dose and risk to natural biota and humans utilizing the watershed lakes. The six lakes studied were McCabe, May, Elliot, Nordic, Quirke and McCarthy Lake. The questions were resolved, as follows:

- Pb-210 and Po-210 are at secular equilibrium in the lake sediments, as would be expected from their half-lives. The average Po/Pb ratio in sediments was 1.01, with a range from 0.87 to 1.18, and no upstream-downstream pattern.

- Radionuclides of the Th-232 decay chain are clearly elevated above background in May and Quirke Lake sediments, although the Th-232 concentration is only about 1/10th of the Th-230 concentration. The contribution of the Th-232 decay chain to total dose was usually 10% or less, except for May Lake where 4 of 8 receptors had Th-232 decay chain contributions greater than 10%, and for aquatic plants where contributions exceeded 10% in most lakes and reached 25% in May Lake.

- Bioaccumulation factors (BAFs) derived from the flooded basins were generally similar to those derived from the watershed lakes for aquatic plants, although the U value was slightly lower in the basins, and the Pb value was slightly higher. Fish BAFs derived from the basins were consistently lower than those derived from the watershed lakes. Po-210 BAFs were not determined in either case due to non-detection of Po-210 in water; however, Po-210 in fish tissue was consistently higher than Pb-210, by a factor of 22 on average.

The high observed Po/Pb ratio in fish indicates that fish to duck transfer factors for Po-210, previously determined in the flooded basins using a Pb BAF to estimate Po-210 in fish, were most likely overestimated by at least a factor of 10. Correction for this error produces a transfer factor of 5.45 d/kg for fish-eating ducks, which is more in line with the Health Canada (2007) generic value of 2.5 for birds.

A survey of fish and wildlife consumption by SRFN fishers and hunters and their families (SRFN, 2010) produced more realistic values for fish and wildlife intake rates than those used previously, and also indicated the fraction of harvest likely to come from the six watershed lakes and from Lake Huron. These data were utilized, along with measured radionuclide concentrations in the six lakes and Lake Huron, to estimate the dose received by SRFN members.

4.1 Ecological Dose and Risk

The radionuclide concentrations from the special investigation studies were utilized to calculate radiation doses received by aquatic biota and riparian wildlife in the six watershed

lakes. The calculated doses to fish, aquatic plants and benthos were well below the UNSCEAR (1996) benchmark dose of 10 mGy/d. The largest doses to aquatic biota occurred at Quirke Lake, where the doses to fish, aquatic plants and benthos were 0.92, 2.61 and 0.256 mGy/d, respectively. For all aquatic biota, the largest component of dose was internal. The largest contributor to dose was generally Po-210 for fish and benthic invertebrates, while the dose was more evenly distributed for aquatic macrophytes, with Ra-226 and short-lived radon daughters usually making the largest contribution.

The radiation doses to riparian wildlife were less than the UNSCEAR (1996) benchmark dose of 1 mGy/d. The largest doses to riparian wildlife occurred at Quirke Lake, where the doses to mallard, scaup, merganser, muskrat and mink, were 0.263, 0.094, 0.793, 0.407 and 0.124 mGy/d, respectively. For all riparian biota, the largest component of dose was usually internal. The largest contributor to dose was Po-210 for waterfowl, and Ra-226 with short-lived radon daughters for muskrat. For mink, one or the other of these contributors was predominant.

4.2 Human Dose and Risk

The radionuclide concentrations from the special investigation studies were utilized to calculate radiation doses received by generic human receptors at the six watershed lakes (receptor assumed to reside there and take all fish and game from there). The calculated doses ranged from 0.036 to 0.301 mSv/a, all less than the public dose limit of 1 mSv/a, before background correction. Background dose from the same pathways was estimated at 0.013 mSv/a. Therefore, incremental doses ranged from 0.023 to 0.288 mSv/a. The smallest doses were at McCarthy, Elliot and Nordic lakes, whereas the largest dose was at Quirke Lake. The dose at Quirke Lake was dominated by consumption of mallard ducks, and was driven by the high concentration of Po-210 in aquatic macrophytes at Quirke Lake.

Macrophytes were collected in Quirke Lake from a former tailings deposition area near Panel Mine and likely over-estimate typical macrophyte uptake within the lake. Moreover, cottage residents at Quirke Lake do not use the lake for duck hunting. The estimated dose at Quirke Lake without the waterfowl component is 0.072 mSv/a (total) or 0.064 mSv/a (incremental).

The calculated dose to a Serpent River First Nation member was based on realistic use of the six watershed lakes, and of Lake Huron, as determined from the survey of households (SRFN, 2010). Most of the harvest comes from Lake Huron. For an actual use scenario the dose was 0.062 mSv/a (total) or 0.049 mSv/a (incremental). For a future use scenario the dose was 0.060 mSv/a (total) or 0.047 mSv/a (incremental). All these doses are less than the public dose limit of 1 mSv/a (incremental). The use of Serpent Harbour water and sediment data to represent Lake Huron may overestimate the Lake Huron component of dose.

The contributions of water, fish, moose and waterfowl to the SRFN dose are approximately 28%, 37%, 25% and 10%, respectively, with slight variations between actual use and future use scenarios.

5.0 REFERENCES

Amiro, B.D. 1997. Radiological dose conversion factors for generic non-human biota used for screening potential ecological impacts. J. Environ. Radioact. 35(1): 37-51.

Beresford, N.A. *et al.* 2004. Estimating radionuclide transfer to wild species – data measurements and availability for terrestrial ecosystems. J. Radiol. Prot. 24: A89-A103.

Brodsky, A.B. 1982. CRC Handbook of Radiation Measurement and Protection, Section A, Volume II: Biological and Mathematical Information.

Canadian Council of Ministers of the Environment (CCME). 1996. A Framework for Ecological Risk Assessment: General Guidance.

Canadian Nuclear Safety Commission (CNSC). 2002. Historical Properties Screening Report.

EcoMetrix Incorporated (EcoMetrix). 2005. Aquatic Environment Baseline Characterization study for the Port Hope Project. LLRWMO-03720-ENA-12001.

Hart, D. and A.J. Burt. 2006. Allometric Relationships in the Transfer of ^{238}U-Series Radionuclides from Food to Wildlife Tissues. Presented at the SETAC North America 27th Annual Meeting, Montreal.

Health Canada. 2007/(Draft). Federal Contaminated Site Risk Assessment in Canada. Pert VI: Guidance on Site-Specific Human health Radiological Risk Assessment.

Health Canada. 1995. Investigating Human Exposure to Contaminants in the Environment: A handbook for Exposure Calculations.

International Atomic Energy Agency (IAEA). 2010. Handbook of Parameter Values for the Prediction of Radionuclide Transfer in Terrestrial and Freshwater Environments. Technical Report Series 472. IAEA, Vienna.

International Commission on Radiological Protection (ICRP). 1991. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. ICRP, Pergamon Press.

International Commission on Radiological Protection (ICRP). 1996. Age-dependent Doses to Members of the Public from Intake of Radionuclides: Part 5. Compilation of Ingestion and Inhalation Dose Coefficients. ICRP Publication 72. Annals of the ICRP, Vol. 26(1). Pergamon Press, Oxford.

Leptich, D.J. and J.R. Gilbert. 1989. Summer home range and habitat use by moose in northern Maine. J. Wildl. Mgmt. 53(4): 880-885.

Lucas, H.F., D. Simmons, F. Markun, J. Farnham and M. Keenan. 1979. Radon and radium retention by the bluegill. Health Physics 36: 147-152.

MacCracken, J.G., V. Van Ballenberghe *et al*. 1997. Habitat relationships of moose on the Copper River Delta in coastal south-central Alaska. Wildlife Monographs 136: 5-52.

McKee, P., C. Russel and K. Trimble. 1996. Supporting Document I: Aquatic Environmental Study, Baseline Conditions Report, Stanleigh Mine, Elliot Lake. Beak Consultants Ltd.

Ministry of the Environment (MOE). 2009. Guide to Eating Ontario Sport Fish, 2009-2010 Edition. Queen's Printer for Ontario.

Minnow Environmental Inc. (Minnow). 2011. Serpent River Watershed State of the Environment.

Minnow Environmental Inc. (Minnow). 2005a. Serpent River Watershed Monitoring Program. Prepared for Rio Algom Limited and Denison Mines Limited.

Minnow Environmental Inc. (Minnow). 2005b. In-Basin Monitoring Program, Cycle 2 Interpretive Report.

Minnow Environmental Inc. and Beak International Incorporated (Minnow and BEAK). 2001. In-Basin Monitoring Program for the Uranium Tailings Areas – 1999 Study.

Sample, B.E. and G.W. Suter II. 1994. Estimating exposure of terrestrial wildlife to contaminants. Oak Ridge National Laboratory, Oak Ridge, TN.

Senes Consultants Limited (Senes). 1995. Supporting Document III. Environmental pathways analysis for the decommissioning of the Stanrock Tailings Management Area. Prepared for Denison Mines Ltd., February 1995.

Senes Consultants Limited (Senes). 1996. Supporting Document IV. Environmental pathways analysis for the Stanleigh Mine decommissioning project. Prepared for Rio Algom Ltd., October 1996.

Serpent River First Nation (SRFN). 2010. Fish and Waterfowl Consumption Study. Prepared for Dension Mines Limited and Rio Algom Limited.

U.S. Environmental Protection Agency (U.S. EPA). 1993. Wildlife Exposure Factors Handbook. Vol. 1 of 11.

U.S. Environmental Protection Agency (U.S. EPA). 1997. Exposure Factors Handbook, Vol. 11. Food Ingestion Factors.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). 2000. Sources and Effects of Ionizing Radiation. Vol. I: Sources. Report to the General Assembly, with Scientific Annexes. United Nations, New York.

United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). 1996. Sources and Effects of Ionizing Radiation. Report to the General Assembly, with Scientific Annex. United Nations, New York.

APPENDIX A

Field Sheets

minnow environmental inc.

Special Investigation Fieldsheet

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimilie: (905) 873 - 6370

Client: Rio Algom/Denison
Date/Time: Sept 14 & 16/2009
Lake: Elliot Lake
Northing:
Easting:
} see below

Project Name/Number: SRWMP - 2308
Field Crew: CR / CS

Submitted as

WATER
Water sample collected and preserved ☑

Northing: 5139752
Easting: 0372526
EL-SI

To be reported as EL-09 SI

SEDIMENT
Core / (Ponar)
Depth of sediment sampled: ~~to~~ 2-3cm

Water depth(m): 1.5m
Northing: 5139752
Easting: 372526
} EL-09-SI

FISH

Sample ID	# in Composite	Species in Composite
EL-Fish-1	5	5 YP
EL-Fish 2	4	4 YP
Fish 3	5	2 YP - 3 Pumpkin

> EL-F1
EL-F2
EL-F3

Field collection sheets completed ☐

MACROPHYTES
Sample Area: Elliot Lake Inlets
Northing: 5139704
Easting: 0372538
} see 3 MT set 4 & 5 for all

Sample ID	Species	Structure Sampled
EL-Pond Lily	Pond lily	leaves & Stems
EL- Carex (1)	~~Carex~~ Arrum	seed Heads
EL- Sedge	Sedge	Roots
EL- Carex (2)	~~Carex~~ Arrum	leaves & Stems
EL - Tape grass	Tapegrass	leaves

EL-09-E4
EL-09-E5
EL-09-E1
EL-09-E2
EL-09-E3

~~2~~ two cormorant(2), seagulls, (+10) canada geese (+10) and mergansers (6)

minnow environmental inc.

Minnow Trapping

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9
Telephone: (905) 873-3371
Facsimile: (905) 873-6370

Client: Rio Dev
Waterbody: Elliot Lake
Project Name/Number: 2308
Field Crew: CR CS

SET # 1B # of TRAPS 2 UTM: 5139720N, 372538
Set Easting: 0823929.1 Northing: 4623565 Map Datum: 83
Set Depth Range: 0.7 to 0.7 m Location/Configuration Marked on Map: (YES) NO
General Observations: In grass
Set Date/Time: 840am Sept 14 Lift Date/Time: 6:18pm Sept 14
Total Fishing Time: 9.63 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
Ø				

SET # 2W # of TRAPS 2 UTM: 5139600N 372444E
Set Easting: 0823931.0 Northing: 4623562.6 Map Datum: 83
Set Depth Range: 1.1 to 1.2 m Location/Configuration Marked on Map: (YES) NO
General Observations:
Set Date/Time: 850 am Sept 14 Lift Date/Time: Sept 14 6:15pm
Total Fishing Time: 9.42 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities
YP	4	4	Ø	Ø

Signature: _____

minnow environmental inc.

Minnow Trapping (con't)

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3771
Facsimilie: (905) 873-6370

Client: Rio Den
Waterbody: elliot Lake

Project Name/Number: 2308
Field Crew: CR CS

SET # 3 **# of TRAPS** 2 UTM: 5138857N, 371035GE

Set Easting: 082 41.623 Northing: 4623.271 Map Datum: 83

Set Depth Range: 1.2 to 1.2 m Location/Configuration Marked on Map: (YES) NO

General Observations: lilly pads & grass some rocks

Set Date/Time: 11:45am Sept 19 Lift Date/Time: 6:02pm sept 19

Total Fishing Time: 6.37 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into ~~Lake Pitama~~	Mortalities
Y/P	1	1		

SET # _____ **# of TRAPS** _____

Set Easting: _____ Northing: _____ Map Datum: _____

Set Depth Range: _____ to _____ m Location/Configuration Marked on Map: YES / NO

General Observations: _____

Set Date/Time: _____ Lift Date/Time: _____

Total Fishing Time: _____ h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities

Signature: _____

minnow environmental inc.

Minnow Trapping (con't)

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3771
Facsimilie: (905) 873-6370

Client: Rio/Den
Waterbody: Elliot Lake

Project Name/Number: 2308
Field Crew: CC CS

SET # B4 # of TRAPS 2

Set Easting: 17T0372526 Northing: 5139752 Map Datum: _____

Set Depth Range: 0.7 to 0.7 m Location/Configuration Marked on Map: YES / (NO)

General Observations: weedy.

Set Date/Time: Sept 16 415pm Lift Date/Time: Sept 16 630pm

Total Fishing Time: 2.25 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
0				

SET # 5 # of TRAPS 2

Set Easting: 17T0372538 Northing: 5139704 Map Datum: 83

Set Depth Range: 0.8 to 0.8 m Location/Configuration Marked on Map: YES / NO

General Observations: weeds

Set Date/Time: Sept 16 420pm Lift Date/Time: Sept 16/630pm

Total Fishing Time: 2.17 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities
0				

Signature: _____

minnow environmental inc.

Minnow Trapping

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9
Telephone: (905) 873-3371
Facsimile: (905) 873-6370

Client: Rio/Pen
Waterbody: Elliot L.
Project Name/Number: 2308
Field Crew: _____

SET # 6 **# of TRAPS** _____
Set Easting: 17T 0372498 Northing: 5139604 Map Datum: 83
Set Depth Range: 13 to _____ m Location/Configuration Marked on Map: YES / NO
General Observations: ~~17T 0372498~~ near Park
Set Date/Time: Sept 16 4:05pm Lift Date/Time: Sept 16 6:28pm
Total Fishing Time: 2.05 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
Pumpkinseed	111			
YP	HH 1			

SET # _____ **# of TRAPS** _____
Set Easting: _____ Northing: _____ Map Datum: _____
Set Depth Range: _____ to _____ m Location/Configuration Marked on Map: YES / NO
General Observations: _____
Set Date/Time: _____ Lift Date/Time: _____
Total Fishing Time: _____ h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities

Signature: _____

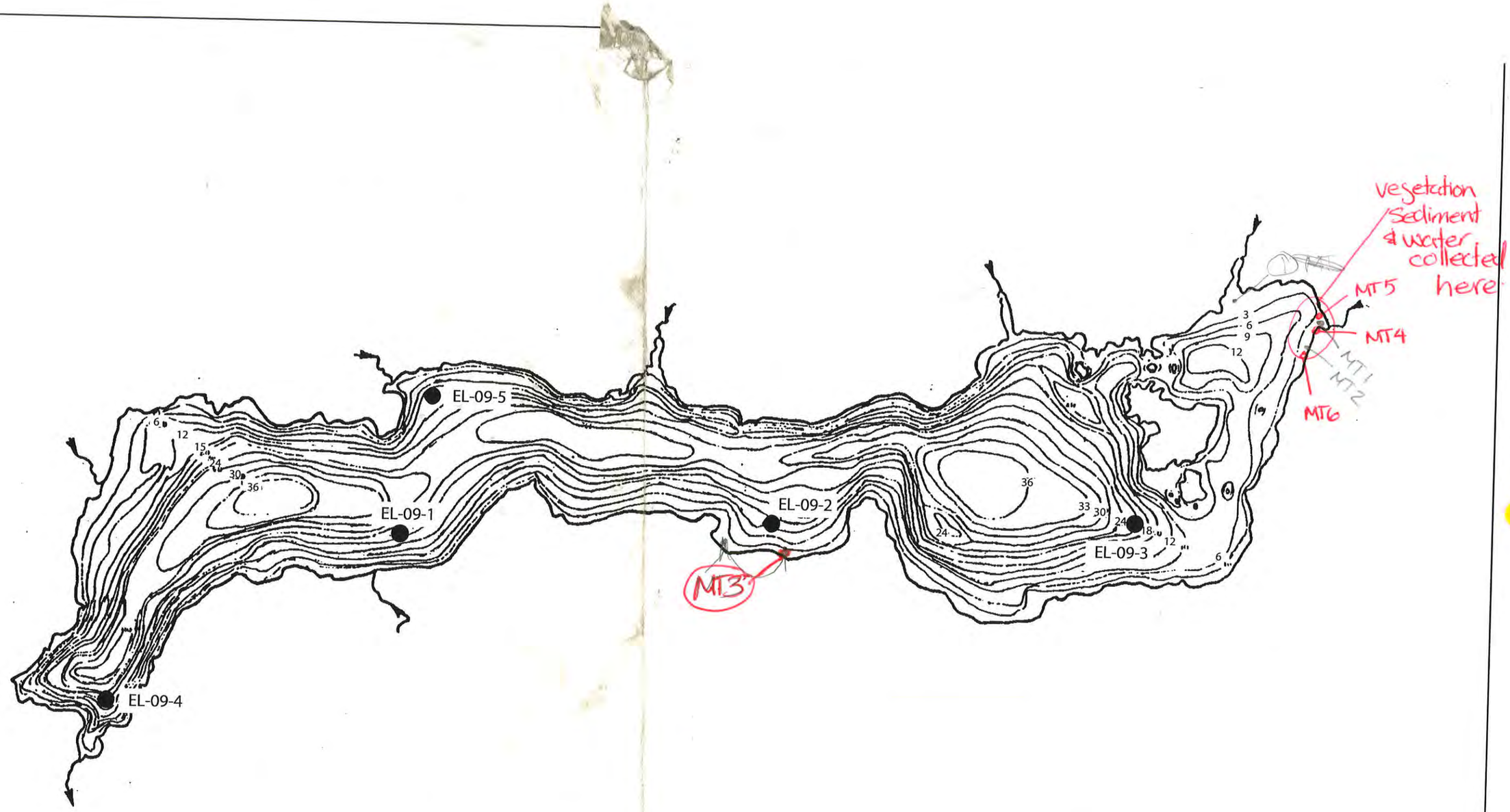


Figure A.3

Elliot Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

minnow environmental inc.

minnow environmental inc.

Special Investigation Fieldsheet

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimilie: (905) 873 - 6370

Client: Rio Algom/Denison
Date/Time: Sept 20
Lake: MAY
Northing:
Easting:
} see below

Project Name/Number: SRWMP - 2308
Field Crew: PL/CS

UA053

WATER
Water sample collected and preserved ☑

Northing: 384 049
Easting: 5 143 150

→ water @ 30', plants area

SEDIMENT
Core / Ponar
Depth of sediment sampled: ~ 6-7 cm (good) top 3 cm using ponar = sampled material

Water depth(m): 1.5

Northing: 384 092
Easting: 5 143 169

FISH all taken from MP3

Sample ID	# in Composite	Species in Composite
MAL-09-F1	10	Common shiner
MAL-09-F2	10	" "
MAL-09-F3	10	" "

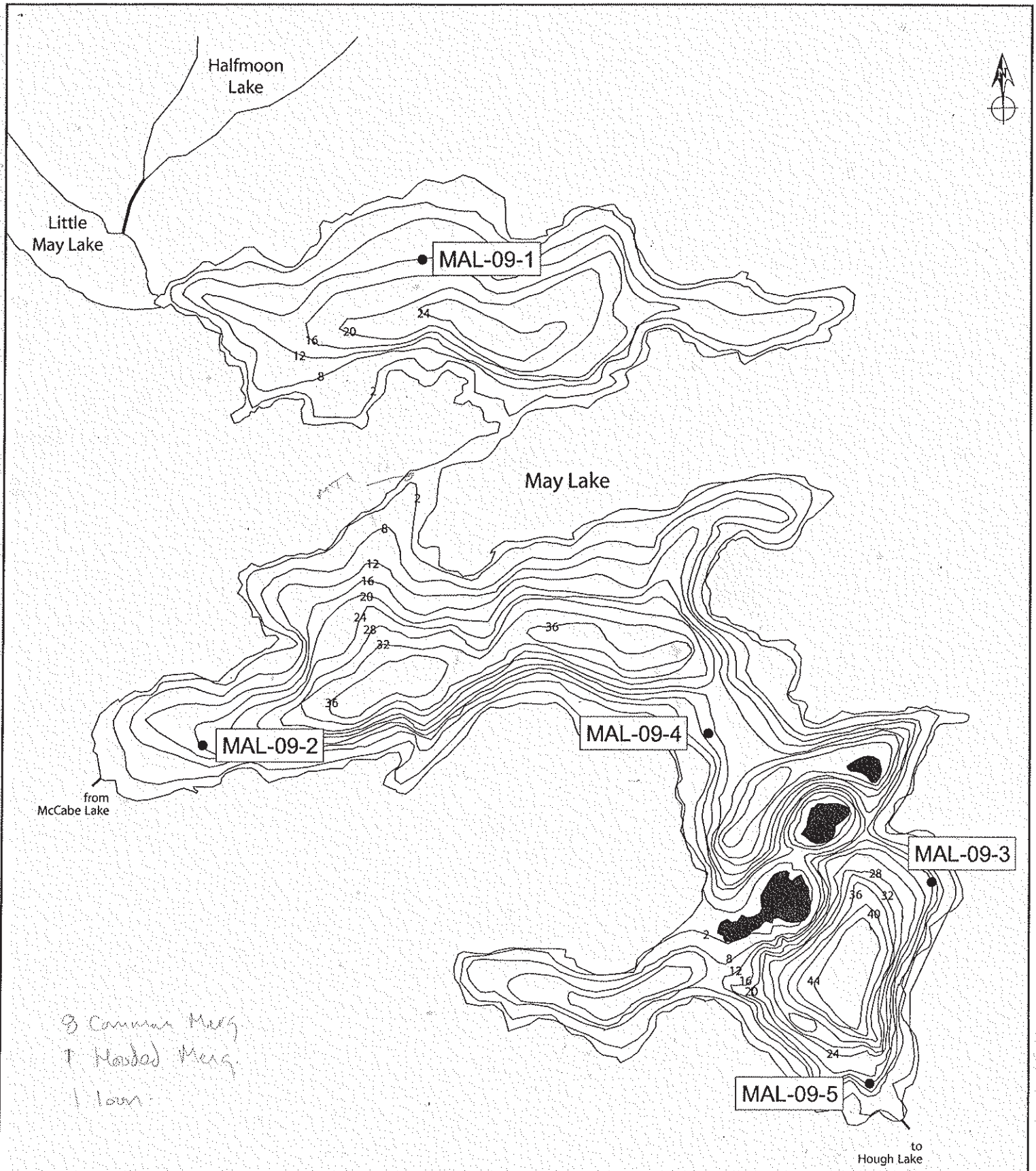
Field collection sheets completed ☐

MACROPHYTES
Sample Area:

Northing: 384 002
Easting: 5 143 124

Sample ID	Species	Structure Sampled
MAL-09-M1	Ceratophyllum	stems/leaves
MAL-09-M2	Pam PH. IP. pond	" "
MAL-09-M3	white pond lily	" "
MAL-09-M4	soft-stem bulrush	roots
MAL-09-M5	Chara	leaves

8 common mergansers
1 Hooded mergansers
1 loon.



3 Common Merg
1 Hooded Merg
1 Loon

Figure A.6

May Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

minnow environmental inc.

