Unit 13 Calcite Business Centre
151 Industrial Road
Whitehorse, YT, Y1A 6S1, Canada
Tel: 604-759-0860 Fax: 604-759-0861
Toll Free: 866-684-8894
www.capstonemining.com

December 18, 2013

Adam Wrench,
Designated Office Manager
Yukon Environmental and Socio-economic Assessment Board

PO Box 297
Mayo, YT Y0B 1M0

Dear Mr. Wrench

Minto Explorations Ltd is pleased to provide this response to your request for additional information conveyed in your email of December 4, 2013.

Reverse Osmosis Effluent Concentration

RO Effluent mean concentration, standard deviation, number of samples and % non-detect for licenced COCs (TSS, Ammonia, NO2, NO3, Phosphorous, Arsenic, Cadmium, Copper, Iron, Lead, Molybdenum, Nickel, Selenium, Zinc) and modifying factors (hardness, pH, organic carbon).

Response:

Attachment #1 includes these results for monitored parameters for 2012 and 2013. DOC is not a licenced parameter, and therefore there are no results for RO effluent.

Drainage Areas for MC1 and W2

Response:

Attachment #2 includes these catchment areas (as well as the catchment area for station W3) in the form of a map.

Flow Statistics

Flow statistics at MC1 and W2: monthly mean flow, standard deviation and number of samples.

Response:

Attachment #3 includes the Minto Creek Baseline Hydrology Report for the Phase V/VI Project Proposal, which includes available hydrological results for these stations.

Background Concentrations

Background monthly concentrations for licenced COCs (TSS, Ammonia, NO2, NO3, Phosphorous, Arsenic, Cadmium, Copper, Iron, Lead, Molybdenum, Nickel, Selenium, Zinc) and modifying factors (hardness, pH, organic carbon), for:

- *Upper Minto Creek*
- *Lower Minto Creek*

Response:

These data have been included in Attachment #4 for each of the 2010 and 2012 background datasets provided in the Minto Creek Surface Water Quality Characterization Report.

Predicted Concentrations

Predicted Expected and Worst Case WSP monthly concentrations for licenced COCs (TSS, Ammonia, NO2, NO3, Phosphorous, Arsenic, Cadmium, Copper, Iron, Lead, Molybdenum, Nickel, Selenium, Zinc) and modifying factors (hardness, pH, organic carbon) during operations.

Response:

Attachment #5 includes predicted parameters for Expected and Worst Case scenarios for station W3, as presented in Appendix K-B in the Project Proposal. These predictions are analogous to predicted WSP concentrations. Modifying factors were not predicted in the water quality prediction exercise, but the actual observed concentrations of these parameters in the WSP are the best reflection of predicted future conditions, and are presented as well in Attachment #5.

We trust this response meets your needs. If you have any additional questions, please contact me at mhaefele@capstonemining.com or (604) 424-8379.

Sincerely

Martin Haefele
Permitting Manager
Capstone Mining

Attachment #1

Minto Water RO Water Treatment Effluent Quality Results (2012 - 2013) and Summary Statistics

Station Name		WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product
Sample Date		24/04/2012	25/04/2012	30/04/2012	08/05/2012	11/05/2012	12/05/2012	13/05/2012	14/05/2012	15/05/2012	16/05/2012	20/05/2012	21/05/2012	22/05/2012	23/05/2012	24/05/2012	25/05/2012
pH-L	pH units	6.69	6.35	7.38	7.57	7.85	7.73	7.67	7.39	7.39	7.41	7.37	7.44	7.49	7.59	7.82	7.67
TSS	mg/L	1.1	0.5	3.7	0.5	0.5	0.5	0.5	0.5	1.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ammonia	mg/L	0.025	0.015	0.024	0.11	0.032	0.026	0.032	0.025	0.028	0.028	0.022	0.033	0.032	0.047	0.1	0.032
Cond-L	µS/cm	51.5	23.8	54.5	82.8	103	79.7	74.6	41.9	119	63.1	50.8	57.4	56.7	60.2	157	77.8
Hard-D	mg/L	16.1	5.74	1.63	0.7	6.36	2.1	2.6	1.08	42	8.21	2.03	4.38	2.83	2.48	36.4	4.81
Hard-T	mg/L	17.7	5.45	0.54	2.56	6.32	2.06	2.44	1.08	40.2	8.21	1.91	4.42	2.87	2.57	36.3	4.77
TDS	mg/L	32	12	24	44	54	46	54	28	80	46	26	34	30	32	94	48
NO2+NO3	mg/L	1.76	1.16	0.699	0.709	1.25	1	1.37	1.07	3.64	1.46	1.22	1.53	1.51	1.46	3.71	1.63
N-NO2	mg/L	0.0025	0.0025	0.0025	0.0025	0.0059	0.0025	0.0025	0.0025	0.0131	0.0056	0.0025	0.0054	0.0065	0.0068	0.0142	0.0063
N-NO3	mg/L	1.76	1.16	0.699	0.709	1.24	1	1.37	1.07	3.62	1.45	1.22	1.52	1.5	1.45	3.7	1.62
P-PO4-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0052	0.0025	0.0025	0.007	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Alk-T	mg/L	7.91	3.19	24	39.3	45.9	36.7	34	16.9	25.6	20.6	21.7	21.3	23.6	21.6	40	29.5
Alk-P	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-OH	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-Carb	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-Bicrb	mg/L	9.65	3.89	29.2	48	56	44.8	41.5	20.7	31.2	25.1	26.5	26	28.8	26.4	48.8	36
SO4-D	mg/L	4.89	1.47	0.25	0.25	2.52	0.25	0.25	0.25	13.6	3.02	0.25	0.63	0.25	0.25	10.9	0.72
Chloride	mg/L	1.5	0.2500	0.2500	0.2500	1.9	0.94	1.1	0.87	1.5	1.5	0.57	1.5	1.3	1.7	6.1	1.7
Fluoride	mg/L	0.03	0.015	0.011	0.005	0.016	0.012	0.011	0.005	0.093	0.018	0.005	0.013	0.01	0.011	0.044	0.013
Ag-T	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Al-T	mg/L	0.0186	0.0068	0.0015	0.0205	0.0275	0.0151	0.0137	0.0033	0.0132	0.0114	0.0015	0.005	0.0074	0.0146	0.0102	0.0044
As-T	mg/L	0.00012	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00016	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Ba-T	mg/L	0.0092	0.0028	0.0005	0.0016	0.0049	0.0047	0.0047	0.0005	0.0214	0.0056	0.0012	0.003	0.0022	0.0043	0.018	0.0029
Be-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bi-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
B-T	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cd-T	mg/L	0.000073	0.000012	0.000005	0.000005	0.000019	0.000005	0.000005	0.000005	0.000005	0.000214	0.000005	0.000005	0.000005	0.000093	0.000005	0.000005
Co-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cr-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0024	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cu-T	mg/L	0.00238	0.00034	0.0001	0.00066	0.00353	0.00159	0.00247	0.00026	0.0117	0.00222	0.00028	0.00061	0.00071	0.00283	0.00212	0.00072
Fe-T	mg/L	0.0566	0.0054	0.0025	0.006	0.0248	0.0245	0.0205	0.0025	0.0205	0.0128	0.0025	0.0025	0.0081	0.0158	0.0025	0.0025
Hg-T	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
K-T	mg/L	0.672	0.391	0.549	0.987	1.34	0.975	1.01	0.832	1.08	0.928	0.719	0.875	0.77	1.03	1.45	0.919
Li-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Mg-T	mg/L	1.47	0.466	0.051	0.163	0.52	0.16	0.173	0.078	3.38	0.679	0.154	0.344	0.21	0.18	2.99	0.376
Mn-T	mg/L	0.0108	0.0032	0.0005	0.0014	0.004	0.0018	0.0018	0.0005	0.0239	0.005	0.0011	0.0025	0.0016	0.0019	0.0206	0.0026
Mo-T	mg/L	0.0014	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0029	0.0005	0.0005	0.0005	0.0005	0.0005	0.0024	0.0005
Na-T	mg/L	2.94	1.79	11.7	11.7	20.4	17.2	15.8	8.56	4.51	9.49	9.75	10.1	10.2	11.6	15.9	14.6
Ni-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Pb-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00089	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001
P-T	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sb-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Se-T	mg/L	0.00042	0.00013	0.00005	0.00005	0.00013	0.00005	0.00005	0.00005	0.00074	0.00017	0.00005	0.00005	0.00005	0.00005	0.00073	0.00005
Si-T	mg/L	0.4	0.189	0.05	0.102	0.171	0.05	0.107	0.05	0.763	0.17	0.05	0.132	0.106	0.102	0.694	0.139
Sn-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Sr-T	mg/L	0.104	0.0328	0.0024	0.0128	0.0348	0.0103	0.0125	0.0053	0.232	0.0474	0.0108	0.0244	0.0157	0.0127	0.202	0.0263
S-T	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	4.7	1.5	1.5	1.5	1.5	1.5	4.1	1.5
Ti-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Tl-T	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
U-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00041	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
V-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zn-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0069	0.0025	0.0025	0.0084	0.0025	0.0077	0.0025	0.0025	0.0025	0.0116	0.0025	0.0025
Zr-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Ag-D	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Al-D	mg/L	0.0076	0.0015	0.0034	0.003	0.0088	0.0046	0.0055	0.0015	0.0289	0.0044	0.0015	0.0015	0.0015	0.0083	0.0081	0.0015
As-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00018	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.00005
Ba-D	mg/L	0.0083	0.003	0.0005	0.0005	0.0048	0.0045	0.0049	0.0005	0.0232	0.0055	0.0013	0.0028	0.0022	0.0039	0.0179	0.0029
B-D	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Be-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Bi-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Ca-D	mg/L	4.24	1.51	0.155	0.185	1.72	0.583	0.737	0.302	11.3	2.22	0.556	1.18	0.781	0.708	9.69	1.3
Cd-D	mg/L	0.000005	0.000005	0.000036	0.000005	0.00002	0.000005	0.000005	0.000005	0.000012	0.000228	0.000005	0.000005	0.000005	0.000098	0.000012	0.000013
Co-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cr-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cu-D	mg/L	0.00065	0.00021	0.0001	0.00114	0.00239	0.00071	0.00074	0.0001	0.0206	0.00179	0.00025	0.00051	0.00042	0.00211	0.00199	0.00056
Hg-D	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
K-D	mg/L	0.64	0.386	0.564	0.929	1.31	0.948	1.05	0.859	1.12	0.881	0.709	0.828	0.759	0.972	1.43	0.923
Li-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Mg-D	mg/L	1.34	0.48	0.134	0.057	0.501	0.157	0.184	0.079	3.35	0.65	0.155	0.345	0.214	0.173	2.95	0.381
Mn-D	mg/L	0.0087	0.0031	0.0013	0.0005	0.0035	0.0015	0.0015	0.0005	0.0257	0.0048	0.0012	0.0025	0.0015	0.0016	0.021	0.0027
Mo-D	mg/L	0.0012	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0029	0.0005	0.0005	0.0005	0.0005	0.0005	0.0025	0.0005
Na-D	mg/L	2.79	1.81	14.2	18.8	20.2	16.9	16.9	8.53	4.54	9.07	9.59	9.97	10.6	11.2	16.1	15.1
Ni-D	mg/L	0.0005	0.0005	0.0014	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Pb-D	mg/L	0.0001	0.0001	0.00041	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00026	0.0001	0.0001	0.0001	0.0001
P-D	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sb-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
S-D	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	4.7	1.5	1.5	1.5	1.5	1.5	4.7	1.5
Se-D	mg/L	0.00041	0.00013	0.00005	0.00005	0.00014	0.00005	0.00005	0.00005	0.00092	0.00014	0.00005	0.00005	0.00005	0.00005	0.00077	0.00005
Si-D	mg/L	0.364	0.183	0.113	0.05	0.183	0.05	0.137	0.05	0.957	0.193	0.106	0.131	0.107	0.05	0.711	0.136
Sn-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Sr-D	mg/L	0.0966	0.0341	0.0046	0.0028	0.0346	0.0101	0.0129	0.0056	0.238	0.0464	0.0105	0.0243	0.0157	0.0129	0.205	0.0262
Ti-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Tl-D	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
U-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00044	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
V-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zn-D	mg/L	0.0025	0.0025	0.0137	0.0025	0.0072	0.0025	0.0025	0.0025	0.0025	0.0088	0.0025	0.0025	0.0025	0.0122	0.0025	0.0025
Zr-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025

indicates <detection result (1/2 detection limit applied)

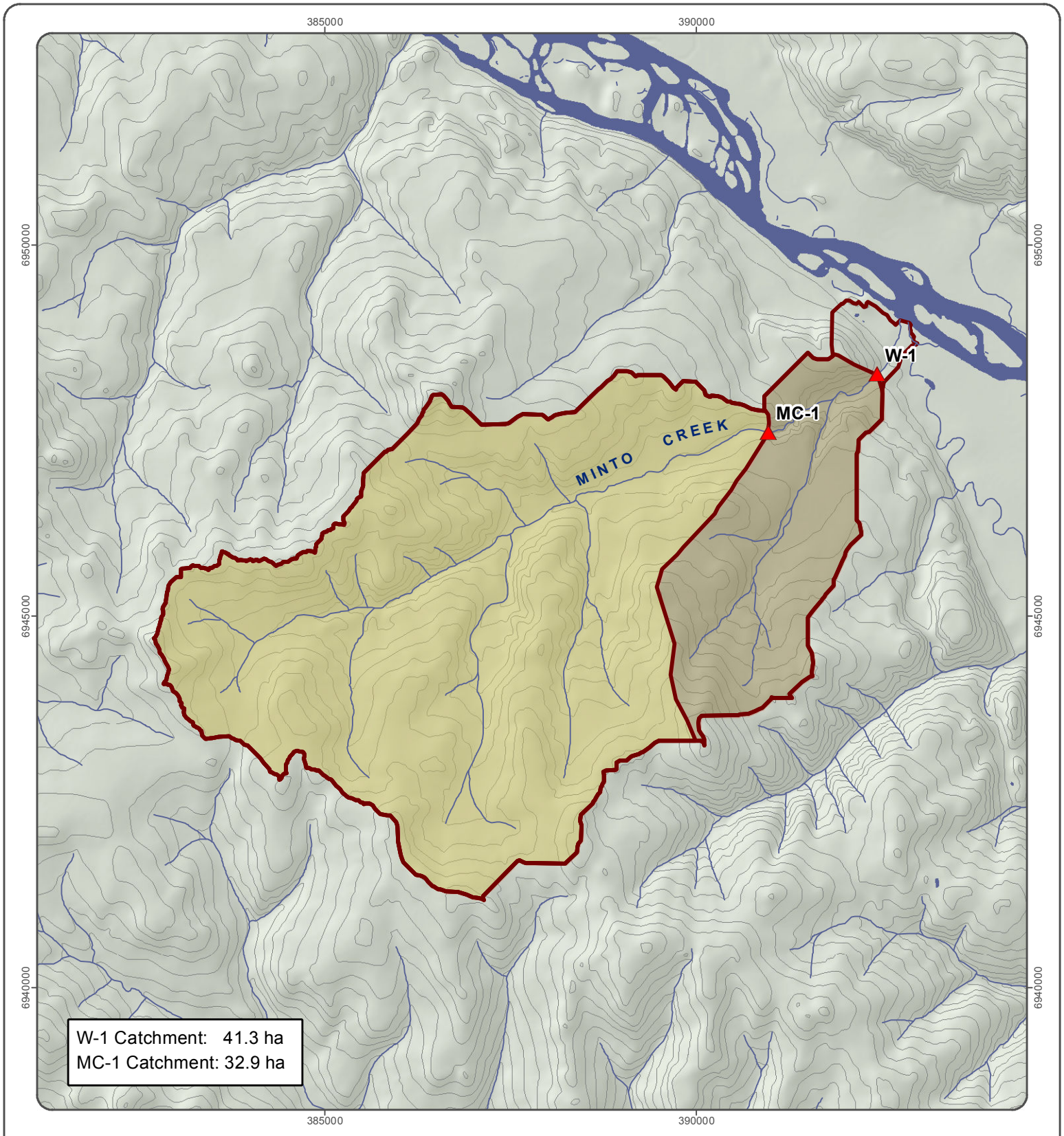
Minto Water RO Water Treatment Effluent Quality Results (2012 - 2013) and Summary Statistics

Station Name		WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product
Sample Date		26/05/2012	27/05/2012	28/05/2012	29/05/2012	31/05/2012	01/06/2012	02/06/2012	03/06/2012	04/06/2012	06/06/2012	07/06/2012	08/06/2012	09/06/2012	10/06/2012	11/06/2012	12/06/2012
pH-L	pH units	7.58	7.67	7.53	7.47	7.7	6.19	6.59	5.25	6.17	6.45	6.97	6.9	7.06	7.06	7.49	7.04
TSS	mg/L	0.5	1	1.9	0.5	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	1.1
Ammonia	mg/L	0.062	0.079	0.09	0.06	0.071	0.081	0.02	0.07	0.0058	0.04	0.022	0.013	0.035	0.035	0.035	0.031
Cond-L	µS/cm	74.4	102	93.9	51.7	159	19.7	26.7	36.4	22.1	21.5	89.4	36.9	48.8	79	130	51.8
Hard-D	mg/L	5.19	16.4	17.6	1.12	41.7	1.05	1.43	1.52	1.24	1.63	23.4	6.79	10.2	23.4	40.7	12.6
Hard-T	mg/L	4.97	16.2	17	1.15	38	1.04	1.38	1.48	1.26	1.64	22.8	5.73	8.9	19.8	38.3	12.5
TDS	mg/L	40	54	42	28	84	16	12	14	12	22	38	20	28	42	78	30
NO2+NO3	mg/L	1.56	2.41	1.79	1.37	3.87	1.53	1.59	1.58	1.82	1.36	2.94	1.7	2.36	3.07	3.45	2.23
N-NO2	mg/L	0.0055	0.008	0.0073	0.0025	0.0114	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0088	0.0103	0.0142	0.0087
N-NO3	mg/L	1.56	2.4	1.79	1.37	3.86	1.53	1.59	1.58	1.82	1.36	2.94	1.7	2.35	3.06	3.44	2.22
P-PO4-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Alk-T	mg/L	28.3	31.1	25.7	17.7	37.8	1.93	3.21	0.25	1.81	1.42	11	4.86	5.6	10.6	23.3	6.46
Alk-P	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-OH	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-Carb	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Alk-Bicrb	mg/L	34.5	38	31.4	21.5	46.1	2.36	3.92	0.25	2.21	1.73	13.4	5.93	6.83	13	28.5	7.88
SO4-D	mg/L	1.19	4.66	5.2	0.25	13.8	0.25	0.25	0.25	0.25	5.99	7.91	2.49	2.77	6.25	12.8	3.11
Chloride	mg/L	1.4	3	3.1	0.93	9.2	1.2	0.58	0.98	0.9	0.92	4	1.8	2.1	3.5	7.2	2.5
Fluoride	mg/L	0.016	0.03	0.03	0.011	0.052	0.005	0.005	0.01	0.005	0.005	0.033	0.016	0.019	0.037	0.057	0.023
Ag-T	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Al-T	mg/L	0.0491	0.153	0.0808	0.03	0.0604	0.0071	0.0108	0.0086	0.0069	0.0068	0.0615	0.0077	0.0122	0.0572	0.065	0.0335
As-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Ba-T	mg/L	0.0039	0.0092	0.0081	0.0005	0.0184	0.0005	0.0014	0.0013	0.001	0.0011	0.0107	0.0033	0.0043	0.0098	0.0169	0.0059
Be-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bi-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
B-T	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cd-T	mg/L	0.000005	0.000014	0.000005	0.000005	0.00003	0.000005	0.00001	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000014	0.000005	0.000037
Co-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cr-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cu-T	mg/L	0.00114	0.00361	0.00179	0.00058	0.00349	0.00023	0.00089	0.00055	0.00033	0.00054	0.00228	0.00088	0.00121	0.0023	0.00299	0.00219
Fe-T	mg/L	0.0063	0.0304	0.0079	0.0059	0.0205	0.0025	0.0097	0.0025	0.0025	0.0025	0.0104	0.0054	0.0025	0.0025	0.0071	0.0194
Hg-T	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
K-T	mg/L	0.856	1.07	1.06	0.757	1.47	0.578	0.61	0.614	0.629	0.548	1.39	0.868	0.979	1.06	2.08	0.923
Li-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Mg-T	mg/L	0.398	1.34	1.44	0.084	3.15	0.067	0.089	0.1	0.076	0.118	1.88	0.46	0.742	1.67	3.16	1.05
Mn-T	mg/L	0.003	0.01	0.0083	0.0005	0.0199	0.0005	0.0005	0.0005	0.0005	0.0005	0.0104	0.0027	0.0036	0.0069	0.0104	0.0027
Mo-T	mg/L	0.0005	0.0011	0.0012	0.0005	0.0026	0.0005	0.0005	0.0005	0.0005	0.0005	0.0015	0.0005	0.0005	0.0014	0.0033	0.0005
Na-T	mg/L	13.2	13.8	10.9	10.5	12.3	2.59	2.7	2.89	2.95	2.66	4.93	3.2	3.77	4.5	5.81	4.03
Ni-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Pb-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
P-T	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sb-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Se-T	mg/L	0.00012	0.00033	0.00033	0.00005	0.00083	0.00005	0.00005	0.00005	0.00005	0.00005	0.00055	0.00012	0.00017	0.0005	0.00083	0.00027
Si-T	mg/L	0.14	0.349	0.313	0.05	0.733	0.05	0.05	0.05	0.05	0.05	0.23	0.05	0.05	0.05	0.05	0.05
Sn-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Sr-T	mg/L	0.0286	0.0921	0.0957	0.0055	0.213	0.0052	0.0068	0.0079	0.0064	0.0084	0.127	0.0322	0.0535	0.116	0.216	0.0689
S-T	mg/L	1.5	1.5	1.5	1.5	3.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	4.7	1.5
Ti-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Tl-T	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
U-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00019	0.0001
V-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zn-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zr-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Ag-D	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Al-D	mg/L	0.016	0.0242	0.0143	0.0015	0.0472	0.0015	0.0065	0.0056	0.0046	0.0054	0.0143	0.0072	0.0118	0.0422	0.0501	0.0144
As-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005
Ba-D	mg/L	0.004	0.0092	0.008	0.0005	0.0199	0.0005	0.0014	0.0013	0.001	0.001	0.0107	0.0036	0.0047	0.0103	0.0168	0.0057
B-D	mg/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Be-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Bi-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Ca-D	mg/L	1.42	4.39	4.66	0.313	11	0.311	0.427	0.438	0.368	0.452	6.16	1.83	2.68	6.21	10.8	3.34
Cd-D	mg/L	0.000005	0.000005	0.000005	0.000005	0.000033	0.000005	0.00001	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000012	0.000005	0.00003
Co-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cr-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cu-D	mg/L	0.00068	0.00103	0.00119	0.0001	0.00293	0.0001	0.00063	0.00043	0.00026	0.00038	0.00177	0.0009	0.00167	0.00236	0.00232	0.00115
Hg-D	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
K-D	mg/L	0.898	1.17	1.13	0.753	1.6	0.588	0.624	0.639	0.662	0.569	1.4	1.08	1.11	1.25	2.16	0.917
Li-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Mg-D	mg/L	0.401	1.31	1.44	0.083	3.43	0.066	0.089	0.103	0.078	0.122	1.94	0.537	0.843	1.92	3.33	1.03
Mn-D	mg/L	0.0029	0.0094	0.0088	0.0005	0.0216	0.0005	0.0005	0.0005	0.0005	0.0005	0.0099	0.0028	0.0039	0.007	0.0094	0.0019
Mo-D	mg/L	0.0005	0.0012	0.0012	0.0005	0.0028	0.0005	0.0005	0.0005	0.0005	0.0005	0.0015	0.0005	0.0005	0.0016	0.0027	0.0005
Na-D	mg/L	13.6	13	11.3	10.7	13.3	2.63	2.77	2.99	3.07	2.75	5.02	3.74	4.24	5.22	6.28	3.92
Ni-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Pb-D	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
P-D	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sb-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
S-D	mg/L	1.5	1.5	1.5	1.5	5.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	4.8	1.5
Se-D	mg/L	0.00013	0.00033	0.00041	0.00005	0.00099	0.00005	0.00005	0.00005	0.00005	0.00005	0.0006	0.0001	0.0002	0.0006	0.00095	0.00026
Si-D	mg/L	0.147	0.374	0.324	0.05	0.8	0.05	0.05	0.05	0.05	0.05	0.24	0.05	0.05	0.05	0.05	0.05
Sn-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Sr-D	mg/L	0.0285	0.0947	0.1	0.0059	0.231	0.0053	0.007	0.0078	0.0065	0.0087	0.125	0.0374	0.056	0.127	0.219	0.0684
Ti-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Tl-D	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
U-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00017	0.00005
V-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zn-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zr-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025

Minto Water RO Water Treatment Effluent Quality Results (2012 - 2013) and Summary Statistics

Station Name		WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	WTP Product	Count	Count <detect	%<detect	Mean	SD
Sample Date		13/06/2012	14/06/2012	15/06/2012	22/06/2012	23/04/2013	02/05/2013	17/05/2013					
pH-L	pH units	6.49	6.47	6.35	6.83	7.5	7.82	7.93	39	0	0.0%	7.16	0.60
TSS	mg/L	1.6	1	0.5	30.6	0.5	1.1	0.5	39	27	69.2%	1.6	4.8
Ammonia	mg/L	0.031	0.015	0.038	0.31	0.023	0.055	0.083	39	0	0.0%	0.049	0.050
Cond-L	µS/cm	20.9	21.6	24.2	90.3	56.4	78.4	161	39	0	0.0%	67.9	38.9
Hard-D	mg/L	1.38	1.59	2.35	0.89	5.72	0.51	6.09	39	0	0.0%	9.33	12.21
Hard-T	mg/L	1.29	1.47	2.33	0.96	0.25	0.53	6.12	39	1	2.6%	8.83	11.64
TDS	mg/L	18	18	18	58	18	48	94	39	0	0.0%	39	23
NO2+NO3	mg/L	1.55	1.7	1.79	9.07	0.375	0.628	0.854	39	0	0.0%	1.943	1.452
N-NO2	mg/L	0.0025	0.006	0.0058	0.137	0.0025	0.0025	0.0105	39	19	48.7%	0.0088	0.0214
N-NO3	mg/L	1.55	1.7	1.78	8.94	0.375	0.628	0.843	39	0	0.0%	1.935	1.434
P-PO4-T	mg/L	0.0025	0.0025	0.0025	0.0025				36	34	94.4%	0.0027	0.0009
Alk-T	mg/L	1.7	2.02	1.55	3.84	29.8	40.1	79.9	39	1	2.6%	20.0	16.9
Alk-P	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	39	39	100.0%	0.25	0
Alk-OH	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	39	39	100.0%	0.25	0
Alk-Carb	mg/L	0.25	0.25	0.25	0.25	0.25	0.25	0.25	39	39	100.0%	0.25	0
Alk-Bicrb	mg/L	2.07	2.46	1.89	4.69	36.4	48.9	97.5	39	1	2.6%	24.5	20.7
SO4-D	mg/L	0.57	0.61	0.8	0.25	0.53	0.56	4.31	39	14	35.9%	2.94	3.96
Chloride	mg/L	0.96	0.82	0.95	1.7	0.71	1.2	1.7	39	3	7.7%	1.9	1.9
Fluoride	mg/L	0.005	0.005	0.005	0.02	0.005	0.005	0.027	39	12	30.8%	0.019	0.018
Ag-T	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	39	39	100.0%	0.00001	8.58E-21
Al-T	mg/L	0.0189	0.0047	0.0053	0.228	0.0015	0.0015	0.0031	39	4	10.3%	0.028	0.044
As-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	39	36	92.3%	0.0001	0.00002
Ba-T	mg/L	0.0013	0.0011	0.0013	0.0005	0.0005	0.0005	0.0021	39	7	17.9%	0.0049	0.0055
Be-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	39	39	100.0%	0.00005	4.12E-20
Bi-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	39	100.0%	0.0005	3.30E-19
B-T	mg/L	0.025	0.025	0.025	0.132	0.025	0.025	0.025	39	38	97.4%	0.028	0.017
Cd-T	mg/L	0.000875	0.000017	0.000005	0.000005	0.000005	0.000005	0.000005	39	27	69.2%	0.000040	0.000142
Co-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19
Cr-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	38	97.4%	0.0005	0.0003
Cu-T	mg/L	0.00203	0.00089	0.00046	0.0023	0.0001	0.00025	0.00023	39	2	5.1%	0.00164	0.00197
Fe-T	mg/L	0.0245	0.0025	0.0025	0.0153	0.0025	0.0025	0.0025	39	17	43.6%	0.0103	0.0112
Hg-T	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	39	39	100.0%	0.000005	4.29E-21
K-T	mg/L	0.767	0.59	0.641	3.87	0.226	0.358	0.777	39	0	0.0%	0.955	0.590
Li-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Mg-T	mg/L	0.087	0.099	0.173	0.075	0.025	0.067	0.588	39	1	2.6%	0.726	0.972
Mn-T	mg/L	0.0013	0.0005	0.0015	0.0016	0.0005	0.0005	0.0026	39	11	28.2%	0.0044	0.0059
Mo-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	30	76.9%	0.0008	0.0007
Na-T	mg/L	2.76	2.84	3.05	14.3	8.8	18.3	16.5	39	0	0.0%	8.81	5.44
Ni-T	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	39	100.0%	0.0005	3.30E-19
Pb-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	39	37	94.9%	0.00012	0.00013
P-T	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	39	39	100.0%	0.005	2.64E-18
Sb-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19
Se-T	mg/L	0.00005	0.00005	0.00005	0.00021	0.00005	0.00005	0.00005	39	22	56.4%	0.00020	0.00024
Si-T	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	39	22	56.4%	0.15	0.19
Sn-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Sr-T	mg/L	0.0063	0.0079	0.0123	0.0073	0.0038	0.0041	0.109	39	0	0.0%	0.0518	0.0667
S-T	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	39	35	89.7%	1.8	0.9
Ti-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Tl-T	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	39	39	100.0%	0.000025	2.06E-20
U-T	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	39	36	92.3%	0.00006	0.00006
V-T	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Zn-T	mg/L	0.0107	0.0025	0.0098	0.0025	0.0025	0.0025	0.0025	39	33	84.6%	0.0035	0.0025
Zr-T	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19
Ag-D	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	39	39	100.0%	0.00001	8.58E-21
Al-D	mg/L	0.0076	0.0015	0.0038	0.0071	0.0015	0.0015	0.0015	39	12	30.8%	0.0098	0.0124
As-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	39	36	92.3%	0.00006	0.00002
Ba-D	mg/L	0.0005	0.0011	0.0017	0.0005	0.0011	0.0005	0.0022	39	8	20.5%	0.0049	0.0058
B-D	mg/L	0.025	0.025	0.025	0.148	0.025	0.025	0.025	39	38	97.4%	0.028	0.020
Be-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	39	39	100.0%	0.00005	4.12E-20
Bi-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	39	100.0%	0.0005	3.30E-19
Ca-D	mg/L	0.401	0.459	0.666	0.256	1.13	0.088	1.41	39	0	0.0%	2.47	3.25
Cd-D	mg/L	0.000937	0.000017	0.000005	0.000005	0.000005	0.000005	0.000005	39	26	66.7%	0.000041	0.000152
Co-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19
Cr-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	39	100.0%	0.0005	3.30E-19
Cu-D	mg/L	0.00155	0.00056	0.00033	0.0001	0.00086	0.0001	0.0001	39	7	17.9%	0.00143	0.00325
Hg-D	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	39	39	100.0%	0.000005	4.29E-21
K-D	mg/L	0.796	0.634	0.666	3.79	0.29	0.376	0.813	39	0	0.0%	0.980	0.585
Li-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Mg-D	mg/L	0.092	0.109	0.168	0.062	0.702	0.071	0.626	39	0	0.0%	0.762	0.997
Mn-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0054	0.0005	0.0025	39	13	33.3%	0.0044	0.0061
Mo-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	30	76.9%	0.0008	0.0007
Na-D	mg/L	2.9	3	3.15	13.9	7.35	19.2	17.4	39	0	0.0%	9.17	5.75
Ni-D	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	39	38	97.4%	0.00052	0.00014
Pb-D	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	39	37	94.9%	0.00011	0.00006
P-D	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	39	39	100.0%	0.005	2.64E-18
Sb-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19
S-D	mg/L	1.5	1.5	1.5	1.5	1.5	1.5	1.5	39	35	89.7%	1.8	1.0
Se-D	mg/L	0.00005	0.00005	0.00005	0.00011	0.00005	0.00005	0.00005	39	22	56.4%	0.00021	0.00028
Si-D	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	39	22	56.4%	0.16	0.21
Sn-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Sr-D	mg/L	0.0061	0.0081	0.012	0.0069	0.019	0.0039	0.107	39	0	0.0%	0.0531	0.0687
Ti-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Tl-D	mg/L	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	39	39	100.0%	0.000025	2.06E-20
U-D	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	39	37	94.9%	0.00006	0.00006
V-D	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	39	100.0%	0.0025	1.32E-18
Zn-D	mg/L	0.0126	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	39	34	87.2%	0.0036	0.0030
Zr-D	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	39	39	100.0%	0.00025	1.65E-19

Attachment #2



0 1 2 3 Kilometers

1:70,000 *When printed on 8 1/2 by 11 inch paper*

capstone MINTO MINE

MINTO MINE

MINTO CREEK STATION CATCHEMENTS

DECEMBER 2013

ACCESS

I:\Mintolgis\mxd\Overview_Maps\03-SpecificTopics\MintoCreekCatchments\Catchments_MonitoringStations_Dec2013.mxd

Attachment #3

SURFACE WATER HYDROLOGY BASELINE CONDITIONS

MINTO PHASE V/VI EXPANSION

June 2013

Prepared for:

MINTO EXPLORATIONS LTD.