Minnow Trapping

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3371
Facsimilie: (905) 873-6370

Client: Rio / DENISON Project Name/Number: 2308
Waterbody: MAY LK Field Crew: PL / CS

SET # MT 1 # of TRAPS 2
Set Easting: 385 074 Northing: 5 144 194 Map Datum: NAD83
Set Depth Range: 0.4 to 0.6 m Location/Configuration Marked on Map: YES / NO
General Observations: @ beaver lodge entrance
Set Date/Time: Sept 20/09 9:30 Lift Date/Time: Sept 20/09 17:35
Total Fishing Time: 8.08 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into ~~Lake Pitama~~	Mortalities
Common Shiner	35+28+19+37+1 = (120)	Ø	120	
Creek Chub	16+8+2 (26)	Ø	26	
White Sucker	1+1 (2)	Ø	2	
N.R.B.D.	3+6+6 (15)	Ø	15	
B.S.B.	1 (1)	Ø	1	

SET # MT 2 # of TRAPS 2
Set Easting: 386 259 Northing: 5 144 041 Map Datum: 83
Set Depth Range: 0.5 to ____ m Location/Configuration Marked on Map: YES / NO
General Observations: in weeds, in shallow bay.
Set Date/Time: Sept 20/9:45 Lift Date/Time: Sept 20 19:20
Total Fishing Time: 7.58 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities
Creek Chub	13	Ø	13	—
Common Shiner	23	9	23	—

Signature: PL

minnow environmental inc.

Minnow Trapping (con't)

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3771
Facsimile: (905) 873-6370

Client: R. Robinson
Waterbody: MAY Lake

Project Name/Number: 2308
Field Crew: KL / CS

SET # MT 3. # of TRAPS 2

Set Easting: 385 969 Northing: 5144080 Map Datum: NAD 83

Set Depth Range: 0.3 to 0.7 m Location/Configuration Marked on Map: YES / NO

General Observations: @ beaver lodge

Set Date/Time: Sept 20 10:00 Lift Date/Time: Sept 20 17:15

Total Fishing Time: 7.25 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into ~~Lake Pitama~~	Mortalities
Common Shiner	232 + 205 = (258)	30	222	-
Lake Chub	1 + 0 = (1)	0	1	-
Creek Chub	1 + 13 = (14)	0	14	-

SET # _____ # of TRAPS _____

Set Easting: _____ Northing: _____ Map Datum: _____

Set Depth Range: _____ to _____ m Location/Configuration Marked on Map: YES / NO

General Observations: _____

Set Date/Time: _____ Lift Date/Time: _____

Total Fishing Time: _____ h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities

Signature: _____

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimile: (905) 873 - 6370

Special Investigation Fieldsheet

Client: Rio Algom/Denison
Date/Time: Sept 18, 19, 26
Lake: McCabe Lake
Northing: } see below
Easting: }

Project Name/Number: SRWMP - 2308
Field Crew: KC/CR/CW

WATER
Water sample collected and preserved ☑

Northing: 5142144
Easting: 0379486

SEDIMENT
Core / (Ponar)
Depth of sediment sampled: top 2cm

Water depth(m): 0.8m
Northing: 5143319
Easting: 0379965

FISH

Sample ID	# in Composite	Species in Composite
ML-F1	10 (23.41g)	Lake Chub
ML-F2	12 (21.64g)	Norther R.B Dace
ML-F3	8 (23.92g)	Pumpkinseed

* note LC stomachs are full of cat food

Field collection sheets completed ☐

2 I also sampled jw white sucker (10) see 2297 notes.

MACROPHYTES
Sample Area: _____ Northing: _____
Easting: _____

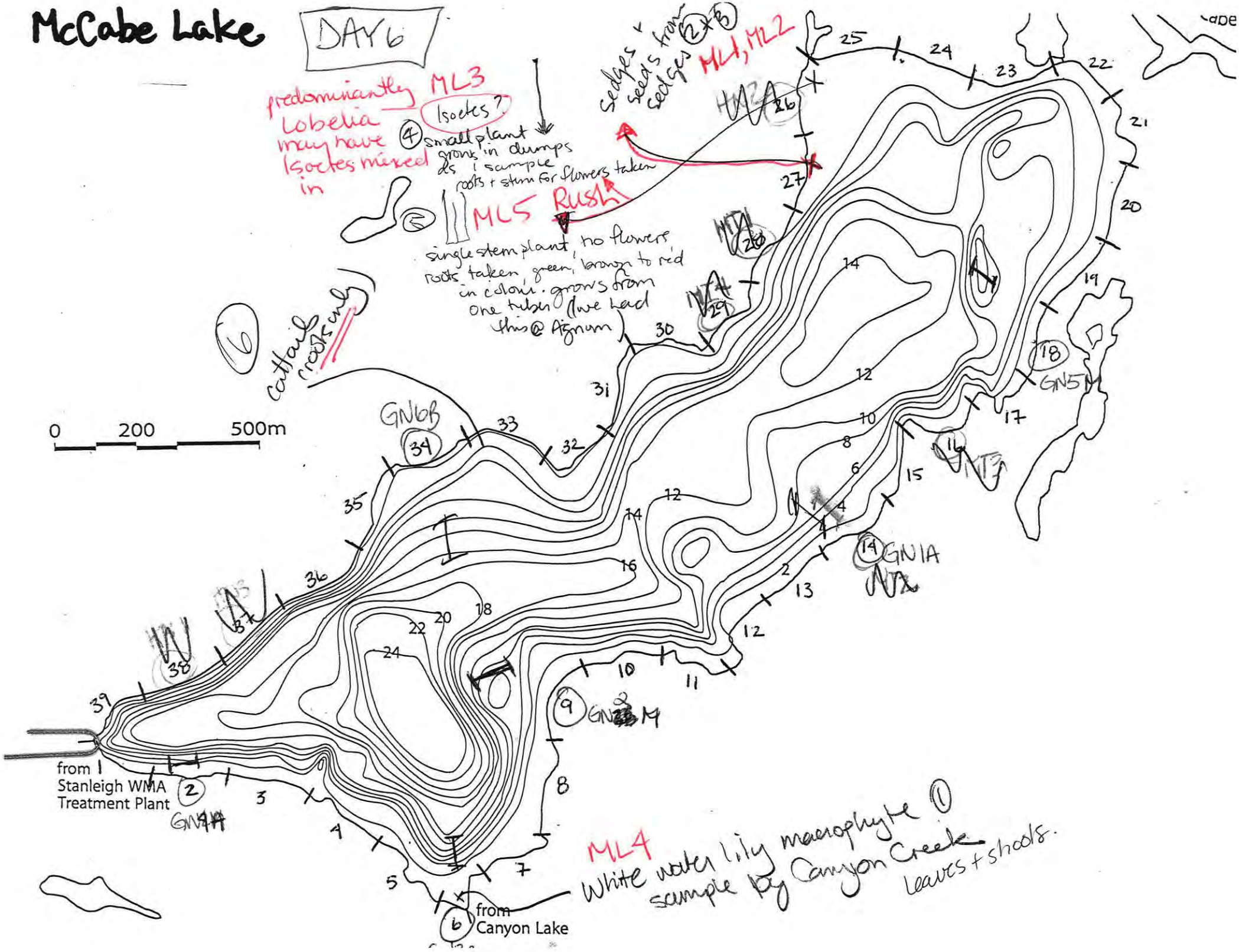
} see map attached.

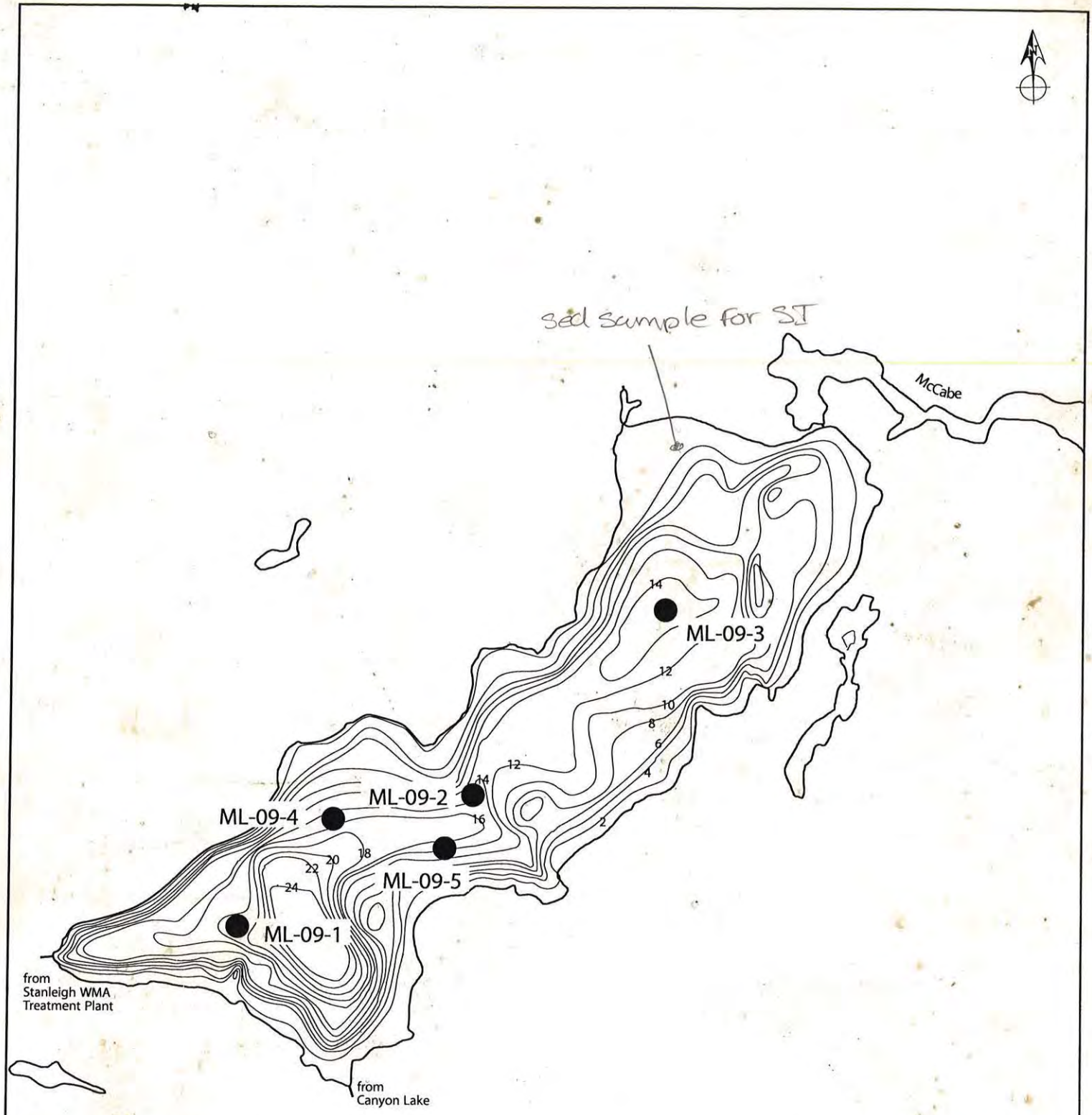
Sample ID	Species	Structure Sampled
ML-09-ML1	Sedge	Roots
ML-09 ML2	Sedge	seeds
ML-09-ML3	Quillwort & Lobelia	whole plant
ML-09-ML4	White water Lily	stems & leaves
ML-09-ML5	Rush	whole plant

I also sampled cattails for you - roots only

* ML3 - sample is likely Lobelia & may have quillwort → Isoetes sp. mixed in with it

- 10- seagulls
6-8 Common merganser ♀ (adult) plus juveniles


McCabe Lake
DAY 6
predominantly ML3
Lobelia
may have Isoetes mixed in
Isoetes?
small plant grows in clumps as I sample roots + stem for flowers taken
sedges + seeds from sedges
ML1, ML2
ML5 RUSH
single stem plant, no flowers
roots taken, green, brown to red in colour. grows from one tuber (have head this @ Agnum)
cattails roots only
0 200 500m
GN6B
GN5
GN1A
GN3
GN4A
from Stanleigh WMA Treatment Plant
from Canyon Lake
ML4
White water lily macrophyte ①
sample by Canyon Creek
Leaves + shoots.



- mergansers (4-5)
- sea gulls.
-

Figure A.7

minnow environmental inc.

McCabe Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimilie: (905) 873 - 6370

Special Investigation Fieldsheet

Client: Rio Algom/Denison
Date/Time: Sept 20 & 22
Lake: McCarthy
Northing:
Easting:
} see below

Project Name/Number: SRWMP - 2308
Field Crew: PC/CS

WATER
Water sample collected and preserved ☑

Northing: 386 109
Easting: 5131922
> MCL-09-SI

SEDIMENT
Core / Ponar
Depth of sediment sampled: top 3cm, grab up to 6cm

Water depth(m): 1.1

Northing: 385 960
Easting: 5131346
> MCL-09-SI

FISH

Sample ID	# in Composite	Species in Composite
MCL-F1	5	Small mouth bass
MCL-F2	20	Pumpkinseed
MCL-F3	8	Yellow Perch

Field collection sheets completed ☐

MACROPHYTES
Sample Area: Boat launch #2

Northing: 386109 (samples 4,5) 385958 (samples 1-3)
Easting: 5131922 5131301

Sample ID	Species	Structure Sampled
MCL-09-M1	white N.	leaf + stem
MCL-09-M2	Pondweed	"
MCL-09-M3	large (V) pond.	leaf + stem
MCL-09-M4	burreed	"
MCL-09-M5	water shield	leaf + stem
MCL-09-M6	fern pondweed	" " "

Water Birds

14 Canadian Geese
10 black mallards
1 Eagle
1 gull
1 loon
1 hoodie

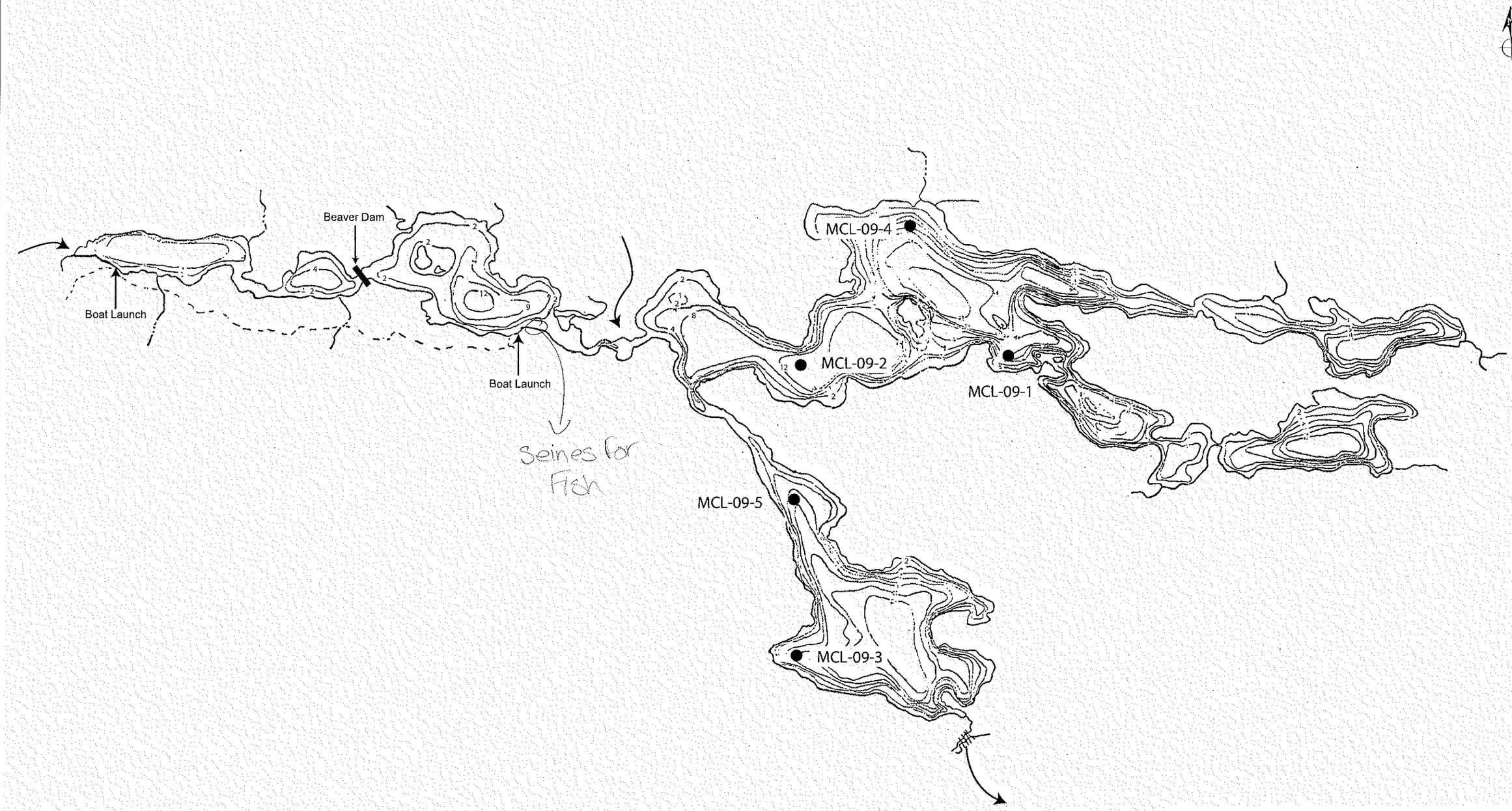


Figure A.8

McCarthy Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimilie: (905) 873 - 6370

Special Investigation Fieldsheet

Client: Rio Algom/Denison
Date/Time: Sept 18/09
Lake: NORDIC
Northing:
Easting:
} see below

Project Name/Number: SRWMP - 2308
Field Crew: PL / CS

WATER

Water sample collected and preserved ☒

Northing: same as macrophytes.
Easting:

SEDIMENT

Core / Ponar
Depth of sediment sampled: top 3cm (4 subs - 5cm worth of material)

Water depth(m): 1.8 m
Northing: 376 229
Easting: 5 135 853

Submitted as NL-09-S1

FISH

Sample ID	# in Composite	Species in Composite
NL 09 F1	6	Golden Shiner
NL 09 F2	6	Common Shiner
NL 09 F3	6	Golden Shiner

NL-F1
NL-F2
NL-F3

Field collection sheets completed ☒

MACROPHYTES

Sample Area: @ launch area

Northing: 0376211
Easting: 5135858

Sample ID	Species	Structure Sampled
NL-09-(PW)	Floating (PW)	leaf + stem
NL-09-Burreed	Burreed (strap leaf)	seed head
NL-09-Lily	white lily	leaf + stem
NL-09-Burreed lf	Burreed (curly leaf)	leaf + stem
NL-09-Calla	Calla	leaf + stem

Submitted as

NL-09-N1
NL-09-N2
NL-09-N3
NL-09-N4
NL-09-N5

12 cormorants
2 gulls

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3371
Facsimile: (905) 873-6370

Seine Netting (con't)

Client: RIO/DENISON Project Name/Number: 2308
Waterbody: NORDIC Field Crew: PC/CS

HAUL # 1 Date/Time: Sept 18/09 ~17:20

Net Length/Height: 50' x 3' Mesh Size(s): 1/8"
UTM Easting: 376 212 Northing: 5 135 878 Map Datum: NAD27

Seine net haul distance (m): ~50' loop from shore Depth Range: 0.1 to 0.5 m
Location/Configuration Marked on Lake Map: YES (NO) at access area
Observations: through bluegrass & lilies over hard silt substrate - visually ID'd fish before seine

Fish Species	Number Caught	Number Sampled	Number Released Alive	Mortalities
Common shiner	10	6	4	—
Golden shiner	14	12	2	—

HAUL # _____ Date/Time: _____

Net Length/Height: _____ Mesh Size(s): _____
UTM Easting: _____ Northing: _____ Map Datum: _____

Seine net haul distance (m): _____ Depth Range: _____ to _____ m
Location/Configuration Marked on Lake Map: YES NO
Observations: _____

Fish Species	Number Caught	Number Sampled	Number Released Alive	Mortalities

Signature: _____

minnow environmental inc.

Minnow Trapping

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9
Telephone: (905) 873-3371
Facsimilie: (905) 873-6370

Client: Rio/Dawson Project Name/Number: 2308
Waterbody: NORDIC Field Crew: PL/CS

SET # NL-1 # of TRAPS 2
Set Easting: 0376232 Northing: 5135884 Map Datum: 27 NAD
Set Depth Range: 0.5 to _____ m Location/Configuration Marked on Map: YES / NO
General Observations: new access, shallow inlet next to burreed
Set Date/Time: Sept 18 8:35 Lift Date/Time: Sept 18 16:45
Total Fishing Time: 8.17 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
	NO CATCH			

SET # NL-2 # of TRAPS 2
Set Easting: 376176 Northing: 5135217 Map Datum: NAD 27
Set Depth Range: 0.4 to _____ m Location/Configuration Marked on Map: YES / NO
General Observations: next to bullrush, rocky shore
Set Date/Time: Sept 18 8:45 Lift Date/Time: Sept 18 16:45
Total Fishing Time: 8.00 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities
NO	CATCH			

Signature: PL

minnow environmental inc.

Minnow Trapping (con't)

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3771
Facsimilie: (905) 873-6370

Client: RIO / DOMTSOW
Project Name/Number: 2308
Waterbody: NORDIC
Field Crew: PL / CS

SET # MT-3 # of TRAPS 2
Set Easting: 376 584 Northing: 5 135 217 Map Datum: NAD 27
Set Depth Range: 0.6 to ____ m Location/Configuration Marked on Map: YES / NO
General Observations: in lilies next to bulrush
Set Date/Time: Sept 18 8:55 Lift Date/Time: Sept 18 16:45
Total Fishing Time: 7.83 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
		NO catch		

SET # _____ # of TRAPS _____
Set Easting: _____ Northing: _____ Map Datum: _____
Set Depth Range: _____ to _____ m Location/Configuration Marked on Map: YES / NO
General Observations: _____
Set Date/Time: _____ Lift Date/Time: _____
Total Fishing Time: _____ h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities

Signature: _____

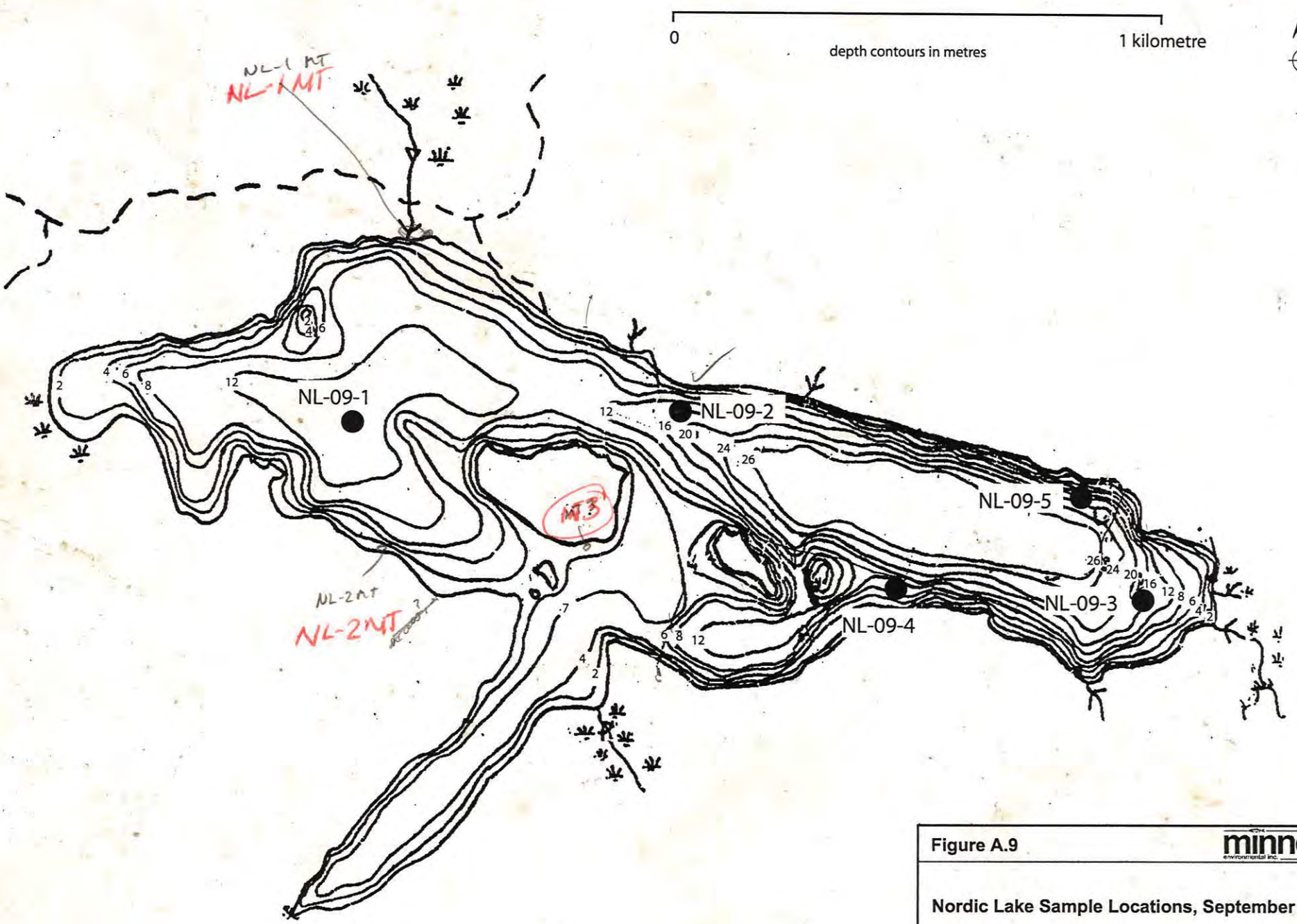


Figure A.9

minnow environmental inc.

Nordic Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873 - 3371
Facsimilie: (905) 873 - 6370

Special Investigation Fieldsheet

Client: Rio Algom/Denison
Date/Time: Sept 20 -
Lake: Quirke Lake
Northing:
Easting:

Project Name/Number: SRWMP - 2308
Field Crew: CR ML

WATER
Water sample collected and preserved ☑

Northing: 5150766
Easting: 0380676

Submitted as QL-SI-1
report as QL-09-SI

SEDIMENT
Core / (Ponar)
Depth of sediment sampled: 3-5cm

Water depth(m): 1m

Northing: 5150768
Easting: 0380613

> QL-09-SI

FISH

Sample ID	# in Composite	Species in Composite
QL-Fish1	~15	Common Shiner
QL-Fish2	~25	Mimic Shiner
QL-Fish3	~25	Mimic Shiner

> QL-F1
QL-F2
- QL-F3

Field collection sheets completed ☑

MACROPHYTES
Sample Area: Quirke near Panel Mill
Northing: 5150768
Easting: 0380613

Sample ID	Species	Structure Sampled	
QL-09-01	Pond lily (Arrowhead)	leaves & stems	collected at inlet to Quirke
QL-09-02	Broad leaved	leaves, stems, roots	" "
QL-09-03	Floating Pondweed	leaves, stems, seeds	
QL-09-04	Cattails	roots	

Plants, mud, Fish, Sed & water taken at small wetland to west of old Panel mill site - seds stained Orange.

→ Saw common merganser ↑ seagulls
1 adult ♀ + 5 juv in inlet of SR.

minnow environmental inc.

Minnow Trapping

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3371
Facsimilie: (905) 873-6370

Client: Rio/Den
Waterbody: Quirkeetalc

Project Name/Number: 2308
Field Crew: CB/M.L.

SET # 1 # of TRAPS 2

Set Easting: 380964 Northing: 5150926 Map Datum: 83

Set Depth Range: 1 to 1 m Location/Configuration Marked on Map: YES / NO

General Observations: rocks & weeds

Set Date/Time: Sept 22 840 am Lift Date/Time: Sept 22 530pm

Total Fishing Time: 8.83 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
0				

SET # 2 # of TRAPS 2

Set Easting: 0380613 Northing: 5150768 Map Datum: 83

Set Depth Range: 0.6 to 0.8 m Location/Configuration Marked on Map: YES / NO

General Observations: Cattails & Rocks

Set Date/Time: Sept 22. 850 am Lift Date/Time: Sept 22 510 pm

Total Fishing Time: 8.67 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities
R.B	2	2	0	
Common Shiner	HH HH HH			
Minnow	16, 11, 2, 5			

Signature: _____

minnow environmental inc.

MINNOW ENVIRONMENTAL INCORPORATED

2 Lamb Street
Georgetown, Ontario L7G 3M9

Telephone: (905) 873-3771
Facsimilie: (905) 873-6370

Minnow Trapping (con't)

Client: Rio/Den
Waterbody: Quirke

Project Name/Number: 2308
Field Crew: CR ML

SET # 3 **# of TRAPS** 2

Set Easting: 0380564 Northing: 5150756 Map Datum: 83

Set Depth Range: 0.8 to 0.8 m Location/Configuration Marked on Map: YES / NO

General Observations:

Set Date/Time: Sept 22/ 9am Lift Date/Time: Sept 22/ 5pm

Total Fishing Time: 8.00 h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released into Lake Pitama	Mortalities
Minnow	0	0	0	0

SET # _____ **# of TRAPS** _____

Set Easting: _____ Northing: _____ Map Datum: _____

Set Depth Range: _____ to _____ m Location/Configuration Marked on Map: YES / NO

General Observations:

Set Date/Time: _____ Lift Date/Time: _____

Total Fishing Time: _____ h

Fish Species	Number Caught	Number Sampled/ Retained	Number Released Alive	Mortalities

Signature: _____

SERPENT R

Pond lilly (QL-09-01)
Floating Pondweed (QL-09-03)
merganser ♀ + juveniles
Sedimental water
MT3
MT2
MT1
Broadleaf arrowhead (QL-09-02)
cattails (QL-09-04)

QL-09-1
QL-09-2
QL-09-3
QL-09-4
QL-09-5

36 11 23 18 23 18 11 23 46 82 11 18 23 46 82 11 18 23 46 102 100 46 23 18 11 82 36 18 23 46 23 10 11 36 11 36

moved

SERPENT R

depth contours in metres

0 1 kilometre

Figure A.11

minnow environmental inc.

Quirke Lake Sample Locations, September 2009

Ref: 2295
Date: June 2009

APPENDIX B

Radionuclide Analysis Results

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01349.0

Date: 04-Nov-2009

Minnow Environmental

2 Lamb St
Georgetown, ON, L7G 3M9

attn: Cynthia Russel

Phone: (905) 873-3371
FAX: (905) 567-6805

Client Ref.2308

6 water samples Received: 30-Sep-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
MAL-09-SI	Pb-210	< 0.02		Bq/l	16-Oct-2009	GFPC
MCL-09-SI	Pb-210	0.03	0.01	Bq/l	14-Oct-2009	GFPC
QL-09-SI	Pb-210	0.06	0.01	Bq/l	14-Oct-2009	GFPC
NL-09-ST	Pb-210	0.03	0.01	Bq/l	14-Oct-2009	GFPC
EL-09-SI	Pb-210	0.03	0.01	Bq/l	14-Oct-2009	GFPC
ML-09-SI	Pb-210	0.03	0.01	Bq/l	14-Oct-2009	GFPC
MAL-09-SI	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
MCL-09-SI	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
QL-09-SI	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
NL-09-ST	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
EL-09-SI	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
ML-09-SI	Po-210	< 0.01		Bq/l	08-Oct-2009	ALPHA
MAL-09-SI	Ra-226	0.05	0.01	Bq/l	10-Oct-2009	ALPHA
MCL-09-SI	Ra-226	< 0.01		Bq/l	10-Oct-2009	ALPHA
QL-09-SI	Ra-226	0.05	0.01	Bq/l	10-Oct-2009	ALPHA
NL-09-ST	Ra-226	0.03	0.01	Bq/l	10-Oct-2009	ALPHA
EL-09-SI	Ra-226	< 0.01		Bq/l	10-Oct-2009	ALPHA
ML-09-SI	Ra-226	0.06	0.01	Bq/l	10-Oct-2009	ALPHA
MAL-09-SI	Ra-228	< 0.1		Bq/l	16-Oct-2009	GAMMA
MCL-09-SI	Ra-228	< 0.1		Bq/l	20-Oct-2009	GAMMA
QL-09-SI	Ra-228	< 0.1		Bq/l	22-Oct-2009	GAMMA
NL-09-ST	Ra-228	< 0.1		Bq/l	02-Nov-2009	GAMMA
EL-09-SI	Ra-228	< 0.1		Bq/l	24-Oct-2009	GAMMA
ML-09-SI	Ra-228	< 0.1		Bq/l	26-Oct-2009	GAMMA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01349.0

Date: 04-Nov-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
MAL-09-SI	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
MCL-09-SI	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
QL-09-SI	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
NL-09-ST	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
EL-09-SI	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
ML-09-SI	Th-228	<	0.01		Bq/l	07-Oct-2009	ALPHA
MAL-09-SI	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
MCL-09-SI	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
QL-09-SI	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
NL-09-ST	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
EL-09-SI	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
ML-09-SI	Th-230	<	0.01		Bq/l	07-Oct-2009	ALPHA
MAL-09-SI	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
MCL-09-SI	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
QL-09-SI	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
NL-09-ST	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
EL-09-SI	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
ML-09-SI	Th-232	<	0.01		Bq/l	07-Oct-2009	ALPHA
MAL-09-SI	Uranium		1.5	0.2	ppb	02-Nov-2009	NAA
MCL-09-SI	Uranium		0.5	0.2	ppb	02-Nov-2009	NAA
QL-09-SI	Uranium		2.6	0.2	ppb	02-Nov-2009	NAA
NL-09-ST	Uranium		1.6	0.3	ppb	02-Nov-2009	NAA
EL-09-SI	Uranium		1.7	0.3	ppb	02-Nov-2009	NAA
ML-09-SI	Uranium		1.2	0.3	ppb	02-Nov-2009	NAA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01349.0

Date: 04-Nov-2009

Methods:	ALPHA	BQ-RAD-ALPHA	alpha-particle spectrometry
	GFPC	BQ-RAD-GFPC	gas-flow proportional counting
	GAMMA	BQ-RAD-GAMMA	gamma-ray spectrometry
	NAA	BQ-NAA-1	neutron activation analysis

Units:	Bq/l	Becquerels per litre
	ppb	micrograms per litre

These results relate only to the samples analysed and only to the items tested.

04-Nov-2009 approved by: _____
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01349.0

Date: 04-Nov-2009

Standards

Standard	Analyte	Units	Result	Expected Result
TH230.11	Th-230	Bq/l	0.94	0.85
RA226.29	Ra-226	Bq/l	1.03	0.92
PB210.09	Pb-210	Bq/l	0.86	0.80
DH1-A	Ra-228	Bq/g	3.49	3.69
PB210.09	Po-210	Bq/l	0.71	0.89
U standard	Uranium	ppb	238	300

Blanks

Analyte	Units	Result
Th-232	Bq/l	< 0.01
Th-230	Bq/l	< 0.01
Th-228	Bq/l	< 0.02
Po-210	Bq/l	< 0.01
Ra-226	Bq/l	< 0.01
Pb-210	Bq/l	< 0.03
Ra-228	Bq/l	< 0.3

Duplicates

Analyte	Units	Result	Duplicate
Ra-226	Bq/l	0.15	0.16
Ra-228	Bq/l		ISS
Pb-210	Bq/l		ISS
Po-210	Bq/l		ISS
Th-230	Bq/l		ISS
Uranium	ppb		ISS

ISS insufficient sample

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01352.0

Date: 09-Nov-2009

Minnow Environmental

2 Lamb St
Georgetown, ON, L7G 3M9

attn: Cynthia Russel

Phone: (905) 873-3371
FAX: (905) 567-6805

Client Ref.2308

6 sed/soil samples

Received: 30-Sep-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
QL-09-SI	Pb-210		2.3	0.1	Bq/g	02-Nov-2009	GFPC
NL-09-SI	Pb-210		0.31	0.02	Bq/g	02-Nov-2009	GFPC
MCL-09-SI	Pb-210		0.49	0.03	Bq/g	02-Nov-2009	GFPC
MAL-09-SI	Pb-210		0.66	0.04	Bq/g	02-Nov-2009	GFPC
EL-09-SI	Pb-210		0.76	0.03	Bq/g	02-Nov-2009	GFPC
ML-09-SI	Pb-210		2.5	0.1	Bq/g	02-Nov-2009	GFPC
QL-09-SI	Po-210		2.6	0.1	Bq/g	27-Oct-2009	ALPHA
NL-09-SI	Po-210		0.27	0.02	Bq/g	27-Oct-2009	ALPHA
MCL-09-SI	Po-210		0.45	0.03	Bq/g	27-Oct-2009	ALPHA
MAL-09-SI	Po-210		0.78	0.04	Bq/g	27-Oct-2009	ALPHA
EL-09-SI	Po-210		0.74	0.03	Bq/g	27-Oct-2009	ALPHA
ML-09-SI	Po-210		2.4	0.1	Bq/g	28-Oct-2009	ALPHA
QL-09-SI	Ra-226		2.2	0.1	Bq/g	03-Nov-2009	ALPHA
NL-09-SI	Ra-226		0.37	0.02	Bq/g	03-Nov-2009	ALPHA
MCL-09-SI	Ra-226		0.44	0.02	Bq/g	03-Nov-2009	ALPHA
MAL-09-SI	Ra-226		0.22	0.01	Bq/g	03-Nov-2009	ALPHA
EL-09-SI	Ra-226		0.63	0.03	Bq/g	03-Nov-2009	ALPHA
ML-09-SI	Ra-226		2.0	0.1	Bq/g	03-Nov-2009	ALPHA
QL-09-SI	Ra-228		0.35	0.04	Bq/g	23-Oct-2009	GAMMA
NL-09-SI	Ra-228	<	0.1		Bq/g	23-Oct-2009	GAMMA
MCL-09-SI	Ra-228	<	0.1		Bq/g	24-Oct-2009	GAMMA
MAL-09-SI	Ra-228		0.5	0.1	Bq/g	24-Oct-2009	GAMMA
EL-09-SI	Ra-228	<	0.1		Bq/g	24-Oct-2009	GAMMA
ML-09-SI	Ra-228	<	0.1		Bq/g	24-Oct-2009	GAMMA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01352.0

Date: 09-Nov-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
QL-09-SI	Th-228	0.37	0.05	Bq/g	03-Nov-2009	ALPHA
NL-09-SI	Th-228	0.06	0.01	Bq/g	03-Nov-2009	ALPHA
MCL-09-SI	Th-228	0.06	0.01	Bq/g	03-Nov-2009	ALPHA
MAL-09-SI	Th-228	0.66	0.03	Bq/g	03-Nov-2009	ALPHA
EL-09-SI	Th-228	0.17	0.02	Bq/g	03-Nov-2009	ALPHA
ML-09-SI	Th-228	0.08	0.01	Bq/g	03-Nov-2009	ALPHA
QL-09-SI	Th-230	2.7	0.3	Bq/g	03-Nov-2009	ALPHA
NL-09-SI	Th-230	0.05	0.01	Bq/g	03-Nov-2009	ALPHA
MCL-09-SI	Th-230	0.05	0.01	Bq/g	03-Nov-2009	ALPHA
MAL-09-SI	Th-230	5.1	0.2	Bq/g	03-Nov-2009	ALPHA
EL-09-SI	Th-230	1.04	0.08	Bq/g	03-Nov-2009	ALPHA
ML-09-SI	Th-230	0.43	0.04	Bq/g	03-Nov-2009	ALPHA
QL-09-SI	Th-232	0.26	0.04	Bq/g	03-Nov-2009	ALPHA
NL-09-SI	Th-232	0.02	0.01	Bq/g	03-Nov-2009	ALPHA
MCL-09-SI	Th-232	0.014	0.004	Bq/g	03-Nov-2009	ALPHA
MAL-09-SI	Th-232	0.78	0.04	Bq/g	03-Nov-2009	ALPHA
EL-09-SI	Th-232	0.08	0.01	Bq/g	03-Nov-2009	ALPHA
ML-09-SI	Th-232	0.04	0.01	Bq/g	03-Nov-2009	ALPHA
QL-09-SI	Uranium	89	3	ppm	20-Nov-2009	NAA
NL-09-SI	Uranium	16	1	ppm	20-Nov-2009	NAA
MCL-09-SI	Uranium	26	1	ppm	20-Nov-2009	NAA
MAL-09-SI	Uranium	16	1	ppm	20-Nov-2009	NAA
EL-09-SI	Uranium	135	4	ppm	20-Nov-2009	NAA
ML-09-SI	Uranium	30	1	ppm	20-Nov-2009	NAA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01352.0

Date: 09-Nov-2009

Methods:	ALPHA	BQ-RAD-ALPHA	alpha-particle spectrometry
	GAMMA	BQ-RAD-GAMMA	gamma-ray spectrometry
	GFPC	BQ-RAD-GFPC	gas-flow proportional counting
	NAA	BQ-NAA-1	neutron activation analysis

Units:	Bq/g	Becquerels per gram
	ppm	micrograms per gram

These results relate only to the samples analysed and only to the items tested.
Ra-228 was estimated from Ac-228.

06-Nov-2009 approved by: _____
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01352.0

Date: 09-Nov-2009

Standards

Standard	Analyte	Units	Result	Expected Result
DL1-A	Ra-226	Bq/g	1.26	1.30
DL1-A	Th-230	Bq/g	0.033	1.40
DL1-A	Pb-210	Bq/g	1.52	1.40
DL1-A	Po-210	Bq/g	1.27	1.40
DL1-A	Th-230	Bq/g	1.36	1.43
DL1-A	Th-232	Bq/g	0.27	0.33
DL1-A	Th-228	Bq/g	0.35	0.33
DH1-A	Ra-228	Bq/g	3.68	3.69
UTS-2	Uranium	ppm	55	56

Blanks

Analyte	Units	Result
Ra-226	Bq/g	< 0.01
Th-230	Bq/g	< 0.09
Th-232	Bq/g	< 0.01
Th-228	Bq/g	< 0.09
Pb-210	Bq/g	< 0.1
Po-210	Bq/g	< 0.01
Ra-228	Bq/g	< 0.1

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01352.0

Date: 09-Nov-2009

Duplicates

Analyte	Units	Result	Duplicate
Ra-226	Bq/g	0.44	0.39
Pb-210	Bq/g	0.49	0.51
Po-210	Bq/g	0.45	0.48
Ra-228	Bq/g	0.35	0.32
Th-230	Bq/g	0.05	0.03
Th-232	Bq/g	0.01	0.02
Th-228	Bq/g	0.06	0.06
Uranium	ppm	16	16

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01350.0

Date: 13-Nov-2009

Minnow Environmental

2 Lamb St
Georgetown, ON, L7G 3M9

Phone: (905) 873-3371
FAX: (905) 567-6805

Client Ref.2308

attn: Cynthia Russel

17 tissue samples

Received: 30-Sep-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
EL-F1	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
EL-F2	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
EL-F3	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
QL-F1	Pb-210		0.02	0.003	Bq/g	22-Oct-2009	GFPC
QL-F2	Pb-210		0.04	0.003	Bq/g	22-Oct-2009	GFPC
QL-F3	Pb-210		0.03	0.003	Bq/g	22-Oct-2009	GFPC
NL-F1	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
NL-F2	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
NL-F3	Pb-210	<	0.02		Bq/g	22-Oct-2009	GFPC
MAL-F1	Pb-210		0.02	0.004	Bq/g	23-Oct-2009	GFPC
MAL-F2	Pb-210	<	0.02		Bq/g	23-Oct-2009	GFPC
MAL-F3	Pb-210		0.03	0.005	Bq/g	23-Oct-2009	GFPC
ML-F1	Pb-210		0.03	0.007	Bq/g	23-Oct-2009	GFPC
ML-F2	Pb-210	<	0.02		Bq/g	23-Oct-2009	GFPC
ML-F3	Pb-210		0.06	0.007	Bq/g	23-Oct-2009	GFPC
MCL-F1	Pb-210	<	0.02		Bq/g	23-Oct-2009	GFPC
MCL-F2	Pb-210	<	0.02		Bq/g	02-Nov-2009	GFPC
EL-F1	Po-210		0.025	0.004	Bq/g	16-Oct-2009	ALPHA
EL-F2	Po-210		0.022	0.002	Bq/g	16-Oct-2009	ALPHA
EL-F3	Po-210		0.040	0.003	Bq/g	16-Oct-2009	ALPHA
QL-F1	Po-210		0.89	0.06	Bq/g	16-Oct-2009	ALPHA
QL-F2	Po-210		0.93	0.07	Bq/g	16-Oct-2009	ALPHA
QL-F3	Po-210		1.2	0.1	Bq/g	16-Oct-2009	ALPHA
NL-F1	Po-210		0.25	0.02	Bq/g	16-Oct-2009	ALPHA
NL-F2	Po-210		0.26	0.02	Bq/g	16-Oct-2009	ALPHA
NL-F3	Po-210		0.68	0.04	Bq/g	16-Oct-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01350.0

Date: 13-Nov-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
MAL-F1	Po-210	0.47	0.03	Bq/g	16-Oct-2009	ALPHA
MAL-F2	Po-210	0.46	0.03	Bq/g	16-Oct-2009	ALPHA
MAL-F3	Po-210	0.43	0.03	Bq/g	16-Oct-2009	ALPHA
ML-F1	Po-210	0.32	0.02	Bq/g	16-Oct-2009	ALPHA
ML-F2	Po-210	0.66	0.04	Bq/g	16-Oct-2009	ALPHA
ML-F3	Po-210	0.53	0.03	Bq/g	16-Oct-2009	ALPHA
MCL-F1	Po-210	0.10	0.01	Bq/g	16-Oct-2009	ALPHA
MCL-F2	Po-210	0.012	0.002	Bq/g	27-Oct-2009	ALPHA
EL-F1	Ra-226	0.009	0.001	Bq/g	23-Oct-2009	ALPHA
EL-F2	Ra-226	0.012	0.001	Bq/g	23-Oct-2009	ALPHA
EL-F3	Ra-226	0.012	0.001	Bq/g	23-Oct-2009	ALPHA
QL-F1	Ra-226	0.039	0.001	Bq/g	23-Oct-2009	ALPHA
QL-F2	Ra-226	0.070	0.003	Bq/g	23-Oct-2009	ALPHA
QL-F3	Ra-226	0.070	0.003	Bq/g	23-Oct-2009	ALPHA
NL-F1	Ra-226	0.008	0.001	Bq/g	23-Oct-2009	ALPHA
NL-F2	Ra-226	0.014	0.001	Bq/g	23-Oct-2009	ALPHA
NL-F3	Ra-226	0.009	0.001	Bq/g	23-Oct-2009	ALPHA
MAL-F1	Ra-226	0.014	0.001	Bq/g	23-Oct-2009	ALPHA
MAL-F2	Ra-226	0.009	0.002	Bq/g	23-Oct-2009	ALPHA
MAL-F3	Ra-226	0.016	0.001	Bq/g	23-Oct-2009	ALPHA
ML-F1	Ra-226	0.019	0.002	Bq/g	23-Oct-2009	ALPHA
ML-F2	Ra-226	0.029	0.002	Bq/g	23-Oct-2009	ALPHA
ML-F3	Ra-226	0.017	0.001	Bq/g	23-Oct-2009	ALPHA
MCL-F1	Ra-226	0.003	0.001	Bq/g	23-Oct-2009	ALPHA
MCL-F2	Ra-226	0.015	0.001	Bq/g	03-Nov-2009	ALPHA
EL-F1	Ra-228	< 0.1		Bq/g	15-Oct-2009	GAMMA
EL-F2	Ra-228	< 0.1		Bq/g	17-Oct-2009	GAMMA
EL-F3	Ra-228	0.15	0.05	Bq/g	19-Oct-2009	GAMMA
QL-F1	Ra-228	< 0.1		Bq/g	16-Oct-2009	GAMMA
QL-F2	Ra-228	< 0.1		Bq/g	18-Oct-2009	GAMMA
QL-F3	Ra-228	0.12	0.04	Bq/g	19-Oct-2009	GAMMA
NL-F1	Ra-228	< 0.1		Bq/g	16-Oct-2009	GAMMA

ANALYSIS REPORT

Becquerel Laboratories Inc. Phone: (905) 826-3080 Batch: T09-01350.0

6790 Kitimat Rd., Unit 4 FAX: (905) 826-4151
Mississauga, Ontario
Canada, L5N 5L9

Date: 13-Nov-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
NL-F2	Ra-228	< 0.1		Bq/g	14-Oct-2009	GAMMA
NL-F3	Ra-228	< 0.1		Bq/g	11-Oct-2009	GAMMA
MAL-F1	Ra-228	< 0.1		Bq/g	19-Oct-2009	GAMMA
MAL-F2	Ra-228	0.13	0.05	Bq/g	20-Oct-2009	GAMMA
MAL-F3	Ra-228	< 0.2		Bq/g	26-Oct-2009	GAMMA
ML-F1	Ra-228	< 0.1		Bq/g	21-Oct-2009	GAMMA
ML-F2	Ra-228	0.35	0.09	Bq/g	26-Oct-2009	GAMMA
ML-F3	Ra-228	0.22	0.06	Bq/g	30-Oct-2009	GAMMA
MCL-F1	Ra-228	< 0.1		Bq/g	15-Oct-2009	GAMMA
MCL-F2	Ra-228	< 0.1		Bq/g	24-Oct-2009	GAMMA
EL-F1	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F2	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F3	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
QL-F1	Th-228	0.003	0.001	Bq/g	23-Oct-2009	ALPHA
QL-F2	Th-228	0.006	0.001	Bq/g	23-Oct-2009	ALPHA
QL-F3	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F1	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F2	Th-228	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F3	Th-228	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F1	Th-228	0.007	0.001	Bq/g	24-Oct-2009	ALPHA
MAL-F2	Th-228	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F3	Th-228	< 0.005		Bq/g	24-Oct-2009	ALPHA
ML-F1	Th-228	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F2	Th-228	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F3	Th-228	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F1	Th-228	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F2	Th-228	< 0.005		Bq/g	29-Oct-2009	ALPHA
EL-F1	Th-230	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F2	Th-230	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F3	Th-230	< 0.003		Bq/g	23-Oct-2009	ALPHA
QL-F1	Th-230	0.010	0.001	Bq/g	23-Oct-2009	ALPHA
QL-F2	Th-230	0.033	0.002	Bq/g	23-Oct-2009	ALPHA

Becquerel LABORATORIES

ANALYSIS REPORT

6790 Kitimat Rd., Unit 4 FAX: (905) 826-4151
Mississauga, Ontario
Canada, L5N 5L9

Date: 13-Nov-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
QL-F3	Th-230	0.023	0.002	Bq/g	23-Oct-2009	ALPHA
NL-F1	Th-230	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F2	Th-230	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F3	Th-230	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F1	Th-230	0.005	0.001	Bq/g	24-Oct-2009	ALPHA
MAL-F2	Th-230	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F3	Th-230	< 0.005		Bq/g	24-Oct-2009	ALPHA
ML-F1	Th-230	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F2	Th-230	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F3	Th-230	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F1	Th-230	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F2	Th-230	< 0.005		Bq/g	29-Oct-2009	ALPHA
EL-F1	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F2	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
EL-F3	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
QL-F1	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
QL-F2	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
QL-F3	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F1	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F2	Th-232	< 0.005		Bq/g	23-Oct-2009	ALPHA
NL-F3	Th-232	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F1	Th-232	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F2	Th-232	< 0.005		Bq/g	24-Oct-2009	ALPHA
MAL-F3	Th-232	< 0.005		Bq/g	24-Oct-2009	ALPHA
ML-F1	Th-232	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F2	Th-232	< 0.005		Bq/g	25-Oct-2009	ALPHA
ML-F3	Th-232	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F1	Th-232	< 0.005		Bq/g	25-Oct-2009	ALPHA
MCL-F2	Th-232	< 0.005		Bq/g	29-Oct-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01350.0

Date: 13-Nov-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
EL-F1	Uranium	460	40	ppb	13-Nov-2009	NAA
EL-F2	Uranium	550	41	ppb	13-Nov-2009	NAA
EL-F3	Uranium	810	51	ppb	13-Nov-2009	NAA
QL-F1	Uranium	1650	57	ppb	13-Nov-2009	NAA
QL-F2	Uranium	3200	110	ppb	13-Nov-2009	NAA
QL-F3	Uranium	2900	100	ppb	13-Nov-2009	NAA
NL-F1	Uranium	140	54	ppb	13-Nov-2009	NAA
NL-F2	Uranium	160	33	ppb	13-Nov-2009	NAA
NL-F3	Uranium	250	60	ppb	13-Nov-2009	NAA
MAL-F1	Uranium	240	48	ppb	13-Nov-2009	NAA
MAL-F2	Uranium	280	69	ppb	13-Nov-2009	NAA
MAL-F3	Uranium	140	53	ppb	13-Nov-2009	NAA
ML-F1	Uranium	440	59	ppb	13-Nov-2009	NAA
ML-F2	Uranium	520	79	ppb	13-Nov-2009	NAA
ML-F3	Uranium	430	73	ppb	13-Nov-2009	NAA
MCL-F1	Uranium	150	31	ppb	13-Nov-2009	NAA
MCL-F2	Uranium	720	27	ppb	13-Nov-2009	NAA

Methods:

GAMMA	BQ-RAD-GAMMA	gamma-ray spectrometry
ALPHA	BQ-RAD-ALPHA	alpha-particle spectrometry
GFPC	BQ-RAD-GFPC	gas-flow proportional counting
NAA	BQ-NAA-1	neutron activation analysis

Units:

Bq/g	Becquerels per gram
ppb	micrograms per kilogram

These results relate only to the samples analysed and only to the items tested.
Sample MCL-F3 was lost during dissolution.