EXECUTIVE SUMMARY

Streamflow data have been collected at several locations within Minto Creek since 1993. Clearwater Consultants Ltd. (CCL) provided two memoranda on Surface Water Hydrology Conditions, in 2006 and in 2010. Discharge records have been taken from those reports and updated to present. Hydrology data from 2010 were processed by CCL and data from 2011 and 2012 were processed by Access Consulting Group (ACG). In addition to Minto Creek, the catchment to the north has been monitored since 2009 to support development of the Minto North deposit, and is referred to as McGinty Creek. These data are also presented in this report.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

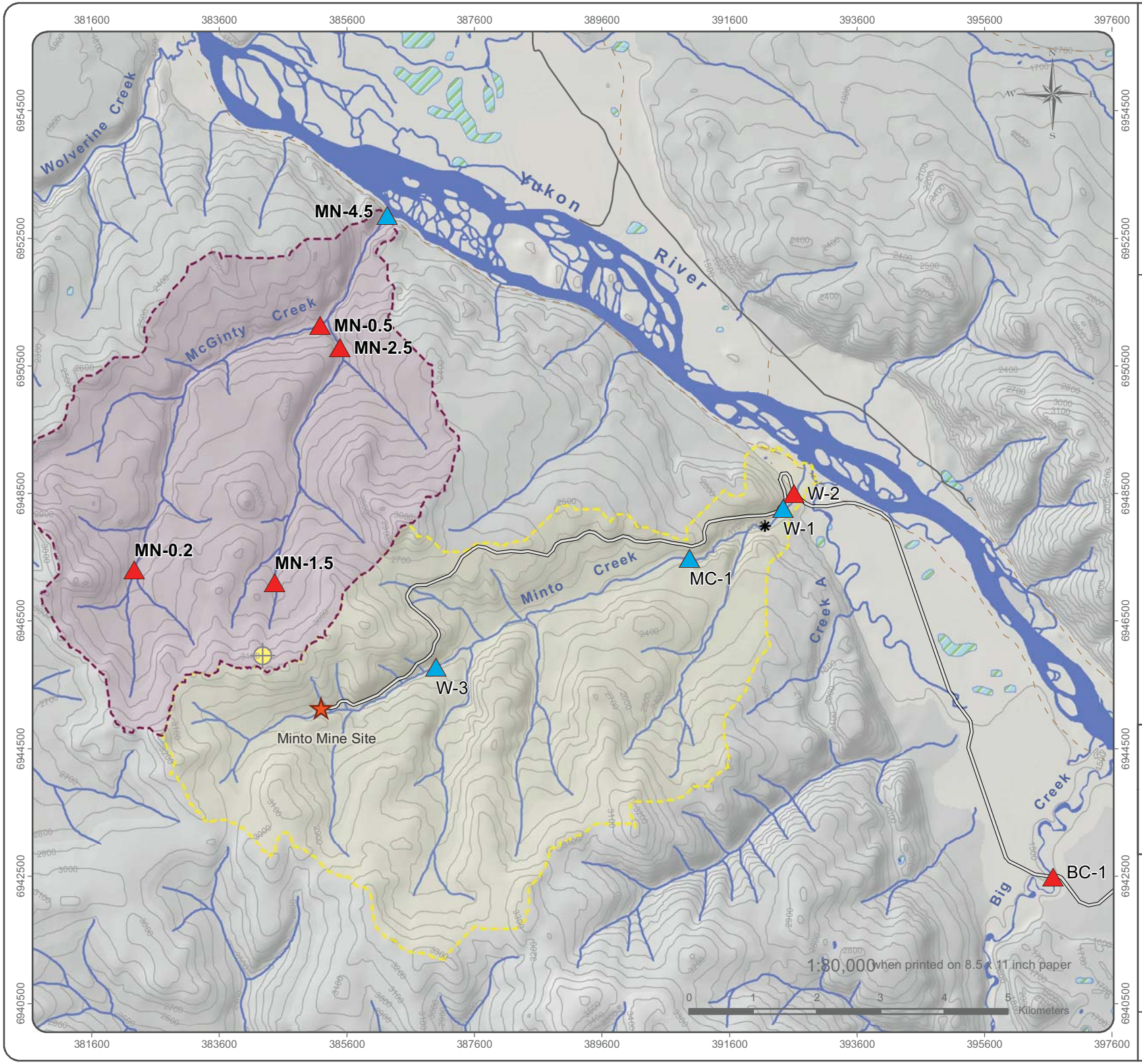
1 INTRODUCTION

The baseline surface hydrology of the Minto Creek watershed prior to mining activity was detailed in Clearwater Consultants Ltd. Memorandum CCL-MC6 "Minto Copper Project—Surface Water Hydrology Conditions" (Appendix A). CCL-MC6 also covered conditions during Mine Operations until 2009. This report updates CCL-MC6 by presenting those previous data, and data gathered since then until the end of the 2012 open water season. Additionally, this report includes the data since 2009 gathered in McGinty Creek, a catchment of similar size to Minto Creek, also draining into the Yukon River and located directly north of the Minto Creek catchment (Figure 1).

Hydrological data have been gathered by either Access Consulting Group (ACG) or Minto Mine (Minto) representatives. Data coverage from year to year varies, depending on when in situ dataloggers were installed and removed, and when instantaneous discharge measurements were taken. Instantaneous discharge is measured using the velocity-area method and a current meter. Solinst Water Leveloggers are used to collect continuous stage readings which are then corrected based on physical staff gauge measurements. The records are processed into continuous discharge based on the stage-discharge relationship. This relationship (stage and discharge) is established each season through rating measurements obtained during regular field visits to the sites.

The locations for which the greatest amount of data have been collected are stations W1, "Minto Creek near the mouth" (catchment area of 42 km^2); and W3, "Minto Creek downstream of water storage pond dam" (catchment area of 10.4 km^2 area). In 2010, another continuously monitored hydrometric site called MC1 was added, approximately 2 km upstream of W1. In 2011, data collection did not allow for processing of stage records into continuous discharge; however, improved monitoring allowed for successful processing in 2012.

There are five stations on McGinty Creek at which discharge is measured. In 2009, four stations were established including MN-4.5, MN-2.5, MN-1.5 and MN-0.5; in 2011 a fifth site, MN-0.2, was added (Figure 1). Continuous hydrometric data has been collected at MN-4.5 since 2009, and additional continuous logging instruments were added to stations MN-2.5 and MN-0.5 in late 2012. Processed continuous records from MN-4.5 are presented in this report.



MINTO MINE

SURFACE HYDROLOGY BASELINE REPORT

FIGURE 1
MINTO AND MCGINTY CREEK HYDROMETRIC MONITORING NETWORK

- Water Quality Station
- Hydrometric Station
- Obeserved Fish Barrier - Minto Creek
- Minto North Deposit
- Minto Access Road
- Limited-use road
- Trail
- Contours (ft)
- Watercourse
- Minto Creek Catchment
- McGuinty Creek Catchment
- Waterbody
- Wetland

Minto Explorations Ltd.
A SUBSIDIARY OF CAPSTONE MINING LTD.

ACCESS

I:\Minto\gis\mxd\Phase_5-6\Permitting\YESAB\Baseline-Appendices\Surface-Hydrology\MintoMcGintyHydrometricMonitoring_20130403.mxd
(Last edited by: mducharme;27/06/2013/12:03 PM)

2 CLIMATE

Minto is located in the subarctic continental climate zone (Köppen-Geiger climate classification), which is characterized by long, cold winters and short, cool summers (Peel et al. 2007). The area experiences moderate precipitation in the form of rain and snow and a wide range of temperatures on a yearly basis with a mean annual temperature below 0°C. Please see the *Minto Climate Baseline Report* (ACG 2012) for a detailed discussion of regional climate- and site-specific data.

3 STREAMFLOW

3.1 MINTO CREEK

Monitoring of hydrological parameters on Minto Creek began in 1993 and has continued intermittently to present at sites W1 and W3 (Figure 1). Monitoring has been more intensive since mine commissioning in 2007. W3 is an in-stream trapezoidal flume with a manufacturer-specified stage-discharge relationship. Both discharge and stage are read on an integrated gauge in the throat of the flume. A Solinst Levelogger record is calibrated with these field observations to process a continuous discharge record at this site. Sites MC1 and W1 are natural stream channels where manual velocity measurements are taken across the channel and discharge is calculated using the velocity area method. Continuous water levels from Solinst Leveloggers are processed into continuous discharge using these rating measurements. Updated mean monthly flows for W1 and W3 are presented in Table 1 and Table 2, respectively.

Table 1: Mean Monthly[1] Discharge (m^3/s) on Minto Creek at Station W1.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1993						0.069	
1994		0.312	0.058	0.095	0.007	0.073	
1995		0.027	0.001	0.091		0.133	
1996		0.031	0.024	0.324		0.146	
1997		1.447			0.265		
1998		0.161			0.003		
1999					0.033		
2000		1.004					
2001		0.467					
2002							
2003					0.129		
2004				0.118			
2005		0.097	0.012	0.127	0.209	0.219	0.134
2006	0.203	0.354	0.15	0.02	0.0068		0.031
2007	0.645	0.175	0.053	0.061	0.025	0.034	0.035
2008		0.117	0.015	0.026	0.184[2]	0.184[2]	0.026
2009		0.868	0.351[2]	0.249[2]	0.139[2]	0.026[2]	
2010[3]	0.560	0.081	0.038	0.106	0.118	0.125	0.092
2011[3]			0.229	0.200	0.200	0.082	
2012[3]		0.174	0.071	0.048	0.048	0.077	0.066
Mean							
Pre-mine 1993 to 2006	-[4]	0.433	0.049	0.129	0.093	0.128	0.083
Mining Period 2007 to 2012	-[4]	0.283	0.126	0.115	0.119	0.088	0.055
All Data 1993 to 2012	-[4]	0.380	0.091	0.122	0.105	0.106	0.064

[1]Monthly flows calculated by averaging all available flow data for a given month. Average flow in months with only a single spot flow measurement assumed equal to the spot flow measurement.
[2]Flows impacted by storage within, and emergency releases from, the Water Storage Pond in August and September 2008 and in June through October 2009.
[3]2010-2012 flows impacted by storage and/or release from the Water Storage Pond as evidenced by the discharge record at W3.
[4]Insufficient data for calculation.

Table 2: Mean Monthly[1] Discharge (m^3/s) on Minto Creek at Station W3.

	Apr	May	Jun	Jul	Aug	Sep	Oct
1993						0.028	
1994		0.101	0.028	0.039	0.011	0.028	
1995			0.0035	0.017		0.027	0.008
1996		0.013		0.087		0.021	
1997		0.554					
1998					0.006		
1999					0.006		
2000							
2001		0.16					
2002							
2003					0.037		
2004				0.026			
2005		0.046	0.008	0.014	0.017	0.022	0.02
2006	0.018	0.128	0.042	0.006	0.0149	0.0093	0.01
2007	0.0012	0.0118	0.0088	0.0062			
2008					0.064[2]	0.122[2]	0.003
2009			0.026[2]	0.106[2]	0.092[2]	0.124[2]	0.11
2010[3]	0.002	0.004	0.005	0.034	0.071	0.086	0.070
2011[3]			0.005	0.005	0.006	0.005	
2012[3]	0.004	0.020	0.003	0.004	0.004	0.004	0.004
Mean							
Pre-mine 1993 to 2006	-[4]	0.167	0.02	0.032	0.015	0.023	0.013
Mining Period 2007 to 2012	-[4]	0.012	0.010	0.031	0.047	0.068	0.047
All Data 1993 to 2012	-[4]	0.115	0.014	0.031	0.030	0.043	0.032

[1] Monthly flows calculated by averaging all available flow data for a given month. Average flow in months with only a single spot flow measurement assumed equal to the spot flow measurement.
[2] Flows impacted by storage within, and emergency releases from, the Water Storage Pond in August and September 2008 and in June through October 2009.
[3] 2010-2012 flows impacted by storage and/or release from the Water Storage Pond as evidenced by the discharge record at W3.
[4] Insufficient data for calculation.

Table 3 below shows the discharge data gathered to date at station MC1. Appendix B contains the available hydrographs from 2007–2012 for W1, W3, and MC1.

Table 3: Instantaneous (2011) and Mean Monthly Discharge (2012) (m^3/s) Measured on Minto Creek at Station MC1.

	Month					
	May	Jun	Jul	Aug	Sep	Oct
2011[1]					0.118	0.093
2012	0.153	0.059	0.048	0.038	0.096	

[1] 2011 data based on two spot flows in September and four in October.

3.2 MCGINTY CREEK

Instantaneous discharge readings gathered on McGinty Creek since 2009 are presented in Table 4. These numbers have been averaged to show the measured flow average during a given month (Table 5). Caution should be exercised in using these to represent the actual average monthly discharge. Comparison of the mean spot flows for MN-4.5 in Table 5 to the mean monthly flows calculated from the continuous discharge (Table 6), show that the mean spot flow measurements are higher. Dataloggers were installed at MN-2.5 and MN-0.5 late in the season therefore no continuous data are available at this time. Review of future continuous discharge records at these sites will provide better accounting of surface flows for McGinty Creek.

Table 4: Discharge Measurements (m^3/s) Taken on McGinty Creek since Monitoring Began in 2009.

	Site				
Date	**MN-0.2**	**MN-0.5**	**MN-1.5**	**MN-2.5**	**MN-4.5**
03/05/2009	-	0.630	0.024	0.488	-
06/05/2009	-	0.661	0.052	0.537	1.230
13/05/2009	-	0.299	0.023	0.151	0.435
21/05/2009	-	0.144	0.008	0.070	0.211
28/05/2009	-	0.040	0.009	0.069	0.118
25/06/2009	-	0.023	0.004	0.019	0.036
28/07/2009	-	0.012	0.002	0.007	0.002
29/08/2009	-	0.080	0.005	0.023	0.077
29/09/2009	-	-	-	0.012	0.007
23/10/2009	-	0.015	0.008	0.007	0.008
27/11/2009	-	0.021		0.003	-
21/04/2010	-	-	0.024	-	-
22/04/2010	-	-	-	-	0.796
28/05/2010	-	0.02	0.0002	0.007	0.025
28/06/2010	-	0.023	0.004	0.008	0.009
21/07/2010	-	-	0.008	0.023	0.041
15/09/2010	-	0.054	0.005	0.023	0.127
21/10/2010	-	0.017	-	0.012	0.023
29/04/2011	-	-	-	-	0.214
19/05/2011	0.005	0.266	0.023	0.130	0.274
28/06/2011	0.070	0.125	0.010	0.077	0.207
15/07/2011	0.048	0.285	0.049	0.220	0.667
10/08/2011	0.004	0.143	0.019	0.077	0.246
28/10/2011	-	-	-	-	0.016
19/04/2012	-	-	-	-	0.331
24/05/2012	0.001	0.080	0.073	-	0.137
14/06/2012	0.040	0.216	0.041	0.067	0.356
12/07/2012	0.001	0.051	0.004	0.029	0.056

Table 5: Mean Measured Instantaneous Discharge (m^3/s) on McGinty Creek.

	Month						
	Apr	May	Jun	Jul	Aug	Sep	Oct
MN-4.5	0.447	0.347	0.152	0.192	0.162	0.067	0.016
MN-2.5		0.161	0.043	0.070	0.050	0.018	0.010
MN-1.5	0.024	0.027	0.015	0.016	0.012	0.005	0.008
MN-0.5		0.216	0.097	0.116	0.111	0.054	0.016

Table 6: Mean Monthly Discharge (m^3/s) Calculated from Continuous Discharge Record on McGinty Creek, at Station MN-4.5

	Month						
	Apr	May	Jun	Jul	Aug	Sep	Oct
2009		0.018	0.033	0.019	0.031	0.016	0.013
2010		0.028	0.051	0.079	0.047	0.034	
2011		0.482	0.096	0.13	0.138	0.068	
2012	0.224	0.245	0.189	0.082	0.052	0.173	
Mean	0.224	0.193	0.092	0.077	0.067	0.073	0.013

Grey values computed with partial data

Hydrographs from 2009–2012 at MN-4.5 are shown in Appendix B. Based on a combination of spot flow measurements and the hydrographs, it appears that maximum monthly discharge occurs in May. These data suggest a later peak runoff on McGinty Creek than on Minto Creek; this could arise from McGinty Creek having a more northerly exposure and a resultant delayed snowmelt. However, April discharge needs to be more thoroughly documented to determine the timing of McGinty Creek's maximum monthly discharge.

4 REFERENCES

Access Consulting Group (2012). *Climate Baseline Conditions, Minto Mine Phase V/VI Expansion*. Whitehorse, YT. October 2012.

Clearwater Consultants Limited (2006). *Memorandum CCL-MC1: Minto Copper Project – Site Hydrology Update*. Clearwater Consultants Limited, Vancouver, BC. October 2006.

Clearwater Consultants Limited (2010). *Memorandum CCL-MC6: Minto Copper Project – Surface Water Hydrology Conditions*. Clearwater Consultants Limited, Vancouver, BC. August 2010.

Peel, M. C. and Finlayson, B. L. and McMahon, T. A. (2007). *Updated world map of the Köppen–Geiger climate classification*. *Hydrol. Earth Syst. Sci.* **11**: 1633–1644. ISSN 1027-5606

APPENDIX A

MINTO COPPER PROJECT – SURFACE WATER HYDROLOGY CONDITIONS

CLEARWATER CONSULTANTS LTD.

MEMORANDUM CCL-MC6

AUGUST 2010

Memorandum CCL-MC6

Date: August 12, 2010 **Our File:** 087.04

To: Randall Thompson – General Manager Minto Mine

From: Clearwater Consultants Ltd. - Peter S. McCreath P.Eng. (pmccreath@shaw.ca)

Subject: Minto Copper Project – Surface Water Hydrology Conditions - **FINAL**

1. Introduction

As part of the information required for permitting a proposed expansion at the Minto Mine site, the Access Consulting Group and Minto Explorations Ltd. requested that Clearwater Consultants Ltd. prepare a review and update of the surface water hydrology baseline streamflow conditions within the Minto Creek watershed. Conditions have been divided into two distinct time periods:

- Pre-Mining: prior to the commencement of mining operations in early 2007, and,
- During Mining: from 2007 to 2009 subsequent to the start of mining operations.

Estimated baseline site hydrology conditions were previously presented in Clearwater Consultants Ltd. Memorandum CCL-MC1 "Site Hydrology Update" dated October 6, 2006, a copy of which is attached as Appendix 1. The streamflow conditions reported therein are applicable to the "Pre-Mining" period.

The purpose of the present memorandum is to summarize surface water streamflow conditions that have been recorded during the mine operating period to date including changes to pre-mining baseline conditions due to mining operations and the implementation of a site water management plan.

2. Available Data

Streamflow data have been collected sporadically at several locations within Minto Creek since 1993. The locations for which the greatest amount of data have been collected are station W1 "Minto Creek near the Mouth" (catchment area of 42 km^2) and station W3 "Minto Creek downstream of decant pond" (10.4 km^2 area). Data consist of numerous spot flow measurements at both stations as well as continuous datalogger data for the stations as follows:

- Station W1: July to October 2005, May 3 to September 24 2007, May 13 to October 21 2008, May 7 to September 27, 2009.
- Station W3: August 21 to November 11 2008, June 4 to October 15, 2009.

The dataloggers recorded continuous records of water levels at the two stations. Rating curves relating the water level at each station to the discharge of water in the creek were developed using direct measurements of flow carried out during the datalogger operational periods. The rating curves were applied to the continuous water level data to produce a continuous record of stream discharge.

Regional streamflow data were collected for WSC Station 09AH003 "Big Creek near the Mouth" (1750 km^2) for the period of record 1974 to 2009. Big Creek drains the catchment area immediately south of Minto Creek.

Since the start of mining operations, Minto Explorations Ltd. has monitored the water levels and calculated the water storage volumes contained within the Water Storage Pond and within the Main Pit. These two facilities provide significant quantities of temporary water storage that were not available

within the natural Minto Creek catchment area prior to the start of mining operations. Records have also been kept of the volumes of water released from the property under the terms of emergency amendments to the Water License.

3. Pre-Mining Conditions

Appendix 1 contains a copy of the previous Clearwater Consultants Ltd. Memorandum CCL-MC1 presenting estimated baseline hydrology conditions prior to the start of mining operations within the Minto Creek catchment area. The available site area streamflow data up to 2006 for stations W1 and W3 and the concurrent data for the WSC station at Big Creek up to 2004 were summarized in Table MC1-7. Table MC1-8 showed the estimated monthly distribution of pre-mining streamflows as a percent of mean annual runoff for the two Minto Creek stations and for Big Creek.

Based on the available data up to 2006 the minimum estimated long-term mean annual runoff (MAR) for the Minto Creek catchment was about 75 mm (Table MC1-7). As noted in Memorandum MC1, however,

"There have been periods when no streamflow has been observed at W1 (the downstream station) at times when flows were observed at the upstream station W3. Infiltration of Minto Creek flows into the alluvial materials of the Yukon River floodplain has been postulated as the reason for the observed zero flow condition in Minto Creek near the mouth."

and,

"*…given the lack of continuous streamflow data, especially the limited data during snowmelt in April (Table MC1-5), the actual average MAR for Minto Creek may be closer to 100 mm.*"

and,

"*The long term MAR at Big Creek has been about 143 mm, thus annual runoff in Minto Creek appears to be from 50% to 70% of the mean annual runoff in Big Creek. The difference is due to differing catchment characteristics: Big Creek is much larger (1750 km^2 v. less than 42 km^2) with a much high average catchment elevation (1150 m v. 760 m) and experiences a higher total precipitation.*"

It was recommended in that memorandum that for water balance modeling purposes a MAR of 100 mm should be used. Table MC1-9 showed estimated wet and dry year runoff depths for Big Creek and Minto Creek for a range of return periods. Table MC1-8 showed the estimated monthly average streamflow distributions for the Minto Creek catchment area.

4. Conditions since 2006

The Water Storage Pond began to store runoff water in April 2007. Milling operations commenced in May 2007 at a rate of about 700 tpd and have increased to 3200 tpd currently. Due to low runoff and concerns regarding the potential availability of water in storage for future operations, additional freshwater was trucked up from the Yukon River and stored in the Water Storage Pond in August and September 2007 for use in the exploration program.

Due to higher runoff volumes and in order to prevent uncontrolled spills of excess water from the Water Storage Pond spillway, in both 2008 and 2009 runoff water from the upper portions of the Minto Creek catchment was diverted into the Main Pit for temporary storage. Water was subsequently transferred from the Pit and released in a controlled manner from the Water Storage Pond under the terms of emergency amendments to the Water License as follows:

- Amendment #4 - 350,000 m^3 released during August and September 2008
- Amendments #5 and #6 – a total of 976,400 m^3 released from June through October 2009.

As a result of the temporary storage of water in the Pit and in the Pond and the subsequent release of excess water from the system, the streamflow patterns at both stations W1 and W3 on Minto Creek have been significantly altered from pre-mining conditions. Since 2007, spring runoff water has gone into temporary storage in either the Pit or the Pond, a lot of that water being subsequently released during summer and fall when natural (pre-mining) flows in the creek were lower.

Streamflow data collected at stations W1 and W3 in 2007, 2008 and 2009 are summarized in Appendices 2 and 3. Tables MC6-1 to MC6-5 show daily and monthly flows. Figures MC6-1 to MC6-5 show recorded water levels, directly-measured flows and flows calculated from the datalogger installations for the same periods. Table MC6-6 shows the monthly flows for the 1974 to 2009 period of record for Big Creek near the Mouth. Tables MC6-7, -8 and -9 show and compare all available concurrent monthly flows for W1, W3 and Big Creek from 1993 to 2009. Figures MC6-6 and MC6-7 show water level and water storage volume variations in the Main Pit and in the Water Storage Pond, respectively.

Based on the Big Creek data in Table MC6-9, the periods from 2007 to 2009 and from 1993 to 2006 are comparable to the long-term average conditions recorded at Big Creek. However, Tables MC6-7 (W1) and MC6-8 (W3) indicate that the 2007 to 2009 mining period apparently resulted in higher runoff values from Minto Creek (87 mm to 95 mm runoff from April to October) than experienced during the pre-mining period (71 mm to 74 mm).

This apparent trend has one most significant contributory cause: spring runoff flows were not completely recorded during the pre-mining period due to the late installation of dataloggers whereas since 2007 the spring runoff upstream of station W3 has been temporarily stored in the Pit and/or the Water Storage Pond and released (and measured) later in the summer/fall. Figure MC6-5 shows how the monthly distributions of flows at W1 and at W3 have changed from the pre-mining period to the period after 2007. As a result, the flow data recorded since 2007 may in fact be more representative (from a total runoff perspective) of natural conditions within the Minto Creek catchment than data recorded prior to 2007.

There is a likelihood that the increase in cleared areas around the mine (mill site, roads etc.) has also contributed to slightly increased runoff volumes from the upper portions of the catchment area. This increase in runoff will have been offset in part by additional losses of water to the milling process, tailings and waste rock moisture and wetting, and increased evaporation losses from free water ponded in the Water Storage Pond, the Mill Pond, and the Main Pit. This has been confirmed in part by water balance analyses (Clearwater Consultants Ltd. Memorandum CCL-MC5 dated May 21, 2010, "Minto Mine - Site Water Balance Update 2010").

Overall, the streamflow data collected since 2007 suggest that the mean annual runoff depth from the Minto Creek catchment may be in the order of 87 mm to 95 mm per year. This range is similar to the mean annual runoff of 100 mm recommended in the earlier 2006 study for use in water balance analyses. A Minto Creek MAR of 90 mm to 100 mm represents about 65% to 70% of the long-term MAR for Big Creek.

Frequency analyses were carried out on the annual runoff depths for Big Creek over the period 1974 to 2009. The results are shown on Table MC6-11. Based on runoff in Minto Creek representing about 65% of Big Creek runoff, the Table shows estimated annual runoff depths for Minto Creek for a range of return periods.

5. Conclusions

The estimated surface water hydrologic characteristics of the Minto Creek catchment area have been updated using the available site and regional data collected since the start of milling operations in 2007. The following conclusions are made:

1) Continuous seasonal streamflow data have been collected on Minto Creek at station W1 since 2005 and at station W3 since 2008. Periodic spot flow measurements have been carried out at these and other stations since 1993.

2) Water storage volumes temporarily available in the Main Pit and in the Water Storage Pond have changed the monthly distribution of streamflows in Minto Creek since 2007.

3) Big Creek streamflow data for the period from 2007 to 2009 are comparable to the long-term average conditions recorded at Big Creek.

4) Due to temporary storage of spring runoff water in the Main Pit and the Water Storage Pond, recorded runoff volumes in Minto Creek at W1 and W3 may be more representative from a total runoff perspective of natural conditions within the Minto Creek catchment than streamflow data recorded prior to 2007.

5) Similar to analyses carried out in 2006, the mean annual runoff in Minto Creek based on data up to 2009 may be 90 mm to 100 mm representing about 65% to 70% of the mean annual runoff in Big Creek.

CLEARWATER CONSULTANTS LTD.

Peter S. McCreath P.Eng.

APPENDIX 1

Minto Creek Surface Water Hydrology Conditions

Clearwater Consultants Ltd.

Memorandum CCL-MC1

Site Hydrology Update

(October 6, 2006)

Memorandum CCL-MC1

Date: October 6, 2006 **Our File:** 087.01

To: Access Consulting Group - Dan Cornett (dan@accessconsulting.ca)

From: Clearwater Consultants Ltd. - Peter S. McCreath P.Eng. (pmccreath@shaw.ca)

Subject: Minto Copper Project – Site Hydrology Update

1. Introduction

This memorandum presents an update to the Minto Creek area site hydrology using available site and regional data. Previous summaries of the estimated site hydrology were presented in Volume II of the IEE by Hallam Knight Piesold (December 1994). The purpose of the update presented herein is, based on the most recent available data, to present revised site hydrological design parameters that will be applied to the updated water balance analysis for the Minto Copper Project. The hydrology update includes precipitation, evaporation and streamflow distributions.

2. Available Data

The Minto Creek site is located about 240 km north of Whitehorse on the left (west) bank of the Yukon River. The site is about 40 km northwest of the proposed Carmacks Copper project at Williams Creek. The creek drains a total catchment area of about 42 km2 at the confluence with the Yukon River. Elevations within the catchment range up to about 1000 m with an average catchment elevation of about 760 m. Planned mining facilities will be located within the upper reaches of the catchment at elevations typically from 850 m to 900 m.

Limited climate data are available for the Minto Creek site. A few (partial) months of data were collected in 1993 and 1994. A complete meteorological station was established at the site in September 2005 and data for the station is available up to mid-July 2006. The data includes temperatures, solar radiation, wind speed and direction, relative humidity, barometric pressure, and rainfall: no winter snowfall data have been collected. Table MC1-1 and Figures MC1-1 to MC1-5 summarize the available site data.

Snow surveys have been carried out by J. Gibson & Associates in 1994, 1995, 1998 and 2006 at three locations in the Minto Creek catchment ranging in elevation from 890 m to 980 m.

Regional data were used in the update from the following stations:

- Pelly River Ranch at elevation 454 m: temperatures, precipitation, rainfall, snowfall and lake evaporation
- Snow survey data at Pelly Farm (elevation 472 m), Williams Creek (914 m), Mount Nansen (1021 m), Casino Creek (1065 m), and MacIntosh (1160 m).
- Whitehorse at elevation 703 m: solar radiation, pan evaporation

Due to the proximity to the proposed Carmacks Copper project site, methodologies developed during recent updates to the Williams Creek area hydrology (Clearwater Consultants Ltd. Memo CCL-CC6 Final Draft "Carmacks Copper Project – Williams Creek Site Hydrology Update" dated January 13, 2006) have been used and applied as appropriate to the Minto Creek hydrology update.

Streamflow data have been collected sporadically at several locations within Minto Creek since 1993. The primary locations used herein are station W1 "Minto Creek near the Mouth" (42 km^2) and station W3 "Minto Creek downstream of decant pond" (10.4 km^2). Data consist of various spot flow measurements at both stations as well as limited datalogger data for station W1 from July to October 2005.

Due to the proximity, regional streamflow data were evaluated for WSC Station 09AH003 "Big Creek near the mouth" (1750 km^2). Big Creek drains the catchment area immediately south of Minto Creek.

3. Precipitation

3.1 Average Conditions

Due to the lack of site-specific data for Minto Creek, orographic factors previously developed for the Williams Creek area were applied to the Minto Creek area with Pelly River Ranch (1955 to 2004, elevation 454 m) providing the base dataset. The assumptions and results presented herein are believed to be conservative and appropriate for design applications for the Minto Copper Project.

Orographic factors and estimated annual average rainfall, snowfall and total precipitation are summarized following for Pelly River Ranch and for two elevations within the Minto Creek drainage:

Item	Orographic Factor %/100 m	Pelly River Ranch (mm)	Minto at Elev 760 m		Minto at Elev 885 m	
			Factor	Depth	Factor	Depth
Annual Rainfall	0.94%	189.4	1.029	195	1.041	197
Annual Snowfall	6.26%	113.7	1.192	136	1.270	144
Total Precipitation	2.94%	303.1	1.090	331	1.127	341

Notes
1) Elevation 760 m corresponds to the average catchment elevation for Minto Creek at the mouth
2) Elevation 885 m is the approximate elevation of the proposed tailings pond for the project.
3) Pelly River Ranch data was collected at elevation 454 m
4) Depths are rounded to the nearest mm

Table MC1-2 summarizes estimated monthly average rainfall, snowfall and total precipitation for Pelly River and the two Minto Creek locations.

3.2 Wet and Dry Year Precipitation

Frequency analyses were carried out on Pelly River Ranch total annual precipitation and the orographic factor for total precipitation shown above was applied to estimate comparable values for the Minto Creek area. Results are shown in Table MC1-3, including estimated annual rainfall and snowfall for extreme wet and dry years for two locations in the Minto Creek drainage for a range of return periods from a 20 year dry year up to a 500 year return period wet year. Values shown on the Table are the expected values (best estimates) for each return period: lower and upper bounds for each estimate are within +/-5% to +/-9% of the values shown.

An evaluation of Pelly River Ranch precipitation data corrected for the effects of precipitation undercatch by Environment Canada suggests that annual average total precipitation could be about 5% higher with the increase due primarily to increased rainfall (i.e. more undercatch correction on rainfall data). Corrections on the Pelly River annual total precipitation each year varied from less than 3% to

about 9%. Frequency analyses on the corrected precipitation database yielded values from 3% to 5% higher than the results using the uncorrected database. This difference is not considered significant and is within the lower to upper bound range calculated for the results using the uncorrected database.

3.3 Wet Periods – One Day, One Month to 12 Month Duration

Total precipitation for wet periods for one day and from one month to 12 months duration were estimated based on the analyses above and assuming the following:

- One day wet periods will have an orographic factor of 1.30 times Pelly River Ranch as previously estimated for Williams Creek
- One month wet periods will have an orographic factor of 1.15 times Pelly River Ranch, also as previously estimated for Williams Creek;
- Orographic factors for wet periods with durations of 2, 3 and 4 months were estimated by interpolation as shown on Table MC1-4.
- The annual rainfall orographic factor of 1.03 will apply to five month duration wet periods extending from the start of May through to the end of September. This period is responsible for about 94% of the total annual rainfall recorded at Pelly Ranch;
- The snowfall orographic factor of 1.19 will apply to wet periods of six to seven months duration extending from the start of October through to the end of the following April;
- Wet periods starting in October and lasting more than seven months will be comprised of both snowfall and rainfall; therefore, the orographic factor will be less than the snowfall factor (1.19) but more than the annual precipitation factor (1.09). For wet periods of 8, 9, 10 and 11 months duration, the orographic factor was estimated by interpolation as shown on Table MC1-4.

Estimates of extreme wet and dry year and wet and dry period precipitation depths were prepared for the Minto Creek site at two elevations (760 m and 885 m) and are presented in Table MC1-4.

3.4 Snowmelt

Based on the Minto Creek snow survey data from 1994, 1995, 1998 and 2006, the maximum annual snowpack within the Minto Creek drainage was generally measured on either March 1 or April 1. For most years (except 2006) there was no snow remaining on the ground by May 1 (Table MC1-5). For design purposes it is recommended that the entire accumulated snowpack should be assumed to melt during April. The total snowmelt could occur over a period of as little as two weeks.

Based on comparisons with regional snow survey data, the average of the site data maximum snowpack measurements represented about 85% of the long term average maximum snowpack. As shown on Table MC1-5, the estimated long term average maximum snowpack at the Minto Creek sites may range from about 90 mm to 105 mm (water equivalent).

4. Other Climate Data

Table MC1-1 and Figures MC1-1 to MC1-5 summarize the measured climatic data at the Minto Creek site from September 2005 to July 2006. Figure MC1-2 compares the site temperature data to long-term average temperature data reported for Pelly Ranch and for Carmacks. Overall, the Minto Creek 2005 data indicates the site was significantly warmer than average Pelly and Carmacks temperatures for

December, January and February, slightly warmer from September to November, cooler in March and April, and essentially the same temperature in May, June and July. Based on typical temperature lapse rates, the Minto Creek site elevations (760 m to 885 m) would be expected to be about 2°C to 4°C cooler than Pelly Ranch.

5. Evapotranspiration and Lake Evaporation

Lake evaporation and areal evapotranspiration (including transpiration from vegetation) were estimated using the computer model WREVAP, which was developed by Environment Canada's National Hydrology Research Institute (NHRI, 1985). WREVAP is a semi-empirical, semi-physical model that estimates evaporation from meteorological data (humidity, air temperature and sunshine duration). The model uses different routines to estimate lake evaporation and land evapotranspiration. Estimates were prepared for Whitehorse Airport, Mayo Airport, Williams Creek, and Minto Creek using the available site climate data (September 2005 to July 2006) supplemented by regional data. Monthly values for Minto Creek were estimated for August based on regional data due to missing site climate data as indicated on Table MC1-6. Minor adjustments were also made to calculated monthly evapotranspiration values for April and June so as to be consistent with regional long-term average values. Table MC1-6 summarizes the calculated and adjusted values of lake evaporation and areal evapotranspiration for Minto Creek. Monthly values are shown on Figures MC1-6a and MC1-6B.

Annual calculated total lake evaporation ranges from 467 mm/year at Mayo to 528 mm/year at Williams Creek with Minto Creek falling midway between these values at 495 mm. During the typical open water season from May through September, calculated lake evaporation was 440 mm at Whitehorse and Williams Creek and 430 mm at Minto Creek, about 83% to 87% of the annual total. Pan evaporation data have been collected by Environment Canada for Pelly Ranch and for Whitehorse Airport. Table MC1-6 shows lake evaporation calculated from the pan evaporation data assuming a typical pan coefficient of 0.7. Lake evaporation calculated from the pan evaporation data from May to September was 480 mm at Whitehorse and 450 mm at Pelly Ranch, approximately 10% higher than calculated using the WREVAP program.

For application to the Minto Copper Project water balance it is recommended that lake (open water) evaporation losses be based on the values calculated using the WREVAP program and adjusted for regional consistency. For conservatism in design the following is recommended:

- For the evaluation of maximum design storage volumes a "low" estimate of open water season (May to September) annual lake evaporation of 390 mm corresponding to 10% less than the WREVAP calculated value.
- For average operating conditions and the evaluation of make-up water requirements annual open water season lake evaporation of 430 mm.

Evapotranspiration losses around the mine site will be a function of the type of ground cover and local elevation and aspect. Annual average calculated areal evapotranspiration ranges from about 175 mm/year at Minto Creek to 220 mm/year at Mayo with about 80% of the total occurring from May through September. At Minto Creek annual areal evapotranspiration is equal to about 35% of annual lake evaporation. Actual evapotranspiration losses of 175 mm/year are recommended for general application to the Minto Creek site for areas covered with natural, undisturbed vegetation. For areas that are swampy or are covered with some ponded water, a total evaporative loss of between 175 mm/year (evapotranspiration) and 430 mm/year (lake evaporation) would be appropriate: a value of 300 mm/year is suggested. For disturbed ground (i.e. mill area, waste dumps, open pit walls etc.) annual evaporative losses will be less than 175 mm/year: a value of 100 mm/year is suggested.

6. Monthly Streamflow Distributions and Mean Annual Runoff

The monthly distribution of streamflows within the Minto Creek drainage is required in order to evaluate and monitor potential impacts due to mine development and operation. The available site area streamflow data for stations W1 and W3 are summarized in Table MC1-7. The concurrent data for the WSC station at Big Creek are also shown on the table. The data indicate that the 1994 to 2004 period was typical of longer-term average conditions reported for Big Creek from 1974 to 2004.

Field observations indicate that Minto Creek experiences glaciations and essentially freezes solid during most winters between November and March. The measured streamflows from April through October were, therefore, assumed to represent the entire year's runoff from the Minto Creek catchment. Table MC1-8 shows the estimated monthly distribution of streamflows as a percent of mean annual runoff for the two Minto Creek stations and for Big Creek.

There have been periods when no streamflow has been observed at W1 (the downstream station) at times when flows were observed at the upstream station W3. Infiltration of Minto Creek flows into the alluvial materials of the Yukon River floodplain has been postulated as the reason for the observed zero flow condition in Minto Creek near the mouth.

Most available streamflow data for Minto Creek consists of spot measurements of flow: continuous datalogger records are only available for July to October 2005 for station W1. In addition April streamflows have only been measured in 2006 and personnel report that peak snowmelt streamflows have not been measured. Assuming that the available streamflow data collected since 1994 have been representative of long term average conditions would yield a minimum estimate of the mean annual runoff depth (MAR) for Minto Creek of about 75 mm (Table MC1-7). However, given the lack of continuous streamflow data, especially the limited data during snowmelt in April (Table MC1-5), the actual average MAR for Minto Creek may be closer to 100 mm. Figure MC1-7 shows average estimated monthly flows for Minto Creek at W1 and at W3 assuming a mean average annual runoff of 100 mm. The long term MAR at Big Creek has been about 143 mm, thus annual runoff in Minto Creek appears to be from 50% to 70% of the mean annual runoff in Big Creek. The difference is due to differing catchment characteristics: Big Creek is much larger (1750 km^2 v. less than 42 km^2) with a much high average catchment elevation (1150 m v. 760 m) and experiences a higher total precipitation.

For water balance modeling within the Minto Creek catchment an average annual runoff depth of 100 mm should be used. Table MC1-9 shows estimated wet and dry year runoff depths for Big Creek and Minto Creek for a range of return periods.

7. Conclusions

The estimated hydrologic characteristics of the Minto Creek site area have been updated using the available site and regional data. The updated site hydrology parameter values will be applied to the site water balance analysis of the project. The following conclusions are made:

1) The estimated annual average precipitation at the Minto Creek site is 330 to 340 mm, depending on elevation, and is comprised of 58% to 59% rainfall occurring from April to September.

2) Average estimated monthly rainfall, snowfall and total precipitation depths for the Minto Creek area are shown on Table MC1-2.

3) Frequency analyses for annual precipitation and one day and one to twelve month duration wet and dry periods are shown on Table MC1-4.

4) For average conditions the annual snowmelt should be assumed to occur in April. The average maximum snowpack in upper Minto Creek is from about 90 mm to 105 mm

5) Average potential lake evaporation for the Minto Creek area is estimated to be 495 mm/year with about 87% of the lake evaporation (430 mm) occurring during the open water season from May to September. A 10% lower value is recommended as a conservative design parameter to evaluate maximum design reservoir storage volumes.

6) Average areal evapotranspiration for natural vegetated undisturbed ground in the Minto Creek catchment is estimated to be 175 mm/year (35% of lake evaporation). Evaporative losses for differing ground cover conditions may vary from 100 mm/year for disturbed ground to more than 300 mm/year for swampy ground.

7) The Minto Creek site appears slightly warmer than Pelly Ranch and Carmacks from September to February and slightly cooler from March to May based on the limited available site data.

8) Monthly average streamflow distributions for the Minto Creek catchment area are shown on Table MC1-8.

9) Mean annual runoff depth for Minto Creek is estimated to be about 100 mm. Table MC1-9 shows estimated wet and dry year runoff for a range of return periods.

CLEARWATER CONSULTANTS LTD.

Peter S. McCreath P.Eng.

APPENDIX 1

Minto Creek Area Hydrology Update

Tables

Table MC1-1 - Minto Camp Climate Station - Monthly Data Summary September 2005 to July 2006

	Rainfall (mm)		Wind Speed (m/s)					Air Temperature (°C)					
Month	Total Monthly	Maximum Daily	Average Monthly	Maximum Gust	Average Wind Direction (ø)	Total Solar Radiation (W/m^2)	Average Soil Temperature (*C)	Extreme Maximum	Extreme Minimum	Average Monthly	Average Dew Point (oC)	Average RH (%)	Average Pressure (mbar)
Sep-05	21.6	1.6	1.63	15.77	193.9	52,873	7.3	15.23	-0.61	6.89	1.95	72.6	914.1
Oct-05	23.0	2.8	1.80	17.63	173.6	32,319	1.3	7.43	-10.56	-0.94	-3.74	82.8	907.2
Nov-05	11.6	4.8	1.57	19.48	231.0	9,506	-0.6	7.43	-28.05	-12.70	-15.34	82.0	908.6
Dec-05	4.6	2.4	0.78	17.25	207.7	2,911	-6.8	6.22	-29.10	-10.21	-12.61	84.0	907.5
Jan-06	0.0	0.0	0.23	7.79	240.3	6,441	-10.7	-3.85	-36.50	-19.25	-21.19	84.6	904.7
Feb-06	0.4	0.4	1.82	19.11	207.5	27,202	-9.5	5.81	-30.20	-11.80	-16.35	71.4	918.0
Mar-06	2.8	1.6	1.71	11.32	214.8	78,691	-9.0	5.40	-28.05	-12.10	-17.80	63.9	915.3
Apr-06	0.0	0.0	3.43	20.22	212.3	81,660	m	7.03	-14.10	-1.03	-8.96	56.9	898.4
May-06	0.9	0.1	3.27	18.37	209.3	162,958	m	19.04	-2.44	7.32	-3.28	50.1	908.0
Jun-06	1.4	0.1	3.17	16.14	204.2	90,487	m	25.95	-0.61	13.56	0.65	45.9	909.7
Jul-06	0.3	0.1	2.29	13.36	151.7	m	m	23.63	8.23	15.55	5.77	53.9	910.6

Notes

1) Station data collection halted on March 30th at 1726 hrs
2) Station re-started on April 12, 2006, 0027 hrs, station relocated to airstrip
3) Data to July 19, 2006 at 1344 hrs
4) Apparent Solar Radiation sensor error starting June 15, 2006 at 1744 hrs
5) Average Soil Temperature sensor disabled March 30, 2006 at 1727 hrs
6) November to March precipitation is not accurate. Sensor measures rainfall only.

Table MC1-2 - Average Monthly Precipitation Conditions - Minto Creek Areas

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Pelly River Ranch at Elevation 454 m													
Average Conditions - Monthly Depths - mm													
Average Rainfall	0.0	0.0	0.2	3.5	22.6	36.3	53.5	38.1	27.6	7.1	0.4	0.1	189.4
Average Snowfall	20.0	14.7	11.1	6.7	0.0	0.0	0.0	0.0	0.0	15.8	24.2	21.2	113.7
Average Precipitation	20.0	14.7	11.3	10.2	22.6	36.3	53.5	38.1	27.6	22.9	24.6	21.3	303.1
Percent per month of Total Annual Precipitation													
Average Rainfall	0.0%	0.0%	0.1%	1.2%	7.5%	12.0%	17.6%	12.6%	9.1%	2.3%	0.1%	0.0%	62.5%
Average Snowfall	6.6%	4.9%	3.7%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	8.0%	7.0%	37.5%
Total Precipitation	6.6%	4.9%	3.7%	3.4%	7.5%	12.0%	17.6%	12.6%	9.1%	7.6%	8.1%	7.0%	100.0%
Minto Creek Catchment (42 km2) at Average Elevation 760 m													
Percent per month of Total Annual Precipitation													
Average Rainfall	0.0%	0.0%	0.0%	1.7%	7.1%	11.7%	16.9%	12.2%	9.4%	0.0%	0.0%	0.0%	59.0%
Average Snowfall	6.4%	4.8%	4.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%	7.9%	6.9%	41.0%
Total Precipitation	6.4%	4.8%	4.0%	4.6%	7.1%	11.7%	16.9%	12.2%	9.4%	8.1%	7.9%	6.9%	100.0%
Average Conditions - Monthly Depths - mm													
Average Rainfall	0.0	0.0	0.0	5.6	23.5	38.6	55.8	40.3	31.0	0.0	0.0	0.0	194.8
Average Snowfall	21.1	15.9	13.2	9.6	0.0	0.0	0.0	0.0	0.0	26.8	26.1	22.8	135.5
Total Precipitation	21.1	15.9	13.2	15.2	23.5	38.6	55.8	40.3	31.0	26.8	26.1	22.8	330.3
Minto Creek Tailings (9.6 km2) at Average Elevation 885 m													
Percent per month of Total Annual Precipitation													
Average Rainfall	0.0%	0.0%	0.0%	1.0%	7.1%	11.7%	16.9%	12.2%	8.8%	0.0%	0.0%	0.0%	57.7%
Average Snowfall	6.4%	4.8%	4.0%	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	8.5%	7.9%	6.9%	42.3%
Total Precipitation	6.4%	4.8%	4.0%	4.8%	7.1%	11.7%	16.9%	12.2%	8.8%	8.5%	7.9%	6.9%	100.0%
Average Conditions - Monthly Depths - mm													
Average Rainfall	0.0	0.0	0.0	3.4	24.2	40.0	57.7	41.7	30.1	0.0	0.0	0.0	197.1
Average Snowfall	21.9	16.4	13.7	13.0	0.0	0.0	0.0	0.0	0.0	29.0	27.0	23.6	144.4
Total Precipitation	21.9	16.4	13.7	16.4	24.2	40.0	57.7	41.7	30.1	29.0	27.0	23.6	341.5

NOTES

1) Minto Creek % per month for rainfall, snowfall and total precipitation estimated assuming
annual rainfall = 57.7% and annual snowfall = 42.3% of total annual precipitation for Tailings area, and
annual rainfall = 59% and annual snowfall = 41% of total annual precipitation for Total Minto Creek catchment
2) Assumed orographic factors of: Rainfall 0.94%/100 m, Snowfall 6.26%/100 m above Pelly River Ranch, and

Table MC1-3 - Annual Precipitation Frequency Analyses

Return Period (years)	Annual Percent Probability	Pelly Ranch Total Annual Precipitation	Minto Creek Total Catchment			Minto Creek Tailings Area		
			Total Precipitation	Rainfall	Snowfall	Total Precipitation	Rainfall	Snowfall
		(Elev. 454 m)	(Average Elev 760 m)			(Average Elev. 885 m)		
		(Note 1)						
20 (Dry)	95%	222	242	143	99	250	144	106
10 (Dry)	90%	238	259	153	106	268	155	113
5 (Dry)	80%	258	281	166	115	291	168	123
Average	50%	303	330	195	135	341	197	144
5 (Wet)	20%	346	377	223	155	390	225	165
10 (Wet)	10%	373	407	240	167	420	242	178
20 (Wet)	5%	397	433	255	177	447	258	189
25 (Wet)	4%	404	440	260	181	455	263	193
50 (Wet)	2%	424	462	273	189	478	276	202
100 (Wet)	1%	444	484	286	198	500	289	212
200 (Wet)	0.5%	462	504	297	206	521	300	220
				59.0%			57.7%	

Notes

1) Frequency analyses results for Pelly Ranch based on 3-parameter lo-Normal distribution with 47 points, Mean = 303 mm, Standard Deviation = 53.3 mm.
2) Annual total precipitation assumed to increase at 2.94% per 100 m elevation increase. Annual factors are 1.09 for Minto Creek at elevation 760 m and 1.1267 for elevation 885 m.
3) Annual Percent Probability is the probability of the indicated value being equalled or exceeded in any single year

Table MC1-4- Wet Period Precipitation - One Day and One to Twelve Month Duration

Table MC1-4A - Pelly River Ranch

			Wet Periods Starting on May 1					Wet Periods Starting October 1			Annual
Return Period (years)	Annual Percent Probability	One Day	1 -Month Rainfall	2 -Month Rainfall	3 -Month Rainfall	4 -Month Rainfall	5 -Month Rainfall	6 -Month Snowfall	7 -Month Snowfall	8 -Month Precipitation	12 -Month Precipitation
20 (Dry)	95.0%	9.0	37	58	80	99	112	76	83	92	222
5 (Dry)	80.0%	12.7	47	78	104	125	142	88	85	116	258
Average	50.0%	17.6	63	104	138	163	181	115	125	147	299
5 (Wet)	20.0%	24.1	78	128	169	198	218	137	150	176	346
10 (Wet)	10.0%	28.3	89	144	190	221	242	157	176	199	373
20 (Wet)	5.0%	32.2	99	157	209	241	262	178	199	220	397
50 (Wet)	2.0%	37.2	113	173	231	267	287	207	227	247	424
100 (Wet)	1.0%	40.9	122	185	247	284	304	229	248	267	444
200 (Wet)	0.5%	44.6	132	195	262	302	321	252	270	287	462

Table MC1-4B - Minto Creek Area at Elevation 760 m

			Wet Periods Starting on May 1					Wet Periods Starting October 1			Annual
Return Period (years)	Annual Percent Probability	One Day	1 -Month Rainfall	2 -Month Rainfall	3 -Month Rainfall	4 -Month Rainfall	5 -Month Rainfall	6 -Month Snowfall	7 -Month Snowfall	8 -Month Precipitation	12 -Month Precipitation
Orographic Factor		**1.30**	**1.15**	**1.12**	**1.09**	**1.06**	**1.029**	**1.192**	**1.192**	**1.17**	**1.090**
20 (Dry)	95.0%	11.7	42.6	65.0	87.2	105	115	90.6	98.9	108	242
5 (Dry)	80.0%	16.5	54.1	87.4	113	133	146	105	101	136	281
Average	50.0%	22.9	72.5	116	150	173	186	137	149	172	326
5 (Wet)	20.0%	31.3	89.7	143	184	210	224	163	179	206	377
10 (Wet)	10.0%	36.8	102	161	207	234	249	187	210	233	407
20 (Wet)	5.0%	41.9	114	176	228	255	270	212	237	257	433
50 (Wet)	2.0%	48.4	130	194	252	283	295	247	271	289	462
100 (Wet)	1.0%	53.2	140	207	269	301	313	273	296	312	484
200 (Wet)	0.5%	58.0	152	218	286	320	330	300	322	336	504

Table MC1-4C - Minto Creek Area at Elevation 885 m

			Wet Periods Starting on May 1					Wet Periods Starting October 1			Annual
Return Period (years)	Annual Percent Probability	One Day	1 -Month Rainfall	2 -Month Rainfall	3 -Month Rainfall	4 -Month Rainfall	5 -Month Rainfall	6 -Month Snowfall	7 -Month Snowfall	8 -Month Precipitation	12 -Month Precipitation
Orographic Factor		**1.30**	**1.15**	**1.12**	**1.09**	**1.06**	**1.041**	**1.27**	**1.27**	**1.24**	**1.127**
20 (Dry)	95.0%	11.7	42.6	65.0	87.2	105	117	96.5	105.4	114	250
5 (Dry)	80.0%	16.5	54.1	87.4	113	133	148	112	108	144	291
Average	50.0%	22.9	72.5	116	150	173	188	146	159	182	337
5 (Wet)	20.0%	31.3	89.7	143	184	210	227	174	191	218	390
10 (Wet)	10.0%	36.8	102	161	207	234	252	199	224	247	420
20 (Wet)	5.0%	41.9	114	176	228	255	273	226	253	273	447
50 (Wet)	2.0%	48.4	130	194	252	283	299	263	288	306	478
100 (Wet)	1.0%	53.2	140	207	269	301	316	291	315	331	500
200 (Wet)	0.5%	58.0	152	218	286	320	334	320	343	356	521

Notes
1) Orographic Factors *times* Pelly River values *equals* Minto Creek values
2) Snowmelt for 6 to 8 month duration wet periods will allow for 20 mm sublimation loss from the snowpack
3) Orographic factors determined as follows:
   One Day and One Month factors assumed the same as for Williams Creek due to lack of site data at Minto Creek
   Five month factor equal to annual rainfall factors of 1.029 and 1.041
   Six- and Seven-month factors equal to annual snowfall factors of 1.192 and 1.270
   12-month factor equal to annual total precipitation factors of 1.090 and 1.127
   Other factors estimated by interpolation.
4) Factors for other elevations may be estimated assuming annual orographic increases of:
   Rainfall 0.94%/100 m, Snowfall 6.26%/100 m, and Total Precipitation 2.94% per 100 m above Pelly River Ranch

Table MC1- 5 - Comparison of Snowsurvey Data

Concurrent Minto Creek and Regional Data

			1994				1995				1998				2006			
Station	Elevation	Location	Mar-01	Apr-01	May-01	May-15	Mar-01	Apr-01	May-01	May-15	Mar-01	Apr-01	May-01	May-15	Mar-01	Apr-01	May-01	May-15
Minto #1	980	Site	98	**112**	0	0	53	**73**	54	0	75	**76**	0	0	81	**99**	51	
Minto #2	890	Site	87	**93**	0	0	**63**	53	0	0	61	**66**	0	0	72	101	**107**	
Minto #3	890	Site	**84**	78	0	0	**56**	48	0	0	59	**70**	0	0	65	**93**	0	
Pelly Farm	472	20 km NW	**62**	60	0	0	**52**	52	0	0	**59**	56	0	0	**70**	61	19	
Williams Ck	914	45 km SE	m	m	m	m	55	**78**	20		80	**92**	0	0	71	**90**	61	
Mt Nansen	1021	70 km SW	**73**	73	0	0	**50**	49	0	0	56	**81**	0		56	**84**	0	
Casino Creek	1065	90 km W	**83**	83	56	0	75	m	**104**		61	**88**			89	**134**	121	
MacIntosh	1160	120 km S	87	**88**	23	0	56	**78**	13		50	**74**			60	**92**	76	
Average - Minto 1, 2 & 3			90	**94**	0	0	57	**58**	18	0	65	**71**	0	0	73	**98**	53	
Average - Regional Data			76	76	20	0	58	64	27	0	61	78	0	0	69	92	55	
Ratio - Minto/Average Regional			1.18	1.24	0.00		1.00	0.90	0.66		1.06	0.90			1.05	1.06	0.95	

Average Maximum Snowpacks each year (mm water equivalent)

Station	1994/5/8/06 Avg	Ratio to Long Term	Estimated Long Term Average
Minto #1	90	-	106
Minto #2	82	-	97
Minto #3	76	-	89
Pelly Farm	61	0.77	79
Williams Creek	87	0.98	88
Mt Nansen	72	0.95	76
Casino Creek	102	0.72	142
MacIntosh	83	0.84	99

Average Ratio = **0.85**

Minto stations estimated long term Average Maximum Snowpack = (1994/5/8/2006 Average) / (Average Regional Ratio to long term)

Table MC1-6 - Minto Creek - Estimated Average Areal Evapotranspiration and Lake Evaporation

Average Monthly Areal Evapotranspiration (mm)

Month	Williams Creek	Mayo A	Whitehorse A	Minto Camp (calculated)	Minto Camp (adjusted)
Jan	0	0	0	0	0
Feb	0	0	0	0	0
Mar	16.7	0	12.8	5.6	5.6
Apr	16.5	19.3	24	28	***20***
May	27	33.2	35.1	32.4	32.4
Jun	40.5	49.9	45.2	28.7	***40***
Jul	38.3	55.9	44.5	34.5	34.5
Aug	18.4	38.7	23.9		***22***
Sep	15.3	17.3	15.3	15.5	15.5
Oct	4.6	6	8.1	4	4
Nov	0	0	0	0	0
Dec	0	0	0	0	0
Total	177.3	220.3	208.9		174

Average Monthly Lake Evaporation (mm)

Month	Williams Creek (WREVAP)	Mayo A (WREVAP)	Whitehorse A (WREVAP)	Whitehorse A (adjusted Class	Pelly Ranch (adjusted Class	Minto Camp (WREVAP)	
						Calculated	Adjusted
Jan	0	0	0			0	0
Feb	0	0	0			0	0
Mar	21.6	0	15.3			5.3	5.3
Apr	61.6	47.8	58.4			55.9	55.9
May	99.7	90.6	97.3	104.3	107.6	95.1	95.1
Jun	119.4	110.5	118.7	124.8	120.3	119.2	119.2
Jul	110.7	108.4	113.1	109.9	108	111.9	111.9
Aug	76.5	77.9	81.2	96	79.8		***80***
Sep	34	26.2	34.1	47.7	37.2	24.4	24.4
Oct	4.1	5.7	10.3			3.5	3.5
Nov	0	0	0			0	0
Dec	0	0	0			0	0
Annual	527.6	467.1	528.4				495.3
May-Sept	440.3	413.6	444.4	482.7	452.9		430.6

Notes

1) Minto Camp "calculated" values calculated using available climate data from Minto Camp station in 2005
2) Minto Camp "Adjusted" values (in bold italics) estimated based on regional values.

Table MC1- 7 - Available Monthly Streamflow Data - Minto Creek and Big Creek

Monthly Averages - All Flows - Minto Creek W1 & W2 (42 km2)

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993						0.069		
1994		0.312	0.058	0.095	0.007	0.073		
1995		0.027	0.001	0.091		0.133		
1996		0.031	0.024	0.324		0.146		
1997		1.447			0.265			
1998		0.161			0.003			
1999					0.033			
2000		1.004						
2001		0.467						
2002								
2003					0.129			
2004				0.118				
2005		0.097	0.012	0.127	0.209	0.219	0.134	
2006	0.203	0.354	0.150	0.020				
Average Flow m3/s	0.203	0.433	0.049	0.129	0.108	0.128	0.134	
Average Runoff mm	12.5	27.6	3.0	8.2	6.9	7.9	8.6	74.7
% of Annual	16.7%	37.0%	4.1%	11.0%	9.2%	10.6%	11.5%	

Monthly Averages - All Flows - Minto Creek W3 (10.4 km2)

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993						0.028		
1994		0.101	0.028	0.039	0.011	0.028		
1995			0.0035	0.017		0.027	0.008	
1996		0.013		0.087		0.021		
1997		0.554						
1998					0.006			
1999					0.006			
2000								
2001		0.16						
2002								
2003					0.037			
2004				0.026				
2005		0.046	0.008	0.014	0.017	0.022	0.02	
2006	0.018	0.128	0.042	0.006				
Average Flow m3/s	0.018	0.167	0.020	0.032	0.015	0.025	0.014	
Average Runoff mm	4.6	43.0	5.1	8.1	4.0	6.3	3.6	74.7
% of Annual	6.1%	57.6%	6.8%	10.9%	5.3%	8.4%	4.8%	

Monthly flows calculated by averaging all available flow data for a given month. Average flow in months with only a single spot flow measurement assumed equal to the spot flow measurement.

Big Creek (1750 km2) - 1993 to 2004

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993	5.33	36	10	12.6	13.5	7.22	2.04	
1994	7.91	19.1	9.01			3.03	2.27	
1995								
1996	0.003	6.34	6.03	22.5	21.2	12.1	2.91	
1997	0.049	28.7	38.8	26.5	24.4	11	3.85	
1998	0.224	8.61	8.29	2.67	1.87	2.37	1.19	
1999	0.173	9.6	22	6.31	4.18	8.94	3.12	
2000	0.682	58	27.6	30	32.6	37	12.8	
2001	1.76	15.3	37	38.2	19.5	14.8	5.42	
2002	0.732	19.4	9.12	9.15	14.8	16.4	4.62	
2003	3.98	12.3	18.5	20.1	11.7	7.09	4.67	
2004	2.38	40.2	6.27	4.79	7.13	6.14	4.82	
2005								
2006								
Averages - 1993 to 2004								
Flow m3/s	2.11	23.1	17.5	17.3	15.1	11.5	4.34	
Runoff mm	3.1	35.3	25.9	26.5	23.1	17.0	6.6	137.5
Averages - 1974 to 2004 (all available data)								
Flow m3/s	1.83	25.0	17.6	18.9	13.8	10.6	3.98	
Runoff mm	2.7	38.3	26.1	28.9	21.1	15.7	6.1	138.9
Monthly % of Annual Total								
1993 to 2004	2.2%	24.4%	17.9%	18.3%	15.9%	11.7%	4.6%	94.9%
1974 to 2004	1.9%	26.8%	18.3%	20.2%	14.8%	11.0%	4.3%	97.4%

Big Creek 1993 to 2004 - April to October represents 95% of the average annual total runoff of 142.1 mm
1974 to 2004 - April to October represents 97% of the annual total runoff of 142.6 mm
Conclude that 1993 to 2004 period is comparable to the longer term 1974 to 2004 period.

Table MC1-8 - Summary of Average Monthly Streamflows and Runoff

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Big Creek 09AH003, 1750 km2													
Average Flow m3/s	0.31	0.18	0.15	1.83	25.0	17.6	18.9	13.8	10.6	3.98	1.29	0.59	8.01
Average Runoff mm	0.5	0.2	0.2	2.7	38.3	26.1	28.9	21.1	15.7	6.1	1.9	0.9	142.6
Minto Creek at W1 (42 km2)													
Average Flow m3/s				0.203	0.433	0.049	0.129	0.108	0.128	0.134			
Average Runoff mm				12.5	27.6	3.0	8.2	6.9	7.9	8.6			74.7
Minto Creek at W3 (10.4 km2)													
Average Flow m3/s				0.018	0.167	0.020	0.032	0.015	0.025	0.014			
Average Runoff mm				4.6	43.0	5.1	8.1	4.0	6.3	3.6			74.7
Monthly Percent of Annual Average Flow													
Big Creek nr mouth	0.3%	0.2%	0.2%	1.9%	26.8%	18.3%	20.2%	14.8%	11.0%	4.3%	1.3%	0.6%	
Minto Creek at W1	0%	0%	0%	16.7%	37.0%	4.1%	11.0%	9.2%	10.6%	11.5%	0%	0%	
Minto Creek at W3	0%	0%	0%	6.1%	57.6%	6.8%	10.9%	5.3%	8.4%	4.8%	0%	0%	

Notes

1) Minto Creek assumed to glaciate with zero flow from November to March on average.
2) April flows for W1 and W3 probably underestimate actual average monthly April flow due to lack of data during snowmelt.

Table MC1-9 - Wet and Dry Year Runoff

Return Period	Annual Percent	Big Creek Annual Runoff (mm)	Minto Creek Catchment Annual Runoff (mm)
20 (Dry)	95%	62	43
10 (Dry)	95%	75	53
5 (Dry)	80%	94	66
Average	50%	143	100
5 (Wet)	20%	190	133
10 (Wet)	10%	224	157
20 (Wet)	5%	255	179
25 (Wet)	4%	265	186
50 (Wet)	2%	294	206
100 (Wet)	1%	323	226
200 (Wet)	0.5%	351	246
Percent of Big Creek Annual Runoff			70%

Notes

1) Frequency analysis for Big Creek annual runoff based on 3-parameter log-Normal distribution with 27 points, Mean = 144 mm, Standard Deviation 60.4 mm.
2) Ratio of runoff for Minto Creek catchment based on flow data comparison with Big Creek and stations W1 and W3 over the period 1993 to 2006.
3) Annual Percent Probability is the probability of the indicated value being equalled or exceeded in any single year.

APPENDIX 2

Minto Creek Site Hydrology Update

Figures

Figure MC1-1 – Minto Camp – Air Temperature

Figure MC1-2 – Monthly Temperature Comparison

Figure MC1-3 – Minto Camp – Dew Point Temperature

Figure MC1-4 – Minto Camp – Relative Humidity

Figure MC1-5 – Minto Camp – Barometric Pressure

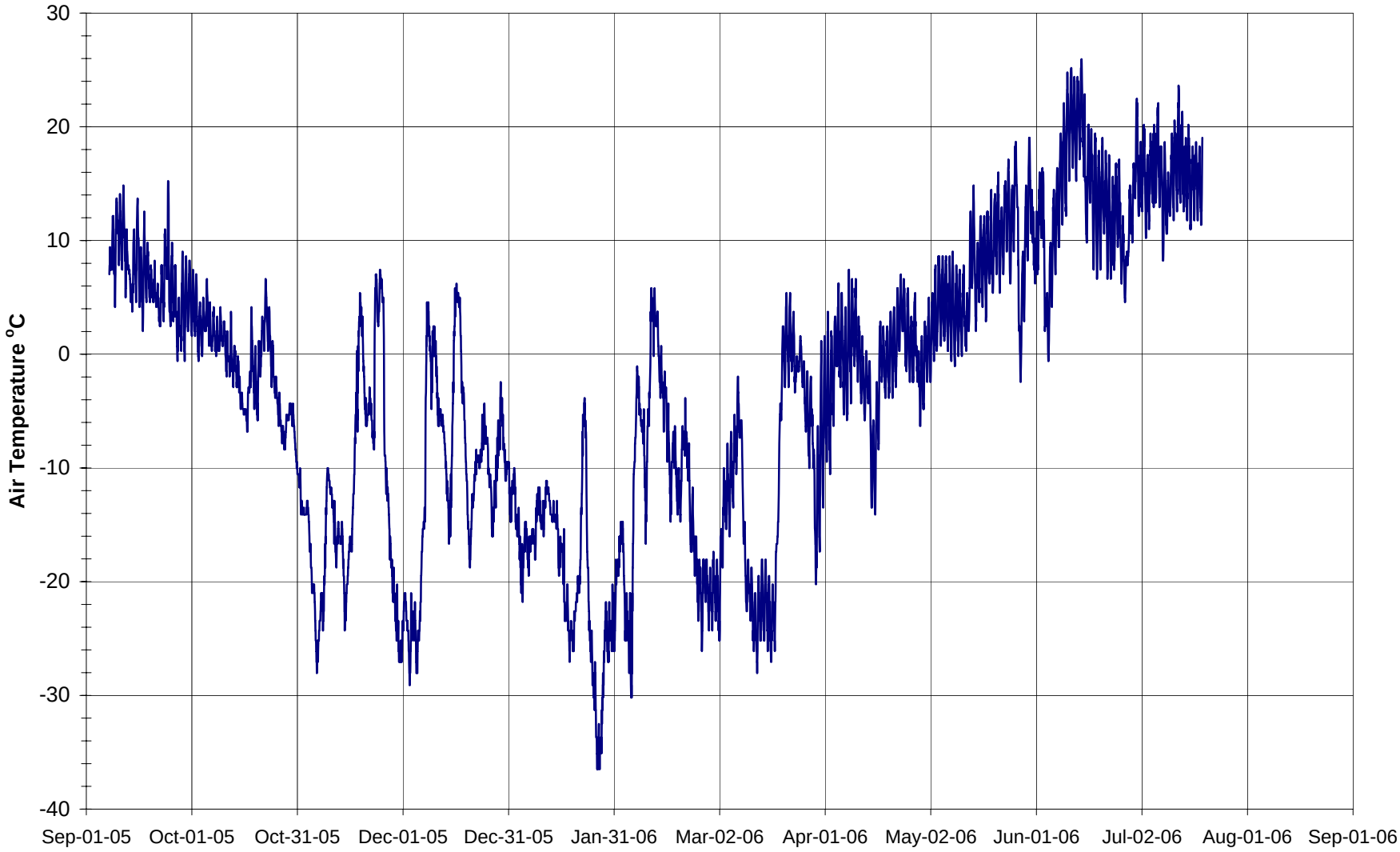
Figure MC1-6A – Estimated Mean Monthly Areal Evapotranspiration

Figure MC1-6B – Estimated Mean Monthly Lake Evaporation

Figure MC1-7 – Average Monthly Flows – Minto Creek at W1 and W3

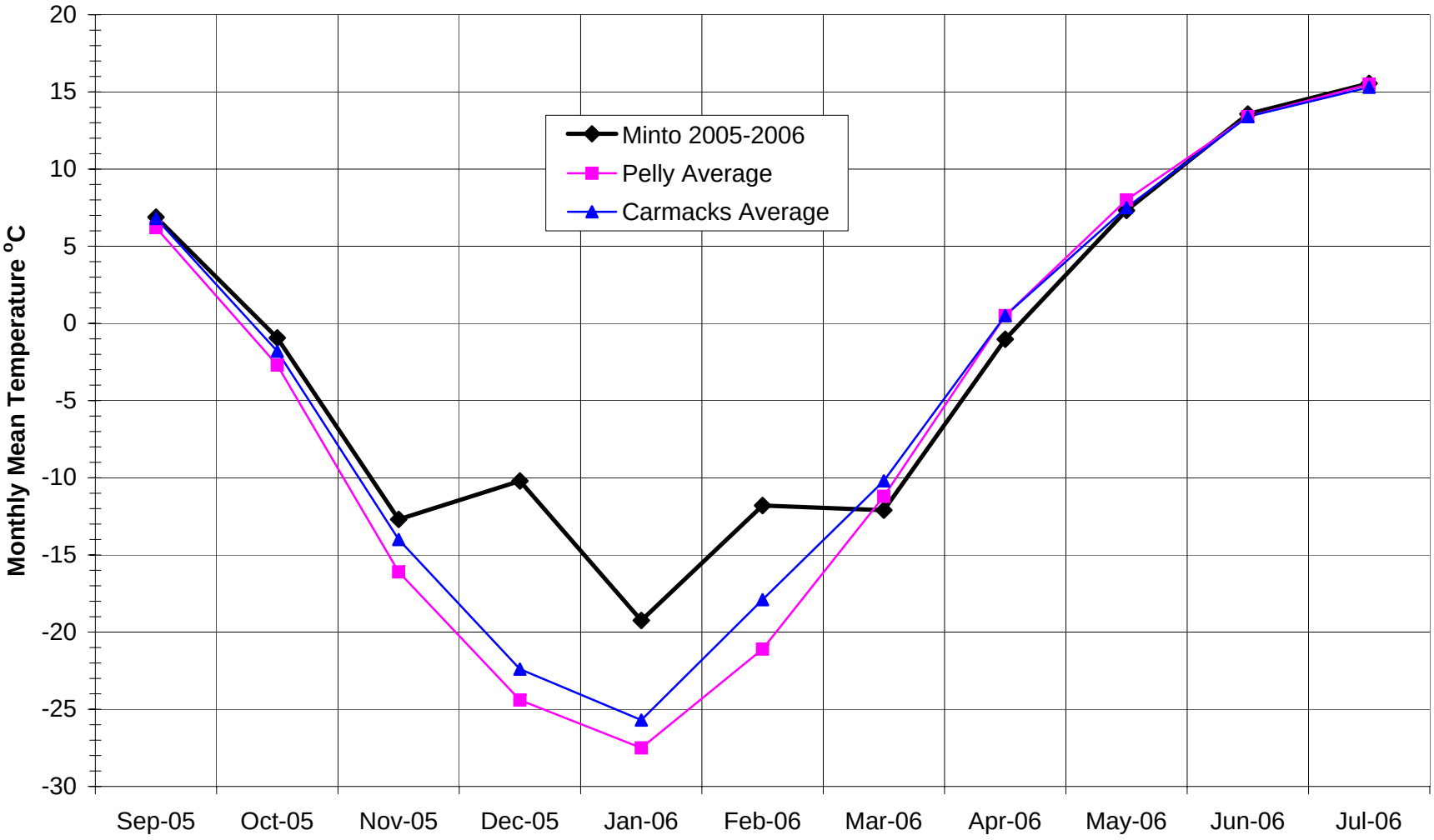
October 6, 2006

Figure MC1 - 1 : Minto Camp - Air Temperature ^{o}C



CLEARWATER CONSULTANTS LTD.