13-Nov-2009 approved by: _____
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01350.0

Date: 13-Nov-2009

Standards

Standard	Analyte	Units	Result	Expected Result
DH1-A	Ra-228	Bq/g	3.32	3.69
RA226.29	Ra-226	Bq/l	0.82	0.92
TH230.11	Th-230	Bq/l	0.94	0.85
PB210.09	Pb-210	Bq/l	0.89	0.80
PB210.09	Po-210	Bq/l	0.73	0.89
DL1-A	Pb-210	Bq/g	1.52	1.30
DL1-A	Uranium	ppb	118	116

Blanks

Analyte	Units	Result
Ra-228	Bq/g	< 0.1
Ra-226	Bq/g	< 0.005
Th-232	Bq/g	< 0.005
Th-230	Bq/g	< 0.005
Th-228	Bq/g	< 0.005
Pb-210	Bq/g	< 0.006
Po-210	Bq/g	< 0.005

Duplicates

Analyte	Units	Result	Duplicate
Ra-228	Bq/g	< 0.1	< 0.1
Ra-226	Bq/g	0.070	0.065
Th-232	Bq/g	< 0.005	< 0.005
Th-230	Bq/g	0.033	0.030
Th-228	Bq/g	0.006	0.005
Pb-210	Bq/g	0.02	0.02
Po-210	Bq/g	0.93	0.88

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Minnow Environmental

2 Lamb St
Georgetown, ON, L7G 3M9

Phone: (905) 873-3371
FAX: (905) 567-6805

Client Ref.2308

attn: Cynthia Russel

30 vegetation samples

Received: 30-Sep-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
MCL-09-M1	Pb-210	0.056	0.004	Bq/g	18-Nov-2009	GFPC
MCL-09-M2	Pb-210	0.13	0.01	Bq/g	18-Nov-2009	GFPC
MCL-09-M3	Pb-210	0.12	0.01	Bq/g	18-Nov-2009	GFPC
MCL-09-M4	Pb-210	0.066	0.006	Bq/g	18-Nov-2009	GFPC
MCL-09-M5	Pb-210	0.064	0.004	Bq/g	18-Nov-2009	GFPC
MCL-09-M6	Pb-210	0.11	0.02	Bq/g	18-Nov-2009	GFPC
QL-09-Q1	Pb-210	0.13	0.01	Bq/g	18-Nov-2009	GFPC
QL-09-Q2	Pb-210	2.1	0.1	Bq/g	24-Nov-2009	GFPC
QL-09-Q3	Pb-210	0.38	0.01	Bq/g	18-Nov-2009	GFPC
QL-09-Q4	Pb-210	5.1	0.2	Bq/g	18-Nov-2009	GFPC
EL-09-E1	Pb-210	0.072	0.004	Bq/g	18-Nov-2009	GFPC
EL-09-E2	Pb-210	0.064	0.006	Bq/g	19-Nov-2009	GFPC
EL-09-E3	Pb-210	0.054	0.006	Bq/g	19-Nov-2009	GFPC
EL-09-E4	Pb-210	0.025	0.003	Bq/g	19-Nov-2009	GFPC
EL-09-E5	Pb-210	0.015	0.003	Bq/g	19-Nov-2009	GFPC
NL-09-N1	Pb-210	0.16	0.01	Bq/g	19-Nov-2009	GFPC
NL-09-N2	Pb-210	0.010	0.003	Bq/g	19-Nov-2009	GFPC
NL-09-N3	Pb-210	0.030	0.003	Bq/g	19-Nov-2009	GFPC
NL-09-N4	Pb-210	0.041	0.003	Bq/g	19-Nov-2009	GFPC
NL-09-N5	Pb-210	0.055	0.004	Bq/g	19-Nov-2009	GFPC
ML-09-ML1	Pb-210	0.27	0.01	Bq/g	19-Nov-2009	GFPC
ML-09-ML2	Pb-210	0.28	0.01	Bq/g	19-Nov-2009	GFPC
ML-09-ML3	Pb-210	0.90	0.03	Bq/g	24-Nov-2009	GFPC
ML-09-ML4	Pb-210	0.057	0.004	Bq/g	19-Nov-2009	GFPC
ML-09-ML5	Pb-210	0.19	0.01	Bq/g	19-Nov-2009	GFPC
MAL-09-M1	Pb-210	0.50	0.02	Bq/g	19-Nov-2009	GFPC
MAL-09-M2	Pb-210	0.21	0.01	Bq/g	19-Nov-2009	GFPC

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
MAL-09-M3	Pb-210		0.047	0.004	Bq/g	20-Nov-2009	GFPC
MAL-09-M4	Pb-210		0.81	0.05	Bq/g	24-Nov-2009	GFPC
MAL-09-M5	Pb-210		0.11	0.01	Bq/g	20-Nov-2009	GFPC
MCL-09-M1	Po-210		0.017	0.003	Bq/g	12-Nov-2009	ALPHA
MCL-09-M2	Po-210		0.078	0.007	Bq/g	12-Nov-2009	ALPHA
MCL-09-M3	Po-210		0.086	0.005	Bq/g	12-Nov-2009	ALPHA
MCL-09-M4	Po-210		0.033	0.003	Bq/g	12-Nov-2009	ALPHA
MCL-09-M5	Po-210		0.030	0.002	Bq/g	12-Nov-2009	ALPHA
MCL-09-M6	Po-210		0.051	0.007	Bq/g	12-Nov-2009	ALPHA
QL-09-Q1	Po-210		0.13	0.01	Bq/g	13-Nov-2009	ALPHA
QL-09-Q2	Po-210		2.9	0.1	Bq/g	17-Nov-2009	ALPHA
QL-09-Q3	Po-210		0.42	0.02	Bq/g	13-Nov-2009	ALPHA
QL-09-Q4	Po-210		5.1	0.3	Bq/g	13-Nov-2009	ALPHA
EL-09-E1	Po-210		0.036	0.005	Bq/g	13-Nov-2009	ALPHA
EL-09-E2	Po-210		0.017	0.005	Bq/g	13-Nov-2009	ALPHA
EL-09-E3	Po-210		0.019	0.004	Bq/g	13-Nov-2009	ALPHA
EL-09-E4	Po-210		0.014	0.001	Bq/g	16-Nov-2009	ALPHA
EL-09-E5	Po-210		0.010	0.002	Bq/g	13-Nov-2009	ALPHA
NL-09-N1	Po-210		0.11	0.01	Bq/g	13-Nov-2009	ALPHA
NL-09-N2	Po-210	<	0.002		Bq/g	13-Nov-2009	ALPHA
NL-09-N3	Po-210		0.020	0.001	Bq/g	14-Nov-2009	ALPHA
NL-09-N4	Po-210		0.026	0.002	Bq/g	15-Nov-2009	ALPHA
NL-09-N5	Po-210		0.021	0.002	Bq/g	15-Nov-2009	ALPHA
ML-09-ML1	Po-210		0.28	0.01	Bq/g	15-Nov-2009	ALPHA
ML-09-ML2	Po-210		0.34	0.01	Bq/g	16-Nov-2009	ALPHA
ML-09-ML3	Po-210		0.69	0.04	Bq/g	17-Nov-2009	ALPHA
ML-09-ML4	Po-210		0.063	0.003	Bq/g	16-Nov-2009	ALPHA
ML-09-ML5	Po-210		0.22	0.01	Bq/g	16-Nov-2009	ALPHA
MAL-09-M1	Po-210		0.54	0.03	Bq/g	17-Nov-2009	ALPHA
MAL-09-M2	Po-210		0.18	0.01	Bq/g	17-Nov-2009	ALPHA
MAL-09-M3	Po-210		0.045	0.005	Bq/g	17-Nov-2009	ALPHA
MAL-09-M4	Po-210		0.88	0.08	Bq/g	17-Nov-2009	ALPHA
MAL-09-M5	Po-210		0.056	0.007	Bq/g	17-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
MCL-09-M1	Ra-226		0.018	0.001	Bq/g	29-Nov-2009	ALPHA
MCL-09-M2	Ra-226		0.20	0.01	Bq/g	29-Nov-2009	ALPHA
MCL-09-M3	Ra-226		0.34	0.01	Bq/g	29-Nov-2009	ALPHA
MCL-09-M4	Ra-226		0.11	0.01	Bq/g	29-Nov-2009	ALPHA
MCL-09-M5	Ra-226		0.20	0.01	Bq/g	29-Nov-2009	ALPHA
MCL-09-M6	Ra-226		0.16	0.01	Bq/g	30-Nov-2009	ALPHA
QL-09-Q1	Ra-226		0.60	0.02	Bq/g	30-Nov-2009	ALPHA
QL-09-Q2	Ra-226		1.6	0.1	Bq/g	30-Nov-2009	ALPHA
QL-09-Q3	Ra-226		1.4	0.1	Bq/g	30-Nov-2009	ALPHA
QL-09-Q4	Ra-226		3.8	0.1	Bq/g	30-Nov-2009	ALPHA
EL-09-E1	Ra-226		0.10	0.01	Bq/g	30-Nov-2009	ALPHA
EL-09-E2	Ra-226		0.086	0.005	Bq/g	30-Nov-2009	ALPHA
EL-09-E3	Ra-226		0.26	0.02	Bq/g	30-Nov-2009	ALPHA
EL-09-E4	Ra-226		0.050	0.004	Bq/g	01-Dec-2009	ALPHA
EL-09-E5	Ra-226		0.044	0.003	Bq/g	30-Nov-2009	ALPHA
NL-09-N1	Ra-226		0.27	0.01	Bq/g	30-Nov-2009	ALPHA
NL-09-N2	Ra-226		0.005	0.001	Bq/g	30-Nov-2009	ALPHA
NL-09-N3	Ra-226		0.087	0.004	Bq/g	30-Nov-2009	ALPHA
NL-09-N4	Ra-226		0.23	0.01	Bq/g	01-Dec-2009	ALPHA
NL-09-N5	Ra-226		0.082	0.007	Bq/g	01-Dec-2009	ALPHA
ML-09-ML1	Ra-226		0.28	0.02	Bq/g	01-Dec-2009	ALPHA
ML-09-ML2	Ra-226		0.40	0.02	Bq/g	01-Dec-2009	ALPHA
ML-09-ML3	Ra-226		0.92	0.04	Bq/g	30-Nov-2009	ALPHA
ML-09-ML4	Ra-226		0.22	0.01	Bq/g	01-Dec-2009	ALPHA
ML-09-ML5	Ra-226		1.1	0.1	Bq/g	01-Dec-2009	ALPHA
MAL-09-M1	Ra-226		1.34	0.1	Bq/g	01-Dec-2009	ALPHA
MAL-09-M2	Ra-226		0.18	0.01	Bq/g	01-Dec-2009	ALPHA
MAL-09-M3	Ra-226		0.079	0.006	Bq/g	01-Dec-2009	ALPHA
MAL-09-M4	Ra-226		0.53	0.02	Bq/g	01-Dec-2009	ALPHA
MAL-09-M5	Ra-226		0.058	0.007	Bq/g	01-Dec-2009	ALPHA
MCL-09-M1	Ra-228	<	0.1		Bq/g	23-Oct-2009	GAMMA
MCL-09-M2	Ra-228		0.11	0.02	Bq/g	22-Oct-2009	GAMMA
MCL-09-M3	Ra-228		0.15	0.03	Bq/g	23-Oct-2009	GAMMA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
MCL-09-M4	Ra-228	<	0.1		Bq/g	22-Oct-2009	GAMMA
MCL-09-M5	Ra-228		0.11	0.02	Bq/g	24-Oct-2009	GAMMA
MCL-09-M6	Ra-228	<	0.1		Bq/g	23-Oct-2009	GAMMA
QL-09-Q1	Ra-228		0.13	0.02	Bq/g	24-Oct-2009	GAMMA
QL-09-Q2	Ra-228		0.48	0.02	Bq/g	23-Oct-2009	GAMMA
QL-09-Q3	Ra-228		0.45	0.03	Bq/g	24-Oct-2009	GAMMA
QL-09-Q4	Ra-228		1.0	0.1	Bq/g	24-Oct-2009	GAMMA
EL-09-E1	Ra-228	<	0.1		Bq/g	25-Oct-2009	GAMMA
EL-09-E2	Ra-228	<	0.1		Bq/g	24-Oct-2009	GAMMA
EL-09-E3	Ra-228	<	0.1		Bq/g	25-Oct-2009	GAMMA
EL-09-E4	Ra-228	<	0.1		Bq/g	25-Oct-2009	GAMMA
EL-09-E5	Ra-228	<	0.1		Bq/g	25-Oct-2009	GAMMA
NL-09-N1	Ra-228	<	0.1		Bq/g	26-Oct-2009	GAMMA
NL-09-N2	Ra-228	<	0.1		Bq/g	25-Oct-2009	GAMMA
NL-09-N3	Ra-228	<	0.1		Bq/g	26-Oct-2009	GAMMA
NL-09-N4	Ra-228	<	0.1		Bq/g	26-Oct-2009	GAMMA
NL-09-N5	Ra-228	<	0.1		Bq/g	27-Oct-2009	GAMMA
ML-09-ML1	Ra-228	<	0.1		Bq/g	26-Oct-2009	GAMMA
ML-09-ML2	Ra-228		0.27	0.03	Bq/g	26-Oct-2009	GAMMA
ML-09-ML3	Ra-228		0.74	0.03	Bq/g	27-Oct-2009	GAMMA
ML-09-ML4	Ra-228		0.10	0.02	Bq/g	27-Oct-2009	GAMMA
ML-09-ML5	Ra-228		0.52	0.03	Bq/g	27-Oct-2009	GAMMA
MAL-09-M1	Ra-228		0.66	0.06	Bq/g	30-Oct-2009	GAMMA
MAL-09-M2	Ra-228	<	0.1		Bq/g	27-Oct-2009	GAMMA
MAL-09-M3	Ra-228	<	0.1		Bq/g	28-Oct-2009	GAMMA
MAL-09-M4	Ra-228	<	0.1		Bq/g	30-Oct-2009	GAMMA
MAL-09-M5	Ra-228	<	0.1		Bq/g	30-Oct-2009	GAMMA
MCL-09-M1	Th-228	<	0.005		Bq/g	25-Nov-2009	ALPHA
MCL-09-M2	Th-228		0.015	0.002	Bq/g	26-Nov-2009	ALPHA
MCL-09-M3	Th-228		0.018	0.001	Bq/g	26-Nov-2009	ALPHA
MCL-09-M4	Th-228		0.006	0.001	Bq/g	26-Nov-2009	ALPHA
MCL-09-M5	Th-228		0.009	0.001	Bq/g	26-Nov-2009	ALPHA
MCL-09-M6	Th-228		0.008	0.004	Bq/g	26-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
QL-09-Q1	Th-228		0.020	0.002	Bq/g	27-Nov-2009	ALPHA
QL-09-Q2	Th-228		0.27	0.01	Bq/g	27-Nov-2009	ALPHA
QL-09-Q3	Th-228		0.071	0.005	Bq/g	27-Nov-2009	ALPHA
QL-09-Q4	Th-228		0.77	0.03	Bq/g	27-Nov-2009	ALPHA
EL-09-E1	Th-228		0.014	0.001	Bq/g	30-Nov-2009	ALPHA
EL-09-E2	Th-228		0.004	0.001	Bq/g	30-Nov-2009	ALPHA
EL-09-E3	Th-228		0.009	0.002	Bq/g	01-Dec-2009	ALPHA
EL-09-E4	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
EL-09-E5	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N1	Th-228		0.007	0.002	Bq/g	01-Dec-2009	ALPHA
NL-09-N2	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N3	Th-228		0.009	0.002	Bq/g	01-Dec-2009	ALPHA
NL-09-N4	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N5	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
ML-09-ML1	Th-228		0.007	0.002	Bq/g	01-Dec-2009	ALPHA
ML-09-ML2	Th-228		0.12	0.01	Bq/g	01-Dec-2009	ALPHA
ML-09-ML3	Th-228		0.23	0.01	Bq/g	01-Dec-2009	ALPHA
ML-09-ML4	Th-228		0.023	0.003	Bq/g	01-Dec-2009	ALPHA
ML-09-ML5	Th-228		0.098	0.007	Bq/g	01-Dec-2009	ALPHA
MAL-09-M1	Th-228		0.12	0.01	Bq/g	01-Dec-2009	ALPHA
MAL-09-M2	Th-228	<	0.012		Bq/g	01-Dec-2009	ALPHA
MAL-09-M3	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
MAL-09-M4	Th-228		0.027	0.004	Bq/g	01-Dec-2009	ALPHA
MAL-09-M5	Th-228	<	0.005		Bq/g	01-Dec-2009	ALPHA
MCL-09-M1	Th-230	<	0.005		Bq/g	25-Nov-2009	ALPHA
MCL-09-M2	Th-230	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M3	Th-230	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M4	Th-230	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M5	Th-230	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M6	Th-230	<	0.005		Bq/g	26-Nov-2009	ALPHA
QL-09-Q1	Th-230		0.031	0.003	Bq/g	27-Nov-2009	ALPHA
QL-09-Q2	Th-230		2.8	0.1	Bq/g	27-Nov-2009	ALPHA
QL-09-Q3	Th-230		0.21	0.01	Bq/g	27-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test		Result	Std Dev	Units	Date	Method
QL-09-Q4	Th-230		6.7	0.3	Bq/g	27-Nov-2009	ALPHA
EL-09-E1	Th-230		0.053	0.003	Bq/g	30-Nov-2009	ALPHA
EL-09-E2	Th-230		0.010	0.001	Bq/g	30-Nov-2009	ALPHA
EL-09-E3	Th-230		0.007	0.002	Bq/g	01-Dec-2009	ALPHA
EL-09-E4	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
EL-09-E5	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N1	Th-230		0.011	0.003	Bq/g	01-Dec-2009	ALPHA
NL-09-N2	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N3	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N4	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N5	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
ML-09-ML1	Th-230		0.022	0.003	Bq/g	01-Dec-2009	ALPHA
ML-09-ML2	Th-230		0.39	0.01	Bq/g	01-Dec-2009	ALPHA
ML-09-ML3	Th-230		1.44	0.06	Bq/g	01-Dec-2009	ALPHA
ML-09-ML4	Th-230		0.046	0.004	Bq/g	01-Dec-2009	ALPHA
ML-09-ML5	Th-230		0.29	0.01	Bq/g	01-Dec-2009	ALPHA
MAL-09-M1	Th-230		0.51	0.03	Bq/g	01-Dec-2009	ALPHA
MAL-09-M2	Th-230		0.011	0.005	Bq/g	01-Dec-2009	ALPHA
MAL-09-M3	Th-230		0.005	0.002	Bq/g	01-Dec-2009	ALPHA
MAL-09-M4	Th-230		0.099	0.007	Bq/g	01-Dec-2009	ALPHA
MAL-09-M5	Th-230	<	0.005		Bq/g	01-Dec-2009	ALPHA
MCL-09-M1	Th-232	<	0.005		Bq/g	25-Nov-2009	ALPHA
MCL-09-M2	Th-232		0.007	0.001	Bq/g	26-Nov-2009	ALPHA
MCL-09-M3	Th-232	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M4	Th-232	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M5	Th-232	<	0.005		Bq/g	26-Nov-2009	ALPHA
MCL-09-M6	Th-232	<	0.005		Bq/g	26-Nov-2009	ALPHA
QL-09-Q1	Th-232		0.005	0.001	Bq/g	27-Nov-2009	ALPHA
QL-09-Q2	Th-232		0.40	0.02	Bq/g	27-Nov-2009	ALPHA
QL-09-Q3	Th-232		0.026	0.003	Bq/g	27-Nov-2009	ALPHA
QL-09-Q4	Th-232		0.81	0.04	Bq/g	27-Nov-2009	ALPHA
EL-09-E1	Th-232		0.005	0.001	Bq/g	30-Nov-2009	ALPHA
EL-09-E2	Th-232	<	0.005		Bq/g	30-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
EL-09-E3	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
EL-09-E4	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
EL-09-E5	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N1	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N2	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N3	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N4	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
NL-09-N5	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
ML-09-ML1	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
ML-09-ML2	Th-232	0.069	0.005	Bq/g	01-Dec-2009	ALPHA
ML-09-ML3	Th-232	0.22	0.01	Bq/g	01-Dec-2009	ALPHA
ML-09-ML4	Th-232	0.005	0.001	Bq/g	01-Dec-2009	ALPHA
ML-09-ML5	Th-232	0.053	0.005	Bq/g	01-Dec-2009	ALPHA
MAL-09-M1	Th-232	0.09	0.01	Bq/g	01-Dec-2009	ALPHA
MAL-09-M2	Th-232	< 0.007		Bq/g	01-Dec-2009	ALPHA
MAL-09-M3	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
MAL-09-M4	Th-232	0.014	0.003	Bq/g	01-Dec-2009	ALPHA
MAL-09-M5	Th-232	< 0.005		Bq/g	01-Dec-2009	ALPHA
MCL-09-M1	Uranium	1.38	0.05	ppm	23-Nov-2009	NAA
MCL-09-M2	Uranium	13.2	0.4	ppm	23-Nov-2009	NAA
MCL-09-M3	Uranium	9.1	0.2	ppm	23-Nov-2009	NAA
MCL-09-M4	Uranium	6.8	0.2	ppm	23-Nov-2009	NAA
MCL-09-M5	Uranium	5.0	0.1	ppm	23-Nov-2009	NAA
MCL-09-M6	Uranium	8.7	0.2	ppm	23-Nov-2009	NAA
QL-09-Q1	Uranium	20.5	0.6	ppm	23-Nov-2009	NAA
QL-09-Q2	Uranium	369	11	ppm	23-Nov-2009	NAA
QL-09-Q3	Uranium	94	3	ppm	23-Nov-2009	NAA
QL-09-Q4	Uranium	470	14	ppm	23-Nov-2009	NAA
EL-09-E1	Uranium	5.1	0.1	ppm	23-Nov-2009	NAA
EL-09-E2	Uranium	0.93	0.04	ppm	23-Nov-2009	NAA
EL-09-E3	Uranium	7.0	0.2	ppm	23-Nov-2009	NAA
EL-09-E4	Uranium	1.65	0.05	ppm	23-Nov-2009	NAA
EL-09-E5	Uranium	2.6	0.1	ppm	23-Nov-2009	NAA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Results of Analysis

Sample	Test	Result	Std Dev	Units	Date	Method
NL-09-N1	Uranium	8.1	0.2	ppm	23-Nov-2009	NAA
NL-09-N2	Uranium	0.06	0.01	ppm	23-Nov-2009	NAA
NL-09-N3	Uranium	1.16	0.04	ppm	23-Nov-2009	NAA
NL-09-N4	Uranium	2.7	0.1	ppm	23-Nov-2009	NAA
NL-09-N5	Uranium	0.45	0.03	ppm	23-Nov-2009	NAA
ML-09-ML1	Uranium	7.7	0.2	ppm	23-Nov-2009	NAA
ML-09-ML2	Uranium	7.5	0.2	ppm	23-Nov-2009	NAA
ML-09-ML3	Uranium	8.3	0.2	ppm	23-Nov-2009	NAA
ML-09-ML4	Uranium	1.8	0.1	ppm	23-Nov-2009	NAA
ML-09-ML5	Uranium	7.4	0.2	ppm	23-Nov-2009	NAA
MAL-09-M1	Uranium	9.0	0.2	ppm	23-Nov-2009	NAA
MAL-09-M2	Uranium	5.1	0.1	ppm	23-Nov-2009	NAA
MAL-09-M3	Uranium	4.4	0.1	ppm	23-Nov-2009	NAA
MAL-09-M4	Uranium	31	1	ppm	23-Nov-2009	NAA
MAL-09-M5	Uranium	0.87	0.03	ppm	23-Nov-2009	NAA

Methods:

ALPHA	BQ-RAD-ALPHA	alpha-particle spectrometry
GAMMA	BQ-RAD-GAMMA	gamma-ray spectrometry
GFPC	BQ-RAD-GFPC	gas-flow proportional counting
NAA	BQ-NAA-1	neutron activation analysis

Units:

Bq/g	Becquerels per gram
ppm	micrograms per gram

These results relate only to the samples analysed and only to the items tested.