Figure MC1 - 2 : Monthly Temperature Comparison



October 6, 2006

Figure MC1 - 3 : Minto Camp - Dew Point Temperature ^{o}C

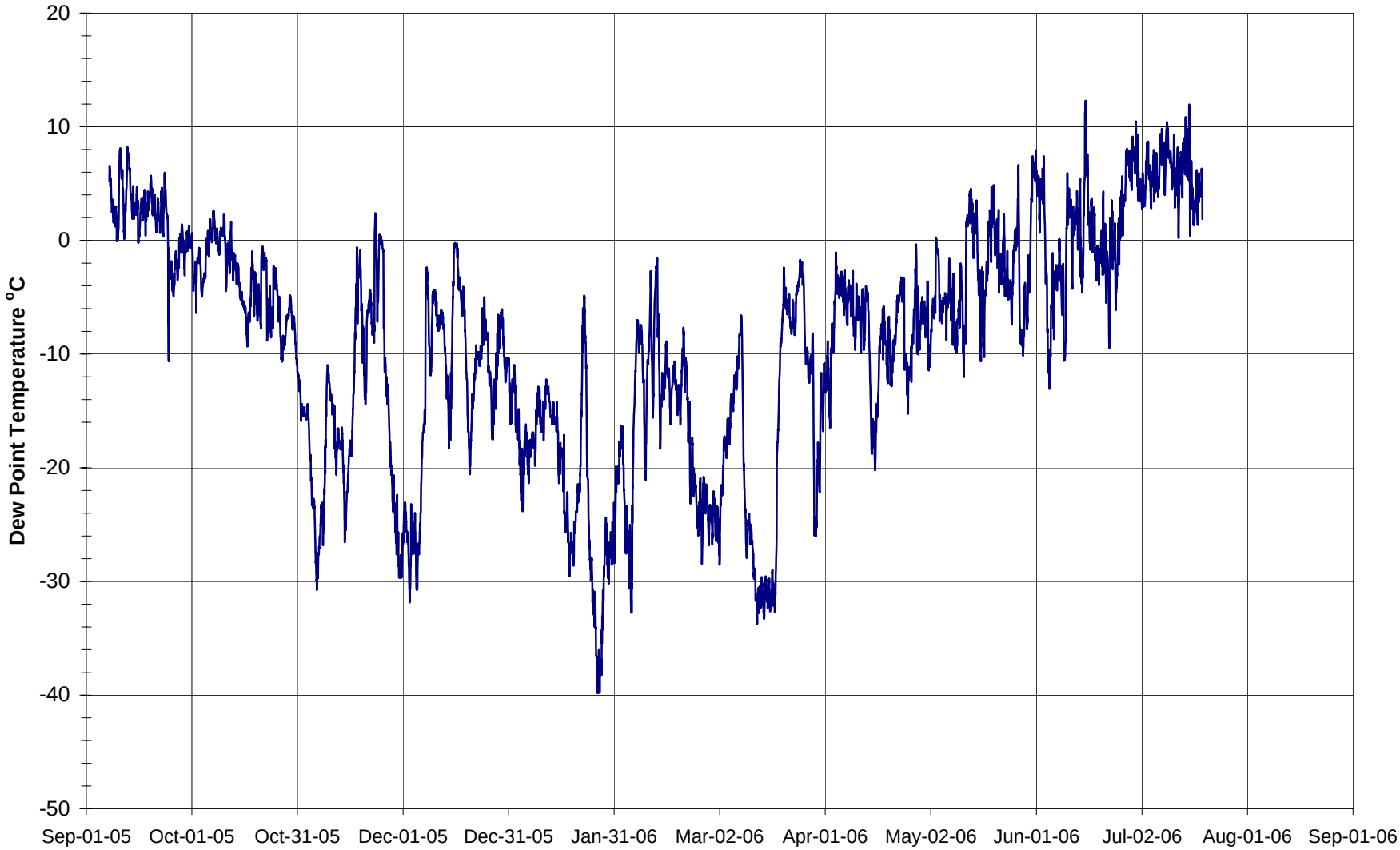


Figure MC1 - 4 : Minto Camp - Relative Humidity %

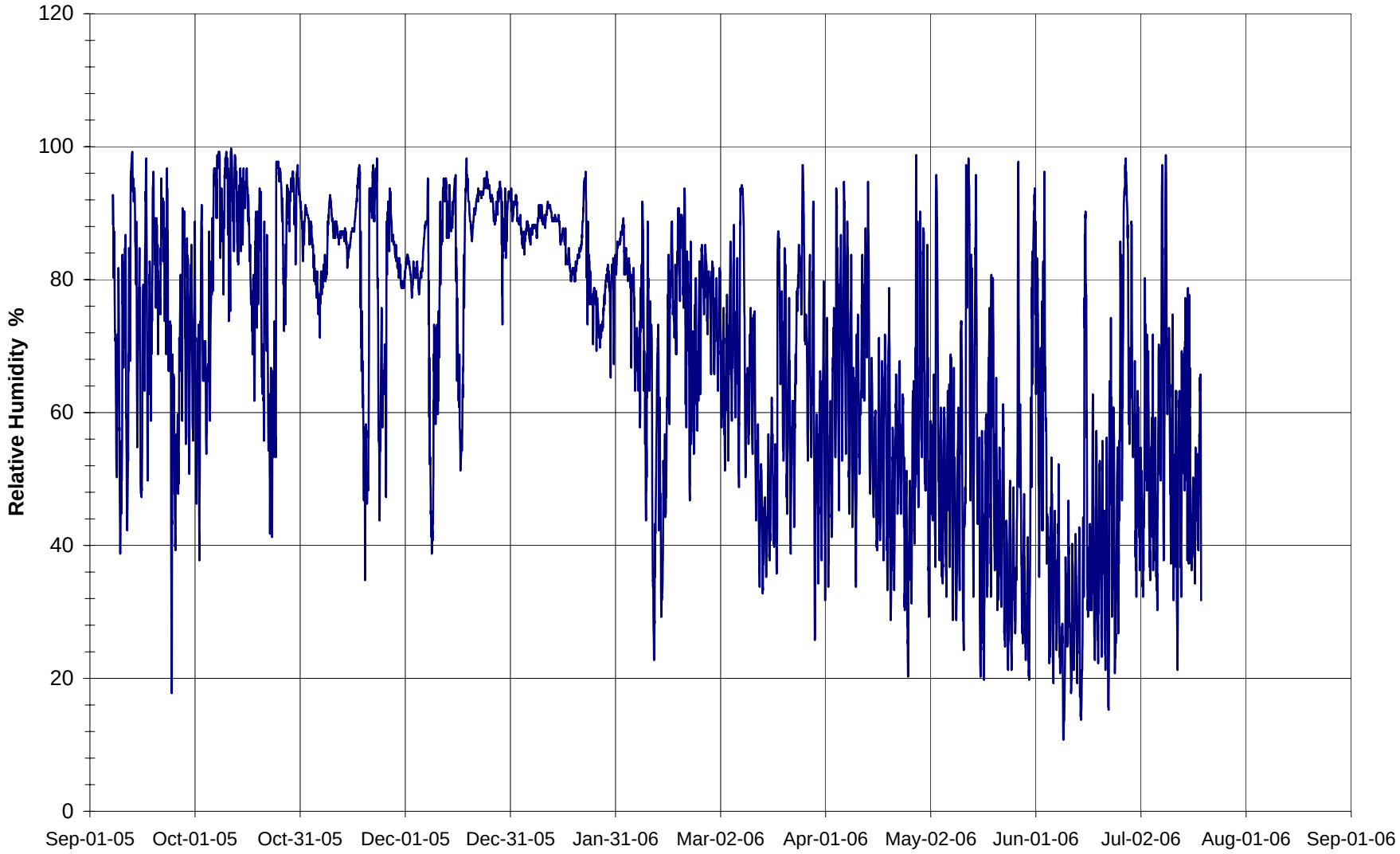


Figure MC1 - 5 : Minto Camp - Barometric Pressure (mbar)

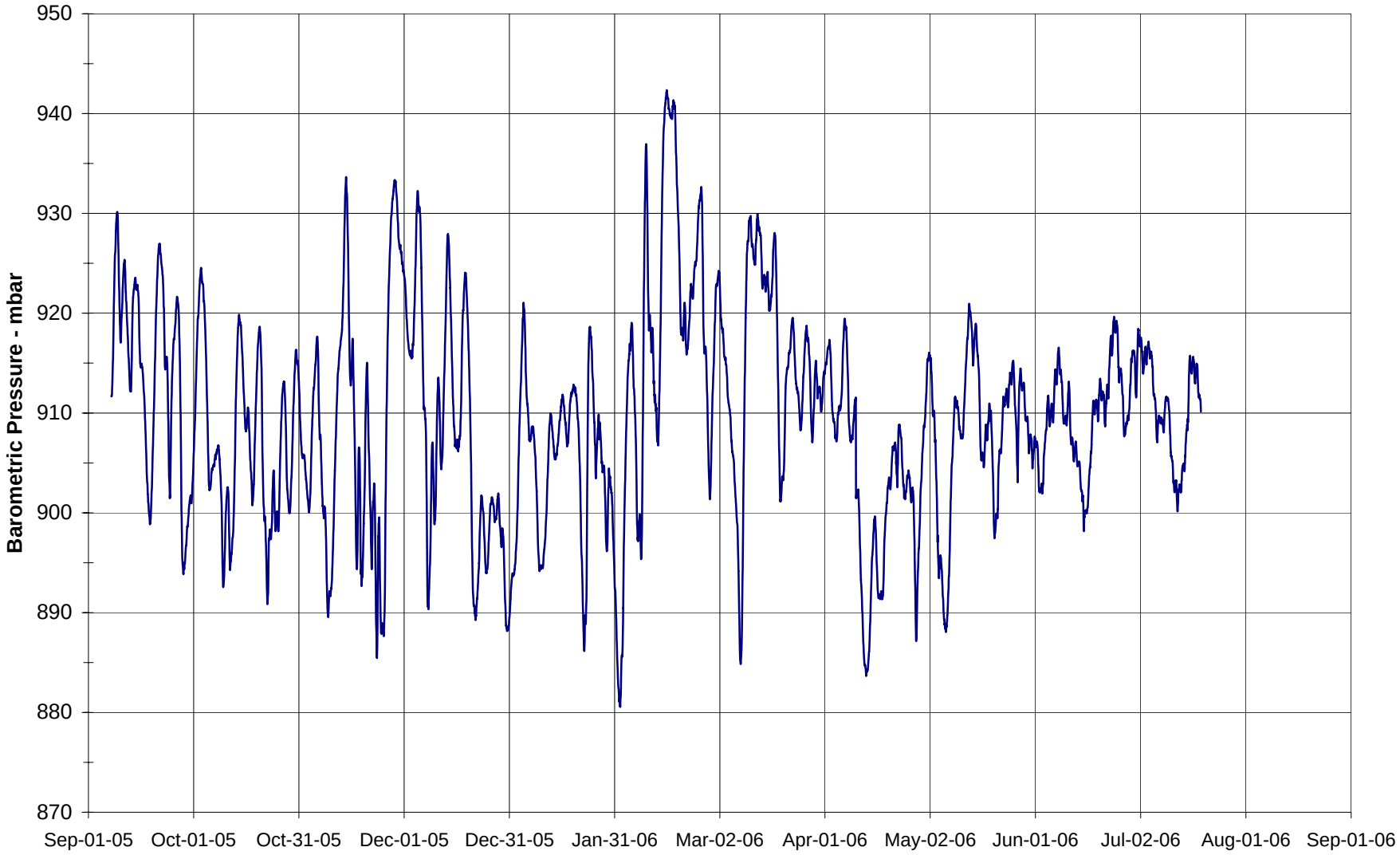


Figure MC1 - 6A: Estimated Mean Monthly Areal Evapotranspiration

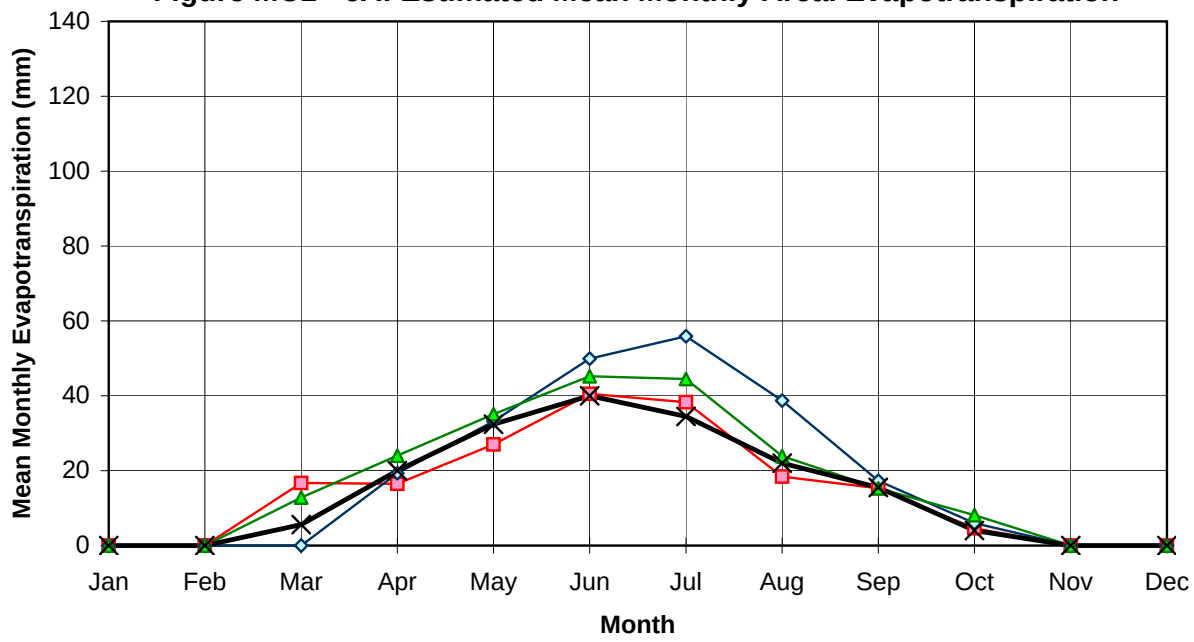


Figure MC1 - 6B: Estimated Mean Monthly Lake Evaporation

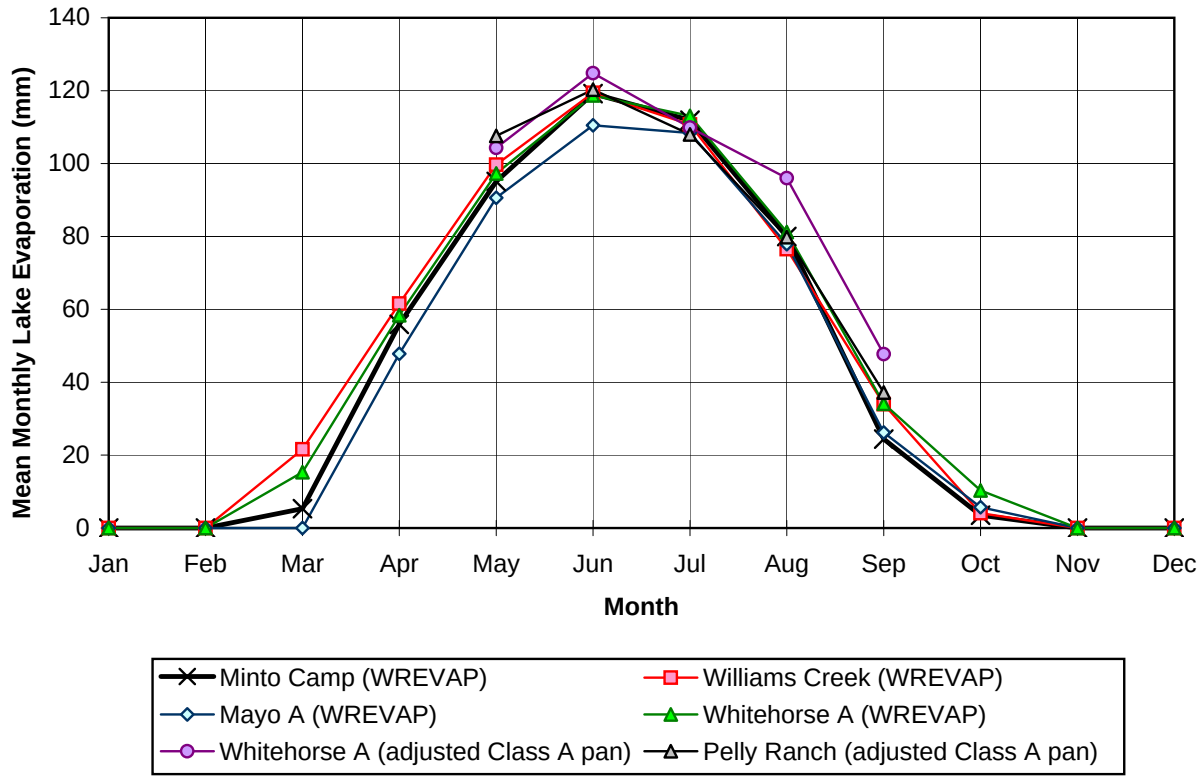
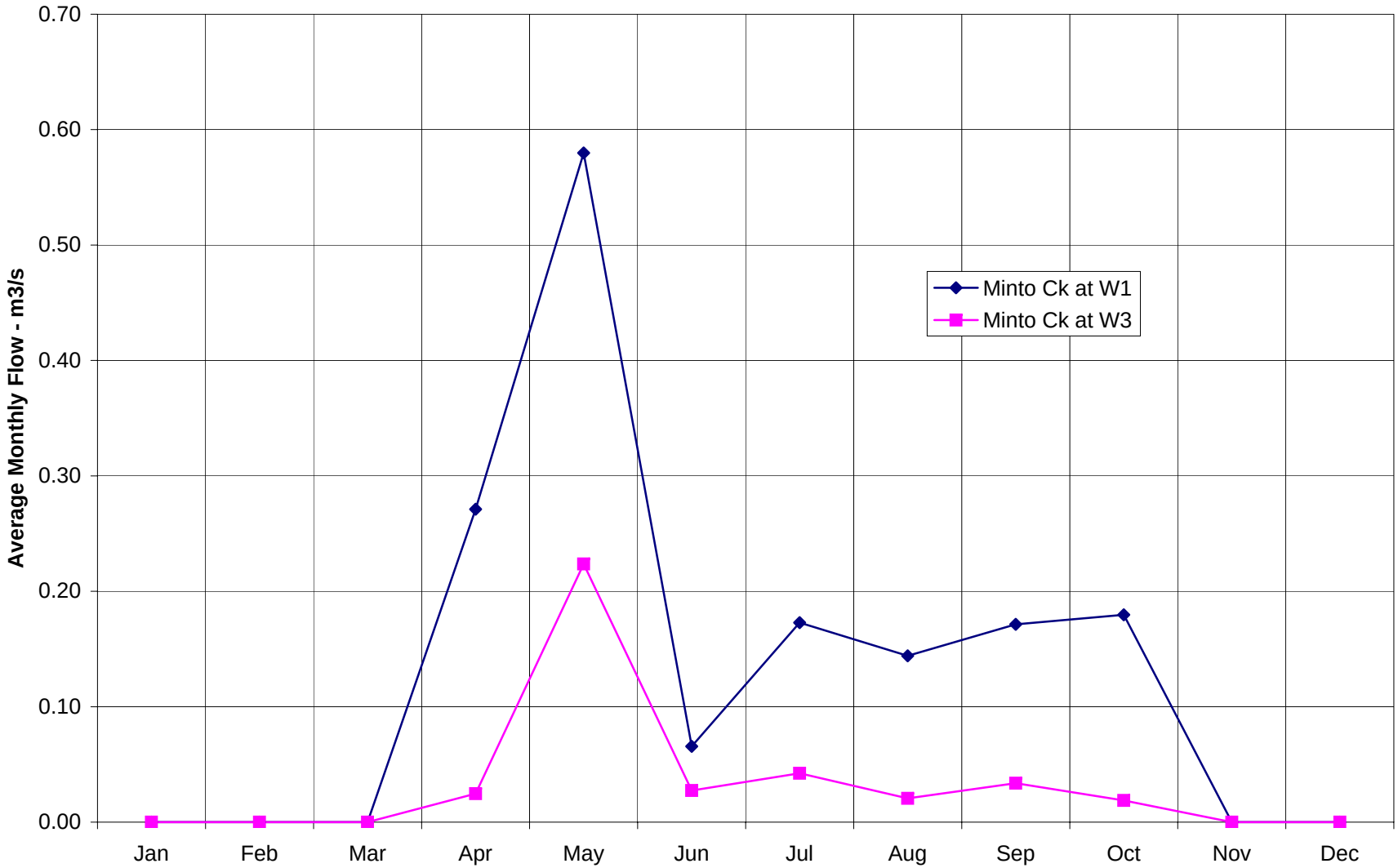


Figure MC1 - 7 Average Monthly Flows - Minto Creek at W1 and W3
(assuming MAR = 100 mm, distribution based on flows measured/estimated from 1993 to 2006)



APPENDIX 2

Minto Creek Surface Water Hydrology Conditions

Tables

TABLE MC6-1

Minto Creek at W1 - Daily Discharges (m^3/s) - 2007

Date	May	June	July	Aug	Sept	Oct
1		0.057	0.051	0.100	0.016	
2		0.055	0.177	0.054	0.019	
3	0.474	0.052	0.258	0.030	0.028	
4	0.494	0.047	0.146	0.012	0.026	
5	0.393	0.052	0.091	0.003	0.018	
6	0.334	0.052	0.058	0.003	0.021	
7	0.338	0.064	0.056	0.015	0.016	
8	0.282	0.057	0.089	0.024	0.016	
9	0.280	0.046	0.086	0.015	0.015	
10	0.261	0.052	0.073	0.009	0.035	
11	0.212	0.105	0.068	0.006	0.069	
12	0.179	0.195	0.056	0.015	0.044	
13	0.165	0.157	0.066	0.011	0.029	
14	0.153	0.122	0.051	0.004	0.024	
15	0.144	0.102	0.046	0.006	0.022	
16	0.121	0.069	0.037	0.024	0.034	
17	0.120	0.050	0.033	0.025	0.051	
18	0.101	0.040	0.031	0.031	0.032	
19	0.098	0.031	0.029	0.015	0.040	
20	0.102	0.023	0.026	0.014	0.070	
21	0.091	0.018	0.026	0.022	0.056	
22	0.083	0.014	0.019	0.031	0.038	
23	0.084	0.013	0.016	0.050	0.055	
24	0.078	0.014	0.027	0.057	0.035	
25	0.081	0.015	0.035	0.057		
26	0.079	0.024	0.024	0.043		
27	0.075	0.015	0.014	0.021		
28	0.069	0.010	0.011	0.019		
29	0.062	0.007	0.010	0.014		
30	0.065	0.025	0.023	0.020		
31	0.061		0.163	0.019		
# Days	29	30	31	31	24	
Average Daily	0.175	0.053	0.061	0.025	0.034	
Maximum Daily	0.494	0.195	0.258	0.100	0.070	
Minimum Daily	0.061	0.007	0.010	0.003	0.015	
Maximum Inst.	0.629	0.249	0.350	0.153	0.118	
Minimum Inst.	0.031	0.000	0.000	0.000	0.004	

TABLE MC6-2

Minto Creek at W1 - Daily Discharges (m^3/s) - 2008

Date	May	June	July	Aug	Sept	Oct
1		0.049	0.014	0.008	0.155	0.048
2		0.045	0.013	0.005	0.150	0.067
3		0.043	0.003	0.001	0.140	0.090
4		0.036	0.000	0.001	0.132	0.071
5		0.027	0.000	0.000	0.124	0.048
6		0.024	0.000	0.006	0.114	0.049
7		0.019	0.017	0.018	0.203	0.036
8		0.017	0.017	0.032	0.317	0.025
9		0.018	0.007	0.031	0.371	0.018
10		0.017	0.002	0.025	0.324	0.014
11		0.011	0.000	0.024	0.290	0.011
12		0.007	0.000	0.023	0.318	0.009
13	0.208	0.007	0.000	0.021	0.289	0.009
14	0.139	0.003	0.000	0.014	0.176	0.006
15	0.123	0.006	0.006	0.010	0.171	0.003
16	0.119	0.003	0.011	0.010	0.196	0.008
17	0.123	0.000	0.001	0.014	0.193	0.007
18	0.143	0.000	0.000	0.029	0.167	0.011
19	0.151	0.001	0.040	0.028	0.173	0.004
20	0.145	0.000	0.074	0.022	0.207	0.003
21	0.150	0.000	0.163	0.041	0.186	0.006
22	0.140	0.000	0.184	0.084	0.140	
23	0.125	0.000	0.092	0.077	0.133	
24	0.114	0.040	0.052	0.190	0.129	
25	0.111	0.029	0.036	2.035	0.130	
26	0.086	0.013	0.028	1.231	0.136	
27	0.091	0.004	0.019	0.590	0.129	
28	0.085	0.000	0.013	0.387	0.132	
29	0.057	0.011	0.009	0.300	0.111	
30	0.059	0.023	0.005	0.271	0.090	
31	0.053		0.007	0.186		
# Days	19	30	31	31	30	21
Average Daily	0.117	0.015	0.026	0.184	0.184	0.026
Maximum Daily	0.208	0.049	0.184	2.035	0.371	0.090
Minimum Daily	0.053	0.000	0.000	0.000	0.090	0.003
Maximum Inst.	0.218	0.071	0.250	3.125	0.414	0.100
Minimum Inst.	0.027	0.000	0.000	0.000	0.046	0.000

TABLE MC6-3

Minto Creek at W1 - Daily Discharges (m^3/s) - 2009

Date	May	June	July	Aug	Sept	Oct
1		0.444	0.439	0.134	0.047	
2		0.418	0.357	0.244	0.033	
3		0.403	0.328	0.303	0.026	
4		0.378	0.344	0.273	0.024	
5		0.361	0.415	0.156	0.022	
6		0.355	0.432	0.058	0.021	
7	2.228	0.339	0.338	0.050	0.020	
8	1.781	0.316	0.417	0.229	0.016	
9	1.525	0.318	0.363	0.121	0.013	
10	1.308	0.297	0.301	0.121	0.017	
11	1.092	0.281	0.313	0.071	0.017	
12	1.066	0.278	0.286	0.049	0.019	
13	1.222	0.288	0.290	0.058	0.020	
14	1.037	0.354	0.249	0.174	0.018	
15	0.912	0.345	0.283	0.198	0.020	
16	0.852	0.367	0.295	0.191	0.022	
17	0.801	0.294	0.276	0.208	0.018	
18	0.739	0.476	0.216	0.149	0.022	
19	0.672	0.683	0.039	0.186	0.022	
20	0.637	0.470	0.038	0.143	0.026	
21	0.616	0.358	0.151	0.135	0.028	
22	0.590	0.296	0.176	0.128	0.029	
23	0.557	0.249	0.179	0.126	0.035	
24	0.540	0.220	0.232	0.114	0.043	
25	0.517	0.190	0.220	0.107	0.036	
26	0.508	0.182	0.228	0.113	0.035	
27	0.491	0.415	0.199	0.103	0.050	
28	0.502	0.512	0.141	0.091		
29	0.525	0.240	0.040	0.085		
30	0.505	0.398	0.037	0.103		
31	0.473		0.095	0.086		
# Days	25	30	31	31	27	
Average Daily	0.868	0.351	0.249	0.139	0.026	
Maximum Daily	2.228	0.683	0.439	0.303	0.050	
Minimum Daily	0.473	0.182	0.037	0.049	0.013	
Maximum Inst.	2.259	0.803	0.485	0.357	0.067	
Minimum Inst.	0.405	0.164	0.004	0.010	0.000	

TABLE MC6-4

Minto Creek at W3 - Daily Discharges (m^3/s) - 2008

Date	Aug	Sep	Oct	Nov
1		0.083	0.004	0.003
2		0.082	0.004	0.003
3		0.080	0.004	0.003
4		0.077	0.003	0.003
5		0.082	0.003	0.003
6		0.102	0.003	0.003
7		0.189	0.003	0.003
8		0.182	0.003	0.003
9		0.175	0.003	0.003
10		0.168	0.003	0.004
11		0.172	0.003	0.005
12		0.205	0.003	
13		0.180	0.003	
14		0.103	0.003	
15		0.111	0.003	
16		0.142	0.003	
17		0.131	0.003	
18		0.123	0.003	
19		0.136	0.003	
20		0.158	0.003	
21	0.003	0.119	0.003	
22	0.003	0.095	0.003	
23	0.003	0.098	0.003	
24	0.004	0.100	0.006	
25	0.043	0.100	0.005	
26	0.114	0.102	0.003	
27	0.070	0.103	0.003	
28	0.096	0.105	0.003	
29	0.126	0.107	0.003	
30	0.152	0.049	0.003	
31	0.089		0.003	
# Days	11	30	31	11
Average Daily	0.064	0.122	0.003	0.003
Maximum Daily	0.152	0.205	0.006	0.005
Minimum Daily	0.003	0.049	0.003	0.003
Maximum Inst.				
Minimum Inst.				

TABLE MC6-5

Minto Creek at W3 - Daily Discharges (m^3/s) - 2009

Date	Jun	Jul	Aug	Sep	Oct
1		0.136	0.057	0.139	0.118
2		0.157	0.101	0.137	0.066
3		0.144	0.103	0.134	0.068
4	0.013	0.143	0.102	0.130	0.114
5	0.014	0.146	0.102	0.133	0.114
6	0.014	0.145	0.056	0.128	0.115
7	0.014	0.120	0.018	0.129	0.116
8	0.014	0.109	0.011	0.128	0.118
9	0.015	0.140	0.011	0.125	0.117
10	0.017	0.111	0.011	0.121	0.113
11	0.016	0.122	0.012	0.126	0.116
12	0.017	0.114	0.011	0.125	0.118
13	0.014	0.110	0.011	0.126	0.119
14	0.016	0.110	0.043	0.121	0.120
15	0.013	0.109	0.124	0.119	0.119
16	0.014	0.123	0.125	0.120	
17	0.017	0.135	0.130	0.120	
18	0.014	0.131	0.118	0.117	
19	0.016	0.067	0.119	0.122	
20	0.016	0.010	0.132	0.121	
21	0.015	0.033	0.128	0.120	
22	0.014	0.061	0.132	0.120	
23	0.014	0.079	0.130	0.120	
24	0.014	0.093	0.131	0.120	
25	0.014	0.116	0.134	0.119	
26	0.014	0.138	0.134	0.118	
27	0.022	0.136	0.130	0.116	
28	0.141	0.114	0.133	0.118	
29	0.136	0.071	0.137	0.118	
30	0.064	0.009	0.135	0.119	
31		0.062	0.139		
# Days	27	31	31	30	15
Average Daily	0.026	0.106	0.092	0.124	0.110
Maximum Daily	0.141	0.157	0.139	0.139	0.120
Minimum Daily	0.013	0.009	0.011	0.116	0.066
Maximum Inst.					
Minimum Inst.					

TABLE MC6-6 - Big Creek near the Mouth Station 09AH003 - Monthly Discharges (m^3/s)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1974								19.6	4.53	2.16	0.608	0.118	
1975	0.058	0.083	0.149	0.443	37.3	14.6	23.9	23.1	13.8	4.06	0.423	0.199	9.96
1976	0.121	0.081	0.062	0.400	23.4	25.7	42.5	5.94	2.92	1.69	0.758	0.256	8.72
1977	0.224	0.201	0.152	0.512	17.6	17.9	15.8	3.92	4.28	2.79	0.696	0.087	5.39
1978	0.048	0.028	0.023	0.023	7.04	20.8	40.1	23.4	7.72	4.81	1.77	0.635	8.95
1979	0.342	0.125	0.123	0.178	18.0	18.4	19.6	12.0	10.3	3.46	1.07	0.355	7.05
1980	0.152	0.157	0.184	0.304	7.8	4.7	16.6	11.0	22.1	7.68	0.781	0.189	5.99
1981	0.175	0.169	0.173	0.225	12.8	4.72	18.4	14.0	5.89	4.80	1.61	0.432	5.35
1982	0.153	0.135	0.140	0.218	24.0	20.1	4.88	16.0	2.73	1.91	0.850	0.298	6.00
1983	0.125	0.068	0.050	0.054	8.49	21.3	17.9	27.3	8.89	3.27	0.426	0.026	7.38
1984	0.005	0.006	0.012	0.124			19.6	4.29	13.8	2.56	0.375	0.073	
1985	0.030	0.020	0.045	0.089	25.9	23.4	20.1	11.7	10.8	3.46	1.34	0.759	8.21
1986	0.496	0.298	0.111	0.052	21.6	18.4	17.2	10.9	9.28	3.51	0.668	0.595	6.98
1987	0.412	0.207	0.081	0.684	26.8	18.6	7.01	12.0	7.78	3.28	1.04	0.433	6.58
1988	0.192	0.167	0.211	0.499	26.7	11.0	23.0	15.7	6.14	3.20	1.66	0.786	7.50
1989	0.404	0.181	0.081	0.180	10.6	7.88	6.13	4.74	3.96	2.47	1.13	0.515	3.22
1990	0.262	0.113	0.065	21.8	76.8	17.0	8.48	3.65	19.0	5.88	0.960	0.317	12.9
1991	0.210	0.257	0.368	2.77	49.6	23.0	18.1	18.0	20.5	5.75	3.59	2.15	12.1
1992	1.10	0.447	0.488	1.37	52.2	33.7	36.2	12.4	16.5	4.92	2.02	1.10	13.6
1993	0.481	0.242	0.189	5.33	36.0	10.0	12.6	13.5	7.22	2.04	1.89	1.33	7.64
1994	0.675	0.294	0.162	7.91	19.1	9.01			3.03	2.27	0.529	0.286	
1996	0.207	0.035	0.006	0.003	6.34	6.03	22.5	21.2	12.1	2.91	0.717	0.147	6.05
1997	0.045	0.028	0.022	0.049	28.7	38.8	26.5	24.4	11.0	3.85	1.78	0.661	11.4
1998	0.179	0.128	0.105	0.224	8.61	8.29	2.67	1.87	2.37	1.19	0.221	0.035	2.17
1999	0.022	0.018	0.019	0.173	9.60	22.0	6.31	4.18	8.94	3.12	0.356	0.074	4.57
2000	0.033	0.024	0.032	0.682	53.2	26.6	27.8	30.6	34.2	11.8	4.09	2.42	16.0
2001	1.28	0.708	0.571	1.76	15.3	35.4	33.9	19.5	14.8	5.42	2.54	1.09	11.1
2002	0.519	0.288	0.227	0.732	19.4	9.12	9.15	14.8	16.4	4.62	1.90	1.00	6.56
2003	0.543	0.264	0.132	3.98	12.3	18.5	20.1	11.7	7.09	4.67	1.63	0.655	6.84
2004	0.369	0.378	0.423	2.38	40.2	6.27	4.79	7.13	6.14	4.82	1.25	0.621	6.29
2005	0.434	0.352	0.336	7.00	14.8	8.64	11.8	12.8	16.4	6.10	2.13	0.446	6.80
2006	0.207	0.168	0.176	0.625	20.2	10.6	9.55	5.90	4.92	2.86	1.15	0.277	4.77
2007	0	0	0.040	2.83	23.3	8.93	11.0	6.80	7.61	3.66	0.852	0.276	5.49
2008	0.146	0.117	0.136	1.28	42.4	11.6	6.74	**31.8**	16.6	5.92	2.44	1.33	10.1
2009	0.864	0.652	0.587	1.70	45.1	19.0	3.59	4.33	4.78	2.75	1.64	0.755	7.20
All Data 1974-2009													
Mean	0.309	0.189	0.167	1.96	25.5	16.7	17.1	13.5	10.41	3.99	1.34	0.592	7.78
Max	1.28	0.708	0.587	21.8	76.8	38.8	42.5	31.8	34.2	11.8	4.09	2.42	16.0
Min	0.0	0.0	0.006	0.003	6.34	4.70	2.67	1.87	2.37	1.19	0.221	0.026	2.17
Runoff mm	0.5	0.3	0.3	2.9	39.0	24.7	26.2	20.7	15.4	6.1	2.0	0.9	138.9
1993-2006													
Mean	0.384	0.225	0.185	2.37	21.8	16.1	15.6	14.0	11.1	4.28	1.55	0.696	12.05
Runoff mm	0.6	0.3	0.3	3.5	33.4	23.8	23.9	21.4	16.5	6.6	2.3	1.1	133.6
2007-2009													
Mean	0.337	0.256	0.254	1.94	36.9	13.2	7.11	14.3	9.66	4.11	1.64	0.787	6.89
Runoff mm	0.5	0.4	0.4	2.9	56.5	19.5	10.9	21.9	14.3	6.3	2.4	1.2	137.2

Lat 62°34'7" N **Long** 137°0'58" W Drainage Area 1750 km2

values revised by WSC since 2006

TABLE MC6-7 - Monthly Average Flows - Minto Creek W1 & W2 (42 km^2)

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993						0.069		
1994		0.312	0.058	0.095	0.007	0.073		
1995		0.027	0.001	0.091		0.133		
1996		0.031	0.024	0.324		0.146		
1997		1.447			0.265			
1998		0.161			0.003			
1999					0.033			
2000		1.004						
2001		0.467						
2002								
2003					0.129			
2004				0.118				
2005		0.097	0.012	0.127	0.209	0.219	0.134	
2006	0.203	0.354	0.150	0.020	0.0068		0.031	
2007	0.645	0.175	0.053	0.061	0.025	0.034	0.035	
2008		0.117	0.015	0.026	0.184	0.184	0.026	
2009		0.868	0.351	0.249	0.139	0.026		
Pre-Mine 1993 to 2006								Total
Average Flow m3/s	0.203	0.433	0.049	0.129	0.093	0.128	0.083	
Average Runoff mm	12.5	27.6	3.0	8.2	5.9	7.9	5.3	70.6
% of Annual	17.8%	39.2%	4.3%	11.7%	8.4%	11.2%	7.5%	
Mining Period 2007 to 2009								
Average Flow m3/s	0.645	0.387	0.140	0.112	0.116	0.081	0.030	
Average Runoff mm	39.8	24.7	8.6	7.2	7.4	5.0	1.9	94.6
% of Annual	42.1%	26.1%	9.1%	7.6%	7.8%	5.3%	2.0%	
All Data 1993 to 2009								
Average Flow m3/s	0.424	0.422	0.083	0.123	0.100	0.111	0.057	
Average Runoff mm	26.2	26.9	5.1	7.9	6.4	6.8	3.6	82.9
% of Annual	31.6%	32.5%	6.2%	9.5%	7.7%	8.2%	4.3%	

Monthly flows calculated by averaging all available flow data for a given month. Average flow in months with only a single spot flow measurement assumed equal to the spot flow measurement.

Flows impacted by storage within and emergency releases from the Water Storage Pond in August and September 2008 and in June through October 2009.

TABLE MC6-8 - Monthly Average Flows - Minto Creek W3 (10.4 km^2)

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993						0.028		
1994		0.101	0.028	0.039	0.011	0.028		
1995			0.0035	0.017		0.027	0.008	
1996		0.013		0.087		0.021		
1997		0.554						
1998					0.006			
1999					0.006			
2000								
2001		0.16						
2002								
2003					0.037			
2004				0.026				
2005		0.046	0.008	0.014	0.017	0.022	0.02	
2006	0.018	0.128	0.042	0.006	0.0149	0.0093	0.01	
2007	0.0012	0.0118	0.0088	0.0062				
2008					0.064	0.122	0.003	
2009			0.026	0.106	0.092	0.124	0.110	
Pre-Mine 1993 to 2006								Total
Average Flow m3/s	0.018	0.167	0.020	0.032	0.015	0.023	0.013	
Average Runoff mm	4.6	43.0	5.1	8.1	3.9	5.6	3.3	73.6
% of Annual	6.2%	58.4%	6.9%	11.0%	5.4%	7.6%	4.4%	
Mining Period 2007 to 2009								
Average Flow m3/s	0.001	0.012	0.017	0.056	0.078	0.123	0.057	
Average Runoff mm	0.3	2.9	4.3	14.5	20.1	30.6	14.6	87.3
% of Annual	0.3%	3.4%	5.0%	16.6%	23.0%	35.0%	16.7%	
All Data 1993 to 2009								
Average Flow m3/s	0.010	0.145	0.019	0.038	0.031	0.048	0.030	
Average Runoff mm	2.4	37.3	4.8	9.7	8.0	11.9	7.8	81.9
% of Annual	3.0%	45.5%	5.9%	11.9%	9.7%	14.5%	9.5%	

Monthly flows calculated by averaging all available flow data for a given month. Average flow in months with only a single spot flow measurement assumed equal to the spot flow measurement.

Flows impacted by storage within and emergency releases from the Water Storage Pond in August and September 2008 and in June through October 2009.

TABLE MC6-9 - Monthly Flows - Big Creek - 1993 to 2009 (1750 km^2)

	Apr	May	Jun	Jul	Aug	Sep	Oct	
1993	5.33	36	10	12.6	13.5	7.22	2.04	
1994	7.91	19.1	9.01	m	m	3.03	2.27	
1995	m	m	m	m	m	m	m	
1996	0.003	6.34	6.03	22.5	21.2	12.1	2.91	
1997	0.049	28.7	38.8	26.5	24.4	11	3.85	
1998	0.224	8.61	8.29	2.67	1.87	2.37	1.19	
1999	0.173	9.6	22	6.31	4.18	8.94	3.12	
2000	0.682	58.0	27.6	30	32.6	37	12.8	
2001	1.76	15.3	37	38.2	19.5	14.8	5.42	
2002	0.732	19.4	9.12	9.15	14.8	16.4	4.62	
2003	3.98	12.3	18.5	20.1	11.7	7.09	4.67	
2004	2.38	40.2	6.27	4.79	7.13	6.14	4.82	
2005	7.00	14.8	8.64	11.8	12.8	16.4	6.10	
2006	0.625	20.2	10.6	9.55	5.90	4.92	2.86	
2007	2.83	23.3	8.93	11.0	6.80	7.61	3.66	
2008	1.28	42.4	11.6	6.74	31.8	16.6	5.92	
2009	1.70	45.1	19.0	3.59	4.33	4.78	2.75	
Pre-Mine 1993 to 2006								Total
Average Flow m3/s	2.37	22.20	16.30	16.18	14.13	11.34	4.36	
Average Runoff mm	3.5	34.0	24.1	24.8	21.6	16.8	6.7	131.5
Mining Period 2007 to 2009								
Average Flow m3/s	1.94	36.93	13.18	7.11	14.31	9.66	4.11	
Average Runoff mm	2.9	56.5	19.5	10.9	21.9	14.3	6.3	132.3
All Data - 1993 to 2009								
Average Flow m3/s	2.29	25.0	15.7	14.4	14.2	11.0	4.31	
Average Runoff mm	3.4	38.2	23.3	22.0	21.7	16.3	6.6	131.5
All Available Data - 1974 to 2009								
Average Flow m3/s	1.96	25.5	16.7	17.1	13.5	10.4	3.99	
Average Runoff mm	2.9	39.0	24.7	26.2	20.7	15.4	6.1	135.0
Monthly % of Mean Annual Runoff								
1993 to 2006	2.5%	24.5%	17.4%	17.8%	15.6%	12.1%	4.8%	94.7%
2007 to 2009	2.1%	40.7%	14.1%	7.8%	15.8%	10.3%	4.5%	95.2%
1974 to 2009	2.1%	28.1%	17.8%	18.8%	14.9%	11.1%	4.4%	97.2%

TABLE MC6-10 - Summary of Average Monthly Streamflows and Runoff Distribution

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Big Creek 09AH003 (1750 km^2)													
Average Flow m3/s	0.31	0.19	0.17	1.96	25.5	16.7	17.1	13.5	10.4	3.99	1.34	0.59	7.78
Average Runoff mm	0.5	0.3	0.3	2.9	39.0	24.7	26.2	20.7	15.4	6.1	2.0	0.9	138.9
% of Annual	0.3%	0.2%	0.2%	2.1%	28.1%	17.8%	18.8%	14.9%	11.1%	4.4%	1.4%	0.7%	100.0%

Minto Creek at W1 (42 km^2)													
	Pre-Mining Conditions to 2006												
Average Flow m3/s				0.203	0.433	0.049	0.129	0.093	0.128	0.083			
Average Runoff mm				12.5	27.6	3.0	8.2	5.9	7.9	5.3			70.6
% of Annual				17.8%	39.2%	4.3%	11.7%	8.4%	11.2%	7.5%			100.0%
	Mining Period 2007 to 2009												
Average Flow m3/s				0.645	0.387	0.140	0.112	0.116	0.081	0.030			
Average Runoff mm				39.8	24.7	8.6	7.2	7.4	5.0	1.9			94.6
% of Annual				42.1%	26.1%	9.1%	7.6%	7.8%	5.3%	2.0%			100.0%

Minto Creek at W3 (10.4 km^2)													
	Pre-Mining Conditions to 2006												
Average Flow m3/s				0.018	0.167	0.020	0.032	0.015	0.023	0.013			
Average Runoff mm				4.6	43.0	5.1	8.1	3.9	5.6	3.3			73.6
% of Annual				6.2%	58.4%	6.9%	11.0%	5.4%	7.6%	4.4%			100.0%
	Mining Period 2007 to 2009												
Average Flow m3/s				0.001	0.012	0.017	0.056	0.078	0.123	0.057			
Average Runoff mm				0.3	2.9	4.3	14.5	20.1	30.6	14.6			87.3
% of Annual				0.3%	3.4%	5.0%	16.6%	23.0%	35.0%	16.7%			100.0%

Notes

1) Minto Creek assumed to glaciate with zero flow from November to March on average.
2) April flows for W1 and W3 probably underestimate actual average monthly April flow due to lack of data during peak snowmelt.
3) Flows at W3 during the mining period impacted significantly by releases of excess water from the Water Storage Pond. Spring runoff flows held in storage and not released until later in the summer/fall.

Table MC6-11 - Estimated Wet and Dry Year Runoff

Return Period	Annual Percent	Big Creek Annual Runoff (mm)	Minto Creek Catchment Annual Runoff (mm)
20 (Dry)	95%	64	42
10 (Dry)	95%	76	49
5 (Dry)	80%	94	61
Average	50%	133	86
5 (Wet)	20%	184	120
10 (Wet)	10%	216	140
20 (Wet)	5%	246	160
25 (Wet)	4%	255	166
50 (Wet)	2%	283	184
100 (Wet)	1%	311	202
200 (Wet)	0.5%	338	220
Percent of Big Creek Annual Runoff			65%

Notes

1) Frequency analysis for Big Creek annual runoff based on 3-parameter log-Normal distribution with 32 points (1974 to 2009), Mean = 141 mm, Standard Deviation 57.4 mm.
2) Ratio of runoff for Minto Creek catchment based on flow data comparison with Big Creek and stations W1 and W3 over the period 1993 to 2009
3) Annual Percent Probability is the probability of the indicated value being equalled or exceeded in any single year.

APPENDIX 3

Minto Creek Surface Water Hydrology Conditions

Figures

Figure MC6-1 – Minto Creek at W1 – Stage and Discharge Records 2007

Figure MC6-2 – Minto Creek at W1 – Stage and Discharge Records 2008

Figure MC6-3 – Minto Creek at W1 – Stage and Discharge Records 2009

Figure MC6-4 – Minto Creek at W3 – Discharge and Release Records 2008 and 2009

Figure MC6-5 – Monthly Runoff Distributions – Pre-Mining and Mining Periods

Figure MC6-6 – Water Storage Pond – Elevation and Volume Variation

Figure MC6-7 – Minto Main Pit – Water Elevation and Storage Volume Variation

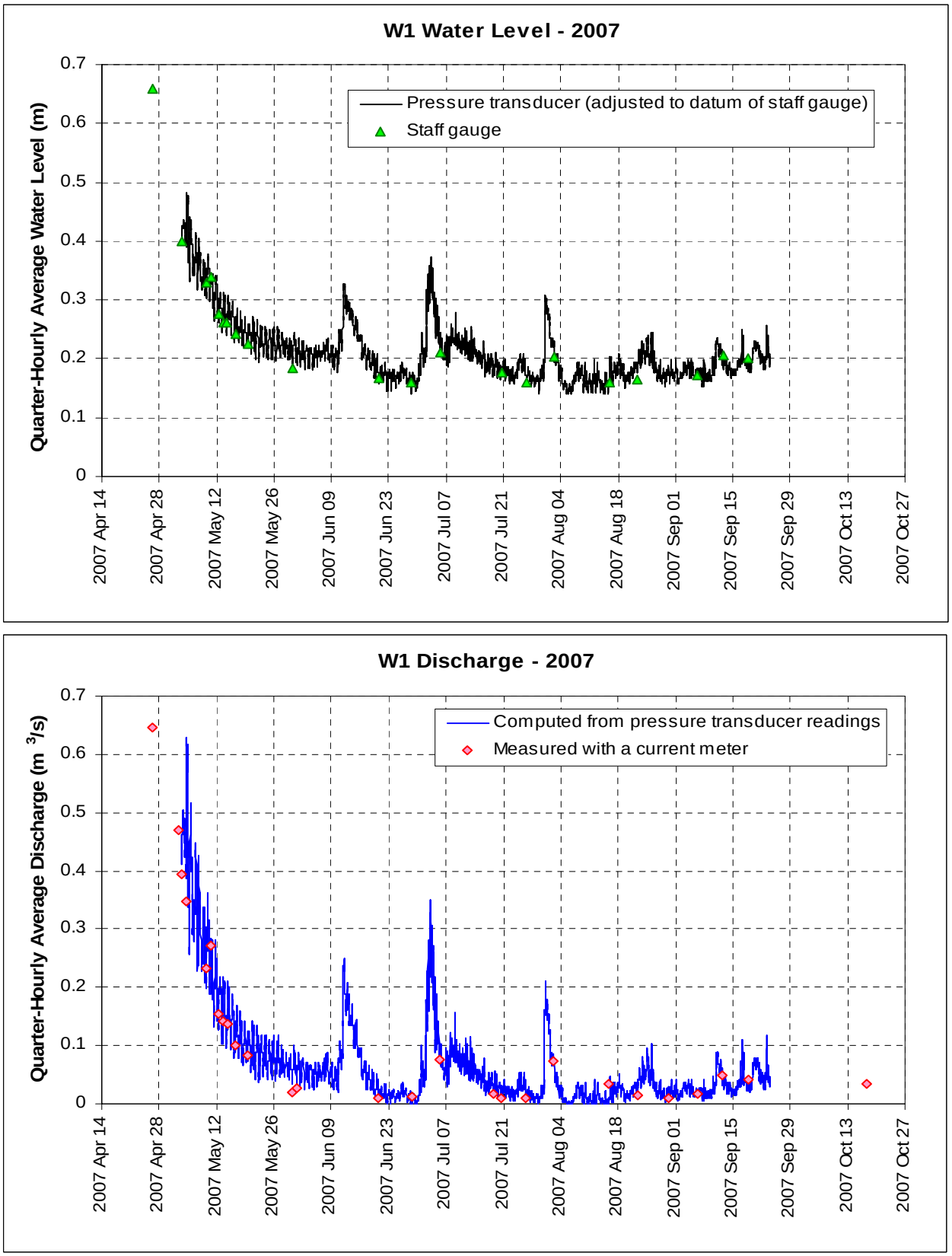


FIGURE MC6-1 - Minto Creek at W1 - Stage and Discharge Records - 2007

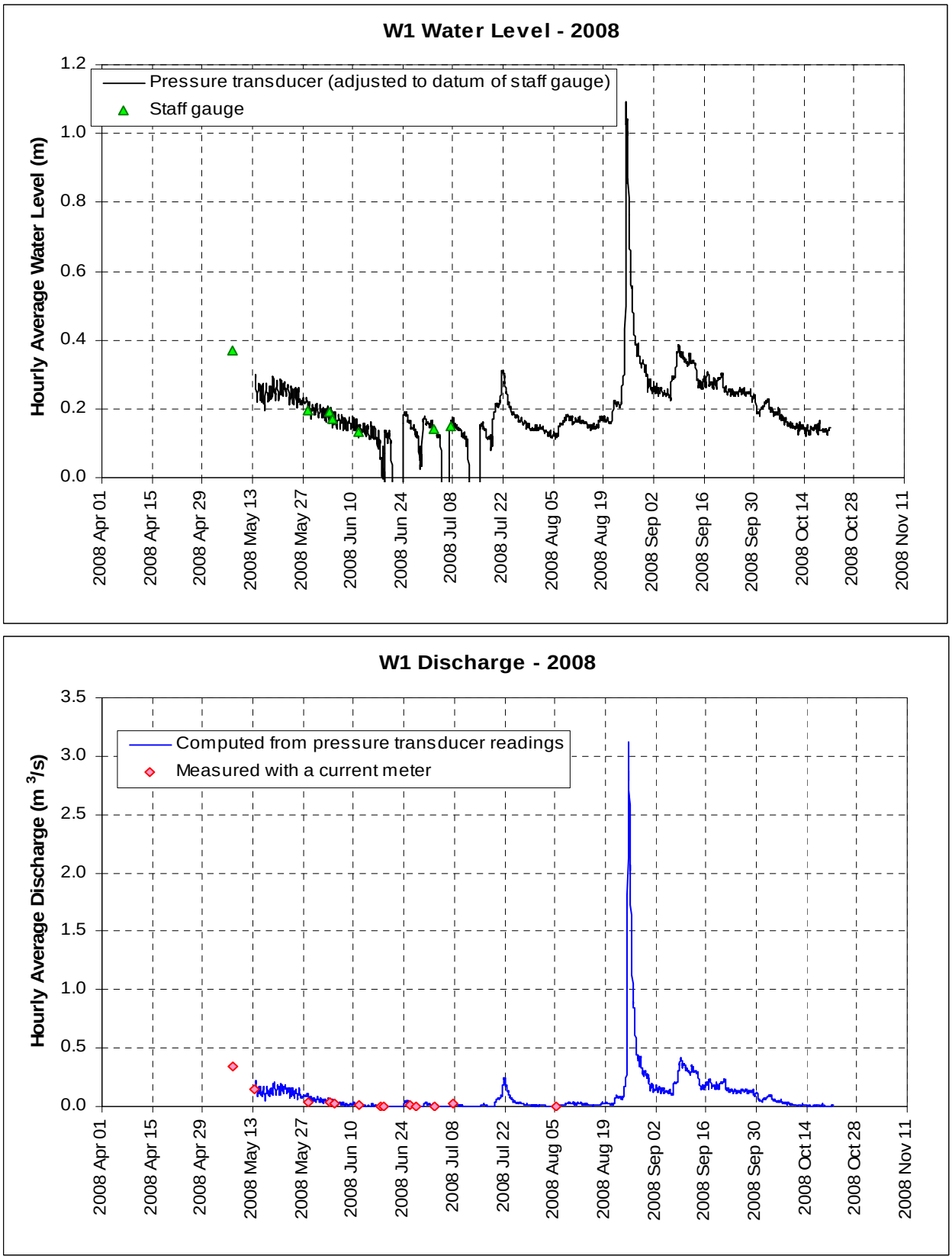


FIGURE MC6-2 - Minto Creek at W1 - Stage and Discharge Records - 2008

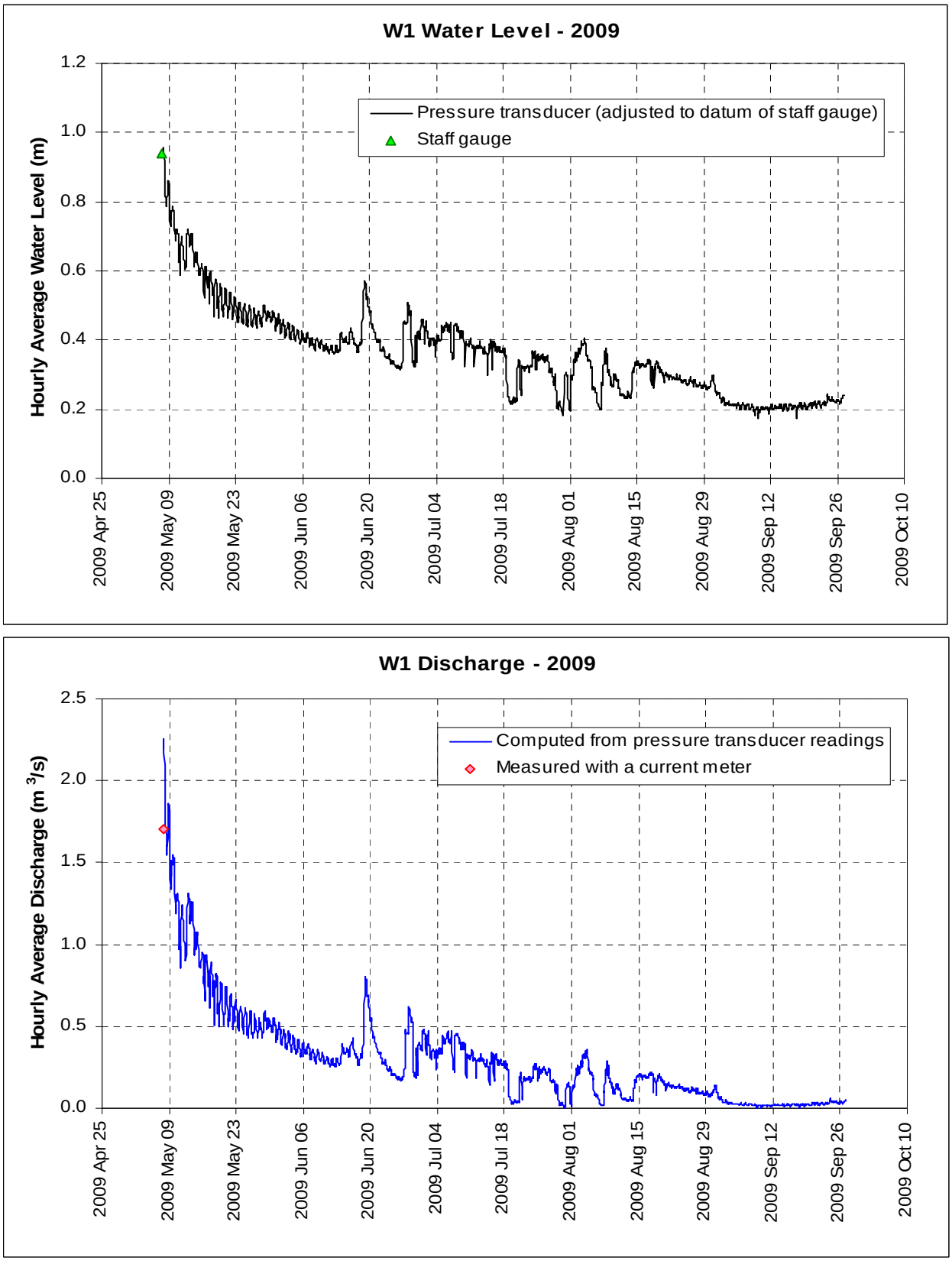
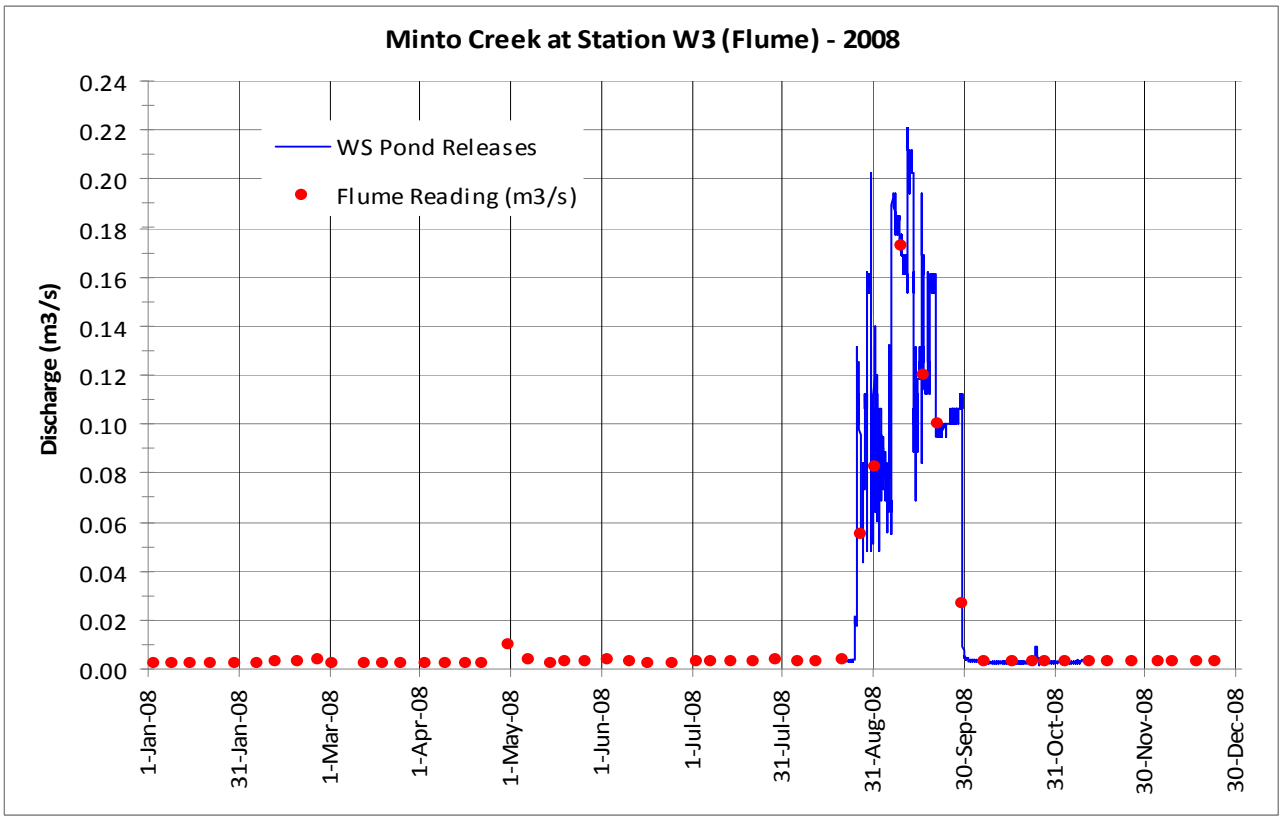


FIGURE MC6-3 - Minto Creek at W1 - Stage and Discharge Records - 2009



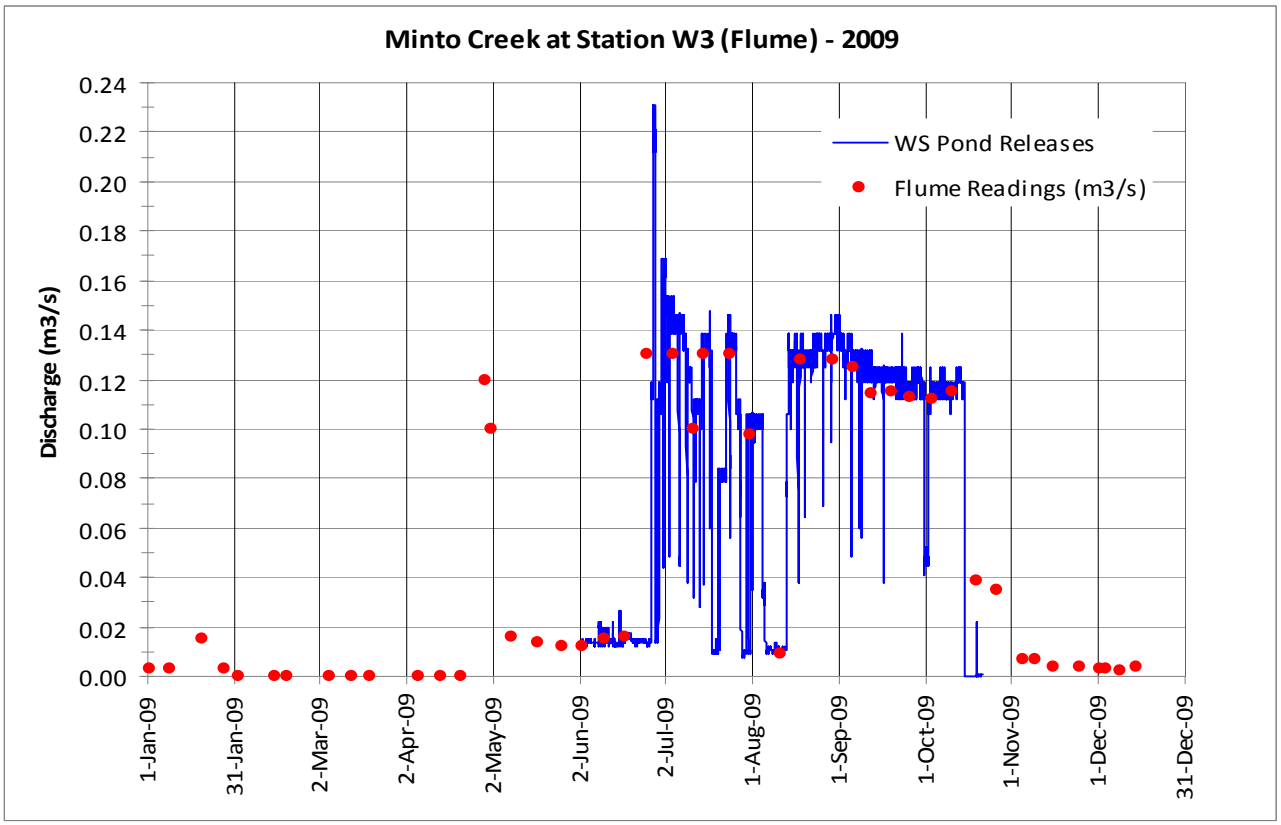
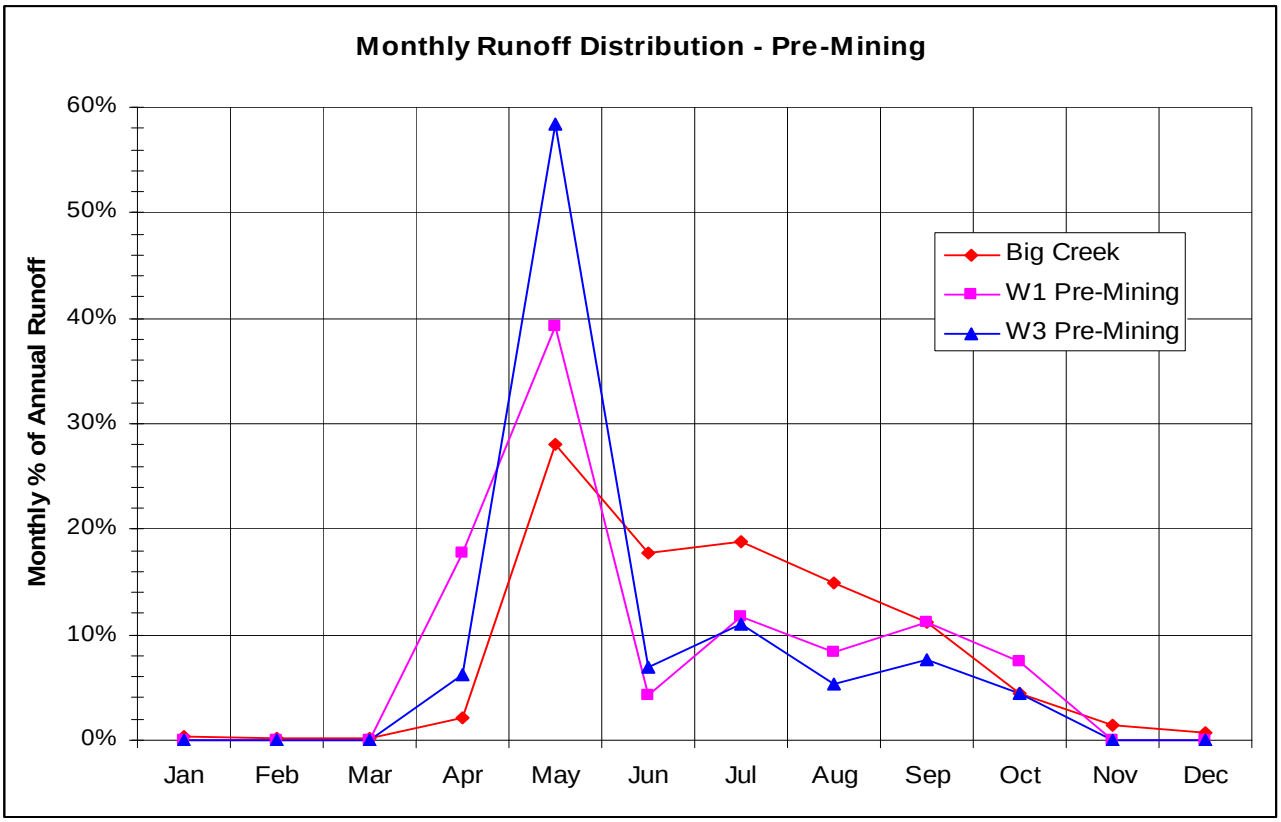