02-Dec-2009 approved by: _____

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Standards

Standard	Analyte	Units		Result	Expected Result
CLV-1	Th-232	Bq/g	<	0.005	0.002
CLV-1	Th-232	Bq/g	<	0.005	0.002
CLV-1	Th-230	Bq/g		0.28	0.31
CLV-1	Th-230	Bq/g		0.29	0.31
CLV-1	Th-228	Bq/g		0.007	0.002
CLV-1	Th-228	Bq/g		0.007	0.002
CLV-1	Ra-226	Bq/g		0.54	0.70
CLV-1	Ra-226	Bq/g		0.60	0.70
DH1-A	Ra-228	Bq/g		3.43	3.69
DH1-A	Ra-228	Bq/g		3.46	3.69
CLV-1	Pb-210	Bq/g		0.62	0.66
CLV-1	Pb-210	Bq/g		0.51	0.66
CLV-1	Po-210	Bq/g		0.59	0.66
CLV-1	Po-210	Bq/g		0.61	0.66
CLV-1	U-238	Bq/g		0.95	1.06

Blanks

Analyte	Units		Result
Th-232	Bq/g	<	0.005
Th-232	Bq/g	<	0.005
Th-230	Bq/g	<	0.005
Th-230	Bq/g	<	0.005
Th-228	Bq/g	<	0.005
Th-228	Bq/g	<	0.005
Ra-226	Bq/g	<	0.005
Ra-226	Bq/g	<	0.005
Ra-228	Bq/g	<	0.1
Ra-228	Bq/g	<	0.1
Pb-210	Bq/g	<	0.01
Pb-210	Bq/g	<	0.01
Po-210	Bq/g	<	0.005
Po-210	Bq/g	<	0.005

QUALITY REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01351.0

Date: 02-Dec-2009

Duplicates

Analyte	Units	Result	Duplicate
Th-232	Bq/g	0.22	0.23
Th-232	Bq/g	< 0.007	< 0.005
Th-230	Bq/g	1.44	1.62
Th-230	Bq/g	0.011	0.023
Th-228	Bq/g	0.23	0.24
Th-228	Bq/g	< 0.012	< 0.005
Ra-226	Bq/g	0.92	1.00
Ra-226	Bq/g	0.18	0.17
Ra-228	Bq/g		iss
Ra-228	Bq/g		iss
Pb-210	Bq/g	0.13	0.10
Pb-210	Bq/g	0.21	0.20
Po-210	Bq/g	0.13	0.13
Po-210	Bq/g	0.18	0.19

iss insufficient sample

APPENDIX C

Fish Collections

Appendix C.1: Fish collected for radionuclide analyses as part of the Special Investigation, September 2009.

Lake	Sample ID	Date sampled	Map ID	Number of traps or seine hauls	Species	Number collected
Elliot Lake	n/a	14-Sep	MT1	2	n/a	n/a
	EL-F1	14-Sep	MT2	2	yellow perch	4
		14-Sep	MT3	2	yellow perch	1
	n/a	16-Sep	MT4	2	n/a	n/a
	n/a	16-Sep	MT5	2	n/a	n/a
	EL-F2	16-Sep	MT6	2	yellow perch	4
	EL-F3				pumpkinseed sunfish	3
					yellow perch	2
May Lake	n/a	20-Sep	MT1	2	n/a	n/a
	n/a	20-Sep	MT2	2	n/a	n/a
	MAL-F1	20-Sep	MT3	2	common shiner	10
	MAL-F2				common shiner	10
	MAL-F3				common shiner	10
McCarthy Lake[a]	MCL-F1	20-Sep	SN	4	small mouth bass	5
	MCL-F2				pumpkinseed sunfish	20
Nordic Lake	NL-F1	18-Sep	SN	1	golden shiner	6
	NL-F2				common shiner	6
	NL-F3				golden shiner	6
	n/a	18-Sep	MT1	2	n/a	n/a
	n/a	18-Sep	MT2	2	n/a	n/a
	n/a	18-Sep	MT3	2	n/a	n/a
Quirke Lake	n/a	22-Sep	MT1	2	n/a	n/a
	QL-F1	22-Sep	MT2	2	common shiner	n/a
	QL-F2			2	mimic shiner	n/a
	QL-F3			2	mimic shiner	n/a
	n/a	22-Sep	MT3	2	n/a	n/a
McCabe Lake	ML-F2[b]	19-Sep	MT1	3	northern redbelly dace	7
	ML-F3			3	pumpkinseed sunfish	2
	ML-F3	19-Sep	MT2	3	pumpkinseed sunfish	5
	ML-F1	19-Sep	MT3	3	lake chub	10
	ML-F2			3	northern redbelly dace	5
	ML-F3			3	pumpkinseed sunfish	1
	ML-F2	19-Sep	MT4	3	northern redbelly dace	2

[a] fish tissue sample MCL-F3 lost during processing at the lab

[b] sample a composite of 12 fish from minnow traps MT1, MT3 and/or MT4

n/a - not applicable; any fish captured from these locations were not retained for radionuclide analyses

APPENDIX D

Detailed Dose Calculations

Ecological Dose Calculations - Aquatic Biota - Background

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0172	0.0040	0.0040	0.006	0.006	0.005	0.003	0.0003	0.0005	0.0003	
Sed to water PC	L/kg (dw)	11442	49200	49200	29100	29100	34733	69467	49200	29100	49200	
Sediment conc.	Bq/kg (dw)	196.8	196.8	196.8	174.6	174.6	174.6	174.6	14	14	14	
Sediment conc.	Bq/kg (ww)	20	20	20	17	17	17	17	1	1	1	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	8.23	0.872	0.872	3.24	0.324	4.33	95.22	0.06	0.26	0.06	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	87.65	24.86	24.86	22.49	2.25	12.56	10.30	1.77	1.80	1.77	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	4.75	1.10	1.10	2.92	0.29	18.31	50.27	0.08	0.23	0.08	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OFs .5)	mGy/d	1.45E-06	4.12E-04	1.44E-06	5.74E-06	1.60E-03	1.09E-04	6.17E-09	8.95E-08	6.81E-05	1.11E-04	2.31E-03
Int. abs. dose fish	mGy/d	5.21E-04	1.09E-05	5.76E-05	2.18E-04	9.94E-05	2.59E-05	7.12E-03	3.50E-06	5.07E-06	3.01E-05	8.09E-03
Int. abs dose plant	mGy/d	5.55E-03	3.11E-04	1.64E-03	1.52E-03	6.90E-04	7.53E-05	7.70E-04	9.98E-05	3.52E-05	8.57E-04	1.15E-02
Int. abs dose benthos	mGy/d	3.01E-04	1.38E-05	7.29E-05	1.97E-04	8.95E-05	1.10E-04	3.76E-03	4.43E-06	4.56E-06	3.81E-05	4.59E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	5.21E-03	4.23E-04	5.77E-04	2.19E-03	2.60E-03	1.35E-04	7.12E-02	3.51E-05	7.31E-05	4.12E-04	8.29E-02
γ eq. dose plant	mGy/d	5.55E-02	7.23E-04	1.64E-02	1.52E-02	8.50E-03	1.84E-04	7.70E-03	9.98E-04	1.03E-04	8.68E-03	1.14E-01
γ eq. . dose benthos	mGy/d	3.01E-03	8.39E-04	7.32E-04	1.98E-03	4.10E-03	3.28E-04	3.76E-02	4.45E-05	1.41E-04	6.04E-04	4.94E-02

value from lake measurement(s) (green font= LT; blue font= average contains a LT used at face value)

red font — PC or BAF based on Lake measurements

blue font — BAF based on in-basin measurements

green font — BAF from literature

Ecological Dose Calculations - Riparian Wildlife - Background

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.01722	0.0040	0.004	0.006	0.006	0.005	0.003	0.0003	0.0005	0.0003	
Sed to water PC	L/kg (dw)	11442	49200	49200	29100	29100	34733	69467	49200	29100	49200	
Sediment conc.	Bq/kg (dw)	196.8	196.8	196.8	174.6	174.6	174.6	174.6	14	14	14	
Sediment conc.	Bq/kg (ww)	20	20	20	17	17	17	17	1	1	1	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	8.23	0.87	0.87	3.24	0.32	4.33	95.22	0.062	0.26	0.062	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	87.65	24.86	24.86	22.49	2.25	12.56	10.30	1.77	1.80	1.77	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	4.75	1.10	1.10	2.92	0.29	18.31	50.27	0.08	0.23	0.079	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	7.27E-07	2.06E-04	7.21E-07	2.87E-06	8.01E-04	5.45E-05	3.09E-09	4.47E-08	3.40E-05	5.57E-05	1.16E-03
Int. abs. dose mallard	mGy/d	5.33E-06	2.04E-06	1.08E-05	9.09E-06	1.24E-05	1.64E-06	4.87E-04	6.56E-07	2.11E-07	5.64E-06	5.35E-04
Int. abs. dose scaup	mGy/d	2.79E-07	1.32E-06	6.97E-06	1.10E-05	1.51E-05	1.90E-06	1.80E-03	4.24E-07	2.56E-07	3.64E-06	1.84E-03
Int. abs. dose merganser	mGy/d	1.43E-05	9.84E-06	5.20E-05	1.45E-04	1.99E-04	8.72E-06	6.44E-03	3.16E-06	3.37E-06	2.72E-05	6.90E-03
Int. abs. dose muskrat	mGy/d	1.89E-04	4.63E-06	2.45E-05	5.08E-04	6.93E-04	1.84E-05	2.29E-04	1.49E-06	1.18E-05	1.28E-05	1.69E-03
Int. abs. dose mink	mGy/d	8.37E-06	1.03E-07	5.46E-07	3.38E-05	4.62E-05	2.59E-06	7.58E-04	3.32E-08	7.84E-07	2.85E-07	8.51E-04
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	5.40E-05	2.08E-04	1.09E-04	9.38E-05	9.25E-04	5.62E-05	4.87E-03	6.61E-06	3.43E-05	1.12E-04	6.47E-03
γ eq. dose scaup	mGy/d	3.52E-06	2.08E-04	7.05E-05	1.13E-04	9.52E-04	5.64E-05	1.80E-02	4.29E-06	3.43E-05	9.21E-05	1.96E-02
γ eq. dose merganser	mGy/d	1.44E-04	2.16E-04	5.21E-04	1.46E-03	2.79E-03	6.33E-05	6.44E-02	3.17E-05	3.74E-05	3.27E-04	7.00E-02
γ eq. dose muskrat	mGy/d	1.89E-03	4.17E-04	2.46E-04	5.08E-03	8.54E-03	1.27E-04	2.29E-03	1.50E-05	7.99E-05	2.39E-04	1.89E-02
γ eq. dose mink	mGy/d	8.51E-05	4.13E-04	6.91E-06	3.44E-04	2.06E-03	1.12E-04	7.58E-03	4.22E-07	6.89E-05	1.14E-04	1.08E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - Background

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.01722	0.0040	0.004	0.006	0.006	0.005027	0.003	0.0003	0.0005	0.0003	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.196	0.021	0.021	0.115	0.011	0.153	0.432	0.001	0.009	0.001	
Moose wb conc.	Bq/kg (fw)	0.33	0.037	0.037	0.85	0.26	0.35	0.34	0.003	0.068	0.003	
Moose meat conc.	Bq/kg (fw)	0.17	0.024	0.024	0.32	0.095	0.13	0.20	0.002	0.025	0.002	
Mallard duck wb conc.	Bq/kg (fw)	0.084	0.16	0.16	0.13	0.040	0.27	6.51	0.012	0.011	0.012	
Mallard duck meat conc.	Bq/kg (fw)	0.042	0.10	0.10	0.050	0.015	0.10	3.84	0.007	0.004	0.007	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	9.43	2.19	2.19	3.29	3.29	2.75	1.38	0.16	0.26	0.16	
Exposure via fish	Bq/a	0.57	0.06	0.06	0.33	0.03	0.45	1.26	0.00	0.03	0.00	
Exposure via moose	Bq/a	0.17	0.02	0.02	0.32	0.09	0.13	0.20	0.00	0.03	0.00	
Exposure via mallard	Bq/a	0.04	0.10	0.10	0.05	0.01	0.10	3.84	0.01	0.00	0.01	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	4.43E-04	7.45E-06	4.60E-04	9.20E-04	8.21E-07	1.90E-03	1.65E-03	3.58E-05	1.82E-04	1.12E-05	5.61E-03
Dose via fish	mSv/a	2.69E-05	2.06E-07	1.28E-05	9.37E-05	8.37E-09	3.09E-04	1.51E-03	9.94E-07	1.85E-05	3.11E-07	1.98E-03
Dose via moose	mSv/a	7.78E-06	8.00E-08	4.94E-06	8.82E-05	2.36E-08	9.07E-05	2.43E-04	3.85E-07	1.74E-05	1.20E-07	4.53E-04
Dose via mallard	mSv/a	1.98E-06	3.50E-07	2.16E-05	1.40E-05	3.74E-09	7.19E-05	4.61E-03	1.69E-06	2.76E-06	5.28E-07	4.72E-03
Total ingestion dose	mSv/a	4.80E-04	8.08E-06	4.99E-04	1.12E-03	8.57E-07	2.37E-03	8.02E-03	3.89E-05	2.20E-04	1.22E-05	1.28E-02

Ecological Dose Calculations - Aquatic Biota - Elliot Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.04182	0.0338	0.01	0.01	0.01	0.03	0.01	0.0016	0.0034	0.0035	
Sed to water PC	L/kg (dw)	79412	49200	49200	23517	23517	25333	50666	49200	23517	49200	
Sediment conc.	Bq/kg (dw)	3321	1660.5	1040	630	630	760	740	80	80	170	
Sediment conc.	Bq/kg (ww)	332	166	104	63	63	76	74	8	8	17	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	14.9241	7.3575	4.33	11	1.1	20	29	0.35	116.7	0.75	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	21.279	209.76	4.0	27	2.70	11.5	4.75	1.25	12.75	1.75	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	11.54	9.32	2.76	4.86	0.49	109.29	200.00	0.45	1.65	0.95	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OFs .5)	mGy/d	2.45E-05	3.48E-03	7.62E-06	2.07E-05	5.78E-03	4.75E-04	2.62E-08	5.11E-07	3.89E-04	1.35E-03	1.15E-02
Int. abs. dose fish	mGy/d	9.45E-04	9.19E-05	2.86E-04	7.41E-04	3.38E-04	1.20E-04	2.17E-03	2.00E-05	2.28E-03	3.65E-04	7.35E-03
Int. abs dose plant	mGy/d	1.35E-03	2.62E-03	2.64E-04	1.82E-03	8.28E-04	6.89E-05	3.55E-04	7.05E-05	2.49E-04	8.48E-04	8.47E-03
Int. abs dose benthos	mGy/d	7.30E-04	1.16E-04	1.82E-04	3.28E-04	1.49E-04	6.55E-04	1.50E-02	2.53E-05	3.23E-05	4.62E-04	1.76E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	9.47E-03	3.57E-03	2.87E-03	7.43E-03	9.16E-03	5.95E-04	2.17E-02	2.01E-04	2.67E-03	5.00E-03	6.27E-02
γ eq. dose plant	mGy/d	1.35E-02	6.10E-03	2.65E-03	1.82E-02	1.41E-02	5.44E-04	3.55E-03	7.06E-04	6.38E-04	9.83E-03	6.98E-02
γ eq. . dose benthos	mGy/d	7.35E-03	7.08E-03	1.84E-03	3.32E-03	1.31E-02	1.60E-03	1.50E-01	2.54E-04	8.10E-04	7.33E-03	1.92E-01

Ecological Dose Calculations - Riparian Wildlife - Elliot Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.04182	0.0338	0.01	0.01	0.01	0.03	0.01	0.0016	0.0034	0.0035	
Sed to water PC	L/kg (dw)	79412	49200	49200	23517	23517	25333	50666	49200	23517	49200	
Sediment conc.	Bq/kg (dw)	3321	1660.5	1040	630	630	760	740	80	80	170	
Sediment conc.	Bq/kg (ww)	332	166	104	63	63	76	74	8	8	17	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	14.924082	7.3575	4.33	11	1.1	20.00	29	0.35	116.7	0.75	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	21.279	209.76	4	27	2.70	11.5	4.75	1.25	12.75	1.75	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	11.54	9.32	2.76	4.86	0.49	109.29	200.00	0.45	1.65	0.95	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	1.23E-05	1.74E-03	3.81E-06	1.04E-05	2.89E-03	2.37E-04	1.31E-08	2.56E-07	1.95E-04	6.77E-04	5.77E-03
Int. abs. dose mallard	mGy/d	2.28E-06	1.72E-05	3.84E-06	1.17E-05	1.60E-05	1.87E-06	3.68E-04	5.89E-07	1.48E-06	7.97E-06	4.31E-04
Int. abs. dose scaup	mGy/d	1.37E-06	1.11E-05	2.66E-05	2.33E-05	3.18E-05	1.12E-05	7.18E-03	2.42E-06	1.73E-06	4.42E-05	7.34E-03
Int. abs. dose merganser	mGy/d	2.84E-05	8.31E-05	2.60E-04	4.94E-04	6.75E-04	4.03E-05	1.98E-03	1.81E-05	1.48E-03	3.30E-04	5.39E-03
Int. abs. dose muskrat	mGy/d	1.65E-04	3.91E-05	1.92E-05	7.56E-04	1.03E-03	2.92E-05	3.04E-04	1.96E-06	8.14E-05	3.00E-05	2.46E-03
Int. abs. dose mink	mGy/d	2.23E-05	8.72E-07	2.77E-06	1.16E-04	1.58E-04	1.19E-05	2.45E-04	1.90E-07	3.11E-04	3.47E-06	8.70E-04
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	3.51E-05	1.76E-03	4.22E-05	1.28E-04	3.05E-03	2.39E-04	3.68E-03	6.15E-06	1.96E-04	7.56E-04	9.89E-03
γ eq. dose scaup	mGy/d	2.60E-05	1.75E-03	2.70E-04	2.44E-04	3.21E-03	2.49E-04	7.18E-02	2.45E-05	1.96E-04	1.12E-03	7.89E-02
γ eq. dose merganser	mGy/d	2.97E-04	1.82E-03	2.60E-03	4.95E-03	9.64E-03	2.78E-04	1.98E-02	1.81E-04	1.67E-03	3.98E-03	4.53E-02
γ eq. dose muskrat	mGy/d	1.67E-03	3.52E-03	2.00E-04	7.58E-03	1.61E-02	5.04E-04	3.04E-03	2.01E-05	4.70E-04	1.65E-03	3.48E-02
γ eq. dose mink	mGy/d	2.47E-04	3.48E-03	3.54E-05	1.18E-03	7.36E-03	4.87E-04	2.45E-03	2.41E-06	7.00E-04	1.39E-03	1.73E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - Elliot Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.04182	0.0338	0.01	0.01	0.01	0.03	0.01	0.0016	0.0034	0.0035	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.477	0.175	0.052	0.191	0.019	0.914	1.719	0.008	0.065	0.018	
Moose wb conc.	Bq/kg (fw)	0.29	0.32	0.03	1.26	0.38	0.55	0.45	0.00	0.47	0.01	
Moose meat conc.	Bq/kg (fw)	0.14	0.20	0.02	0.47	0.14	0.21	0.27	0.002	0.17	0.004	
Mallard duck wb conc.	Bq/kg (fw)	0.04	1.38	0.06	0.17	0.05	0.31	4.92	0.01	0.08	0.02	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.87	0.04	0.06	0.02	0.12	2.90	0.01	0.028	0.01	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	22.90	18.48	5.48	5.48	5.48	16.43	5.48	0.89	1.86	1.89	
Exposure via fish	Bq/a	1.39	0.51	0.15	0.56	0.06	2.67	5.02	0.02	0.19	0.05	
Exposure via moose	Bq/a	0.14	0.20	0.02	0.47	0.14	0.21	0.27	0.00	0.17	0.00	
Exposure via mallard	Bq/a	0.02	0.87	0.04	0.06	0.02	0.12	2.90	0.01	0.03	0.01	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	1.08E-03	6.28E-05	1.15E-03	1.53E-03	1.37E-06	1.14E-02	6.57E-03	2.05E-04	1.29E-03	1.36E-04	2.34E-02
Dose via fish	mSv/a	6.54E-05	1.74E-06	3.19E-05	1.56E-04	1.39E-08	1.84E-03	6.02E-03	5.68E-06	1.31E-04	3.78E-06	8.26E-03
Dose via moose	mSv/a	6.73E-06	6.75E-07	3.85E-06	1.31E-04	3.51E-08	1.44E-04	3.21E-04	5.05E-07	1.20E-04	2.82E-07	7.28E-04
Dose via mallard	mSv/a	8.46E-07	2.95E-06	7.70E-06	1.80E-05	4.83E-09	8.19E-05	3.48E-03	1.51E-06	1.94E-05	7.46E-07	3.62E-03
Total ingestion dose	mSv/a	1.15E-03	6.82E-05	1.19E-03	1.84E-03	1.42E-06	1.34E-02	1.64E-02	2.12E-04	1.56E-03	1.41E-04	3.60E-02

Human Dose Calculations - SRFN Adult - Elliot Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.04182	0.0338	0.01	0.01	0.01	0.03	0.01	0.0016	0.0034	0.0035	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.477	0.175	0.052	0.191	0.019	0.914	1.719	0.008	0.065	0.018	
Moose wb conc.	Bq/kg (fw)	0.29	0.32	0.03	1.26	0.38	0.55	0.45	0.00	0.47	0.01	
Moose meat conc.	Bq/kg (fw)	0.14	0.20	0.02	0.47	0.14	0.21	0.27	0.002	0.28	0.004	
Mallard duck wb conc.	Bq/kg (fw)	0.04	1.38	0.06	0.17	0.05	0.31	4.92	0.01	0.08	0.02	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.87	0.04	0.06	0.02	0.12	2.90	0.01	0.04	0.01	
Ingestion rate water	L/a	16.425	16.425	16.425	16.425	16.425	16.425	16.425	16.425	16.425	16.425	
Ingestion rate fish	kg/a	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	
Exposure via water	Bq/a	0.69	0.55	0.16	0.16	0.16	0.49	0.16	0.03	0.06	0.06	
Exposure via fish	Bq/a	0.18	0.07	0.02	0.07	0.01	0.35	0.65	0.00	0.02	0.01	
Exposure via moose	Bq/a	0.09	0.12	0.01	0.28	0.08	0.13	0.16	0.00	0.17	0.00	
Exposure via mallard	Bq/a	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	3.23E-05	1.88E-06	3.45E-05	4.60E-05	4.11E-08	3.41E-04	1.97E-04	6.14E-06	3.86E-05	4.09E-06	7.01E-04
Dose via fish	mSv/a	8.54E-06	2.27E-07	4.16E-06	2.04E-05	1.82E-09	2.41E-04	7.86E-04	7.41E-07	1.71E-05	4.93E-07	1.08E-03
Dose via moose	mSv/a	4.07E-06	4.08E-07	2.33E-06	7.93E-05	2.12E-08	8.72E-05	1.94E-04	2.86E-07	1.16E-04	1.60E-07	4.84E-04
Dose via mallard	mSv/a	7.83E-09	2.73E-08	7.12E-08	1.67E-07	4.47E-11	7.57E-07	3.22E-05	1.31E-08	2.86E-07	6.46E-09	3.36E-05
Total ingestion dose	mSv/a	4.49E-05	2.55E-06	4.11E-05	1.46E-04	6.42E-08	6.69E-04	1.21E-03	7.18E-06	1.72E-04	4.75E-06	2.30E-03