FIGURE MC6-4 - Minto Creek at W3 - Discharge and Release Records - 2008 & 2009



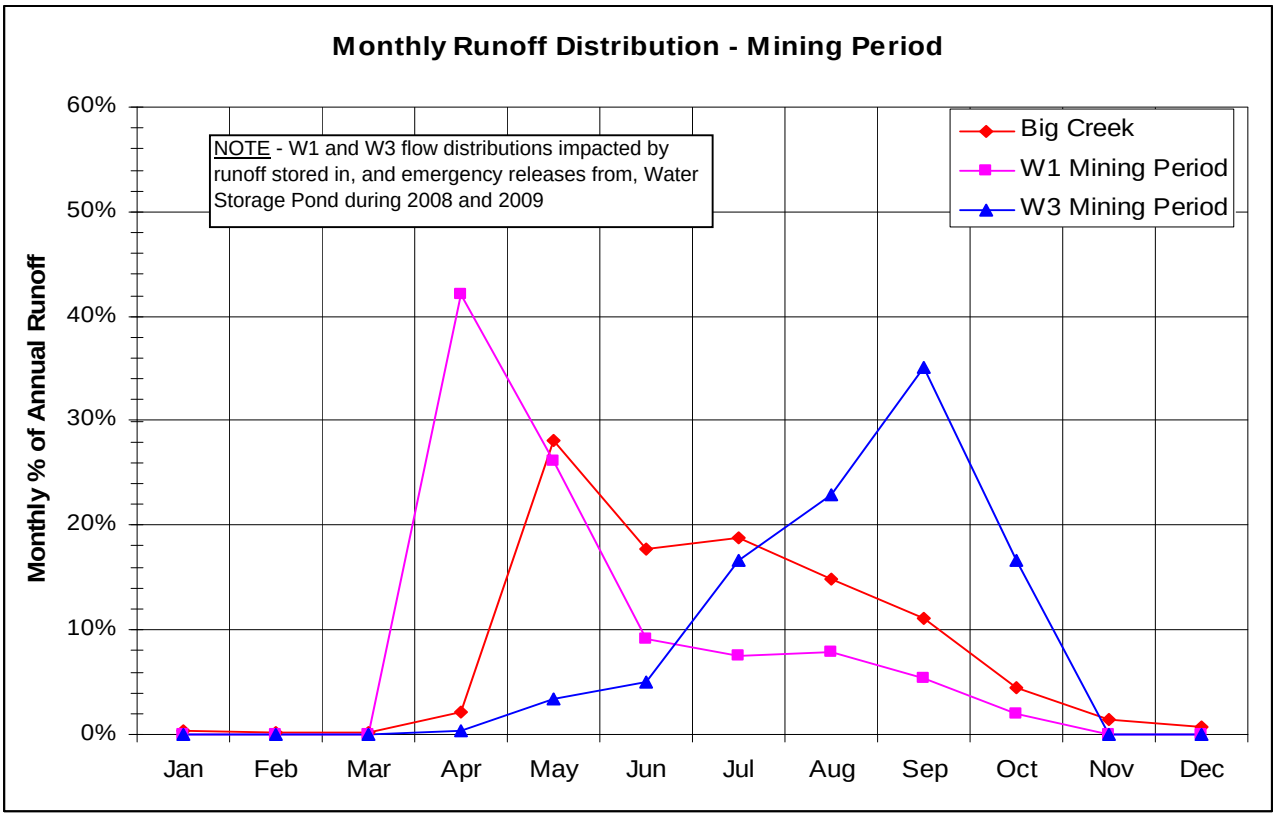


FIGURE MC6-5 - Monthly Runoff Distributions - Pre-Mining and Mining Periods

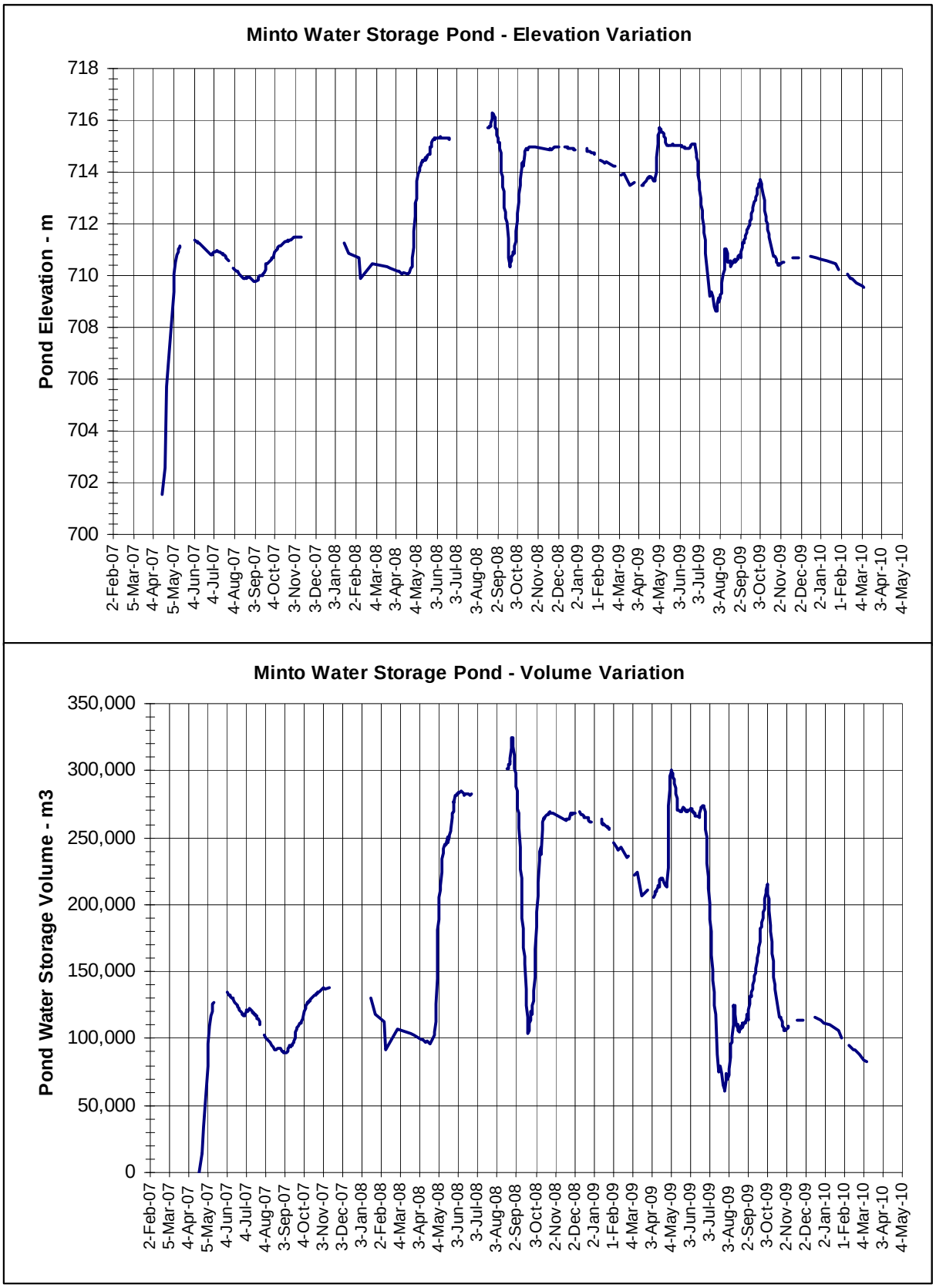


FIGURE MC6-6 - Water Storage Pond - Elevation and Volume Variation

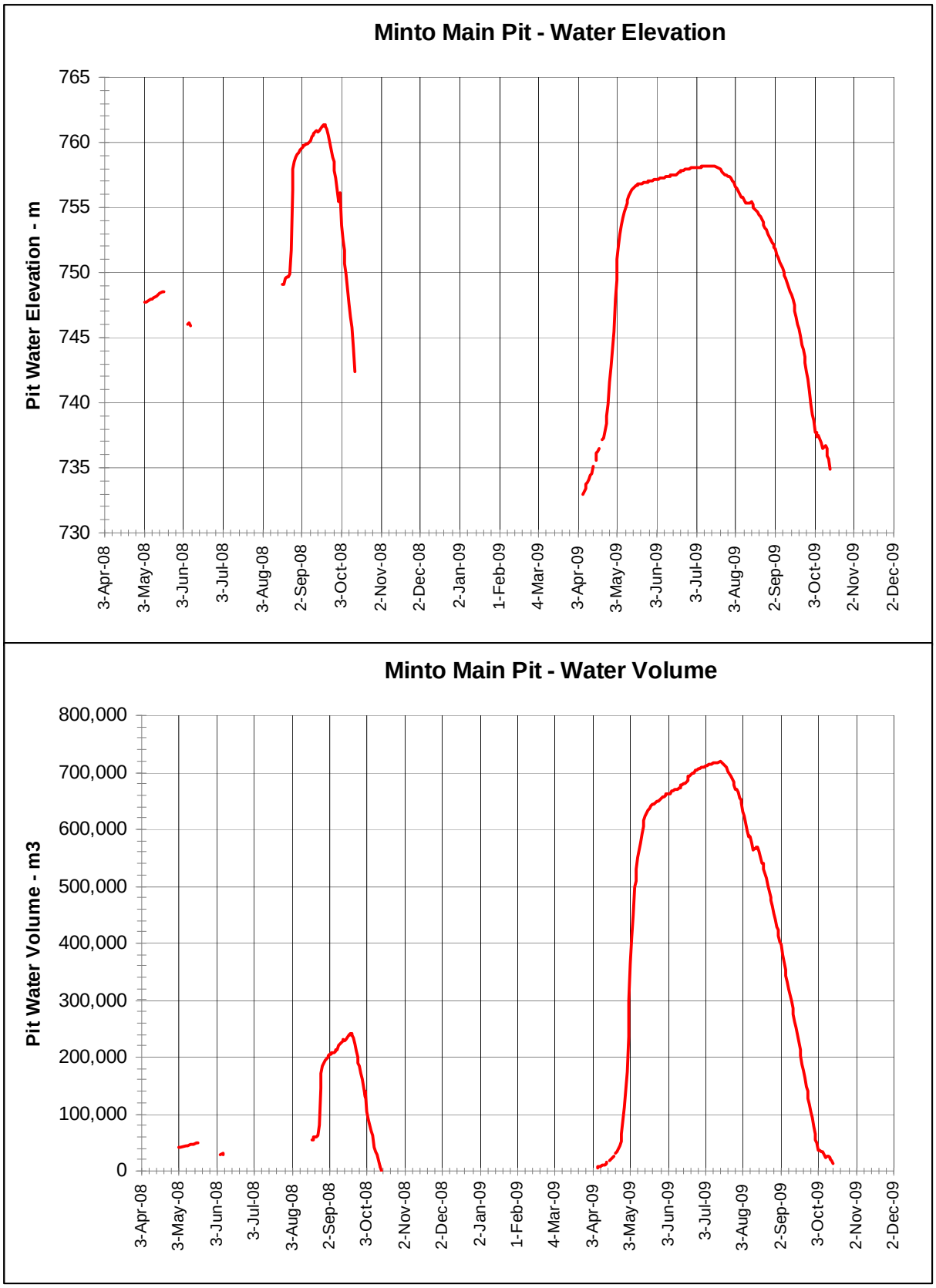
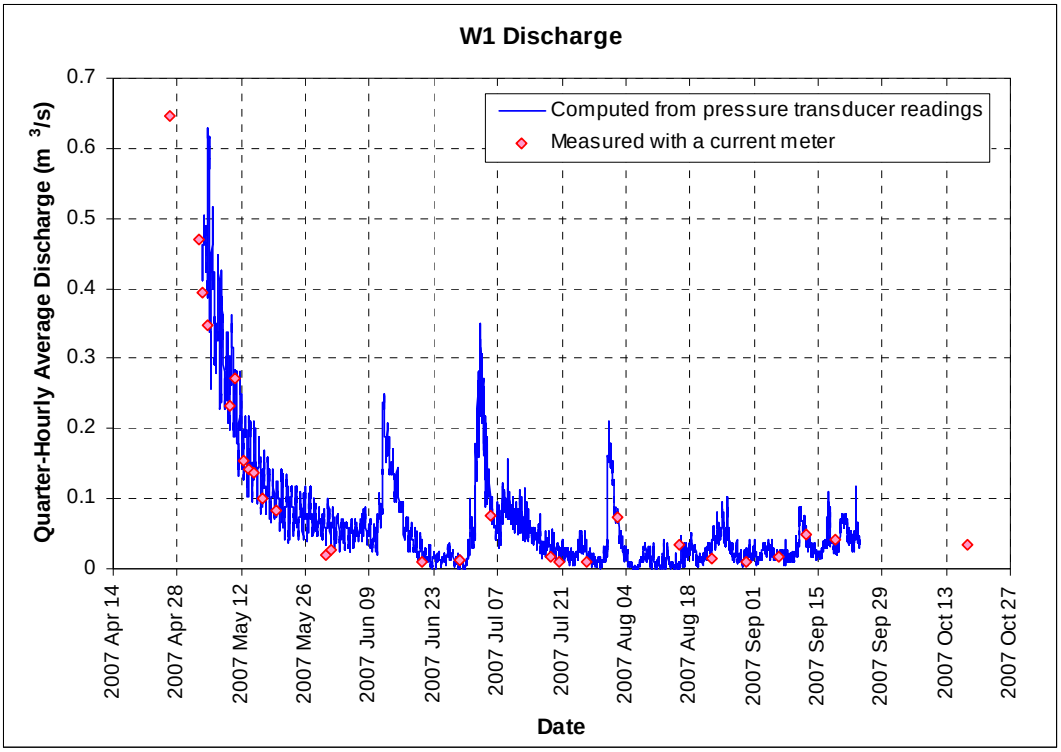


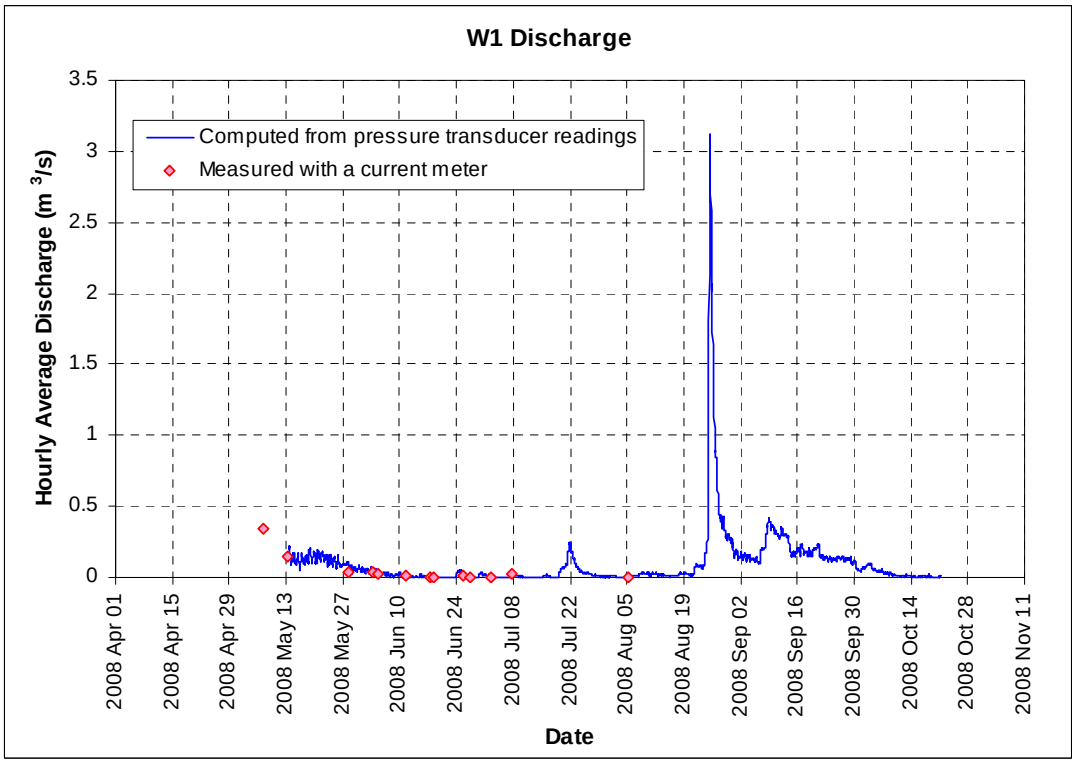
FIGURE MC6-7 - Minto Main Pit - Water Elevation and Storage Volume Variation

APPENDIX B

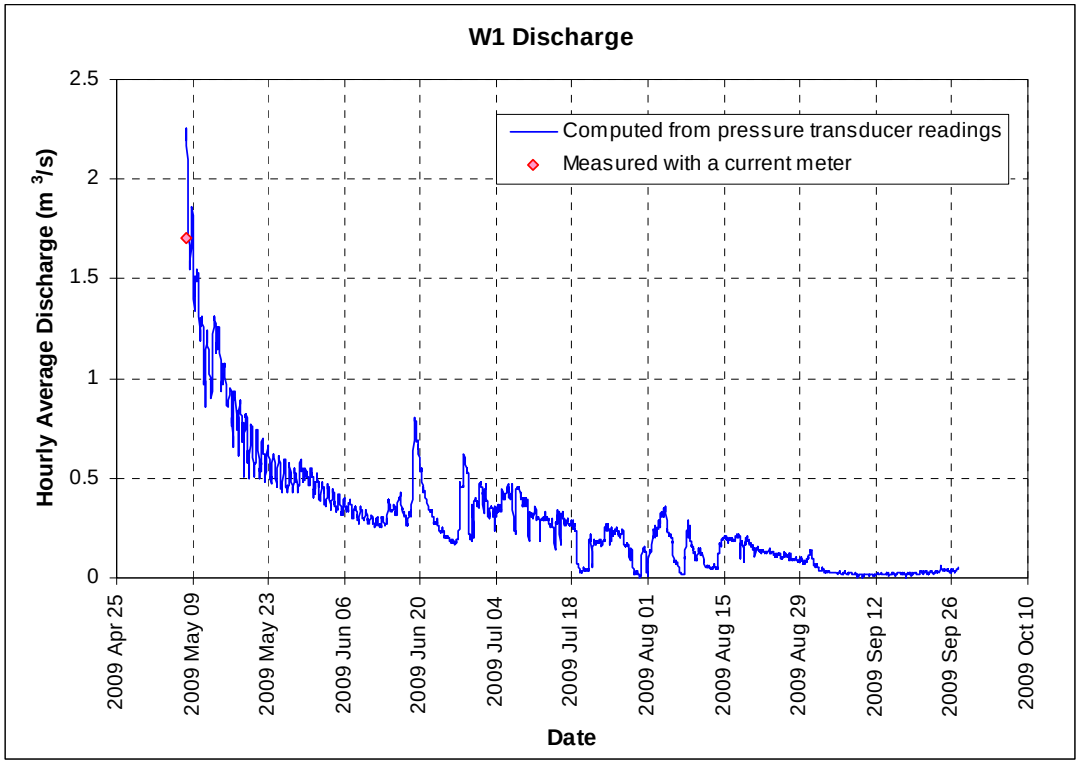
MINTO AND MCGINTY CREEK HYDROGRAPHS



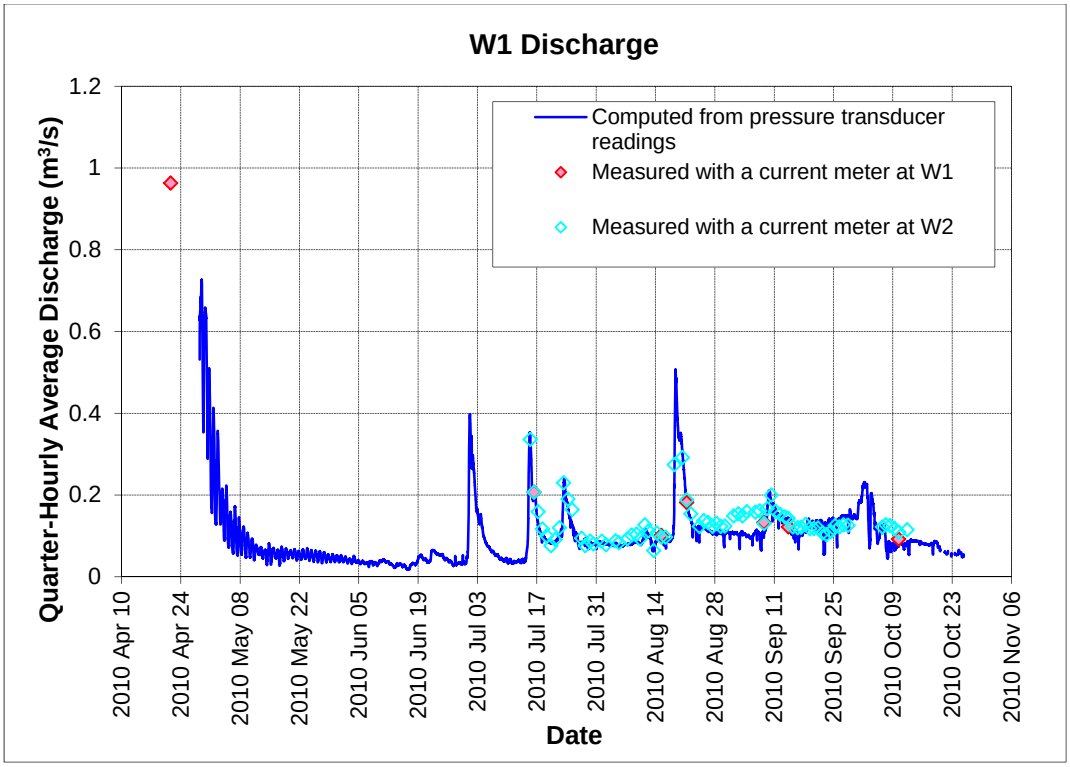
Continuous Discharge on Minto Creek at Station W1, 2007.



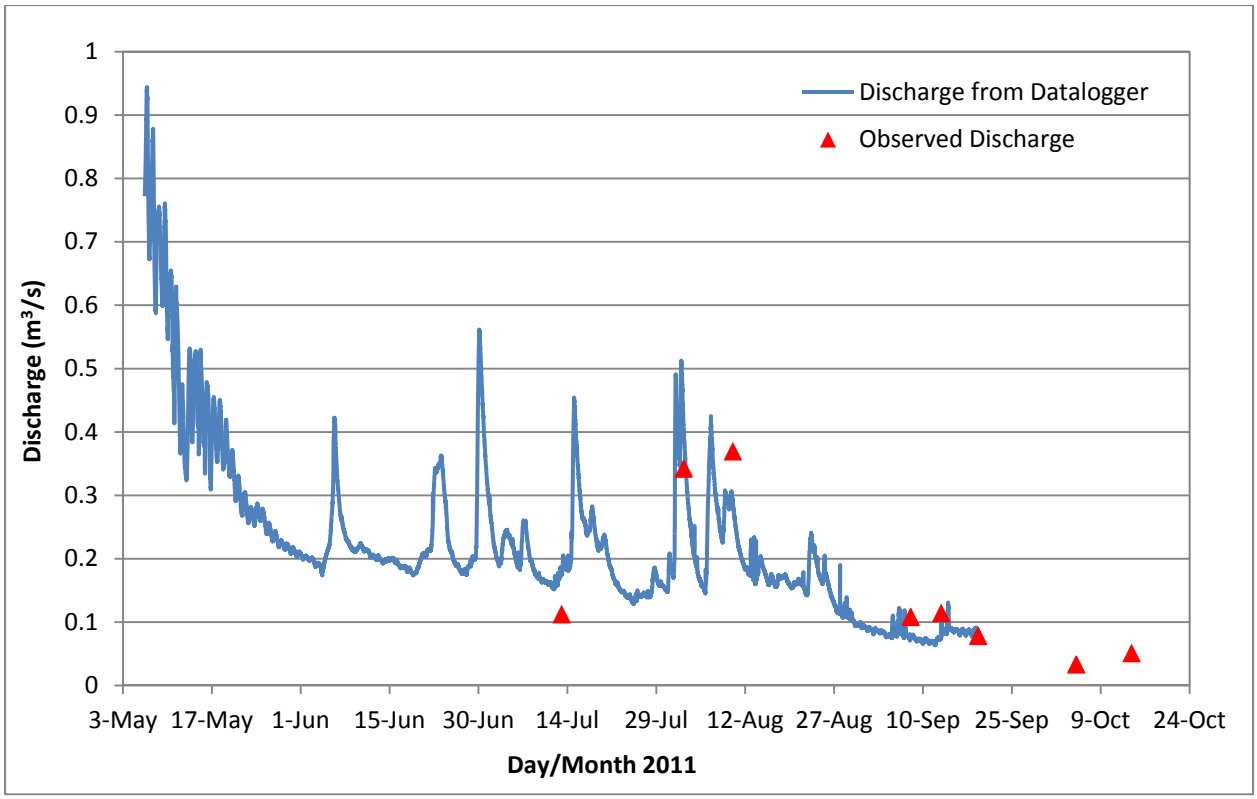
Continuous Discharge on Minto Creek at Station W1, 2008.



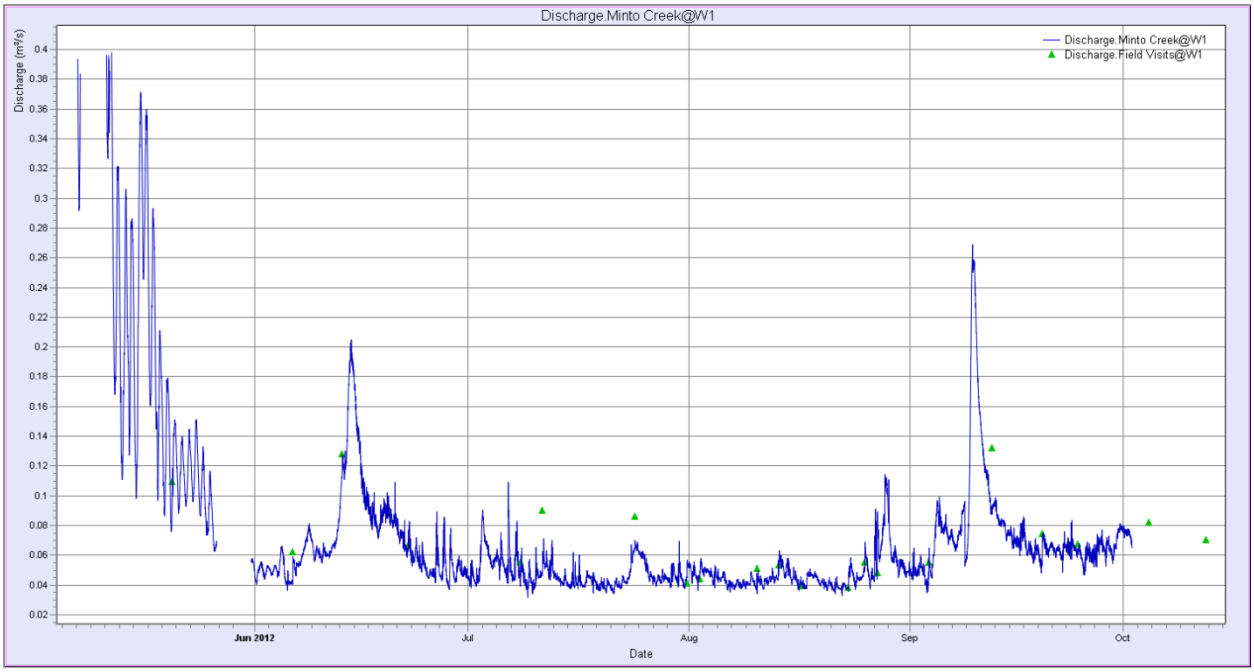
Continuous Discharge on Minto Creek at Station W1, 2009.



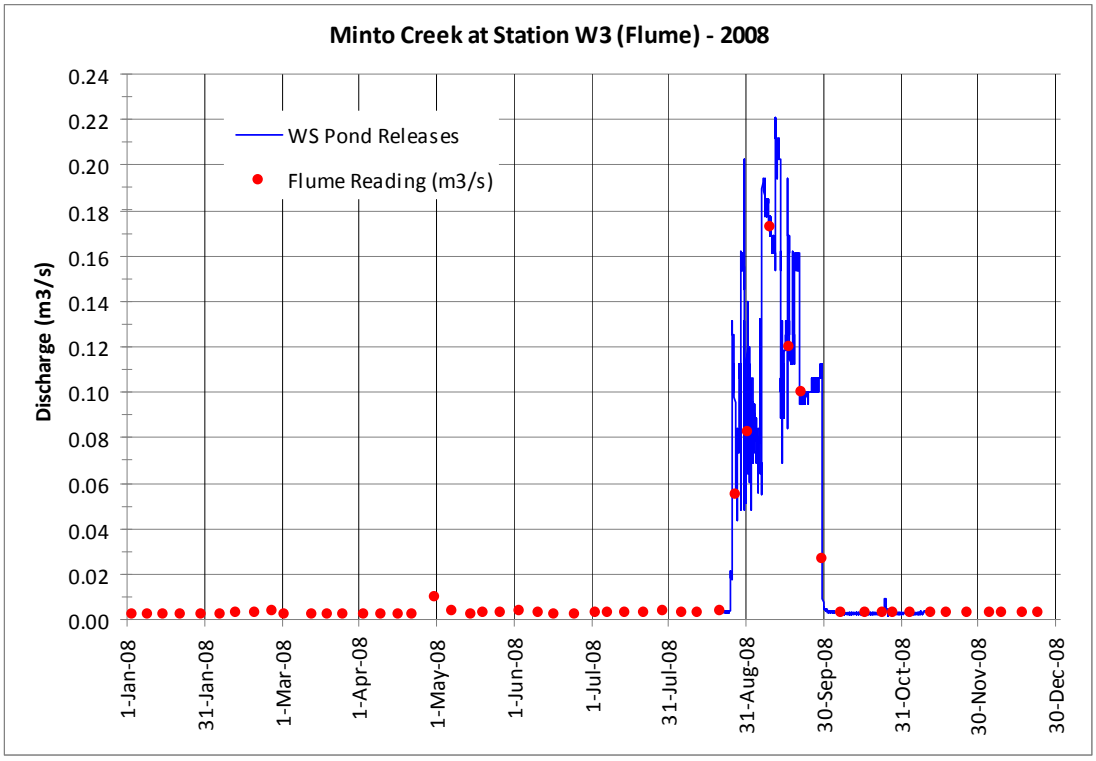
Continuous Discharge on Minto Creek at Station W1, 2010.



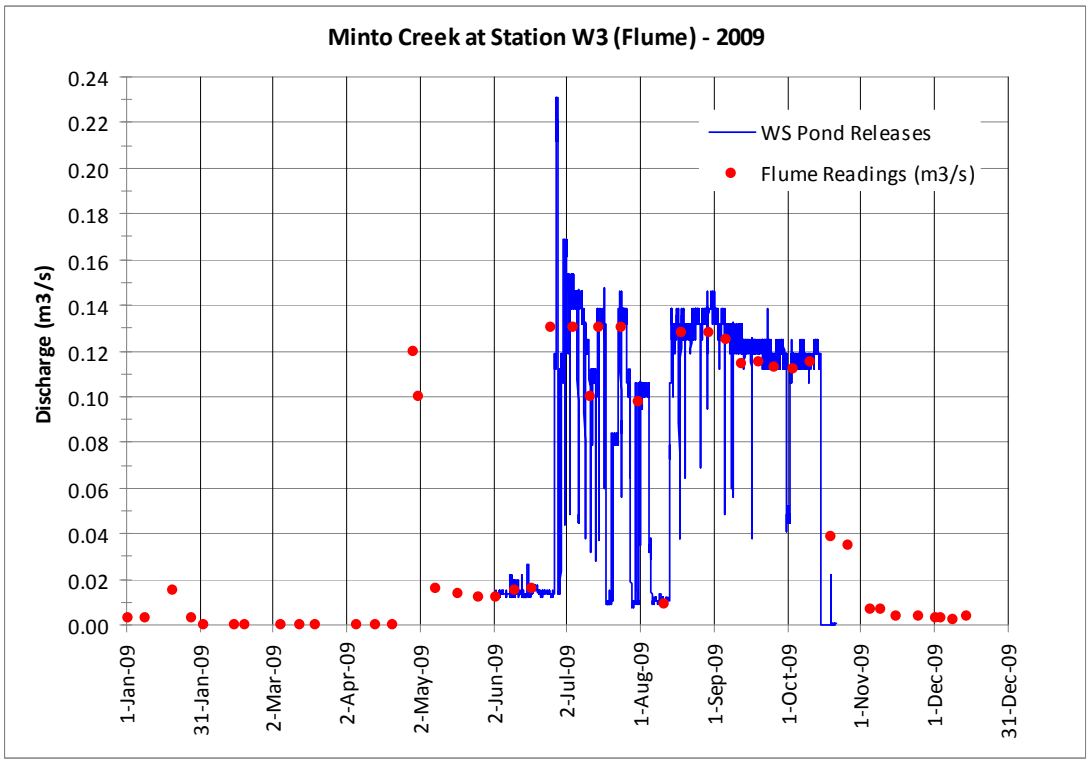
Continuous Discharge on Minto Creek at Station W1, 2011.



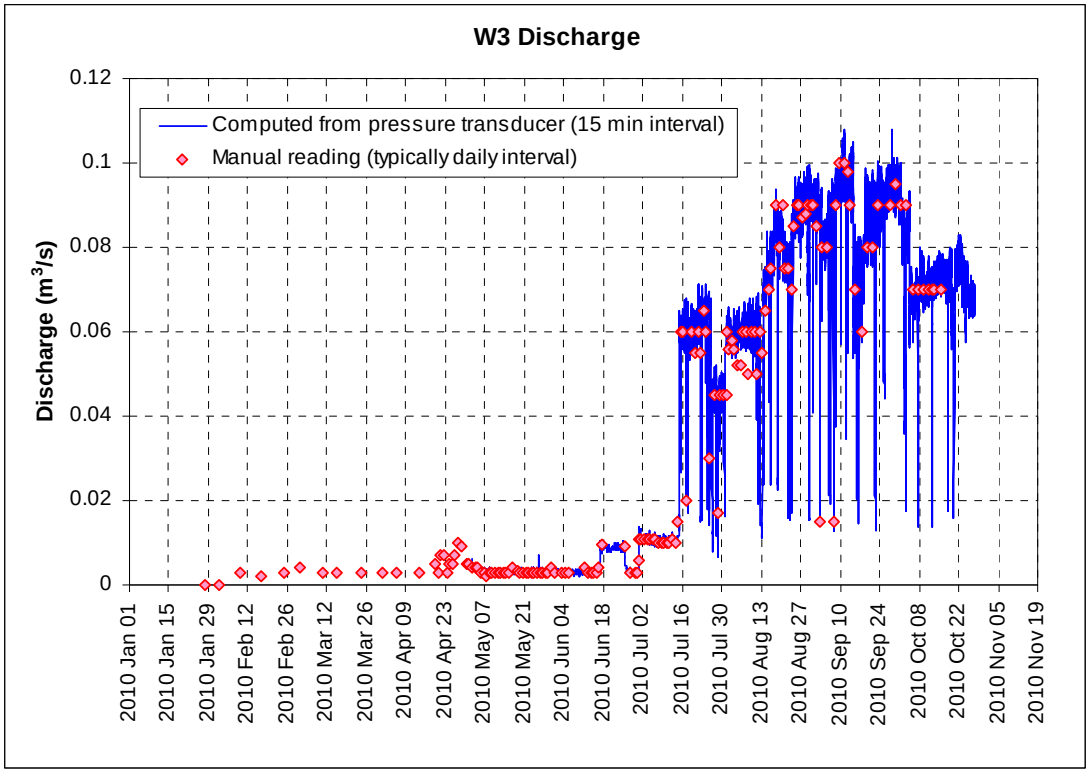
Continuous Discharge on Minto Creek at Station W1, 2012.



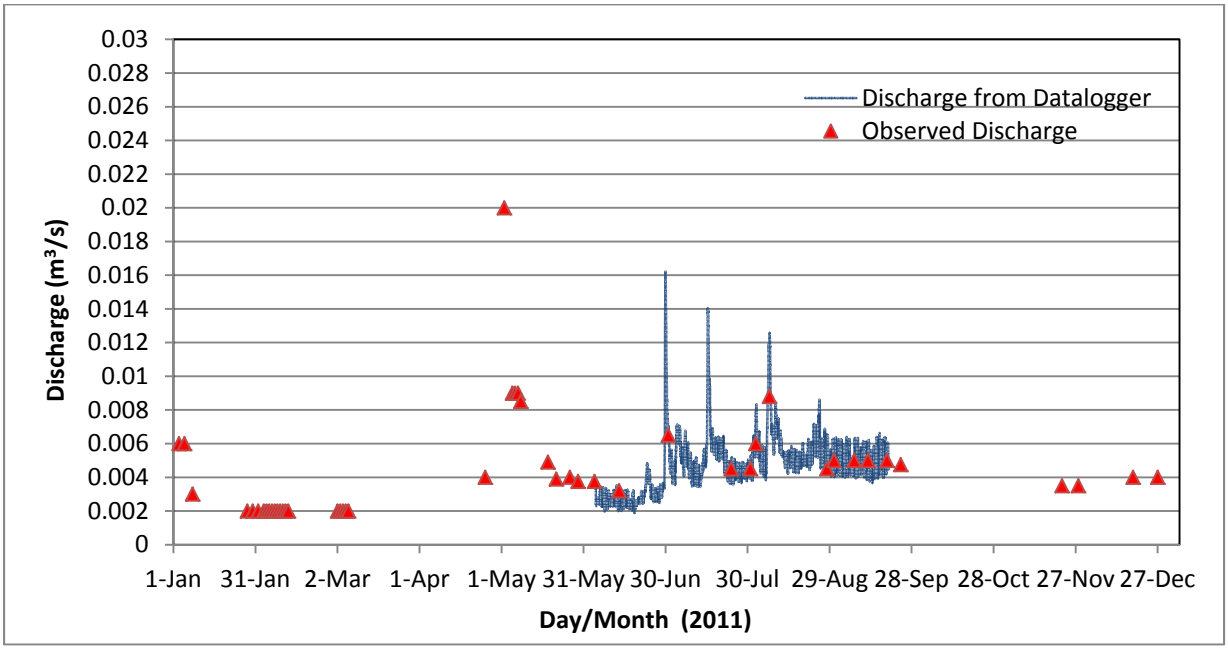
Continuous Discharge on Minto Creek at Station W3, 2008.



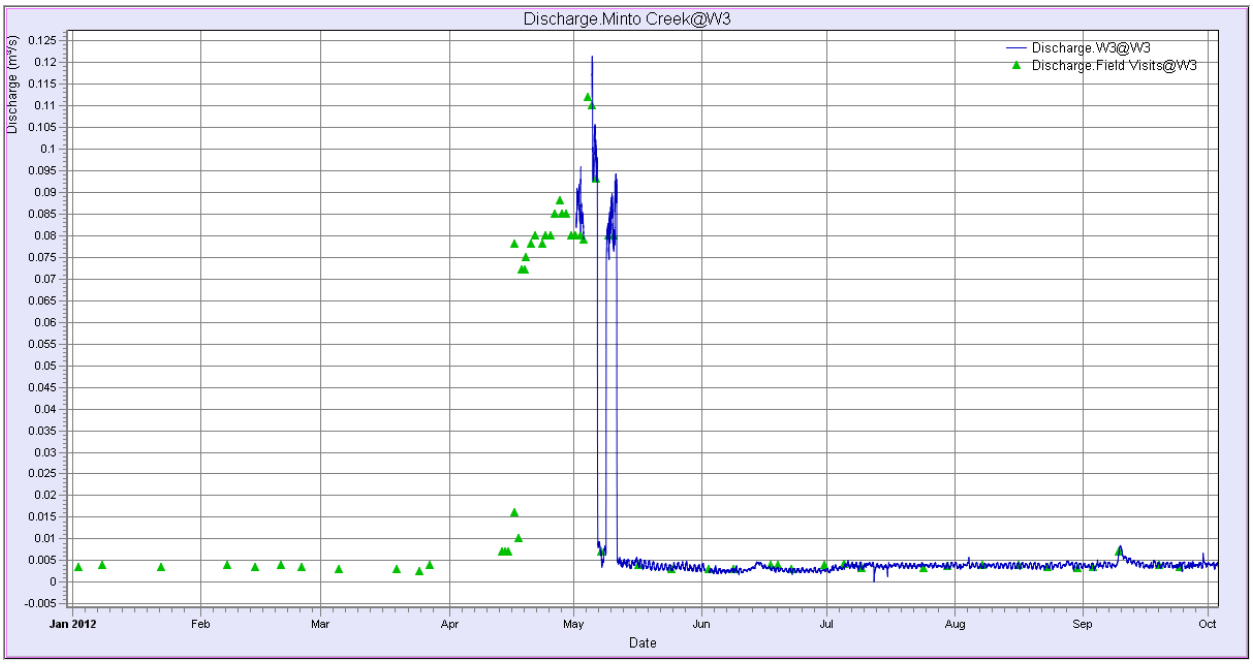
Continuous Discharge on Minto Creek at Station W3, 2009.