Human Dose Calculations - SRFN Adult - Elliot Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.04182	0.0338	0.01	0.01	0.01	0.03	0.01	0.0016	0.0034	0.0035	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.477	0.175	0.052	0.191	0.019	0.914	1.719	0.008	0.065	0.018	
Moose wb conc.	Bq/kg (fw)	0.29	0.32	0.03	1.26	0.38	0.55	0.45	0.00	0.47	0.01	
Moose meat conc.	Bq/kg (fw)	0.14	0.20	0.02	0.47	0.14	0.21	0.27	0.002	0.28	0.004	
Mallard duck wb conc.	Bq/kg (fw)	0.04	1.38	0.06	0.17	0.05	0.31	4.92	0.01	0.08	0.02	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.87	0.04	0.06	0.02	0.12	2.90	0.01	0.04	0.01	
Ingestion rate water	L/a	5.475	5.475	5.475	5.475	5.475	5.475	5.475	5.475	5.475	5.475	
Ingestion rate fish	kg/a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.23	0.18	0.05	0.05	0.05	0.16	0.05	0.01	0.02	0.02	
Exposure via fish	Bq/a	0.06	0.02	0.01	0.02	0.00	0.12	0.22	0.00	0.01	0.00	
Exposure via moose	Bq/a	0.09	0.12	0.01	0.28	0.08	0.13	0.16	0.00	0.17	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	1.08E-05	6.28E-07	1.15E-05	1.53E-05	1.37E-08	1.14E-04	6.57E-05	2.05E-06	1.29E-05	1.36E-06	2.34E-04
Dose via fish	mSv/a	2.85E-06	7.58E-08	1.39E-06	6.79E-06	6.06E-10	8.02E-05	2.62E-04	2.47E-07	5.69E-06	1.64E-07	3.59E-04
Dose via moose	mSv/a	4.07E-06	4.08E-07	2.33E-06	7.93E-05	2.12E-08	8.72E-05	1.94E-04	2.86E-07	1.16E-04	1.60E-07	4.84E-04
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	1.77E-05	1.11E-06	1.52E-05	1.01E-04	3.55E-08	2.81E-04	5.22E-04	2.58E-06	1.35E-04	1.69E-06	1.08E-03

Ecological Dose Calculations - Aquatic Biota - May Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0369	0.004	0.01	0.05	0.05	0.019	0.01	0.01	0.10	0.01	
Sed to water PC	L/kg (dw)	10667	49200	49200	4400	4400	34733	69466	49200	4400	49200	
Sediment conc.	Bq/kg (dw)	393.6	196.8	5100	220	220	660	780	780	500	660	
Sediment conc.	Bq/kg (ww)	39	20	510	22	22	66	78	78	50	66	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	5.412	0.872	5	13	1.3	23.333	453.333	2.18	143.33	5.667	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	61.9551	24.86	31.5	109.35	10.94	83.85	85.05	6.05	53	13.875	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	10.18	1.10	2.76	24.30	2.43	69.22	200.00	2.76	48.60	2.76	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	2.91E-06	4.12E-04	3.74E-05	7.23E-06	2.02E-03	4.12E-04	2.76E-08	4.98E-06	2.43E-03	5.25E-03	1.06E-02
Int. abs. dose fish	mGy/d	3.43E-04	1.09E-05	3.30E-04	8.76E-04	3.99E-04	1.40E-04	3.39E-02	1.23E-04	2.80E-03	2.75E-03	4.17E-02
Int. abs dose plant	mGy/d	3.92E-03	3.11E-04	2.08E-03	7.37E-03	3.36E-03	5.02E-04	6.36E-03	3.41E-04	1.03E-03	6.72E-03	3.20E-02
Int. abs dose benthos	mGy/d	6.45E-04	1.38E-05	1.82E-04	1.64E-03	7.46E-04	4.15E-04	1.50E-02	1.56E-04	9.48E-04	1.34E-03	2.10E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	3.43E-03	4.23E-04	3.34E-03	8.77E-03	6.01E-03	5.52E-04	3.39E-01	1.24E-03	5.23E-03	3.27E-02	4.01E-01
γ eq. dose plant	mGy/d	3.92E-02	7.23E-04	2.08E-02	7.37E-02	3.56E-02	9.15E-04	6.36E-02	3.42E-03	3.47E-03	7.25E-02	3.14E-01
γ eq. . dose benthos	mGy/d	6.45E-03	8.39E-04	1.90E-03	1.64E-02	1.15E-02	1.24E-03	1.50E-01	1.57E-03	5.81E-03	2.39E-02	2.19E-01

Ecological Dose Calculations - Riparian Wildlife - May Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0369	0.004	0.01	0.05	0.05	0.019	0.01	0.01	0.10	0.01	
Sed to water PC	L/kg (dw)	10667	49200	49200	4400	4400	34733	69466	49200	4400	49200	
Sediment conc.	Bq/kg (dw)	393.6	196.8	5100	220	220	660	780	780	500	660	
Sediment conc.	Bq/kg (ww)	39	20	510	22	22	66	78	78	50	66	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	5.412	0.872	5	13	1.3	23.333	453.333	2.18	143.33	5.667	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	61.9551	24.86	31.5	109.35	10.94	83.85	85.05	6.05	53	13.875	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	10.18	1.10	2.76	24.30	2.43	69.22	200.00	2.76	48.60	2.76	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	1.45E-06	2.06E-04	1.87E-05	3.62E-06	1.01E-03	2.06E-04	1.38E-08	2.49E-06	1.22E-03	2.63E-03	5.29E-03
Int. abs. dose mallard	mGy/d	3.84E-06	2.04E-06	2.38E-05	4.30E-05	5.87E-05	1.06E-05	3.87E-03	3.55E-06	6.25E-06	5.27E-05	4.08E-03
Int. abs. dose scaup	mGy/d	5.92E-07	1.32E-06	9.43E-05	7.40E-05	1.01E-04	7.16E-06	7.19E-03	1.90E-05	4.31E-05	1.49E-04	7.68E-03
Int. abs. dose merganser	mGy/d	9.63E-06	9.84E-06	4.04E-04	5.73E-04	7.83E-04	4.67E-05	3.06E-02	1.18E-04	1.82E-03	2.36E-03	3.68E-02
Int. abs. dose muskrat	mGy/d	1.43E-04	4.63E-06	1.04E-04	2.25E-03	3.07E-03	1.12E-04	1.69E-03	1.46E-05	3.55E-04	1.61E-04	7.91E-03
Int. abs. dose mink	mGy/d	6.15E-06	1.03E-07	7.10E-06	1.25E-04	1.70E-04	1.36E-05	3.61E-03	1.41E-06	3.84E-04	2.15E-05	4.34E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	3.99E-05	2.08E-04	2.57E-04	4.34E-04	1.60E-03	2.17E-04	3.87E-02	3.80E-05	1.22E-03	3.15E-03	4.59E-02
γ eq. dose scaup	mGy/d	7.37E-06	2.08E-04	9.62E-04	7.43E-04	2.02E-03	2.13E-04	7.19E-02	1.93E-04	1.26E-03	4.11E-03	8.16E-02
γ eq. dose merganser	mGy/d	9.78E-05	2.16E-04	4.06E-03	5.74E-03	8.84E-03	2.53E-04	3.06E-01	1.18E-03	3.03E-03	2.62E-02	3.56E-01
γ eq. dose muskrat	mGy/d	1.43E-03	4.17E-04	1.08E-03	2.25E-02	3.27E-02	5.25E-04	1.69E-02	1.51E-04	2.79E-03	6.87E-03	8.54E-02
γ eq. dose mink	mGy/d	6.44E-05	4.13E-04	1.08E-04	1.25E-03	3.72E-03	4.26E-04	3.61E-02	1.91E-05	2.82E-03	5.47E-03	5.04E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - May Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0369	0.004	0.01	0.05	0.05	0.0190	0.01	0.01	0.10	0.01	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.421	0.021	0.052	0.955	0.096	0.579	1.719	0.052	1.910	0.052	
Moose wb conc.	Bq/kg (fw)	0.25	0.04	0.16	3.78	1.13	2.11	2.54	0.03	2.08	0.03	
Moose meat conc.	Bq/kg (fw)	0.13	0.02	0.10	1.40	0.42	0.80	1.50	0.02	0.77	0.02	
Mallard duck wb conc.	Bq/kg (fw)	0.06	0.16	0.36	0.64	0.19	1.77	51.80	0.06	0.32	0.11	
Mallard duck meat conc.	Bq/kg (fw)	0.03	0.10	0.23	0.24	0.07	0.67	30.56	0.04	0.12	0.07	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	20.20	2.19	5.48	27.38	27.38	10.40	5.48	5.48	54.75	5.48	
Exposure via fish	Bq/a	1.23	0.06	0.15	2.79	0.28	1.69	5.02	0.15	5.58	0.15	
Exposure via moose	Bq/a	0.13	0.02	0.10	1.40	0.42	0.80	1.50	0.02	0.77	0.02	
Exposure via mallard	Bq/a	0.03	0.10	0.23	0.24	0.07	0.67	30.56	0.04	0.12	0.07	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	9.50E-04	7.45E-06	1.15E-03	7.67E-03	6.84E-06	7.19E-03	6.57E-03	1.26E-03	3.78E-02	3.94E-04	6.30E-02
Dose via fish	mSv/a	5.77E-05	2.06E-07	3.19E-05	7.81E-04	6.97E-08	1.17E-03	6.02E-03	3.49E-05	3.85E-03	1.09E-05	1.20E-02
Dose via moose	mSv/a	5.89E-06	8.00E-08	2.09E-05	3.92E-04	1.05E-07	5.54E-04	1.80E-03	3.75E-06	5.30E-04	1.52E-06	3.30E-03
Dose via mallard	mSv/a	1.43E-06	3.50E-07	4.77E-05	6.61E-05	1.77E-08	4.66E-04	3.67E-02	9.12E-06	8.19E-05	4.93E-06	3.74E-02
Total ingestion dose	mSv/a	1.01E-03	8.08E-06	1.25E-03	8.90E-03	7.04E-06	9.38E-03	5.11E-02	1.31E-03	4.22E-02	4.12E-04	1.16E-01

Human Dose Calculations - SRFN Adult - May Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0369	0.004	0.01	0.05	0.05	0.0190	0.01	0.01	0.10	0.01	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.421	0.021	0.052	0.955	0.096	0.579	1.719	0.052	1.910	0.052	
Moose wb conc.	Bq/kg (fw)	0.25	0.04	0.16	3.78	1.13	2.11	2.54	0.03	2.08	0.03	
Moose meat conc.	Bq/kg (fw)	0.13	0.02	0.10	1.40	0.42	0.80	1.50	0.02	0.77	0.02	
Mallard duck wb conc.	Bq/kg (fw)	0.06	0.16	0.36	0.64	0.19	1.77	51.80	0.06	0.32	0.11	
Mallard duck meat conc.	Bq/kg (fw)	0.03	0.10	0.23	0.24	0.07	0.67	30.56	0.04	0.12	0.07	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.08	0.01	0.06	0.85	0.25	0.48	0.91	0.01	0.46	0.01	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.01	0.28	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	3.56E-06	4.84E-08	1.26E-05	2.37E-04	6.35E-08	3.35E-04	1.09E-03	2.27E-06	3.21E-04	9.18E-07	2.00E-03
Dose via mallard	mSv/a	1.32E-08	3.24E-09	4.41E-07	6.11E-07	1.64E-10	4.31E-06	3.39E-04	8.44E-08	7.57E-07	4.56E-08	3.45E-04
Total ingestion dose	mSv/a	3.57E-06	5.16E-08	1.31E-05	2.38E-04	6.37E-08	3.39E-04	1.43E-03	2.35E-06	3.21E-04	9.64E-07	2.34E-03

Human Dose Calculations - SRFN Adult - May Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0369	0.004	0.01	0.05	0.05	0.0190	0.01	0.01	0.10	0.01	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.421	0.021	0.052	0.955	0.096	0.579	1.719	0.052	1.910	0.052	
Moose wb conc.	Bq/kg (fw)	0.25	0.04	0.16	3.78	1.13	2.11	2.54	0.03	2.08	0.03	
Moose meat conc.	Bq/kg (fw)	0.13	0.02	0.10	1.40	0.42	0.80	1.50	0.02	0.77	0.02	
Mallard duck wb conc.	Bq/kg (fw)	0.06	0.16	0.36	0.64	0.19	1.77	51.80	0.06	0.32	0.11	
Mallard duck meat conc.	Bq/kg (fw)	0.03	0.10	0.23	0.24	0.07	0.67	30.56	0.04	0.12	0.07	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Ecological Dose Calculations - Aquatic Biota - McCabe Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.02952	0.0075	0.00874	0.06	0.06	0.03	0.01	0.0008	0.0012	0.0016	
Sed to water PC	L/kg (dw)	25000	49200	49200	33333	33333	83333	166666	49200	33333	49200	
Sediment conc.	Bq/kg (dw)	738	369	430	2000	2000	2500	2400	40	40	80	
Sediment conc.	Bq/kg (ww)	74	37	43	200	200	250	240	4	4	8	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	11.39792	1.635	1.9053	21.667	2.1667	36.667	503.333	0.18	223.333	0.35	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	40.221	46.61	109.4	146	14.60	84.85	79.65	7.04	34.6	13.7	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	8.15	2.07	2.41	29.16	2.92	109.29	200.00	0.22	0.58	0.45	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	5.45E-06	7.73E-04	3.15E-06	6.58E-05	1.84E-02	1.56E-03	8.48E-08	2.56E-07	1.95E-04	6.37E-04	2.08E-02
Int. abs. dose fish	mGy/d	7.21E-04	2.04E-05	1.26E-04	1.46E-03	6.65E-04	2.20E-04	3.76E-02	1.00E-05	4.36E-03	1.72E-04	4.09E-02
Int. abs dose plant	mGy/d	2.55E-03	5.82E-04	7.22E-03	9.84E-03	4.48E-03	5.08E-04	5.96E-03	3.97E-04	6.75E-04	6.64E-03	3.11E-02
Int. abs dose benthos	mGy/d	5.16E-04	2.59E-05	1.59E-04	1.97E-03	8.95E-04	6.55E-04	1.50E-02	1.27E-05	1.14E-05	2.18E-04	1.92E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	7.22E-03	7.94E-04	1.26E-03	1.47E-02	2.50E-02	1.78E-03	3.76E-01	1.00E-04	4.55E-03	2.35E-03	4.27E-01
γ eq. dose plant	mGy/d	2.55E-02	1.36E-03	7.22E-02	9.85E-02	6.32E-02	2.07E-03	5.96E-02	3.97E-03	8.69E-04	6.70E-02	3.22E-01
γ eq. . dose benthos	mGy/d	5.17E-03	1.57E-03	1.60E-03	1.98E-02	4.57E-02	3.78E-03	1.50E-01	1.27E-04	4.00E-04	3.45E-03	2.27E-01

Ecological Dose Calculations - Riparian Wildlife - McCabe Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.02952	0.0075	0.0087	0.06	0.0600	0.03	0.01	0.0008	0.0012	0.0016	
Sed to water PC	L/kg (dw)	25000	49200	49200	33333	33333	83333	166666	49200	33333	49200	
Sediment conc.	Bq/kg (dw)	738	369	430	2000	2000	2500	2400	40	40	80	
Sediment conc.	Bq/kg (ww)	74	37	43	200	200	250	240	4	4	8	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	11.40	1.635	1.905	21.667	2.1667	36.667	503.333	0.18	223.333	0.35	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	40.221	46.61	109.4	146	14.60	84.85	79.65	7.04	34.6	13.7	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	8.15	2.07	2.41	29.16	2.92	109.29	200.00	0.22	0.58	0.45	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	2.73E-06	3.87E-04	1.58E-06	3.29E-05	9.18E-03	7.81E-04	4.24E-08	1.28E-07	9.73E-05	3.18E-04	1.08E-02
Int. abs. dose mallard	mGy/d	2.64E-06	3.83E-06	4.66E-05	6.07E-05	8.29E-05	1.19E-05	3.99E-03	2.58E-06	3.92E-06	4.32E-05	4.25E-03
Int. abs. dose scaup	mGy/d	5.77E-07	2.47E-06	1.52E-05	1.14E-04	1.56E-04	1.20E-05	7.47E-03	1.21E-06	6.60E-07	2.08E-05	7.80E-03
Int. abs. dose merganser	mGy/d	2.02E-05	1.85E-05	1.14E-04	9.91E-04	1.35E-03	7.49E-05	3.41E-02	9.04E-06	2.82E-03	1.55E-04	3.96E-02
Int. abs. dose muskrat	mGy/d	1.10E-04	8.69E-06	1.01E-04	3.60E-03	4.91E-03	1.51E-04	2.09E-03	5.72E-06	2.03E-04	9.59E-05	1.13E-02
Int. abs. dose mink	mGy/d	1.27E-05	1.94E-07	1.19E-06	2.45E-04	3.35E-04	2.34E-05	4.04E-03	9.49E-08	5.94E-04	1.63E-06	5.25E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	2.91E-05	3.91E-04	4.67E-04	6.40E-04	1.00E-02	7.93E-04	3.99E-02	2.60E-05	1.01E-04	7.51E-04	5.31E-02
γ eq. dose scaup	mGy/d	8.49E-06	3.89E-04	1.54E-04	1.17E-03	1.07E-02	7.93E-04	7.47E-02	1.22E-05	9.79E-05	5.26E-04	8.86E-02
γ eq. dose merganser	mGy/d	2.05E-04	4.05E-04	1.14E-03	9.94E-03	2.27E-02	8.56E-04	3.41E-01	9.05E-05	2.92E-03	1.87E-03	3.81E-01
γ eq. dose muskrat	mGy/d	1.11E-03	7.82E-04	1.01E-03	3.60E-02	6.75E-02	1.71E-03	2.09E-02	5.75E-05	3.98E-04	1.60E-03	1.31E-01
γ eq. dose mink	mGy/d	1.33E-04	7.74E-04	1.51E-05	2.52E-03	2.17E-02	1.59E-03	4.04E-02	1.21E-06	7.88E-04	6.53E-04	6.85E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - McCabe Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.02952	0.0075	0.0087	0.06	0.0600	0.03	0.01	0.0008	0.0012	0.0016	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.337	0.039	0.045	1.146	0.115	0.914	1.719	0.004	0.023	0.008	
Moose wb conc.	Bq/kg (fw)	0.19	0.07	0.15	6.03	1.81	2.84	3.12	0.01	1.18	0.02	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.10	2.23	0.67	1.08	1.84	0.01	0.44	0.01	
Mallard duck wb conc.	Bq/kg (fw)	0.04	0.31	0.71	0.90	0.27	1.98	53.37	0.05	0.20	0.09	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.19	0.44	0.33	0.10	0.75	31.49	0.03	0.07	0.06	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	16.16	4.11	4.79	32.85	32.85	16.43	5.48	0.45	0.66	0.89	
Exposure via fish	Bq/a	0.98	0.11	0.13	3.35	0.33	2.67	5.02	0.01	0.07	0.02	
Exposure via moose	Bq/a	0.10	0.04	0.10	2.23	0.67	1.08	1.84	0.01	0.44	0.01	
Exposure via mallard	Bq/a	0.02	0.19	0.44	0.33	0.10	0.75	31.49	0.03	0.07	0.06	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	7.60E-04	1.40E-05	1.00E-03	9.20E-03	8.21E-06	1.14E-02	6.57E-03	1.02E-04	4.53E-04	6.41E-05	2.95E-02
Dose via fish	mSv/a	4.62E-05	3.87E-07	2.79E-05	9.37E-04	8.37E-08	1.84E-03	6.02E-03	2.84E-06	4.62E-05	1.78E-06	8.93E-03
Dose via moose	mSv/a	4.54E-06	1.50E-07	2.04E-05	6.25E-04	1.67E-07	7.45E-04	2.21E-03	1.48E-06	3.00E-04	9.04E-07	3.91E-03
Dose via mallard	mSv/a	9.81E-07	6.57E-07	9.34E-05	9.33E-05	2.50E-08	5.21E-04	3.78E-02	6.64E-06	5.13E-05	4.05E-06	3.86E-02
Total ingestion dose	mSv/a	8.11E-04	1.52E-05	1.15E-03	1.09E-02	8.49E-06	1.45E-02	5.26E-02	1.13E-04	8.51E-04	7.08E-05	8.09E-02

Human Dose Calculations - SRFN Adult - McCabe Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.02952	0.0075	0.0087	0.06	0.0600	0.03	0.01	0.0008	0.0012	0.0016	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.337	0.039	0.045	1.146	0.115	0.914	1.719	0.004	0.023	0.008	
Moose wb conc.	Bq/kg (fw)	0.19	0.07	0.15	6.03	1.81	2.84	3.12	0.01	1.18	0.02	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.10	2.23	0.67	1.08	1.84	0.01	0.44	0.01	
Mallard duck wb conc.	Bq/kg (fw)	0.04	0.31	0.71	0.90	0.27	1.98	53.37	0.05	0.20	0.09	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.19	0.44	0.33	0.10	0.75	31.49	0.03	0.07	0.06	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.03	0.01	0.03	0.67	0.20	0.33	0.56	0.00	0.13	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	1.37E-06	4.54E-08	6.17E-06	1.89E-04	5.06E-08	2.25E-04	6.68E-04	4.48E-07	9.09E-05	2.73E-07	1.18E-03
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	1.37E-06	4.54E-08	6.17E-06	1.89E-04	5.06E-08	2.25E-04	6.68E-04	4.48E-07	9.09E-05	2.73E-07	1.18E-03

Human Dose Calculations - SRFN Adult - McCabe Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.02952	0.0075	0.00874	0.06	0.060001	0.03	0.01	0.0008	0.0012	0.0016	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.337	0.039	0.045	1.146	0.115	0.914	1.719	0.004	0.023	0.008	
Moose wb conc.	Bq/kg (fw)	0.19	0.07	0.15	6.03	1.81	2.84	3.12	0.01	1.18	0.02	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.10	2.23	0.67	1.08	1.84	0.01	0.44	0.01	
Mallard duck wb conc.	Bq/kg (fw)	0.04	0.31	0.71	0.90	0.27	1.98	53.37	0.05	0.20	0.09	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.19	0.44	0.33	0.10	0.75	31.49	0.03	0.07	0.06	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Ecological Dose Calculations - Aquatic Biota - McCarthy Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0123	0.0065	0.0010	0.01	0.01	0.03	0.01	0.0003	0.0006	0.0012	
Sed to water PC	L/kg (dw)	52000	49200	49200	23517	23517	16333	32666	49200	23517	49200	
Sediment conc.	Bq/kg (dw)	639.6	319.8	50	440	440	490	450	14	14	60	
Sediment conc.	Bq/kg (ww)	64	32	5	44	44	49	45	1	1	6	
Wat to fish BCF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	10.701	1.417	0.2215	9	0.9	20	56	0.062	0.3215	0.27	
Wat to aquatic plant BCF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	45.284	40.40	6.32	42.833	4.28	22.75	12.292	1.333	27.917	7.579	
Wat to benthos BCF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	3.39	1.79	0.28	4.86	0.49	109.29	200.00	0.08	0.29	0.34	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	4.73E-06	6.70E-04	3.66E-07	1.45E-05	4.04E-03	3.06E-04	1.59E-08	8.95E-08	6.81E-05	4.78E-04	5.58E-03
Int. abs. dose fish	mGy/d	6.77E-04	1.77E-05	1.46E-05	6.07E-04	2.76E-04	1.20E-04	4.19E-03	3.50E-06	6.27E-06	1.29E-04	6.04E-03
Int. abs dose plant	mGy/d	2.87E-03	5.05E-04	4.17E-04	2.89E-03	1.31E-03	1.36E-04	9.19E-04	7.52E-05	5.45E-04	3.67E-03	1.33E-02
Int. abs dose benthos	mGy/d	2.15E-04	2.24E-05	1.85E-05	3.28E-04	1.49E-04	6.55E-04	1.50E-02	4.43E-06	5.64E-06	1.63E-04	1.65E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	6.78E-03	6.88E-04	1.47E-04	6.08E-03	6.80E-03	4.26E-04	4.19E-02	3.51E-05	7.44E-05	1.77E-03	6.47E-02
γ eq. dose plant	mGy/d	2.87E-02	1.17E-03	4.17E-03	2.89E-02	1.72E-02	4.42E-04	9.19E-03	7.53E-04	6.13E-04	3.72E-02	1.28E-01
γ eq. . dose benthos	mGy/d	2.16E-03	1.36E-03	1.86E-04	3.30E-03	9.57E-03	1.27E-03	1.50E-01	4.45E-05	1.42E-04	2.59E-03	1.70E-01