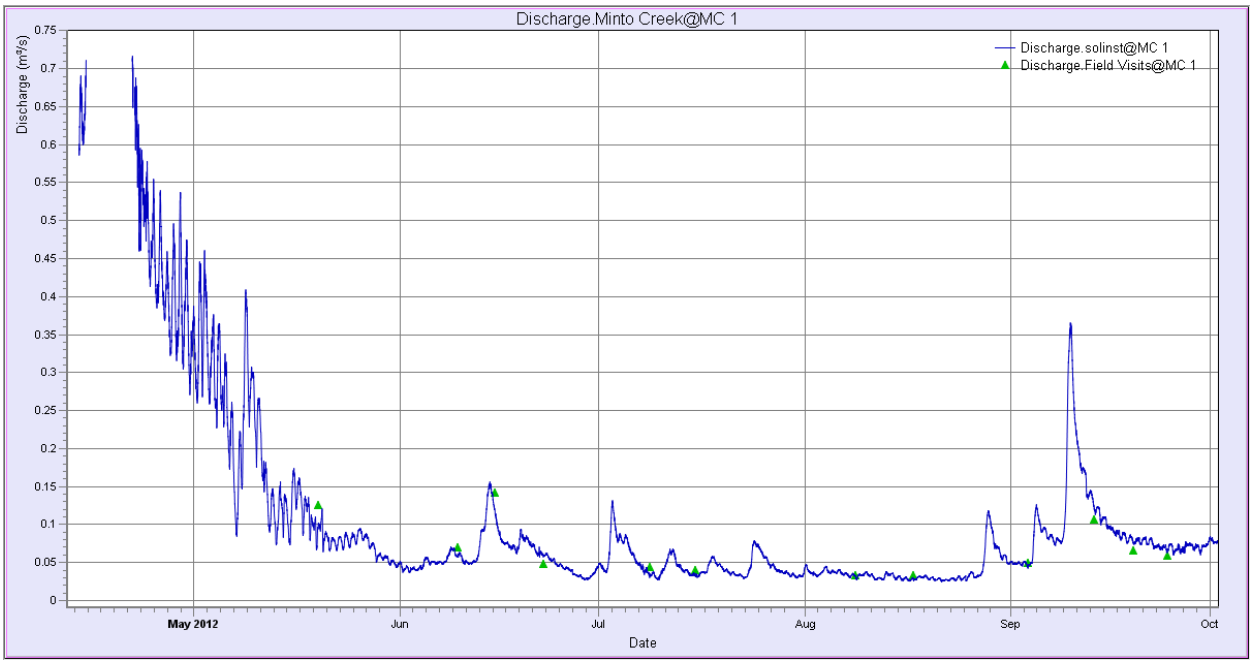
Continuous Discharge on Minto Creek at Station W3, 2010.



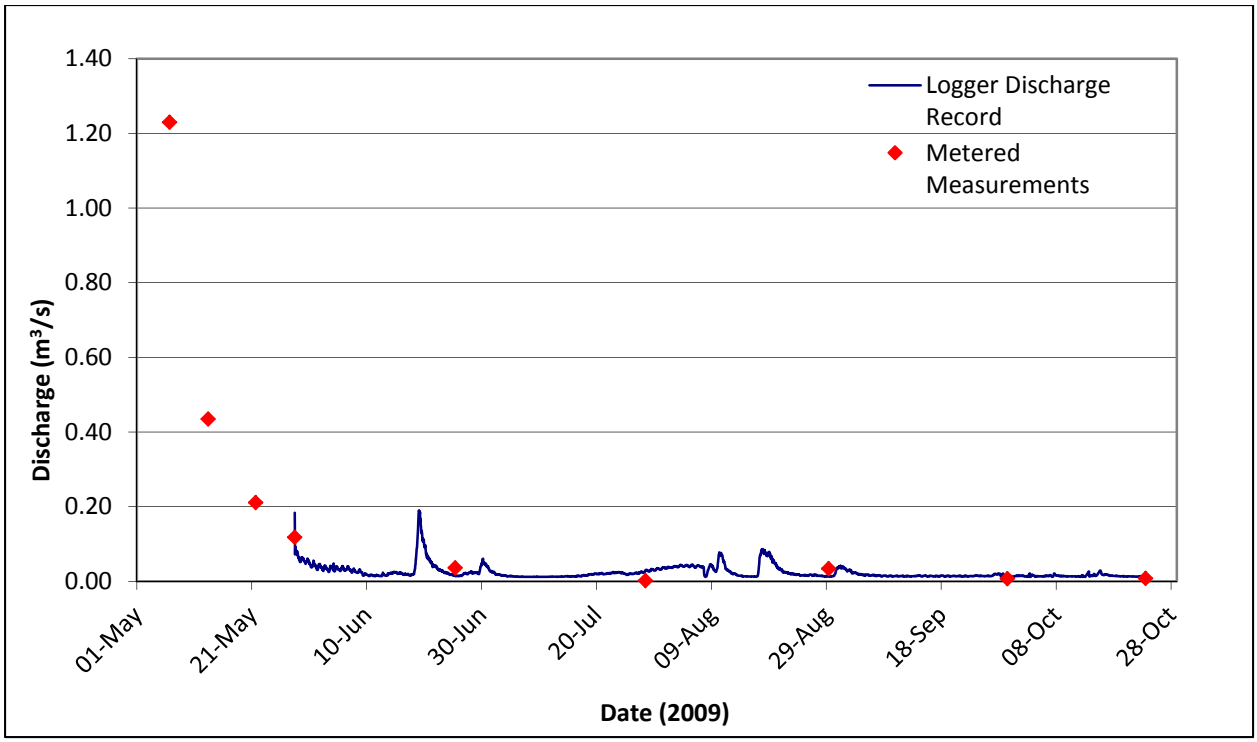
Continuous Discharge on Minto Creek at Station W3, 2011.



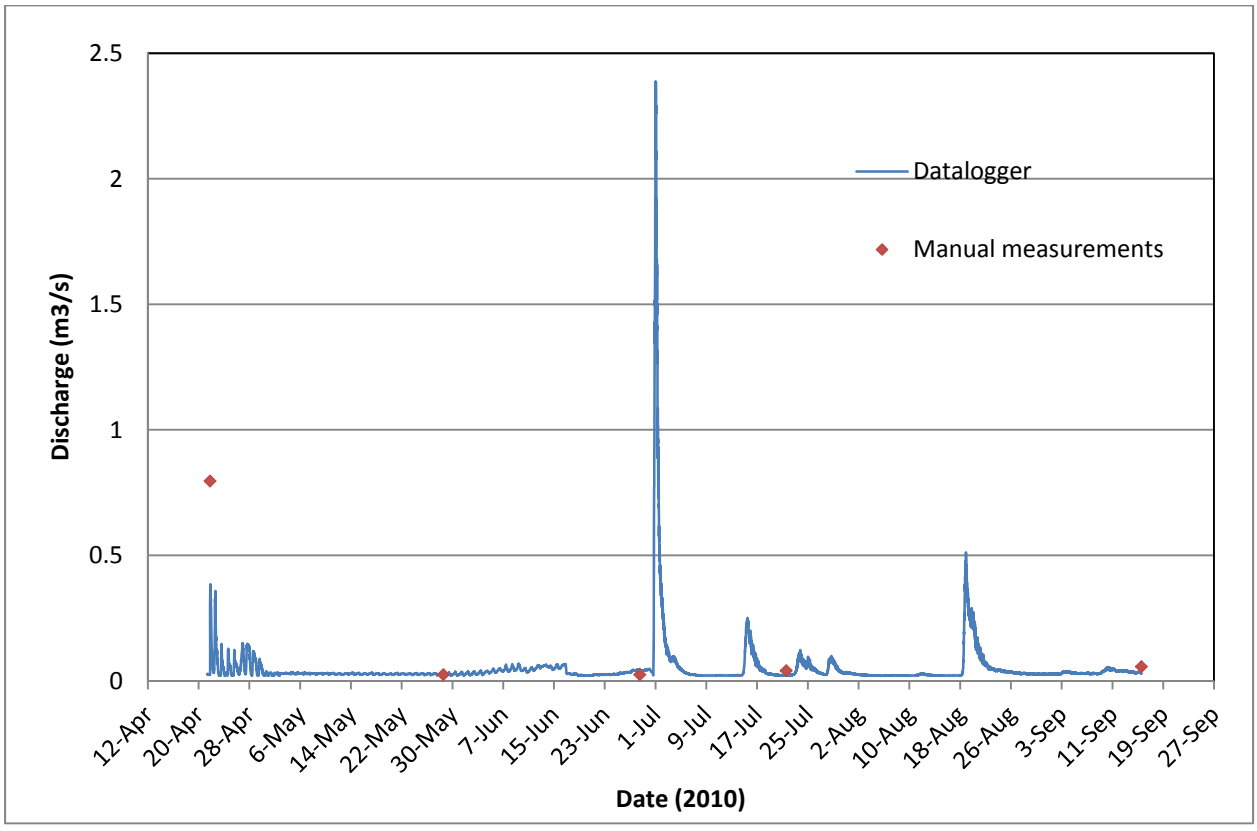
Continuous Discharge on Minto Creek at Station W3, 2012.



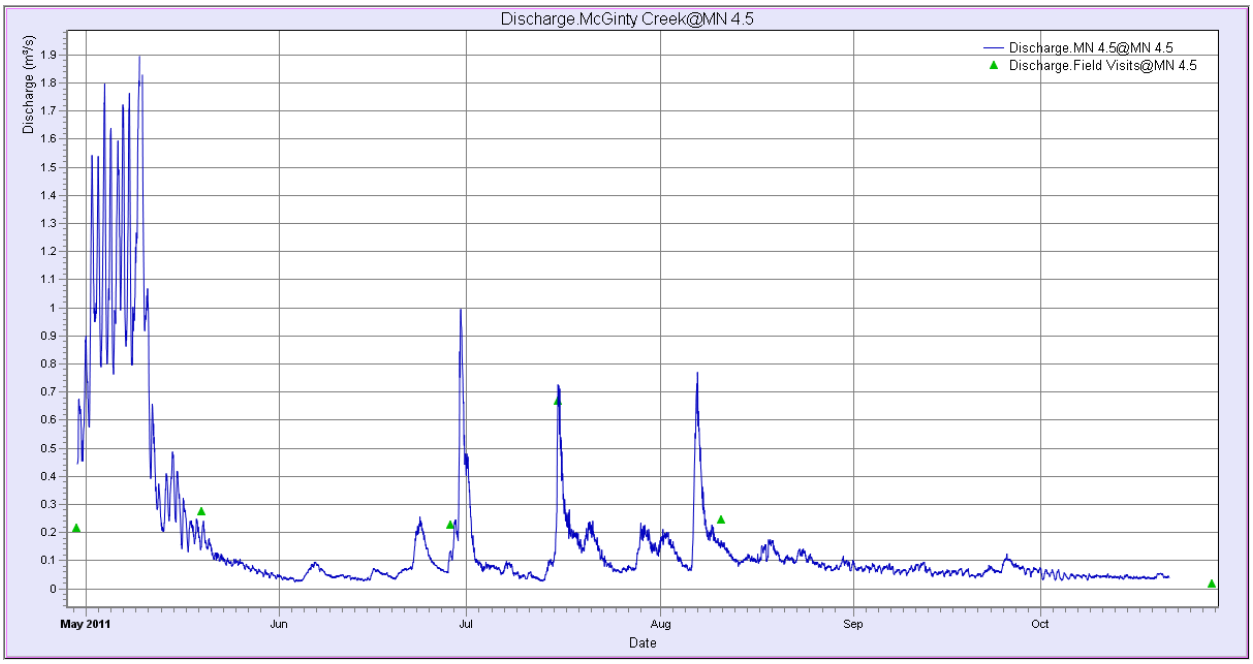
Continuous Discharge on Minto Creek at Station MC1, 2012.



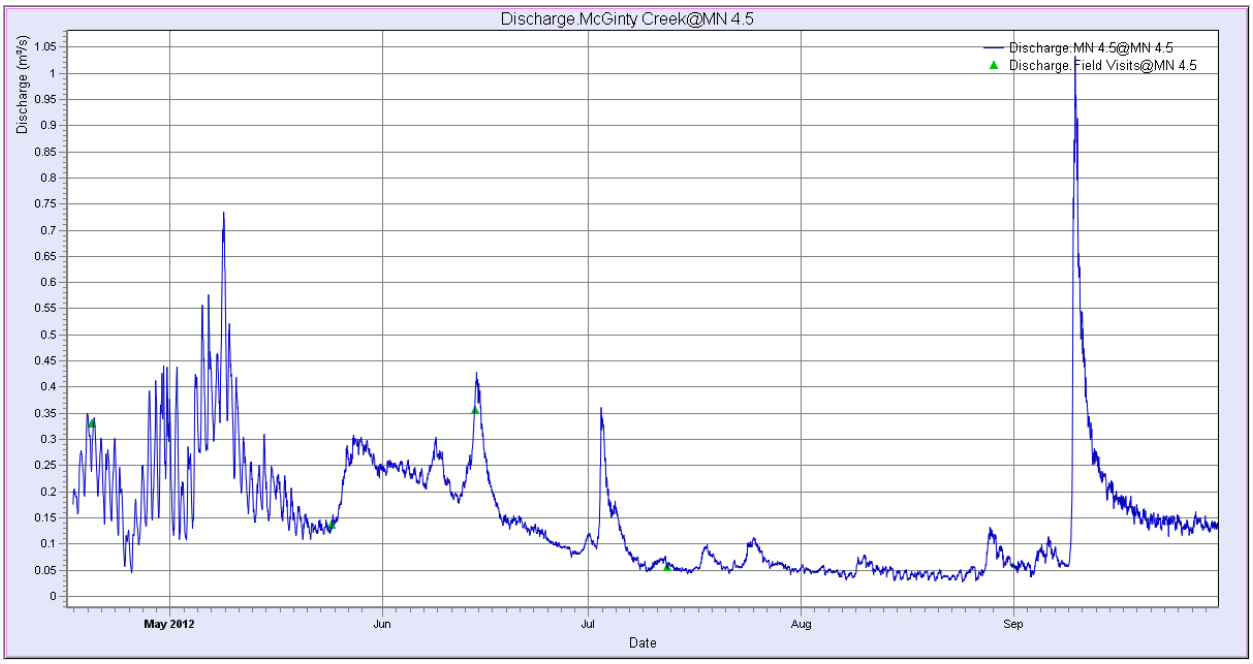
Continuous Discharge on McGinty Creek at Station MN-4.5, 2009.



Continuous Discharge on McGinty Creek at Station MN-4.5, 2010.



Continuous Discharge on McGinty Creek at Station MN-4.5, 2011.



Continuous Discharge on McGinty Creek at Station MN-4.5, 2012.

Attachment #4

Minto Creek Upstream Background Water Quality 2005 - 2010

Parameter	Units	Annual (all data)			May		June		July		August		September		October	
		n	mean	95th	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean
pH (field)	pH units	0			0		0		0		0		0		0	
pH (lab)	pH units	24	7.71	8.21	4	7.70	4	7.75	4	7.59	4	7.99	4	7.84	4	7.41
Hardness (from dissolved)	mg/L	0			0		0		0		0		0		0	
Hardness (from total)	mg/L	20	92.7	136.6	4	63.0	0		4	108.1	4	94.6	4	98.2	4	99.5
Total Dissolved Solids	mg/L	24	140.0	195.6	4	117.8	4	152.5	4	143.3	4	143.0	4	142.0	4	141.3
Total Suspended Solids	mg/L	24	6.1	23.2	4	3.3	4	2.6	4	14.6	4	5.9	4	6.4	4	3.8
Alkalinity, total	mg/L	15	92.5	159.3	3	125.7	4	84.9	0		4	89.5	4	78.0	0	
Sulphate, dissolved	mg/L	15	25.1	81.6	3	67.9	4	17.4	0		4	12.6	4	13.1	0	
Chloride	mg/L	24	0.49	2.25	4	0.25	4	1.68	4	0.25	4	0.25	4	0.25	4	0.25
Fluoride	mg/L	0			0		0		0		0		0		0	
Nitrite (N)	mg/L	24	0.0006	0.0010	4	0.0005	4	0.0005	4	0.0005	4	0.0009	4	0.0005	4	0.0005
Nitrate (N)	mg/L	24	0.0106	0.0390	4	0.0116	4	0.0149	4	0.0090	4	0.0025	4	0.0052	4	0.0204
Ammonia	mg/L	24	0.018	0.040	4	0.014	4	0.027	4	0.010	4	0.031	4	0.010	4	0.017
Aluminum, total	mg/L	24	0.246	0.710	4	0.107	4	0.074	4	0.851	4	0.245	4	0.108	4	0.089
Arsenic, total	mg/L	24	0.00047	0.00080	4	0.00025	4	0.00055	4	0.00071	4	0.00049	4	0.00039	4	0.00043
Cadmium, total	mg/L	24	0.000024	0.000036	4	0.000025	4	0.000025	4	0.000043	4	0.000016	4	0.000009	4	0.000025
Calcium, total	mg/L	24	23.0	36.3	4	15.9	4	23.9	4	27.2	4	23.3	4	24.0	4	23.5
Chromium, total	mg/L	24	0.0008	0.0019	4	0.0005	4	0.0005	4	0.0020	4	0.0007	4	0.0005	4	0.0003
Copper, total	mg/L	24	0.0077	0.0148	4	0.0114	4	0.0054	4	0.0103	4	0.0064	4	0.0062	4	0.0064
Iron, total	mg/L	24	0.682	1.274	4	0.235	4	0.598	4	1.372	4	0.778	4	0.595	4	0.512
Lead, total	mg/L	24	0.00026	0.00038	4	0.00025	4	0.00019	4	0.00057	4	0.00025	4	0.00025	4	0.00003
Magnesium, total	mg/L	24	8.15	16.60	4	5.35	4	8.73	4	9.70	4	8.32	4	8.45	4	8.37
Manganese, total	mg/L	24	0.0570	0.1665	4	0.0096	4	0.0355	4	0.0822	4	0.0586	4	0.0549	4	0.1015
Mercury, total	mg/L	12	0.000011	0.000016	4	0.000013	0		0		4	0.000010	4	0.000010	0	
Molybdenum, total	mg/L	24	0.00076	0.00170	4	0.00065	4	0.00067	4	0.00096	4	0.00073	4	0.00068	4	0.00090
Nickel, total	mg/L	24	0.0016	0.0025	4	0.0017	4	0.0014	4	0.0024	4	0.0016	4	0.0013	4	0.0011
Phosphorus, total	mg/L	0			0		0		0		0		0		0	
Potassium, total	mg/L	24	1	1	4	1	4	1	4	1	4	1	4	1	4	1
Selenium, total	mg/L	24	0.0005	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005
Silver, total	mg/L	24	0.000010	0.000025	4	0.000010	4	0.000005	4	0.000010	4	0.000014	4	0.000015	4	0.000005
Sodium, total	mg/L	24	4.8	9.2	4	2.7	4	6.1	4	5.5	4	5.1	4	4.8	4	4.7
Thallium, total	mg/L	24	0.00008	0.00010	4	0.00010	4	0.00005	4	0.00005	4	0.00010	4	0.00010	4	0.00005
Zinc, total	mg/L	24	0.0040	0.0155	4	0.0025	4	0.0084	4	0.0059	4	0.0037	4	0.0025	4	0.0009
Aluminum, dissolved	mg/L	24	0.042	0.107	4	0.069	4	0.044	4	0.032	4	0.033	4	0.036	4	0.035
Arsenic, dissolved	mg/L	24	0.00036	0.00058	4	0.00025	4	0.00048	4	0.00045	4	0.00033	4	0.00025	4	0.00041
Cadmium, dissolved	mg/L	24	0.000020	0.000025	4	0.000025	4	0.000025	4	0.000025	4	0.000012	4	0.000009	4	0.000025
Calcium, dissolved	mg/L	24	23.5	37.1	4	16.2	4	23.8	4	27.4	4	23.9	4	24.8	4	25.1
Chromium, dissolved	mg/L	24	0.0004	0.0006	4	0.0005	4	0.0004	4	0.0003	4	0.0005	4	0.0005	4	0.0003
Copper, dissolved	mg/L	24	0.0058	0.0134	4	0.0107	4	0.0048	4	0.0053	4	0.0047	4	0.0048	4	0.0045
Iron, dissolved	mg/L	24	0.331	0.667	4	0.167	4	0.306	4	0.308	4	0.400	4	0.407	4	0.399
Lead, dissolved	mg/L	24	0.00016	0.00025	4	0.00025	4	0.00009	4	0.00009	4	0.00025	4	0.00025	4	0.00003
Magnesium, dissolved	mg/L	24	8.35	16.75	4	5.51	4	8.70	4	9.64	4	8.53	4	8.79	4	8.96
Manganese, dissolved	mg/L	24	0.0390	0.1105	4	0.0049	4	0.0218	4	0.0284	4	0.0401	4	0.0466	4	0.0922
Mercury, dissolved	mg/L	12	0.000012	0.000023	4	0.000017	0		0		4	0.000010	4	0.000010	0	
Molydenum, dissolved	mg/L	24	0.00071	0.00162	4	0.00050	4	0.00067	4	0.00085	4	0.00070	4	0.00065	4	0.00087
Nickel, dissolved	mg/L	24	0.0013	0.0018	4	0.0015	4	0.0013	4	0.0013	4	0.0015	4	0.0011	4	0.0010
Phosphorus, dissolved	mg/L	0			0		0		0		0		0		0	
Potassium, dissolved	mg/L	24	1	1	4	1	4	1	4	1	4	1	4	1	4	1
Selenium, dissolved	mg/L	24	0.0005	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005
Silver, dissolved	mg/L	24	0.000009	0.000010	4	0.000010	4	0.000005	4	0.000005	4	0.000010	4	0.000010	4	0.000012
Sodium, dissolved	mg/L	24	4.9	9.4	4	2.8	4	6.0	4	5.6	4	5.2	4	5.1	4	5.0
Thallium, dissolved	mg/L	24	0.00008	0.00010	4	0.00010	4	0.00005	4	0.00005	4	0.00010	4	0.00010	4	0.00005
Zinc, dissolved	mg/L	24	0.0039	0.0111	4	0.0040	4	0.0089	4	0.0037	4	0.0032	4	0.0025	4	0.0014
Dissolved Organic Carbon	mg/L	0			0		0		0		0		0		0	

Minto Creek Downstream Background Water Quality 2005 - 2010

Parameter	Units	Annual (all data)			April		May		June		July		August		September		October	
		n	mean	95th	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean
pH (field)	pH units	7	7.83	8.04	1	7.64	1	7.64	1	7.62	1	8.02	1	7.84	1	8.02	1	8.04
pH (lab)	pH units	25	7.97	8.24	1	7.63	4	8.00	4	7.98	4	7.96	4	8.17	4	7.82	4	7.96
Hardness (from dissolved)	mg/L	9	108.4	121.7	1	80.8	1	83.5	1	103.6	1	119.3	2	120.7	2	112.9	1	121.9
Hardness (from total)	mg/L	23	116.2	156.6	1	50.4	4	86.2	2	95.9	4	153.5	4	124.9	4	118.0	4	125.3
Total Dissolved Solids	mg/L	25	162.9	193.8	1	134.9	4	123.9	4	161.1	4	189.5	4	177.7	4	169.2	4	162.9
Total Suspended Solids	mg/L	25	17.3	70.1	1	1.5	4	27.3	4	29.6	4	10.5	4	7.0	4	27.0	4	6.4
Alkalinity, total	mg/L	18	107.9	141.3	1	82.4	3	58.6	4	119.3	1	119.2	4	131.6	4	109.7	1	121.0
Sulphate, dissolved	mg/L	18	10.8	22.1	1	11.4	3	11.7	4	14.1	1	9.6	4	9.4	4	8.4	1	10.4
Chloride	mg/L	25	0.59	1.18	1	0.75	4	0.30	4	0.99	4	0.51	4	0.40	4	0.61	4	0.70
Fluoride	mg/L	8	0.22	0.32	1	0.09	1	0.21	2	0.20	1	0.22	1	0.36	1	0.22	1	0.23
Nitrite (N)	mg/L	25	0.0064	0.0339	1	0.0369	4	0.0023	4	0.0103	4	0.0027	4	0.0029	4	0.0028	4	0.0095
Nitrate (N)	mg/L	25	0.0599	0.1406	1	0.0125	4	0.0546	4	0.0756	4	0.0688	4	0.0450	4	0.0385	4	0.0891
Ammonia	mg/L	25	0.0196	0.0379	1	0.0203	4	0.0243	4	0.0176	4	0.0123	4	0.0254	4	0.0195	4	0.0184
Aluminum, total	mg/L	25	0.282	0.989	1	0.078	4	0.572	4	0.467	4	0.308	4	0.089	4	0.210	4	0.095
Arsenic, total	mg/L	25	0.00059	0.00090	1	0.00032	4	0.00077	4	0.00061	4	0.00055	4	0.00055	4	0.00059	4	0.00051
Cadmium, total	mg/L	25	0.000024	0.000043	1	0.000045	4	0.000027	4	0.000027	4	0.000023	4	0.000009	4	0.000011	4	0.000042
Calcium, total	mg/L	25	30.6	39.0	1	19.6	4	22.2	4	31.2	4	38.0	4	32.9	4	31.0	4	31.3
Chromium, total	mg/L	25	0.0009	0.0027	1	0.0006	4	0.0016	4	0.0012	4	0.0008	4	0.0006	4	0.0008	4	0.0006
Copper, total	mg/L	25	0.0037	0.0071	1	0.0074	4	0.0047	4	0.0026	4	0.0056	4	0.0020	4	0.0030	4	0.0035
Iron, total	mg/L	25	0.573	1.595	1	0.144	4	0.977	4	0.723	4	0.548	4	0.307	4	0.643	4	0.345
Lead, total	mg/L	25	0.00024	0.00060	1	0.00012	4	0.00035	4	0.00023	4	0.00020	4	0.00022	4	0.00024	4	0.00020
Magnesium, total	mg/L	25	10.07	13.02	1	8.48	4	7.36	4	10.22	4	13.10	4	10.41	4	9.71	4	9.98
Manganese, total	mg/L	25	0.0391	0.0854	1	0.0179	4	0.0498	4	0.0345	4	0.0332	4	0.0300	4	0.0562	4	0.0366
Mercury, total	mg/L	17	0.000024	0.000057	1	0.000011	4	0.000013	2	0.000045	1	0.000075	4	0.000021	4	0.000021	1	0.000018
Molybdenum, total	mg/L	25	0.00091	0.00135	1	0.00080	4	0.00078	4	0.00098	4	0.00131	4	0.00099	4	0.00055	4	0.00086
Nickel, total	mg/L	25	0.0019	0.0037	1	0.0007	4	0.0031	4	0.0021	4	0.0016	4	0.0015	4	0.0020	4	0.0017
Phosphorus, total	mg/L	8	0.072	0.202	1	0.070	1	0.037	2	0.189	0		1	0.018	2	0.028	1	0.021
Potassium, total	mg/L	25	0.98	1.06	1	1.80	4	1.02	4	0.94	4	0.97	4	0.91	4	0.85	4	1.00
Selenium, total	mg/L	25	0.0004	0.0005	1	0.0002	4	0.0005	4	0.0004	4	0.0005	4	0.0004	4	0.0004	4	0.0005
Silver, total	mg/L	25	0.000020	0.000047	1	0.000021	4	0.000018	4	0.000018	4	0.000015	4	0.000029	4	0.000029	4	0.000010
Sodium, total	mg/L	25	6.1	8.7	1	5.4	4	4.2	4	7.0	4	8.2	4	6.3	4	5.7	4	5.7
Thallium, total	mg/L	25	0.00006	0.00010	1	0.00001	4	0.00009	4	0.00004	4	0.00005	4	0.00008	4	0.00007	4	0.00004
Zinc, total	mg/L	25	0.0034	0.0071	1	0.0054	4	0.0052	4	0.0033	4	0.0021	4	0.0036	4	0.0040	4	0.0021
Aluminum, dissolved	mg/L	25	0.017	0.037	1	0.039	4	0.019	4	0.015	4	0.008	4	0.010	4	0.015	4	0.028
Arsenic, dissolved	mg/L	25	0.00042	0.00059	1	0.00017	4	0.00033	4	0.00042	4	0.00039	4	0.00046	4	0.00050	4	0.00047
Cadmium, dissolved	mg/L	25	0.000019	0.000025	1	0.000043	4	0.000023	4	0.000023	4	0.000022	4	0.000008	4	0.000012	4	0.000023
Calcium, dissolved	mg/L	25	31.1	40.2	1	19.8	4	22.2	4	30.6	4	39.6	4	33.1	4	31.3	4	32.5
Chromium, dissolved	mg/L	25	0.00048	0.00080	1	0.00076	4	0.00052	4	0.00036	4	0.00038	4	0.00057	4	0.00073	4	0.00029
Copper, dissolved	mg/L	25	0.0021	0.0033	1	0.0033	4	0.0026	4	0.0017	4	0.0022	4	0.0020	4	0.0021	4	0.0019
Iron, dissolved	mg/L	25	0.139	0.318	1	0.073	4	0.143	4	0.054	4	0.063	4	0.170	4	0.239	4	0.180
Lead, dissolved	mg/L	25	0.00014	0.00025	1	0.00011	4	0.00023	4	0.00004	4	0.00006	4	0.00023	4	0.00026	4	0.00004
Magnesium, dissolved	mg/L	25	10.08	13.20	1	8.81	4	7.32	4	9.98	4	12.88	4	10.53	4	9.76	4	10.32
Manganese, dissolved	mg/L	25	0.0177	0.0338	1	0.0143	4	0.0071	4	0.0118	4	0.0150	4	0.0192	4	0.0307	4	0.0231
Mercury, dissolved	mg/L	16	0.000020	0.000050	1	0.000008	4	0.000013	1	0.000040	1	0.000075	4	0.000018	4	0.000017	1	0.000008
Molydenum, dissolved	mg/L	25	0.00082	0.00126	1	0.00078	4	0.00057	4	0.00093	4	0.00112	4	0.00087	4	0.00062	4	0.00079
Nickel, dissolved	mg/L	25	0.0012	0.0016	1	0.0006	4	0.0015	4	0.0011	4	0.0009	4	0.0013	4	0.0015	4	0.0012
Phosphorus, dissolved	mg/L	7	0.018	0.028	1	0.028	1	0.012	1	0.010	0		1	0.028	2	0.020	1	0.005
Potassium, dissolved	mg/L	25	0.98	1.00	1	1.84	4	0.97	4	0.96	4	0.96	4	0.97	4	0.86	4	0.98
Selenium, dissolved	mg/L	25	0.0005	0.0005	1	0.0002	4	0.0005	4	0.0005	4	0.0004	4	0.0004	4	0.0005	4	0.0004
Silver, dissolved	mg/L	25	0.000012	0.000035	1	0.000007	4	0.000012	4	0.000010	4	0.000013	4	0.000016	4	0.000015	4	0.000008
Sodium, dissolved	mg/L	25	6.2	8.8	1	5.6	4	4.3	4	7.0	4	8.1	4	6.3	4	5.7	4	5.9
Thallium, dissolved	mg/L	25	0.000058	0.000100	1	0.000009	4	0.000081	4	0.000043	4	0.000045	4	0.000080	4	0.000066	4	0.000044
Zinc, dissolved	mg/L	25	0.0027	0.0043	1	0.0044	4	0.0026	4	0.0044	4	0.0024	4	0.0027	4	0.0026	4	0.0013
Dissolved Organic Carbon	mg/L	8	13.4	18.7	1	19.3	1	10.8	1	8.3	1	15.2	1	10.1	2	16.4	1	10.5