Ecological Dose Calculations - Riparian Wildlife - McCarthy Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0123	0.0065	0.0010	0.01	0.01	0.03	0.01	0.0003	0.0006	0.0012	
Sed to water PC	L/kg (dw)	52000	49200	49200	23517	23517	16333	32666	49200	23517	49200	
Sediment conc.	Bq/kg (dw)	639.6	319.8	50	440	440	490	450	14	14	60	
Sediment conc.	Bq/kg (ww)	64	32	5	44	44	49	45	1	1	6	
Wat to fish BCF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	10.701	1.417	0.2215447	9	0.9	20	56	0.062	0.3214696	0.27	
Wat to aquatic plant BCF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	45.284295	40.40	6.32	42.83325	4.28	22.75	12.29175	1.33325	27.91675	7.579268	
Wat to benthos BCF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	3.39	1.79	0.28	4.86	0.49	109.29	200.00	0.08	0.29	0.34	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	2.36E-06	3.35E-04	1.83E-07	7.23E-06	2.02E-03	1.53E-04	7.95E-09	4.47E-08	3.40E-05	2.39E-04	2.79E-03
Int. abs. dose mallard	mGy/d	2.92E-06	3.32E-06	2.74E-06	1.75E-05	2.39E-05	3.08E-06	6.33E-04	5.01E-07	3.15E-06	2.42E-05	7.15E-04
Int. abs. dose scaup	mGy/d	3.21E-07	2.14E-06	1.77E-06	2.06E-05	2.81E-05	1.10E-05	7.13E-03	4.24E-07	3.03E-07	1.56E-05	7.21E-03
Int. abs. dose merganser	mGy/d	1.89E-05	1.60E-05	1.32E-05	4.03E-04	5.50E-04	4.00E-05	3.80E-03	3.16E-06	4.15E-06	1.16E-04	4.96E-03
Int. abs. dose muskrat	mGy/d	1.17E-04	7.53E-06	6.22E-06	1.00E-03	1.37E-03	3.69E-05	3.46E-04	1.17E-06	1.62E-04	5.48E-05	3.11E-03
Int. abs. dose mink	mGy/d	1.18E-05	1.68E-07	1.39E-07	9.28E-05	1.27E-04	1.16E-05	4.53E-04	3.32E-08	9.48E-07	1.22E-06	6.98E-04
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	3.15E-05	3.38E-04	2.76E-05	1.83E-04	2.26E-03	1.56E-04	6.33E-03	5.05E-06	3.72E-05	4.80E-04	9.85E-03
γ eq. dose scaup	mGy/d	5.57E-06	3.37E-04	1.79E-05	2.13E-04	2.30E-03	1.64E-04	7.13E-02	4.29E-06	3.43E-05	3.95E-04	7.48E-02
γ eq. dose merganser	mGy/d	1.91E-04	3.51E-04	1.32E-04	4.04E-03	7.52E-03	1.93E-04	3.80E-02	3.17E-05	3.82E-05	1.40E-03	5.19E-02
γ eq. dose muskrat	mGy/d	1.18E-03	6.78E-04	6.26E-05	1.01E-02	1.78E-02	3.43E-04	3.46E-03	1.18E-05	2.30E-04	1.03E-03	3.48E-02
γ eq. dose mink	mGy/d	1.23E-04	6.70E-04	1.75E-06	9.43E-04	5.31E-03	3.18E-04	4.53E-03	4.22E-07	6.90E-05	4.90E-04	1.24E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - McCarthy Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0123	0.0065	0.001016	0.01	0.01	0.03	0.01	0.0003	0.0006	0.0012	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.140	0.034	0.005	0.191	0.019	0.914	1.719	0.001	0.011	0.006	
Moose wb conc.	Bq/kg (fw)	0.20	0.06	0.009	1.68	0.50	0.69	0.52	0.002	0.94	0.011	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.006	0.62	0.19	0.26	0.31	0.001	0.35	0.007	
Mallard duck wb conc.	Bq/kg (fw)	0.05	0.27	0.04	0.26	0.08	0.51	8.47	0.01	0.16	0.05	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.17	0.03	0.10	0.03	0.20	5.00	0.01	0.06	0.03	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	6.73	3.56	0.56	5.48	5.48	16.43	5.48	0.16	0.33	0.67	
Exposure via fish	Bq/a	0.41	0.10	0.02	0.56	0.06	2.67	5.02	0.004	0.03	0.02	
Exposure via moose	Bq/a	0.10	0.04	0.01	0.62	0.19	0.26	0.31	0.001	0.35	0.007	
Exposure via mallard	Bq/a	0.02	0.17	0.03	0.10	0.03	0.20	5.00	0.01	0.06	0.03	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	3.17E-04	1.21E-05	1.17E-04	1.53E-03	1.37E-06	1.14E-02	6.57E-03	3.58E-05	2.25E-04	4.81E-05	2.02E-02
Dose via fish	mSv/a	1.92E-05	3.36E-07	3.24E-06	1.56E-04	1.39E-08	1.84E-03	6.02E-03	9.94E-07	2.29E-05	1.33E-06	8.07E-03
Dose via moose	mSv/a	4.81E-06	1.30E-07	1.26E-06	1.74E-04	4.67E-08	1.82E-04	3.67E-04	3.02E-07	2.40E-04	5.16E-07	9.70E-04
Dose via mallard	mSv/a	1.08E-06	5.69E-07	5.49E-06	2.69E-05	7.22E-09	1.35E-04	6.00E-03	1.29E-06	4.13E-05	2.26E-06	6.21E-03
Total ingestion dose	mSv/a	3.42E-04	1.31E-05	1.27E-04	1.89E-03	1.44E-06	1.35E-02	1.90E-02	3.84E-05	5.29E-04	5.22E-05	3.55E-02

Human Dose Calculations - SRFN Adult - McCarthy Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0123	0.0065	0.001016	0.01	0.01	0.03	0.01	0.0003	0.0006	0.0012	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.140	0.034	0.005	0.191	0.019	0.914	1.719	0.001	0.011	0.006	
Moose wb conc.	Bq/kg (fw)	0.20	0.06	0.009	1.68	0.50	0.69	0.52	0.002	0.94	0.011	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.006	0.62	0.19	0.26	0.31	0.001	0.35	0.007	
Mallard duck wb conc.	Bq/kg (fw)	0.05	0.27	0.04	0.26	0.08	0.51	8.47	0.01	0.16	0.05	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.17	0.03	0.10	0.03	0.20	5.00	0.01	0.06	0.03	
Ingestion rate water	L/a	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	
Ingestion rate fish	kg/a	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Ingestion rate moose	kg/a	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	
Ingestion rate mallard	kg/a	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	
Exposure via water	Bq/a	0.13	0.07	0.01	0.11	0.11	0.33	0.11	0.00	0.01	0.01	
Exposure via fish	Bq/a	0.04	0.01	0.00	0.05	0.00	0.23	0.44	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.12	0.05	0.01	0.75	0.23	0.32	0.37	0.00	0.42	0.01	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	6.33E-06	2.42E-07	2.34E-06	3.07E-05	2.74E-08	2.27E-04	1.31E-04	7.17E-07	4.50E-06	9.61E-07	4.04E-04
Dose via fish	mSv/a	1.67E-06	2.92E-08	2.82E-07	1.36E-05	1.21E-09	1.60E-04	5.24E-04	8.64E-08	1.99E-06	1.16E-07	7.02E-04
Dose via moose	mSv/a	5.82E-06	1.57E-07	1.52E-06	2.11E-04	5.65E-08	2.21E-04	4.44E-04	3.65E-07	2.90E-04	6.25E-07	1.17E-03
Dose via mallard	mSv/a	2.00E-08	1.05E-08	1.02E-07	4.98E-07	1.34E-10	2.49E-06	1.11E-04	2.38E-08	7.63E-07	4.18E-08	1.15E-04
Total ingestion dose	mSv/a	1.38E-05	4.39E-07	4.24E-06	2.56E-04	8.52E-08	6.11E-04	1.21E-03	1.19E-06	2.97E-04	1.74E-06	2.40E-03

Human Dose Calculations - SRFN Adult - McCarthy Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0123	0.0065	0.001016	0.01	0.01	0.03	0.0100	0.0003	0.0006	0.0012	
Water to fish BCF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.140	0.034	0.005	0.191	0.019	0.914	1.719	0.001	0.011	0.006	
Moose wb conc.	Bq/kg (fw)	0.20	0.06	0.009	1.68	0.50	0.69	0.52	0.002	0.94	0.011	
Moose meat conc.	Bq/kg (fw)	0.10	0.04	0.006	0.62	0.19	0.26	0.31	0.001	0.35	0.007	
Mallard duck wb conc.	Bq/kg (fw)	0.05	0.27	0.04	0.26	0.08	0.51	8.47	0.01	0.16	0.05	
Mallard duck meat conc.	Bq/kg (fw)	0.02	0.17	0.03	0.10	0.03	0.20	5.00	0.01	0.06	0.03	
Ingestion rate water	L/a	1.095	1.095	1.095	1.095	1.095	1.095	1.095	1.095	1.095	1.095	
Ingestion rate fish	kg/a	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.01	0.01	0.00	0.01	0.01	0.03	0.01	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.06	0.02	0.00	0.38	0.11	0.16	0.18	0.00	0.21	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	6.33E-07	2.42E-08	2.34E-07	3.07E-06	2.74E-09	2.27E-05	1.31E-05	7.17E-08	4.50E-07	9.61E-08	4.04E-05
Dose via fish	mSv/a	1.67E-07	2.92E-09	2.82E-08	1.36E-06	1.21E-10	1.60E-05	5.24E-05	8.64E-09	1.99E-07	1.16E-08	7.02E-05
Dose via moose	mSv/a	2.91E-06	7.86E-08	7.59E-07	1.05E-04	2.83E-08	1.10E-04	2.22E-04	1.82E-07	1.45E-04	3.12E-07	5.87E-04
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	3.71E-06	1.06E-07	1.02E-06	1.10E-04	3.11E-08	1.49E-04	2.87E-04	2.63E-07	1.46E-04	4.20E-07	6.98E-04

Ecological Dose Calculations - Aquatic Biota - Nordic Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0394	0.004	0.0010	0.03	0.0300	0.03	0.01	0.0004	0.0016	0.0012	
Sed to water PC	L/kg (dw)	10000	49200	49200	12333	12333	10333	20666	49200	12333	49200	
Sediment conc.	Bq/kg (dw)	393.6	196.8	50	370	370	310	270	20	20	60	
Sediment conc.	Bq/kg (ww)	39	20	5	37	37	31	27	2	2	6	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	4.5099	0.872	0.2215	10.333	1.0333	20	396.667	0.09	0.88	0.27	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	15.3381	24.86	6.32	33.7	3.37	14.8	8.95	2.53	6.08	1.55	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	10.86	1.10	0.28	14.58	1.46	109.29	200.00	0.11	0.79	0.34	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	2.91E-06	4.12E-04	3.66E-07	1.22E-05	3.40E-03	1.94E-04	9.54E-09	1.28E-07	9.73E-05	4.78E-04	4.59E-03
Int. abs. dose fish	mGy/d	2.85E-04	1.09E-05	1.46E-05	6.96E-04	3.17E-04	1.20E-04	2.97E-02	5.00E-06	1.71E-05	1.29E-04	3.13E-02
Int. abs dose plant	mGy/d	9.71E-04	3.11E-04	4.17E-04	2.27E-03	1.03E-03	8.87E-05	6.69E-04	1.43E-04	1.19E-04	7.51E-04	6.77E-03
Int. abs dose benthos	mGy/d	6.88E-04	1.38E-05	1.85E-05	9.83E-04	4.47E-04	6.55E-04	1.50E-02	6.33E-06	1.54E-05	1.63E-04	1.79E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	2.86E-03	4.23E-04	1.47E-04	6.98E-03	6.57E-03	3.14E-04	2.97E-01	5.01E-05	1.14E-04	1.77E-03	3.16E-01
γ eq. dose plant	mGy/d	9.71E-03	7.23E-04	4.17E-03	2.27E-02	1.37E-02	2.82E-04	6.69E-03	1.43E-03	2.16E-04	7.99E-03	6.77E-02
γ eq. . dose benthos	mGy/d	6.88E-03	8.39E-04	1.86E-04	9.85E-03	1.13E-02	1.04E-03	1.50E-01	6.36E-05	2.10E-04	2.59E-03	1.83E-01

Ecological Dose Calculations - Riparian Wildlife - Nordic Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.03936	0.004	0.0010	0.03	0.0300	0.03	0.01	0.0004	0.0016	0.0012	
Sed to water PC	L/kg (dw)	10000	49200	49200	12333	12333	10333	20666	49200	12333	49200	
Sediment conc.	Bq/kg (dw)	393.6	196.8	50	370	370	310	270	20	20	60	
Sediment conc.	Bq/kg (ww)	39	20	5	37	37	31	27	2	2	6	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	4.5099	0.872	0.2215447	10.333	1.0333	20	396.667	0.09	0.88	0.27	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	15.3381	24.86	6.32	33.7	3.37	14.8	8.95	2.53	6.08	1.55	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	10.86	1.10	0.28	14.58	1.46	109.29	200.00	0.11	0.79	0.34	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	1.45E-06	2.06E-04	1.83E-07	6.08E-06	1.70E-03	9.68E-05	4.77E-09	6.39E-08	4.86E-05	2.39E-04	2.01E-03
Int. abs. dose mallard	mGy/d	1.04E-06	2.04E-06	2.74E-06	1.38E-05	1.89E-05	2.00E-06	4.49E-04	9.38E-07	6.96E-07	5.67E-06	4.89E-04
Int. abs. dose scaup	mGy/d	6.25E-07	1.32E-06	1.77E-06	4.78E-05	6.53E-05	1.09E-05	7.10E-03	6.06E-07	7.48E-07	1.56E-05	7.23E-03
Int. abs. dose merganser	mGy/d	8.09E-06	9.84E-06	1.32E-05	4.60E-04	6.28E-04	3.98E-05	2.68E-02	4.52E-06	1.12E-05	1.16E-04	2.80E-02
Int. abs. dose muskrat	mGy/d	4.61E-05	4.63E-06	6.22E-06	7.98E-04	1.09E-03	2.38E-05	2.35E-04	2.13E-06	3.70E-05	1.65E-05	2.20E-03
Int. abs. dose mink	mGy/d	5.29E-06	1.03E-07	1.39E-07	1.04E-04	1.41E-04	1.13E-05	3.15E-03	4.75E-08	2.46E-06	1.22E-06	3.41E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	1.19E-05	2.08E-04	2.76E-05	1.44E-04	1.89E-03	9.88E-05	4.49E-03	9.44E-06	4.93E-05	2.96E-04	6.87E-03
γ eq. dose scaup	mGy/d	7.71E-06	2.08E-04	1.79E-05	4.84E-04	2.35E-03	1.08E-04	7.10E-02	6.12E-06	4.94E-05	3.95E-04	7.42E-02
γ eq. dose merganser	mGy/d	8.23E-05	2.16E-04	1.32E-04	4.60E-03	7.98E-03	1.37E-04	2.68E-01	4.53E-05	5.98E-05	1.40E-03	2.81E-01
γ eq. dose muskrat	mGy/d	4.64E-04	4.17E-04	6.26E-05	8.00E-03	1.43E-02	2.18E-04	2.35E-03	2.14E-05	1.34E-04	6.43E-04	2.58E-02
γ eq. dose mink	mGy/d	5.58E-05	4.13E-04	1.75E-06	1.05E-03	4.81E-03	2.05E-04	3.15E-02	6.03E-07	9.97E-05	4.90E-04	3.80E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - Nordic Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.03936	0.004	0.0010	0.03	0.0300	0.03	0.01	0.0004	0.0016	0.0012	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.449	0.021	0.005	0.573	0.057	0.914	1.719	0.002	0.031	0.006	
Moose wb conc.	Bq/kg (fw)	0.08	0.04	0.01	1.34	0.40	0.45	0.35	0.00	0.21	0.00	
Moose meat conc.	Bq/kg (fw)	0.04	0.02	0.01	0.50	0.15	0.17	0.21	0.00	0.08	0.00	
Mallard duck wb conc.	Bq/kg (fw)	0.02	0.16	0.04	0.21	0.06	0.33	6.00	0.02	0.04	0.01	
Mallard duck meat conc.	Bq/kg (fw)	0.01	0.10	0.03	0.08	0.02	0.13	3.54	0.01	0.01	0.01	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	21.55	2.19	0.56	16.43	16.43	16.43	5.48	0.22	0.89	0.67	
Exposure via fish	Bq/a	1.31	0.06	0.02	1.67	0.17	2.67	5.02	0.01	0.09	0.02	
Exposure via moose	Bq/a	0.04	0.02	0.01	0.50	0.15	0.17	0.21	0.00	0.08	0.00	
Exposure via mallard	Bq/a	0.01	0.10	0.03	0.08	0.02	0.13	3.54	0.01	0.01	0.01	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	1.01E-03	7.45E-06	1.17E-04	4.60E-03	4.11E-06	1.14E-02	6.57E-03	5.12E-05	6.13E-04	4.81E-05	2.44E-02
Dose via fish	mSv/a	6.16E-05	2.06E-07	3.24E-06	4.68E-04	4.18E-08	1.84E-03	6.02E-03	1.42E-06	6.24E-05	1.33E-06	8.47E-03
Dose via moose	mSv/a	1.91E-06	8.00E-08	1.26E-06	1.39E-04	3.73E-08	1.18E-04	2.49E-04	5.50E-07	5.47E-05	1.55E-07	5.65E-04
Dose via mallard	mSv/a	3.87E-07	3.50E-07	5.49E-06	2.13E-05	5.70E-09	8.75E-05	4.25E-03	2.41E-06	9.11E-06	5.31E-07	4.37E-03
Total ingestion dose	mSv/a	1.08E-03	8.08E-06	1.27E-04	5.23E-03	4.19E-06	1.34E-02	1.71E-02	5.56E-05	7.39E-04	5.01E-05	3.78E-02

Human Dose Calculations - SRFN Adult - Nordic Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.03936	0.004	0.0010	0.03	0.0300	0.03	0.01	0.0004	0.0016	0.0012	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.449	0.021	0.005	0.573	0.057	0.914	1.719	0.002	0.031	0.006	
Moose wb conc.	Bq/kg (fw)	0.08	0.04	0.01	1.34	0.40	0.45	0.35	0.00	0.21	0.00	
Moose meat conc.	Bq/kg (fw)	0.04	0.02	0.01	0.50	0.15	0.17	0.21	0.00	0.08	0.00	
Mallard duck wb conc.	Bq/kg (fw)	0.02	0.16	0.04	0.21	0.06	0.33	6.00	0.02	0.04	0.01	
Mallard duck meat conc.	Bq/kg (fw)	0.01	0.10	0.03	0.08	0.02	0.13	3.54	0.01	0.01	0.01	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	0.0185	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.02	0.01	0.00	0.30	0.09	0.10	0.13	0.00	0.05	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	1.16E-06	4.84E-08	7.59E-07	8.42E-05	2.25E-08	7.15E-05	1.51E-04	3.33E-07	3.31E-05	9.40E-08	3.42E-04
Dose via mallard	mSv/a	7.15E-09	6.48E-09	1.02E-07	3.94E-07	1.05E-10	1.62E-06	7.86E-05	4.45E-08	1.69E-07	9.82E-09	8.09E-05
Total ingestion dose	mSv/a	1.16E-06	5.49E-08	8.61E-07	8.46E-05	2.26E-08	7.31E-05	2.29E-04	3.77E-07	3.33E-05	1.04E-07	4.23E-04

Human Dose Calculations - SRFN Adult - Nordic Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.03936	0.004	0.0010	0.03	0.0300	0.03	0.01	0.0004	0.0016	0.0012	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.449	0.021	0.005	0.573	0.057	0.914	1.719	0.002	0.031	0.006	
Moose wb conc.	Bq/kg (fw)	0.08	0.04	0.01	1.34	0.40	0.45	0.35	0.00	0.21	0.00	
Moose meat conc.	Bq/kg (fw)	0.04	0.02	0.01	0.50	0.15	0.17	0.21	0.00	0.08	0.00	
Mallard duck wb conc.	Bq/kg (fw)	0.02	0.16	0.04	0.21	0.06	0.33	6.00	0.02	0.04	0.01	
Mallard duck meat conc.	Bq/kg (fw)	0.01	0.10	0.03	0.08	0.02	0.13	3.54	0.01	0.01	0.01	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	0.02	0.01	0.00	0.30	0.09	0.10	0.13	0.00	0.05	0.00	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	1.16E-06	4.84E-08	7.59E-07	8.42E-05	2.25E-08	7.15E-05	1.51E-04	3.33E-07	3.31E-05	9.40E-08	3.42E-04
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	1.16E-06	4.84E-08	7.59E-07	8.42E-05	2.25E-08	7.15E-05	1.51E-04	3.33E-07	3.31E-05	9.40E-08	3.42E-04

Ecological Dose Calculations - Aquatic Biota - Quirke Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0640	0.02225	0.01	0.05	0.05	0.06	0.01	0.0053	0.0080	0.0075	
Sed to water PC	L/kg (dw)	34231	49200	49200	44000	44000	38333	76666	49200	44000	49200	
Sediment conc.	Bq/kg (dw)	2189.4	1094.7	2700	2200	2200	2300	2600	260	350	370	
Sediment conc.	Bq/kg (ww)	219	109	270	220	220	230	260	26	35	37	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	63.55	4.8505	22	59.67	5.9667	30	1006.67	1.15	106.67	4.67	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	1466.01	138.28	608.81	462.5	46.25	481.875	534.375	77.56	128.75	70.69	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	17.65	6.14	2.76	24.30	2.43	218.58	200.00	1.46	3.87	2.08	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	1.62E-05	2.29E-03	1.98E-05	7.23E-05	2.02E-02	1.44E-03	9.19E-08	1.66E-06	1.70E-03	2.95E-03	2.87E-02
Int. abs. dose fish	mGy/d	4.02E-03	6.06E-05	1.45E-03	4.02E-03	1.83E-03	1.80E-04	7.53E-02	6.50E-05	2.08E-03	2.26E-03	9.13E-02
Int. abs dose plant	mGy/d	9.28E-02	1.73E-03	4.02E-02	3.12E-02	1.42E-02	2.89E-03	4.00E-02	4.38E-03	2.51E-03	3.43E-02	2.64E-01
Int. abs dose benthos	mGy/d	1.12E-03	7.67E-05	1.82E-04	1.64E-03	7.46E-04	1.31E-03	1.50E-02	8.23E-05	7.54E-05	1.01E-03	2.12E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	4.02E-02	2.35E-03	1.45E-02	4.03E-02	3.85E-02	1.62E-03	7.53E-01	6.52E-04	3.78E-03	2.56E-02	9.20E-01
γ eq. dose plant	mGy/d	9.28E-01	4.02E-03	4.02E-01	3.12E-01	1.62E-01	4.32E-03	4.00E-01	4.38E-02	4.21E-03	3.46E-01	2.61E+00
γ eq. . dose benthos	mGy/d	1.12E-02	4.67E-03	1.86E-03	1.65E-02	4.78E-02	4.18E-03	1.50E-01	8.26E-04	3.48E-03	1.60E-02	2.56E-01

Ecological Dose Calculations - Riparian Wildlife - Quirke Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.06396	0.02225	0.01	0.05	0.05	0.06	0.01	0.0053	0.0080	0.0075	
Sed to water PC	L/kg (dw)	34231	49200	49200	44000	44000	38333	76666	49200	44000	49200	
Sediment conc.	Bq/kg (dw)	2189.4	1094.7	2700	2200	2200	2300	2600	260	350	370	
Sediment conc.	Bq/kg (ww)	219	109	270	220	220	230	260	26	35	37	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	63.55	4.8505	22	59.67	5.9667	30	1006.67	1.15	106.67	4.67	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748		
Aquatic plant conc.	Bq/kg (fw)	1466.01	138.28	608.81	462.5	46.25	481.875	534.375	77.5625	128.75	70.69	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	17.65	6.14	2.76	24.30	2.43	218.58	200.00	1.46	3.87	2.08	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	8.09E-06	1.15E-03	9.89E-06	3.62E-05	1.01E-02	7.19E-04	4.59E-08	8.31E-07	8.51E-04	1.47E-03	1.43E-02
Int. abs. dose mallard	mGy/d	8.88E-05	1.14E-05	2.60E-04	1.84E-04	2.52E-04	6.02E-05	2.38E-02	2.82E-05	1.47E-05	2.22E-04	2.50E-02
Int. abs. dose scaup	mGy/d	1.39E-06	7.34E-06	5.43E-05	1.03E-04	1.40E-04	2.27E-05	7.51E-03	7.87E-06	4.73E-06	9.62E-05	7.95E-03
Int. abs. dose merganser	mGy/d	1.11E-04	5.48E-05	1.25E-03	2.65E-03	3.63E-03	6.16E-05	6.81E-02	5.88E-05	1.35E-03	1.91E-03	7.92E-02
Int. abs. dose muskrat	mGy/d	3.12E-03	2.58E-05	5.68E-04	9.96E-03	1.36E-02	6.15E-04	9.95E-03	6.07E-05	7.76E-04	4.90E-04	3.92E-02
Int. abs. dose mink	mGy/d	6.62E-05	5.75E-07	1.15E-05	5.99E-04	8.18E-04	1.95E-05	8.03E-03	6.17E-07	2.86E-04	1.64E-05	9.85E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	8.96E-04	1.16E-03	2.61E-03	1.88E-03	1.26E-02	7.79E-04	2.38E-01	2.82E-04	8.66E-04	3.70E-03	2.63E-01
γ eq. dose scaup	mGy/d	2.20E-05	1.15E-03	5.53E-04	1.06E-03	1.15E-02	7.41E-04	7.51E-02	7.96E-05	8.56E-04	2.44E-03	9.35E-02
γ eq. dose merganser	mGy/d	1.12E-03	1.20E-03	1.25E-02	2.66E-02	4.64E-02	7.80E-04	6.81E-01	5.88E-04	2.20E-03	2.06E-02	7.93E-01
γ eq. dose muskrat	mGy/d	3.12E-02	2.32E-03	5.70E-03	9.96E-02	1.56E-01	2.05E-03	9.95E-02	6.09E-04	2.48E-03	7.85E-03	4.07E-01
γ eq. dose mink	mGy/d	6.78E-04	2.29E-03	1.35E-04	6.06E-03	2.84E-02	1.46E-03	8.03E-02	7.83E-06	1.99E-03	3.11E-03	1.24E-01

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - Quirke Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.06396	0.02225	0.01	0.05	0.05	0.06	0.01	0.0053	0.0080	0.0075	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.729	0.116	0.052	0.955	0.096	1.827	1.719	0.027	0.152	0.039	
Moose wb conc.	Bq/kg (fw)	5.46	0.21	2.38	16.69	5.01	11.54	14.91	0.30	4.49	0.28	
Moose meat conc.	Bq/kg (fw)	2.73	0.13	1.50	6.18	1.85	4.39	8.80	0.19	1.66	0.18	
Mallard duck wb conc.	Bq/kg (fw)	1.40	0.91	3.94	2.73	0.82	10.05	318.74	0.50	0.75	0.46	
Mallard duck meat conc.	Bq/kg (fw)	0.70	0.57	2.48	1.01	0.30	3.82	188.06	0.31	0.28	0.29	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	35.02	12.18	5.48	27.38	27.38	32.85	5.48	2.89	4.36	4.12	
Exposure via fish	Bq/a	2.13	0.34	0.15	2.79	0.28	5.34	5.02	0.08	0.44	0.11	
Exposure via moose	Bq/a	2.73	0.13	1.50	6.18	1.85	4.39	8.80	0.19	1.66	0.18	
Exposure via mallard	Bq/a	0.70	0.57	2.48	1.01	0.30	3.82	188.06	0.31	0.28	0.29	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	1.65E-03	4.14E-05	1.15E-03	7.67E-03	6.84E-06	2.27E-02	6.57E-03	6.65E-04	3.01E-03	2.96E-04	4.38E-02
Dose via fish	mSv/a	1.00E-04	1.15E-06	3.19E-05	7.81E-04	6.97E-08	3.69E-03	6.02E-03	1.85E-05	3.06E-04	8.22E-06	1.10E-02
Dose via moose	mSv/a	1.28E-04	4.45E-07	3.15E-04	1.73E-03	4.63E-07	3.03E-03	1.06E-02	4.32E-05	1.15E-03	1.27E-05	1.70E-02
Dose via mallard	mSv/a	3.30E-05	1.95E-06	5.21E-04	2.83E-04	7.59E-08	2.64E-03	2.26E-01	7.23E-05	1.92E-04	2.08E-05	2.29E-01
Total ingestion dose	mSv/a	1.91E-03	4.50E-05	2.02E-03	1.05E-02	7.45E-06	3.21E-02	2.49E-01	7.99E-04	4.65E-03	3.38E-04	3.01E-01

Human Dose Calculations - SRFN Adult - Quirke Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.06396	0.02225	0.01	0.05	0.05	0.06	0.01	0.0053	0.0080	0.0075	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.729	0.116	0.052	0.955	0.096	1.827	1.719	0.027	0.152	0.039	
Moose wb conc.	Bq/kg (fw)	5.46	0.21	2.38	16.69	5.01	11.54	14.91	0.30	4.49	0.28	
Moose meat conc.	Bq/kg (fw)	2.73	0.13	1.50	6.18	1.85	4.39	8.80	0.19	1.66	0.18	
Mallard duck wb conc.	Bq/kg (fw)	1.40	0.91	3.94	2.73	0.82	10.05	318.74	0.50	0.75	0.46	
Mallard duck meat conc.	Bq/kg (fw)	0.70	0.57	2.48	1.01	0.30	3.82	188.06	0.31	0.28	0.29	
Ingestion rate water	L/a	13.6875	13.6875	13.6875	13.6875	13.6875	13.6875	13.6875	13.6875	13.6875	13.6875	
Ingestion rate fish	kg/a	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	
Ingestion rate moose	kg/a	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	0.3025	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.88	0.30	0.14	0.68	0.68	0.82	0.14	0.07	0.11	0.10	
Exposure via fish	Bq/a	0.23	0.04	0.02	0.30	0.03	0.58	0.55	0.01	0.05	0.01	
Exposure via moose	Bq/a	0.83	0.04	0.45	1.87	0.56	1.33	2.66	0.06	0.50	0.05	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	4.11E-05	1.04E-06	2.87E-05	1.92E-04	1.71E-07	5.68E-04	1.64E-04	1.66E-05	7.51E-05	7.41E-06	1.09E-03
Dose via fish	mSv/a	1.09E-05	1.25E-07	3.47E-06	8.49E-05	7.58E-09	4.01E-04	6.55E-04	2.01E-06	3.33E-05	8.94E-07	1.19E-03
Dose via moose	mSv/a	3.88E-05	1.35E-07	9.52E-05	5.23E-04	1.40E-07	9.17E-04	3.19E-03	1.31E-05	3.47E-04	3.84E-06	5.13E-03
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	9.08E-05	1.29E-06	1.27E-04	8.00E-04	3.19E-07	1.89E-03	4.01E-03	3.17E-05	4.56E-04	1.21E-05	7.42E-03

Human Dose Calculations - SRFN Adult - Quirke Lake

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.06396	0.02225	0.01	0.05	0.05	0.06	0.01	0.0053	0.0080	0.0075	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.729	0.116	0.052	0.955	0.096	1.827	1.719	0.027	0.152	0.039	
Moose wb conc.	Bq/kg (fw)	5.46	0.21	2.38	16.69	5.01	11.54	14.91	0.30	4.49	0.28	
Moose meat conc.	Bq/kg (fw)	2.73	0.13	1.50	6.18	1.85	4.39	8.80	0.19	1.66	0.18	
Mallard duck wb conc.	Bq/kg (fw)	1.40	0.91	3.94	2.73	0.82	10.05	318.74	0.50	0.75	0.46	
Mallard duck meat conc.	Bq/kg (fw)	0.70	0.57	2.48	1.01	0.30	3.82	188.06	0.31	0.28	0.29	
Ingestion rate water	L/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate fish	kg/a	0	0	0	0	0	0	0	0	0	0	
Ingestion rate moose	kg/a	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	0.605	
Ingestion rate mallard	kg/a	0	0	0	0	0	0	0	0	0	0	
Exposure via water	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via fish	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Exposure via moose	Bq/a	1.65	0.08	0.91	3.74	1.12	2.65	5.32	0.11	1.01	0.11	
Exposure via mallard	Bq/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via fish	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dose via moose	mSv/a	7.76E-05	2.69E-07	1.90E-04	1.05E-03	2.80E-07	1.83E-03	6.39E-03	2.61E-05	6.94E-04	7.68E-06	1.03E-02
Dose via mallard	mSv/a	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total ingestion dose	mSv/a	7.76E-05	2.69E-07	1.90E-04	1.05E-03	2.80E-07	1.83E-03	6.39E-03	2.61E-05	6.94E-04	7.68E-06	1.03E-02

Ecological Dose Calculations - Aquatic Biota - Lake Huron (Serpent Harbour)

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0246	0.0079	0.0079	0.013	0.013	0.018	0.009	0.0007	0.0007	0.0030	
Sed to water PC	L/kg (dw)	31500	49200	49200	47738	47738	34733	69466	49200	47738	49200	
Sediment conc.	Bq/kg (dw)	774.9	387.45	387.5	620.6	620.6	620.6	620.6	35	35	150	
Sediment conc.	Bq/kg (ww)	77	39	39	62	62	62	62	4	4	15	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	11.76	1.72	1.72	7.02	0.702	15.38	338.45	0.16	0.40	0.66	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748	6215	
Aquatic plant conc.	Bq/kg (fw)	125.21	48.94	48.94	48.72	4.87	44.65	44.65	4.42	2.75	18.95	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	6.79	2.17	2.17	6.32	0.63	65.09	178.68	0.20	0.36	0.84	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	5.73E-06	8.12E-04	2.84E-06	2.04E-05	5.70E-03	3.88E-04	2.19E-08	2.24E-07	1.70E-04	1.19E-03	8.29E-03
Int. abs. dose fish	mGy/d	7.44E-04	2.14E-05	1.13E-04	4.73E-04	2.15E-04	9.22E-05	2.53E-02	8.75E-06	7.72E-06	3.22E-04	2.73E-02
Int. abs dose plant	mGy/d	7.92E-03	6.11E-04	3.23E-03	3.28E-03	1.50E-03	2.68E-04	3.34E-03	2.50E-04	5.36E-05	9.18E-03	2.96E-02
Int. abs dose benthos	mGy/d	4.30E-04	2.72E-05	1.44E-04	4.26E-04	1.94E-04	3.90E-04	1.34E-02	1.11E-05	6.95E-06	4.08E-04	1.54E-02
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. . dose fish	mGy/d	7.45E-03	8.34E-04	1.14E-03	4.75E-03	7.85E-03	4.80E-04	2.53E-01	8.77E-05	1.78E-04	4.42E-03	2.80E-01
γ eq. dose plant	mGy/d	7.93E-02	1.42E-03	3.23E-02	3.29E-02	2.06E-02	6.55E-04	3.34E-02	2.50E-03	2.24E-04	9.30E-02	2.96E-01
γ eq. . dose benthos	mGy/d	4.31E-03	1.65E-03	1.44E-03	4.30E-03	1.33E-02	1.17E-03	1.34E-01	1.11E-04	3.47E-04	6.47E-03	1.67E-01

Ecological Dose Calculations - Riparian Wildlife - Lake Huron (Serpent Harbour)

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	Th-228+	TOTAL
Water conc.	Bq/L	0.0246	0.0079	0.0079	0.013	0.0130	0.0179	0.0089	0.0007	0.0007	0.0030	
Sed to water PC	L/kg (dw)	31500	49200	49200	47738	47738	34733	69466	49200	47738	49200	
Sediment conc.	Bq/kg (dw)	774.9	387.45	387.45	620.6	620.6	620.6	620.6	35	35	150	
Sediment conc.	Bq/kg (ww)	77	39	39	62	62	62	62	4	4	15	
Wat to fish BAF	L/kg (fw)	478	218	218	540	-	861	-	218	540	218	
Fish tissue conc.	Bq/kg (fw)	11.76	1.72	1.72	7.02	0.702	15.38	338.45	0.16	0.40	0.66	
Wat to aquatic plant BAF	L/kg (fw)	5090	6215	6215	3748	-	2499	-	6215	3748		
Aquatic plant conc.	Bq/kg (fw)	125.21	48.94	48.94	48.72	4.87	44.65	44.65	4.42	2.75	18.95	
Wat to benthos BAF	L/kg (fw)	276	276	276	486	-	3643	20000	276	486	276	
Benthos conc.	Bq/kg (fw)	6.79	2.17	2.17	6.32	0.63	65.09	178.68	0.20	0.36	0.84	
Ing. TF mallard	d/kg	0.008	0.050	0.050	0.046	-	0.162	4.62	0.050	0.046	0.050	
Ing. TF scaup	d/kg	0.008	0.496	0.496	0.423	-	0.162	4.62	0.496	0.423	0.496	
Ing. TF merganser	d/kg	0.163	4.89	4.89	3.91	-	1.99	5.45	4.894	3.910	4.894	
Ing. TF muskrat	d/kg	0.077	0.031	0.031	0.694	-	0.462	0.540	0.031	0.694	0.031	
Ing. TF mink	d/kg	0.080	0.032	0.032	0.717	-	0.478	0.558	0.032	0.717	0.032	
Int. DCF tissue	Gy/a per Bq/kg (fw)	2.31E-05	4.56E-06	2.41E-05	2.46E-05	1.12E-04	2.19E-06	2.73E-05	2.06E-05	7.12E-06	1.77E-04	
Ext. DCF sediment	Gy/a per Bq/kg (ww)	5.40E-08	1.53E-05	5.35E-08	2.4E-07	6.70E-05	4.56E-06	2.58E-10	4.67E-08	3.55E-05	5.81E-05	
Ext. dose sediment (OF_s .5)	mGy/d	2.86E-06	4.06E-04	1.42E-06	1.02E-05	2.85E-03	1.94E-04	1.10E-08	1.12E-07	8.51E-05	5.97E-04	4.14E-03
Int. abs. dose mallard	mGy/d	7.76E-06	4.02E-06	2.13E-05	2.02E-05	2.76E-05	5.83E-06	2.08E-03	1.64E-06	3.29E-07	6.04E-05	2.23E-03
Int. abs. dose scaup	mGy/d	5.19E-07	2.60E-06	1.37E-05	2.74E-05	3.75E-05	6.74E-06	6.41E-03	1.06E-06	4.48E-07	3.90E-05	6.54E-03
Int. abs. dose merganser	mGy/d	2.08E-05	1.94E-05	1.02E-04	3.20E-04	4.38E-04	3.10E-05	2.29E-02	7.91E-06	5.23E-06	2.91E-04	2.41E-02
Int. abs. dose muskrat	mGy/d	2.88E-04	9.12E-06	4.82E-05	1.18E-03	1.62E-03	6.54E-05	9.52E-04	3.72E-06	1.93E-05	1.37E-04	4.32E-03
Int. abs. dose mink	mGy/d	1.31E-05	2.04E-07	1.08E-06	7.88E-05	1.08E-04	9.22E-06	2.69E-03	8.31E-08	1.29E-06	3.06E-06	2.91E-03
RBE alpha	-	10	1	10	10	10	1	10	10	1	10	
γ eq. dose mallard	mGy/d	8.05E-05	4.10E-04	2.14E-04	2.12E-04	3.12E-03	2.00E-04	2.08E-02	1.65E-05	8.54E-05	1.20E-03	2.63E-02
γ eq. dose scaup	mGy/d	8.06E-06	4.09E-04	1.39E-04	2.84E-04	3.22E-03	2.01E-04	6.41E-02	1.07E-05	8.56E-05	9.87E-04	6.94E-02
γ eq. dose merganser	mGy/d	2.11E-04	4.25E-04	1.03E-03	3.21E-03	7.22E-03	2.25E-04	2.29E-01	7.92E-05	9.03E-05	3.51E-03	2.45E-01
γ eq. dose muskrat	mGy/d	2.88E-03	8.21E-04	4.85E-04	1.19E-02	2.19E-02	4.53E-04	9.52E-03	3.75E-05	1.90E-04	2.56E-03	5.07E-02
γ eq. dose mink	mGy/d	1.37E-04	8.12E-04	1.36E-05	8.08E-04	6.77E-03	3.97E-04	2.69E-02	1.05E-06	1.71E-04	1.22E-03	3.73E-02

		Mallard	Scaup	Merganser	Muskrat	Mink		Moose
Body weight	kg	1.134	0.815	1.723	1.415	1.354		400
Ing. water	L/d	0.065	0.051	0.085	0.135	0.142		21.8
Ing. sediment	kg/d (dw)	0.00126	0.00102	0.00017	0.00744	0.000475		0.057
Ing. plant	kg/d (fw)	0.252			0.425			3.3
Ing. benthos	kg/d (fw)		0.204					
Ing. fish	kg/d (fw)			0.331		0.19		
Occupancy factor	-	0.5	0.5	0.5	1.0	1.0		1.0

Human Dose Calculations - Generic Adult - Lake Huron (Serpent Harbour)

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0246	0.0079	0.0079	0.013	0.013	0.0179	0.0089	0.0007	0.0007	0.0030	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.280	0.041	0.041	0.248	0.025	0.544	1.536	0.004	0.014	0.016	
Moose wb conc.	Bq/kg (fw)	0.50	0.07	0.20	1.98	0.60	1.23	1.43	0.02	0.11	0.08	
Moose meat conc.	Bq/kg (fw)	0.25	0.05	0.13	0.73	0.22	0.47	0.84	0.01	0.04	0.05	
Mallard duck wb conc.	Bq/kg (fw)	0.12	0.32	0.32	0.30	0.09	0.97	27.81	0.03	0.02	0.12	
Mallard duck meat conc.	Bq/kg (fw)	0.06	0.20	0.20	0.11	0.03	0.37	16.41	0.02	0.01	0.08	
Ingestion rate water	L/a	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	547.5	
Ingestion rate fish	kg/a	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	
Ingestion rate moose	kg/a	1	1	1	1	1	1	1	1	1	1	
Ingestion rate mallard	kg/a	1	1	1	1	1	1	1	1	1	1	
Exposure via water	Bq/a	13.47	4.31	4.31	7.12	7.12	9.78	4.89	0.39	0.40	1.67	
Exposure via fish	Bq/a	0.82	0.12	0.12	0.73	0.07	1.59	4.48	0.01	0.04	0.05	
Exposure via moose	Bq/a	0.25	0.05	0.13	0.73	0.22	0.47	0.84	0.01	0.04	0.05	
Exposure via mallard	Bq/a	0.06	0.20	0.20	0.11	0.03	0.37	16.41	0.02	0.01	0.08	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	6.33E-04	1.47E-05	9.05E-04	1.99E-03	1.78E-06	6.76E-03	5.87E-03	8.96E-05	2.77E-04	1.20E-04	1.67E-02
Dose via fish	mSv/a	3.85E-05	4.06E-07	2.51E-05	2.03E-04	1.81E-08	1.10E-03	5.38E-03	2.48E-06	2.82E-05	3.33E-06	6.78E-03
Dose via moose	mSv/a	1.18E-05	1.57E-07	2.67E-05	2.06E-04	5.51E-08	3.22E-04	1.01E-03	2.65E-06	2.86E-05	3.55E-06	1.61E-03
Dose via mallard	mSv/a	2.88E-06	6.89E-07	4.26E-05	3.10E-05	8.31E-09	2.55E-04	1.97E-02	4.21E-06	4.31E-06	5.65E-06	2.00E-02
Total ingestion dose	mSv/a	6.86E-04	1.59E-05	1.00E-03	2.43E-03	1.86E-06	8.44E-03	3.19E-02	9.89E-05	3.38E-04	1.33E-04	4.51E-02

Human Dose Calculations - SRFN Adult - Lake Huron (Serpent Harbour)

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0246	0.0079	0.0079	0.013	0.013	0.0179	0.0089	0.0007	0.0007	0.0030	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.280	0.041	0.041	0.248	0.025	0.544	1.536	0.004	0.014	0.016	
Moose wb conc.	Bq/kg (fw)	0.50	0.07	0.20	1.98	0.60	1.23	1.43	0.02	0.11	0.08	
Moose meat conc.	Bq/kg (fw)	0.25	0.05	0.13	0.73	0.22	0.47	0.84	0.01	0.04	0.05	
Mallard duck wb conc.	Bq/kg (fw)	0.12	0.32	0.32	0.30	0.09	0.97	27.81	0.03	0.02	0.12	
Mallard duck meat conc.	Bq/kg (fw)	0.06	0.20	0.20	0.11	0.03	0.37	16.41	0.02	0.01	0.08	
Ingestion rate water	L/a	506.438	506.438	506.438	506.438	506.438	506.438	506.438	506.438	506.438	506.438	
Ingestion rate fish	kg/a	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	
Ingestion rate moose	kg/a	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	
Ingestion rate mallard	kg/a	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	
Exposure via water	Bq/a	12.46	3.99	3.99	6.58	6.58	9.05	4.52	0.36	0.37	1.54	
Exposure via fish	Bq/a	2.35	0.34	0.34	2.08	0.21	4.56	12.87	0.03	0.12	0.13	
Exposure via moose	Bq/a	0.61	0.11	0.31	1.78	0.53	1.13	2.04	0.03	0.10	0.12	
Exposure via mallard	Bq/a	0.01	0.05	0.05	0.03	0.01	0.09	3.95	0.00	0.00	0.02	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	5.86E-04	1.36E-05	8.38E-04	1.84E-03	1.65E-06	6.26E-03	5.43E-03	8.29E-05	2.56E-04	1.11E-04	1.54E-02
Dose via fish	mSv/a	1.10E-04	1.17E-06	7.21E-05	5.83E-04	5.20E-08	3.15E-03	1.54E-02	7.13E-06	8.10E-05	9.57E-06	1.95E-02
Dose via moose	mSv/a	2.86E-05	3.81E-07	6.47E-05	4.97E-04	1.33E-07	7.80E-04	2.44E-03	6.40E-06	6.91E-05	8.59E-06	3.90E-03
Dose via mallard	mSv/a	6.93E-07	1.66E-07	1.02E-05	7.46E-06	2.00E-09	6.14E-05	4.74E-03	1.01E-06	1.04E-06	1.36E-06	4.82E-03
Total ingestion dose	mSv/a	7.25E-04	1.53E-05	9.85E-04	2.93E-03	1.83E-06	1.02E-02	2.81E-02	9.74E-05	4.07E-04	1.31E-04	4.36E-02

Human Dose Calculations - SRFN Adult - Lake Huron (Serpent Harbour)

Parameter	Units	U238/234	TH234+	TH230	RA226	RN222+	PB210+	PO210	TH232	RA228+	TH228+	TOTAL
Water conc.	Bq/L	0.0246	0.0079	0.0079	0.013	0.013	0.0179	0.0089	0.0007	0.0007	0.0030	
Wat to fish BAF	L/kg (fw)	11.4	5.2	5.2	19.1	-	30.5	171.9	5.2	19.1	5.2	
Sport fish tissue conc.	Bq/kg (fw)	0.280	0.041	0.041	0.248	0.025	0.544	1.536	0.004	0.014	0.016	
Moose wb conc.	Bq/kg (fw)	0.50	0.07	0.20	1.98	0.60	1.23	1.43	0.02	0.11	0.08	
Moose meat conc.	Bq/kg (fw)	0.25	0.05	0.13	0.73	0.22	0.47	0.84	0.01	0.04	0.05	
Mallard duck wb conc.	Bq/kg (fw)	0.12	0.32	0.32	0.30	0.09	0.97	27.81	0.03	0.02	0.12	
Mallard duck meat conc.	Bq/kg (fw)	0.06	0.20	0.20	0.11	0.03	0.37	16.41	0.02	0.01	0.08	
Ingestion rate water	L/a	540.93	540.93	540.93	540.93	540.93	540.93	540.93	540.93	540.93	540.93	
Ingestion rate fish	kg/a	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27	9.27	
Ingestion rate moose	kg/a	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	
Ingestion rate mallard	kg/a	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	
Exposure via water	Bq/a	13.31	4.26	4.26	7.03	7.03	9.67	4.83	0.38	0.40	1.65	
Exposure via fish	Bq/a	2.60	0.38	0.38	2.30	0.23	5.04	14.24	0.03	0.13	0.15	
Exposure via moose	Bq/a	0.61	0.11	0.31	1.78	0.53	1.13	2.04	0.03	0.10	0.12	
Exposure via mallard	Bq/a	0.02	0.08	0.08	0.04	0.01	0.14	6.07	0.01	0.00	0.03	
Ingestion DCF adult	Sv/Bq	4.70E-08	3.40E-09	2.10E-07	2.80E-07	2.50E-10	6.91E-07	1.20E-06	2.30E-07	6.90E-07	7.20E-08	
Dose via water	mSv/a	6.25E-04	1.45E-05	8.95E-04	1.97E-03	1.76E-06	6.68E-03	5.80E-03	8.85E-05	2.74E-04	1.19E-04	1.65E-02
Dose via fish	mSv/a	1.22E-04	1.29E-06	7.97E-05	6.45E-04	5.75E-08	3.49E-03	1.71E-02	7.89E-06	8.96E-05	1.06E-05	2.15E-02
Dose via moose	mSv/a	2.86E-05	3.81E-07	6.47E-05	4.97E-04	1.33E-07	7.80E-04	2.44E-03	6.40E-06	6.91E-05	8.59E-06	3.90E-03
Dose via mallard	mSv/a	1.07E-06	2.55E-07	1.58E-05	1.15E-05	3.07E-09	9.45E-05	7.28E-03	1.56E-06	1.59E-06	2.09E-06	7.41E-03
Total ingestion dose	mSv/a	7.77E-04	1.64E-05	1.05E-03	3.12E-03	1.95E-06	1.10E-02	3.26E-02	1.04E-04	4.34E-04	1.40E-04	4.93E-02