Minto Creek Upstream Background Water Quality 2005 - 2012

Parameter	Units	Annual (all data)			May		June		July		August		September		October	
		n	mean	95th	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean
pH (field)	pH units	0			0		0		0		0		0		0	
pH (lab)	pH units	24	7.71	8.21	4	7.70	4	7.75	4	7.59	4	7.99	4	7.84	4	7.41
Hardness (from dissolved)	mg/L	0			0		0		0		0		0		0	
Hardness (from total)	mg/L	20	92.7	136.6	4	63.0	0		4	108.1	4	94.6	4	98.2	4	99.5
Total Dissolved Solids	mg/L	24	140.0	195.6	4	117.8	4	152.5	4	143.3	4	143.0	4	142.0	4	141.3
Total Suspended Solids	mg/L	24	6.1	23.2	4	3.3	4	2.6	4	14.6	4	5.9	4	6.4	4	3.8
Alkalinity, total	mg/L	15	92.5	159.3	3	125.7	4	84.9	0		4	89.5	4	78.0	0	
Sulphate, dissolved	mg/L	15	25.1	81.6	3	67.9	4	17.4	0		4	12.6	4	13.1	0	
Chloride	mg/L	24	0.49	2.25	4	0.25	4	1.68	4	0.25	4	0.25	4	0.25	4	0.25
Fluoride	mg/L	0			0		0		0		0		0		0	
Nitrite (N)	mg/L	24	0.00057	0.00101	4	0.00050	4	0.00050	4	0.00050	4	0.00093	4	0.00050	4	0.00050
Nitrate (N)	mg/L	24	0.01059	0.03902	4	0.01163	4	0.01485	4	0.00898	4	0.00250	4	0.00518	4	0.02043
Ammonia	mg/L	24	0.018	0.040	4	0.014	4	0.027	4	0.010	4	0.031	4	0.010	4	0.017
Aluminum, total	mg/L	24	0.246	0.710	4	0.107	4	0.074	4	0.851	4	0.245	4	0.108	4	0.089
Arsenic, total	mg/L	24	0.00047	0.00080	4	0.00025	4	0.00055	4	0.00071	4	0.00049	4	0.00039	4	0.00043
Cadmium, total	mg/L	24	0.000024	0.000036	4	0.000025	4	0.000025	4	0.000043	4	0.000016	4	0.000009	4	0.000025
Calcium, total	mg/L	24	23.0	36.3	4	15.9	4	23.9	4	27.2	4	23.3	4	24.0	4	23.5
Chromium, total	mg/L	24	0.0008	0.0019	4	0.0005	4	0.0005	4	0.0020	4	0.0007	4	0.0005	4	0.0003
Copper, total	mg/L	24	0.0077	0.0148	4	0.0114	4	0.0054	4	0.0103	4	0.0064	4	0.0062	4	0.0064
Iron, total	mg/L	24	0.682	1.274	4	0.235	4	0.598	4	1.372	4	0.778	4	0.595	4	0.512
Lead, total	mg/L	24	0.00026	0.00038	4	0.00025	4	0.00019	4	0.00057	4	0.00025	4	0.00025	4	0.00003
Magnesium, total	mg/L	24	8.15	16.60	4	5.35	4	8.73	4	9.70	4	8.32	4	8.45	4	8.37
Manganese, total	mg/L	24	0.0570	0.1665	4	0.0096	4	0.0355	4	0.0822	4	0.0586	4	0.0549	4	0.1015
Mercury, total	mg/L	12	0.000011	0.000016	4	0.000013	0		0		4	0.000010	4	0.000010	0	
Molybdenum, total	mg/L	24	0.00076	0.00170	4	0.00065	4	0.00067	4	0.00096	4	0.00073	4	0.00068	4	0.00090
Nickel, total	mg/L	24	0.0016	0.0025	4	0.0017	4	0.0014	4	0.0024	4	0.0016	4	0.0013	4	0.0011
Phosphorus, total	mg/L	0			0		0		0		0		0		0	
Potassium, total	mg/L	24	1	1	4	1	4	1	4	1	4	1	4	1	4	1
Selenium, total	mg/L	24	0.0005	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005
Silver, total	mg/L	24	0.000010	0.000025	4	0.000010	4	0.000005	4	0.000010	4	0.000014	4	0.000015	4	0.000005
Sodium, total	mg/L	24	4.8	9.2	4	2.7	4	6.1	4	5.5	4	5.1	4	4.8	4	4.7
Thallium, total	mg/L	24	0.00008	0.00010	4	0.00010	4	0.00005	4	0.00005	4	0.00010	4	0.00010	4	0.00005
Zinc, total	mg/L	24	0.0040	0.0155	4	0.0025	4	0.0084	4	0.0059	4	0.0037	4	0.0025	4	0.0009
Aluminum, dissolved	mg/L	24	0.042	0.107	4	0.069	4	0.044	4	0.032	4	0.033	4	0.036	4	0.035
Arsenic, dissolved	mg/L	24	0.00036	0.00058	4	0.00025	4	0.00048	4	0.00045	4	0.00033	4	0.00025	4	0.00041
Cadmium, dissolved	mg/L	24	0.000020	0.000025	4	0.000025	4	0.000025	4	0.000025	4	0.000012	4	0.000009	4	0.000025
Calcium, dissolved	mg/L	24	23.5	37.1	4	16.2	4	23.8	4	27.4	4	23.9	4	24.8	4	25.1
Chromium, dissolved	mg/L	24	0.0004	0.0006	4	0.0005	4	0.0004	4	0.0003	4	0.0005	4	0.0005	4	0.0003
Copper, dissolved	mg/L	24	0.0058	0.0134	4	0.0107	4	0.0048	4	0.0053	4	0.0047	4	0.0048	4	0.0045
Iron, dissolved	mg/L	24	0.331	0.667	4	0.167	4	0.306	4	0.308	4	0.400	4	0.407	4	0.399
Lead, dissolved	mg/L	24	0.00016	0.00025	4	0.00025	4	0.00009	4	0.00009	4	0.00025	4	0.00025	4	0.00003
Magnesium, dissolved	mg/L	24	8.35	16.75	4	5.51	4	8.70	4	9.64	4	8.53	4	8.79	4	8.96
Manganese, dissolved	mg/L	24	0.0390	0.1105	4	0.0049	4	0.0218	4	0.0284	4	0.0401	4	0.0466	4	0.0922
Mercury, dissolved	mg/L	12	0.000012	0.000023	4	0.000017	0		0		4	0.000010	4	0.000010	0	
Molydenum, dissolved	mg/L	24	0.00071	0.00162	4	0.00050	4	0.00067	4	0.00085	4	0.00070	4	0.00065	4	0.00087
Nickel, dissolved	mg/L	24	0.0013	0.0018	4	0.0015	4	0.0013	4	0.0013	4	0.0015	4	0.0011	4	0.0010
Phosphorus, dissolved	mg/L	0			0		0		0		0		0		0	
Potassium, dissolved	mg/L	24	1	1	4	1	4	1	4	1	4	1	4	1	4	1
Selenium, dissolved	mg/L	24	0.0005	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005	4	0.0005
Silver, dissolved	mg/L	24	0.000009	0.000010	4	0.000010	4	0.000005	4	0.000005	4	0.000010	4	0.000010	4	0.000012
Sodium, dissolved	mg/L	24	4.9	9.4	4	2.8	4	6.0	4	5.6	4	5.2	4	5.1	4	5.0
Thallium, dissolved	mg/L	24	0.00008	0.00010	4	0.00010	4	0.00005	4	0.00005	4	0.00010	4	0.00010	4	0.00005
Zinc, dissolved	mg/L	24	0.0039	0.0111	4	0.0040	4	0.0089	4	0.0037	4	0.0032	4	0.0025	4	0.0014
Dissolved Organic Carbon	mg/L	0			0		0		0		0		0		0	

Minto Creek Downstream Background Water Quality 2005 - 2012

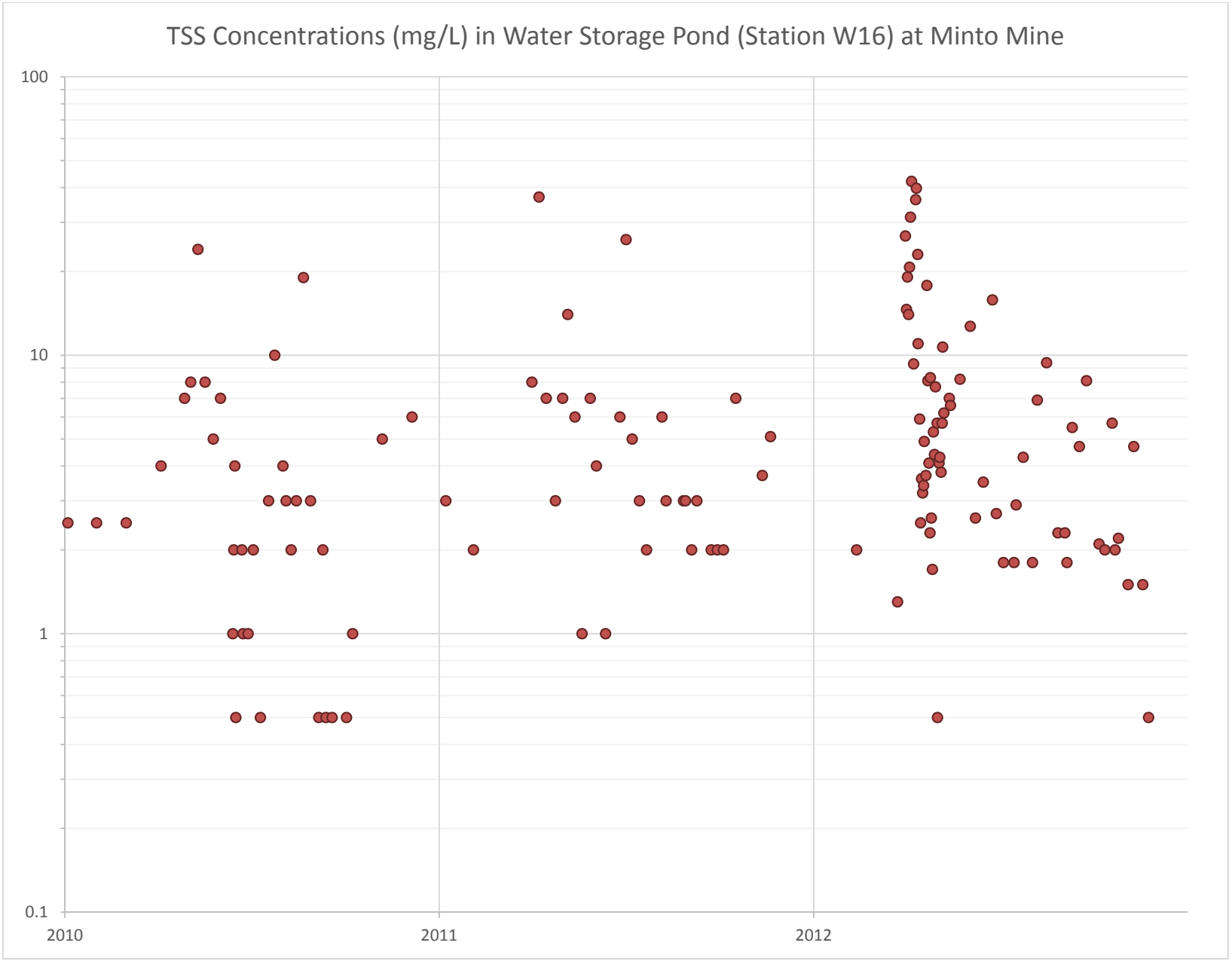
Parameter	Units	Annual (all data)			January		February		March		April		May		June		July		August		September		October		November		December	
		n	mean	95th	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean
pH (field)	pH units	20	7.74	8.31	0		1	7.16	1	6.72	1	7.57	3	7.59	1	7.61	3	7.99	4	8.04	2	7.98	2	8.15	1	6.69	1	7.97
pH (lab)	pH units	36	7.97	8.25	1	8.13	1	7.99	1	8.17	1	7.58	6	7.76	4	7.99	5	8.02	6	8.16	4	7.84	4	7.99	2	7.94	1	8.13
Hardness (from dissolved)	mg/L	21	120.5	169.0	1	169.0	1	165.0	1	161.0	1	64.7	3	55.0	1	100.6	3	115.6	4	123.5	2	107.6	1	121.1	2	153.0	1	223.0
Hardness (from total)	mg/L	34	135.1	209.8	1	158.0	1	160.0	1	159.0	1	43.3	6	109.5	2	94.8	5	160.4	6	154.2	4	119.4	4	127.8	2	151.8	1	206.0
Total Dissolved Solids	mg/L	36	165.6	218.5	1	226.0	1	216.0	1	176.0	1	115.3	6	114.1	4	159.7	5	178.3	6	179.9	4	166.0	4	165.3	2	173.5	1	262.0
Total Suspended Solids	mg/L	36	215.2	1316.3	1	2.0	1	2.0	1	3.2	1	3.2	6	592.9	4	31.7	5	296.3	6	401.5	4	23.8	4	11.9	2	8.3	1	0.5
Alkalinity, total	mg/L	31	114.8	160.0	1	165.0	1	155.0	1	154.0	1	63.5	5	51.5	4	118.2	3	116.3	6	132.4	4	109.5	2	110.8	2	140.0	1	207.0
Sulphate, dissolved	mg/L	31	9.4	22.3	1	18.0	1	17.8	1	19.0	1	7.4	5	6.9	4	13.7	3	2.8	6	6.5	4	8.2	2	5.7	2	10.1	1	29.1
Chloride	mg/L	36	0.81	1.43	1	0.80	1	0.90	1	0.50	1	1.11	6	0.52	4	0.97	5	0.71	6	0.89	4	0.71	4	0.79	2	0.96	1	1.90
Fluoride	mg/L	23	0.34	0.43	1	0.43	1	0.42	1	0.42	1	0.10	3	0.16	2	0.20	3	0.27	4	0.72	2	0.21	2	0.22	2	0.26	1	0.43
Nitrite (N)	mg/L	36	0.0056	0.0232	1	0.0025	1	0.0025	1	0.0025	1	0.0216	6	0.0037	4	0.0097	5	0.0068	6	0.0056	4	0.0025	4	0.0069	2	0.0025	1	0.0025
Nitrate (N)	mg/L	36	0.0827	0.2185	1	0.3240	1	0.2890	1	0.1950	1	0.0113	6	0.0435	4	0.0720	5	0.0866	6	0.0634	4	0.0407	4	0.0959	2	0.0938	1	0.0630
Ammonia	mg/L	36	0.035	0.111	1	0.005	1	0.006	1	0.007	1	0.013	6	0.060	4	0.022	5	0.062	6	0.039	4	0.019	4	0.019	2	0.024	1	0.025
Aluminum, total	mg/L	36	3.863	24.638	1	0.010	1	0.018	1	0.043	1	0.220	6	11.857	4	0.602	5	6.333	6	5.342	4	0.191	4	0.121	2	0.128	1	0.013
Arsenic, total	mg/L	36	0.00246	0.01288	1	0.00040	1	0.00030	1	0.00040	1	0.00040	6	0.00602	4	0.00066	5	0.00369	6	0.00397	4	0.00060	4	0.00055	2	0.00051	1	0.00042
Cadmium, total	mg/L	36	0.000096	0.000439	1	0.000010	1	0.000030	1	0.000010	1	0.000043	6	0.000251	4	0.000030	5	0.000130	6	0.000124	4	0.000012	4	0.000034	2	0.000069	1	0.000015
Calcium, total	mg/L	36	34.7	52.5	1	39.5	1	41.0	1	39.7	1	15.9	6	26.4	4	31.1	5	41.1	6	40.6	4	31.2	4	32.0	2	40.1	1	49.6
Chromium, total	mg/L	36	0.0077	0.0462	1	0.0005	1	0.0005	1	0.0005	1	0.0008	6	0.0239	4	0.0015	5	0.0118	6	0.0101	4	0.0007	4	0.0006	2	0.0006	1	0.0005
Copper, total	mg/L	36	0.0121	0.0591	1	0.0013	1	0.0055	1	0.0068	1	0.0081	6	0.0304	4	0.0028	5	0.0174	6	0.0157	4	0.0030	4	0.0034	2	0.0050	1	0.0028
Iron, total	mg/L	36	6.901	43.138	1	0.113	1	0.043	1	0.108	1	0.388	6	20.384	4	0.926	5	10.606	6	10.620	4	0.656	4	0.423	2	0.321	1	0.072
Lead, total	mg/L	36	0.00202	0.01264	1	0.00010	1	0.00010	1	0.00010	1	0.00015	6	0.00585	4	0.00027	5	0.00296	6	0.00314	4	0.00023	4	0.00020	2	0.00028	1	0.00010
Magnesium, total	mg/L	36	11.67	19.60	1	14.50	1	13.90	1	14.60	1	6.46	6	10.48	4	10.19	5	13.41	6	12.49	4	9.78	4	10.32	2	12.45	1	19.90
Manganese, total	mg/L	36	0.2296	1.1733	1	0.0600	1	0.0040	1	0.0050	1	0.0284	6	0.5339	4	0.0370	5	0.2797	6	0.4768	4	0.0591	4	0.0453	2	0.0501	1	0.0405
Mercury, total	mg/L	30	0.000015	0.000046	1	0.000005	1	0.000005	1	0.000005	1	0.000010	6	0.000009	2	0.000040	3	0.000041	6	0.000013	4	0.000017	2	0.000010	2	0.000006	1	0.000005
Molybdenum, total	mg/L	36	0.00100	0.00203	1	0.00100	1	0.00100	1	0.00100	1	0.00068	6	0.00108	4	0.00096	5	0.00143	6	0.00108	4	0.00055	4	0.00087	2	0.00083	1	0.00120
Nickel, total	mg/L	36	0.0085	0.0496	1	0.0005	1	0.0005	1	0.0005	1	0.0009	6	0.0224	4	0.0023	5	0.0125	6	0.0128	4	0.0021	4	0.0018	2	0.0015	1	0.0016
Phosphorus, total	mg/L	23	0.357	1.254	1	0.014	1	0.012	1	0.016	1	0.065	3	1.075	2	0.180	3	0.649	4	0.589	2	0.031	2	0.038	2	0.033	1	0.022
Potassium, total	mg/L	36	1.35	3.27	1	1.57	1	1.51	1	1.46	1	1.70	6	1.96	4	0.94	5	1.53	6	1.38	4	0.82	4	0.93	2	0.82	1	2.29
Selenium, total	mg/L	36	0.0004	0.0007	1	0.0003	1	0.0003	1	0.0004	1	0.0002	6	0.0006	4	0.0004	5	0.0005	6	0.0004	4	0.0004	4	0.0004	2	0.0002	1	0.0003
Silver, total	mg/L	36	0.000044	0.000204	1	0.000010	1	0.000010	1	0.000010	1	0.000017	6	0.000103	4	0.000017	5	0.000065	6	0.000058	4	0.000024	4	0.000010	2	0.000010	1	0.000010
Sodium, total	mg/L	36	6.2	8.7	1	8.4	1	8.1	1	8.4	1	4.0	6	3.9	4	7.0	5	7.4	6	6.1	4	5.6	4	5.8	2	6.7	1	11.7
Thallium, total	mg/L	36	0.00008	0.00023	1	0.00003	1	0.00003	1	0.00003	1	0.00002	6	0.00016	4	0.00004	5	0.00008	6	0.00010	4	0.00007	4	0.00004	2	0.00003	1	0.00003
Zinc, total	mg/L	36	0.0186	0.1001	1	0.0025	1	0.0025	1	0.0025	1	0.0043	6	0.0509	4	0.0035	5	0.0270	6	0.0277	4	0.0037	4	0.0021	2	0.0051	1	0.0025
Aluminum, dissolved	mg/L	36	0.022	0.059	1	0.005	1	0.021	1	0.003	1	0.045	6	0.035	4	0.014	5	0.020	6	0.023	4	0.016	4	0.028	2	0.007	1	0.006
Arsenic, dissolved	mg/L	36	0.00058	0.00142	1	0.00041	1	0.00033	1	0.00039	1	0.00026	6	0.00059	4	0.00043	5	0.00065	6	0.00093	4	0.00052	4	0.00049	2	0.00043	1	0.00051
Cadmium, dissolved	mg/L	36	0.000018	0.000035	1	0.000035	1	0.000064	1	0.000005	1	0.000037	6	0.000024	4	0.000022	5	0.000016	6	0.000007	4	0.000010	4	0.000023	2	0.000012	1	0.000005
Calcium, dissolved	mg/L	36	32.3	42.0	1	43.0	1	41.2	1	41.2	1	16.1	6	19.3	4	30.4	5	37.4	6	34.4	4	31.3	4	32.5	2	40.2	1	56.1
Chromium, dissolved	mg/L	36	0.0005	0.0007	1	0.0005	1	0.0005	1	0.0005	1	0.0007	6	0.0005	4	0.0003	5	0.0004	6	0.0005	4	0.0007	4	0.0003	2	0.0005	1	0.0005
Copper, dissolved	mg/L	36	0.0025	0.0037	1	0.0011	1	0.0154	1	0.0012	1	0.0046	6	0.0028	4	0.0018	5	0.0020	6	0.0019	4	0.0021	4	0.0019	2	0.0016	1	0.0023
Iron, dissolved	mg/L	36	0.308	1.250	1	0.094	1	0.049	1	0.012	1	0.169	6	0.551	4	0.072	5	0.323	6	0.569	4	0.274	4	0.205	2	0.099	1	0.030
Lead, dissolved	mg/L	36	0.00015	0.00027	1	0.00010	1	0.00024	1	0.00010	1	0.00010	6	0.00021	4	0.00004	5	0.00019	6	0.00017	4	0.00024	4	0.00004	2	0.00013	1	0.00010
Magnesium, dissolved	mg/L	36	10.21	14.95	1	14.90	1	15.10	1	14.20	1	6.64	6	5.84	4	9.92	5	11.14	6	10.03	4	9.77	4	10.33	2	12.75	1	20.20
Manganese, dissolved	mg/L	36	0.0678	0.2720	1	0.0614	1	0.0070	1	0.0015	1	0.0237	6	0.0964	4	0.0115	5	0.0576	6	0.1777	4	0.0359	4	0.0258	2	0.0416	1	0.0374
Mercury, dissolved	mg/L	29	0.000011	0.000030	1	0.000005	1	0.000005	1	0.000005	1	0.000008	6	0.000009	1	0.000029	3	0.000020	6	0.000011	4	0.000014	2	0.000007	2	0.000006	1	0.000005
Molydenum, dissolved	mg/L	36	0.00088	0.00143	1	0.00150	1	0.00140	1	0.00110	1	0.00067	6	0.00052	4	0.00093	5	0.00114	6	0.00102	4	0.00058	4	0.00079	2	0.00090	1	0.00120
Nickel, dissolved	mg/L	36	0.0014	0.0023	1	0.0005	1	0.0005	1	0.0005	1	0.0008	6	0.0017	4	0.0011	5	0.0013	6	0.0017	4	0.0016	4	0.0013	2	0.0013	1	0.0011
Phosphorus, dissolved	mg/L	21	0.022	0.039	1	0.012	1	0.031	1	0.005	1	0.032	3	0.030	1	0.014	3	0.023	4	0.032	2	0.017	1	0.014	2	0.014	1	0.005
Potassium, dissolved	mg/L	36	1.04	1.65	1	1.60	1	1.63	1	1.50	1	1.69	6	1.00	4	0.95	5	0.89	6	0.90	4	0.83	4	0.96	2	0.83	1	2.54
Selenium, dissolved	mg/L	36	0.0003	0.0005	1	0.0004	1	0.0003	1	0.0003	1	0.0002	6	0.0003	4	0.0005	5	0.0003	6	0.0003	4	0.0004	4	0.0004	2	0.0001	1	0.0005
Silver, dissolved	mg/L	36	0.000011	0.000027	1	0.000010	1	0.000010	1	0.000010	1	0.000008	6	0.000011	4	0.000009	5	0.000011	6	0.000013	4	0.000014	4	0.000007	2	0.000010	1	0.000010
Sodium, dissolved	mg/L	36	6.2	8.9	1	8.7	1	8.9	1	8.0	1	4.1	6	3.5	4	6.9	5	7.2	6	5.9	4	5.7	4	5.8	2	6.9	1	12.2
Thallium, dissolved	mg/L	36	0.00005	0.00010	1	0.00003	1	0.00003	1	0.00003	1	0.00002	6	0.00006	4	0.00004	5	0.00004	6	0.00006	4	0.00007	4	0.00004	2	0.00003	1	0.00003
Zinc, dissolved	mg/L	36	0.0028	0.0055	1	0.0025	1	0.0083	1	0.0025	1	0.0042	6	0.0028	4	0.0043	5	0.0023	6	0.0026	4	0.0025	4	0.0013	2	0.0025	1	0.0025
Dissolved Organic Carbon	mg/L	22	11.5	17.8	1	5.3	1	6.1	1	5.2	1	18.8	3	13.5	1	10.6	3	14.0	4	11.5	2	15.5	2	10.5	2	8.4	1	10.2

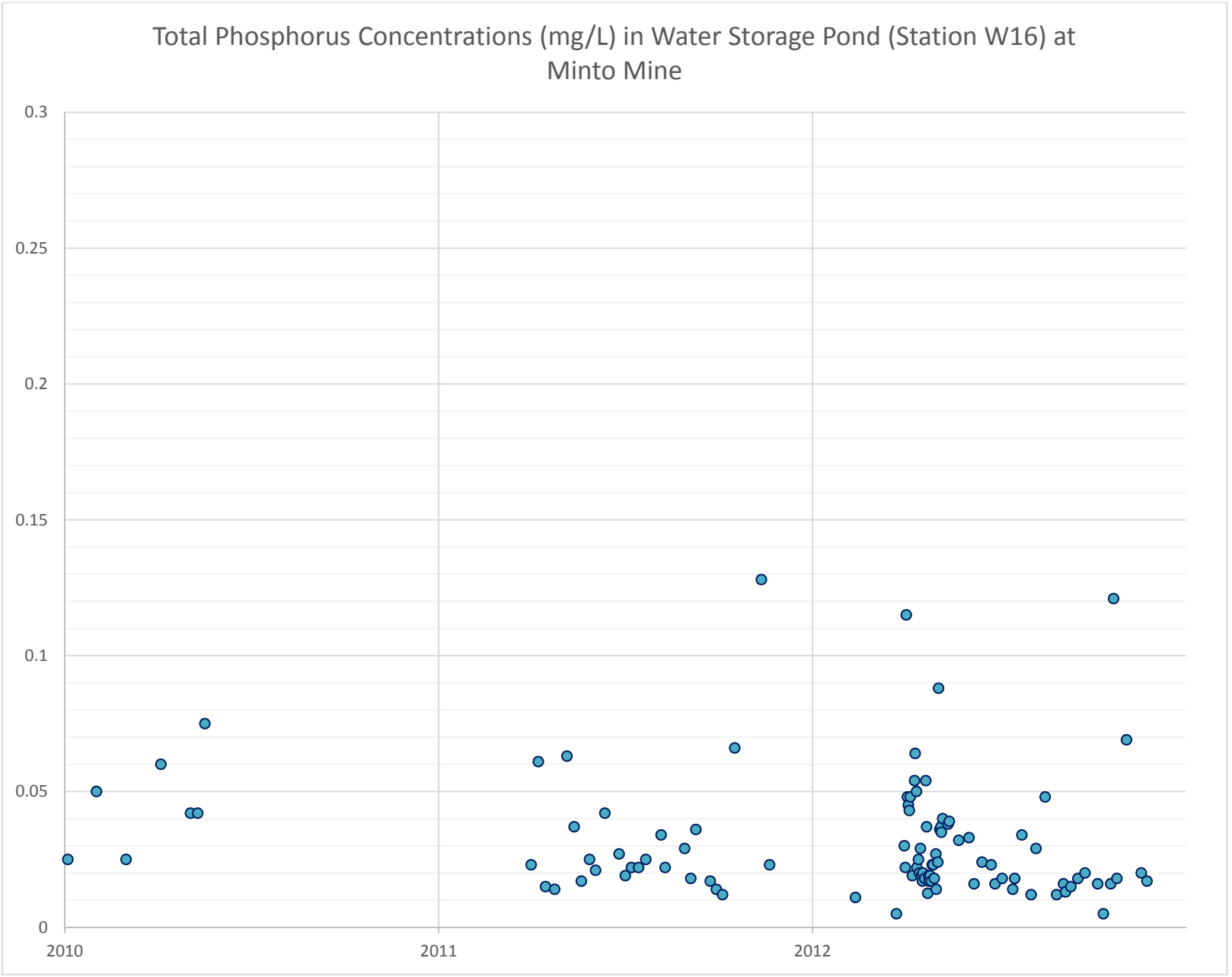
Attachment #5

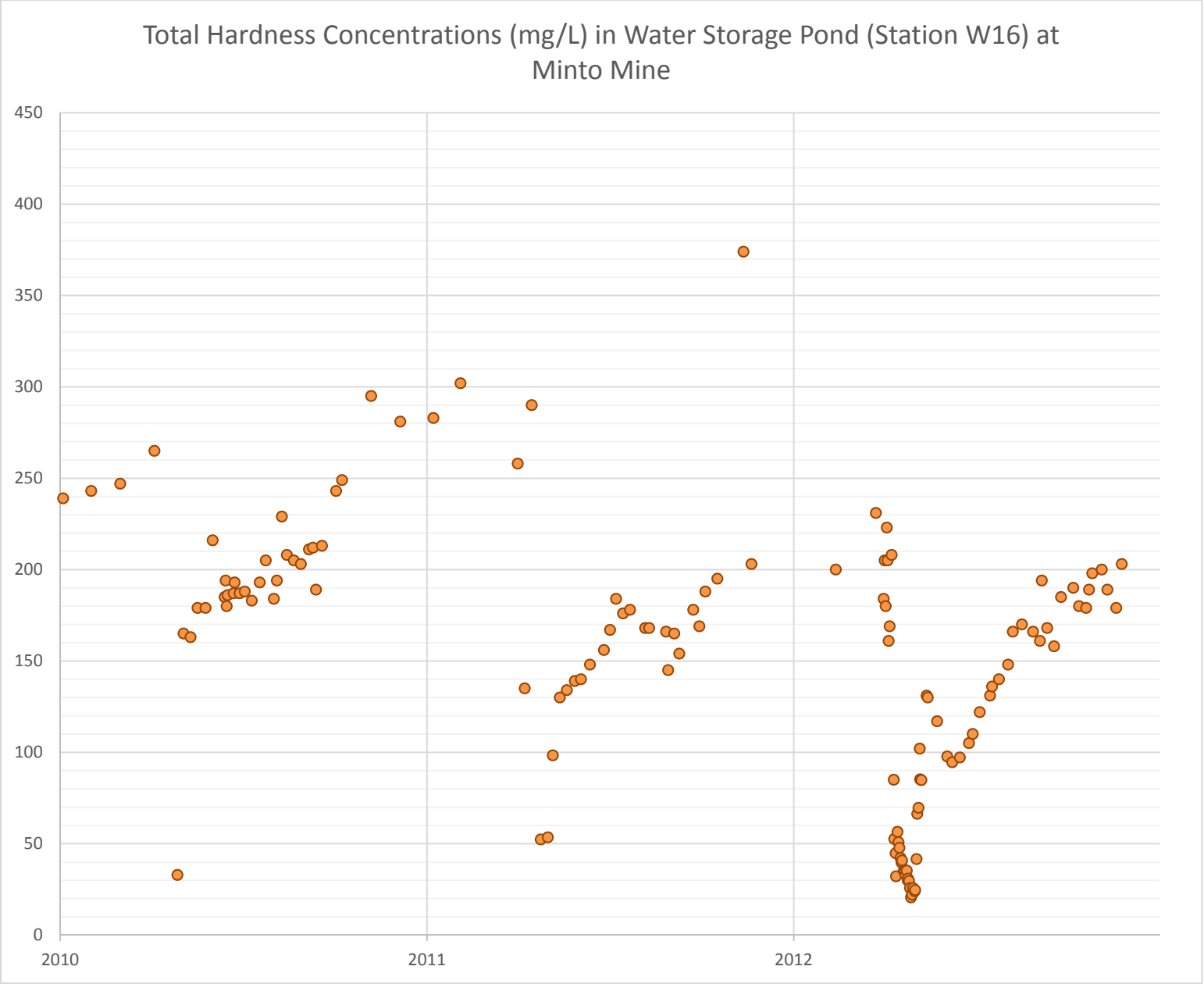
Table 5-2 Modelling Predictions of W3 Water Quality

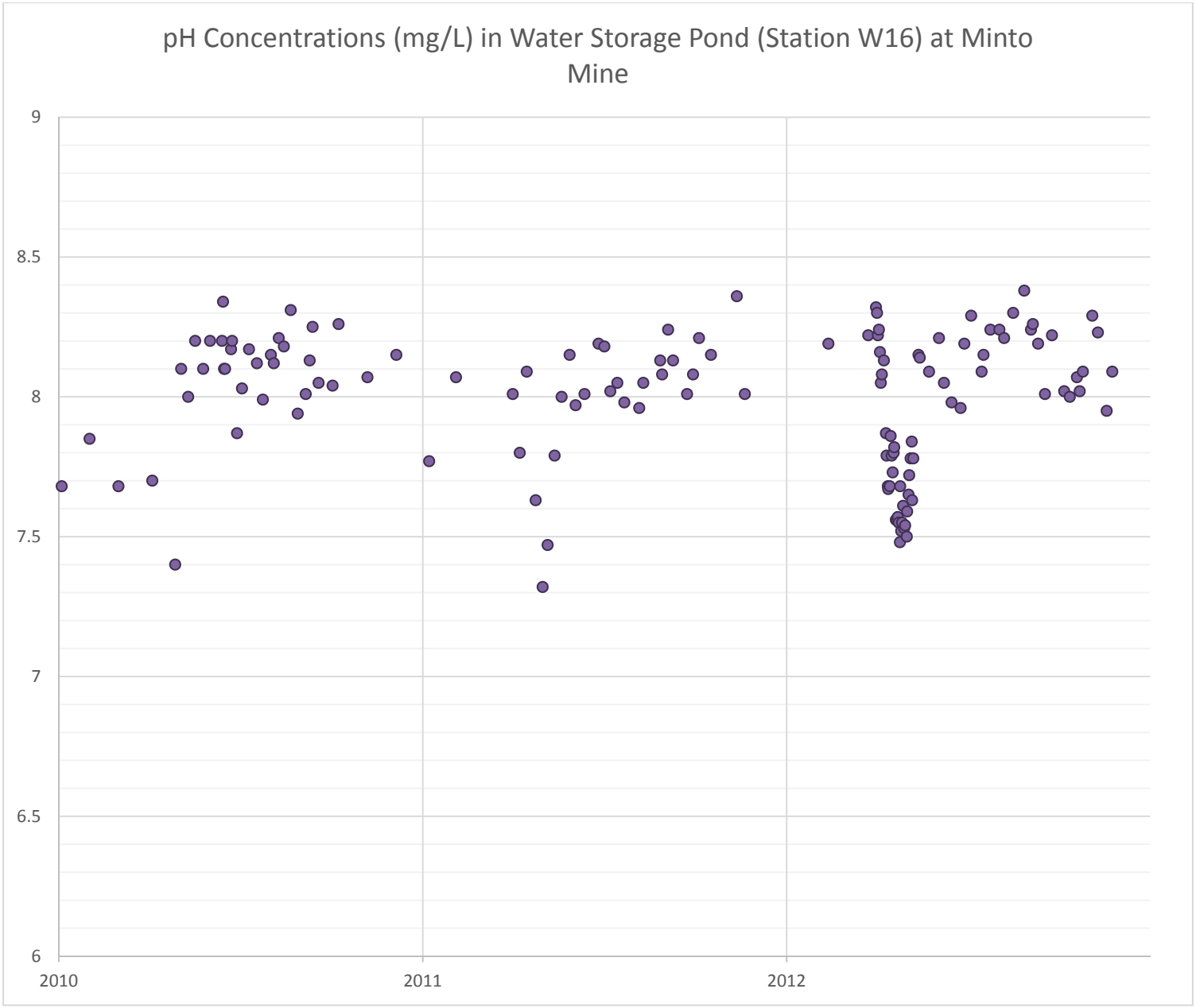
		Modelling Predictions* of W3 Water Quality											
		Phase V/VI Operations				Post-Closure (After 2028), No Mitigation				Post-Closure (After 2028), Covers in Effect			
		Best Estimate		Reasonable Worst Case		Best Estimate		Reasonable Worst Case		Best Estimate		Reasonable Worst Case	
		Average	**Max**	**Average**	**Max**	**Average**	**Max**	**Average**	**Max**	**Average**	**Max**	**Average**	**Max**
Ammonia	mg/L	0.59	0.64	0.96	1.0	0.066	0.29	0.11	0.47	0.066	0.29	0.11	0.47
F-	mg/L	0.26	0.34	0.30	0.40	0.52	0.75	0.74	1.0	0.49	0.71	0.68	0.96
N-NO2	mg/L	0.10	0.11	0.59	0.64	0.011	0.050	0.066	0.29	0.011	0.050	0.066	0.29
N-NO3	mg/L	8.1	8.8	21	23	0.91	3.9	2.3	10	0.91	3.9	2.3	10
SO2-4	mg/L	39	54	71	110	47	65	81	110	41	59	66	90
Al	mg/L	0.68	0.74	0.76	0.87	0.75	0.79	0.92	1.00	0.75	0.79	0.90	0.96
As	mg/L	0.00096	0.0012	0.0012	0.0017	0.0014	0.0016	0.0025	0.0031	0.0013	0.0015	0.0023	0.0028
Cd	mg/L	0.000086	0.00010	0.00014	0.00019	0.00010	0.00011	0.00020	0.00024	0.000094	0.00010	0.00018	0.00021
Cr	mg/L	0.0019	0.0024	0.0027	0.0037	0.0019	0.0022	0.0033	0.0039	0.0018	0.0020	0.0029	0.0034
Cu	mg/L	0.027	0.036	0.044	0.066	0.032	0.036	0.060	0.068	0.027	0.031	0.048	0.056
Fe	mg/L	1.4	1.7	1.8	2.3	1.3	1.3	1.6	1.8	1.2	1.3	1.5	1.6
Pb	mg/L	0.00054	0.00066	0.00054	0.00066	0.00058	0.00063	0.0012	0.0015	0.00055	0.00060	0.0011	0.0014
Mn	mg/L	0.34	0.53	0.71	1.1	0.33	0.38	0.71	0.82	0.26	0.30	0.52	0.62
Hg	mg/L	0.000041	0.000053	0.00018	0.00028	0.000052	0.000060	0.00018	0.00021	0.000048	0.000055	0.00014	0.00016
Mo	mg/L	0.0027	0.0037	0.0039	0.0057	0.0074	0.014	0.015	0.025	0.0068	0.014	0.014	0.023
Ni	mg/L	0.0030	0.0036	0.0037	0.0048	0.0029	0.0032	0.0042	0.0048	0.0028	0.0030	0.0039	0.0044
Se	mg/L	0.0011	0.0016	0.0027	0.0043	0.0023	0.0038	0.0048	0.0075	0.0020	0.0035	0.0039	0.0067
Ag	mg/L	0.000099	0.00011	0.00016	0.00021	0.00011	0.00012	0.00018	0.00020	0.00011	0.00011	0.00016	0.00018
Tl	mg/L	0.000089	0.00012	0.000089	0.00012	0.000080	0.000091	0.000090	0.00010	0.000075	0.000084	0.000083	0.000095
Zn	mg/L	0.013	0.016	0.017	0.022	0.013	0.015	0.020	0.023	0.013	0.014	0.018	0.021

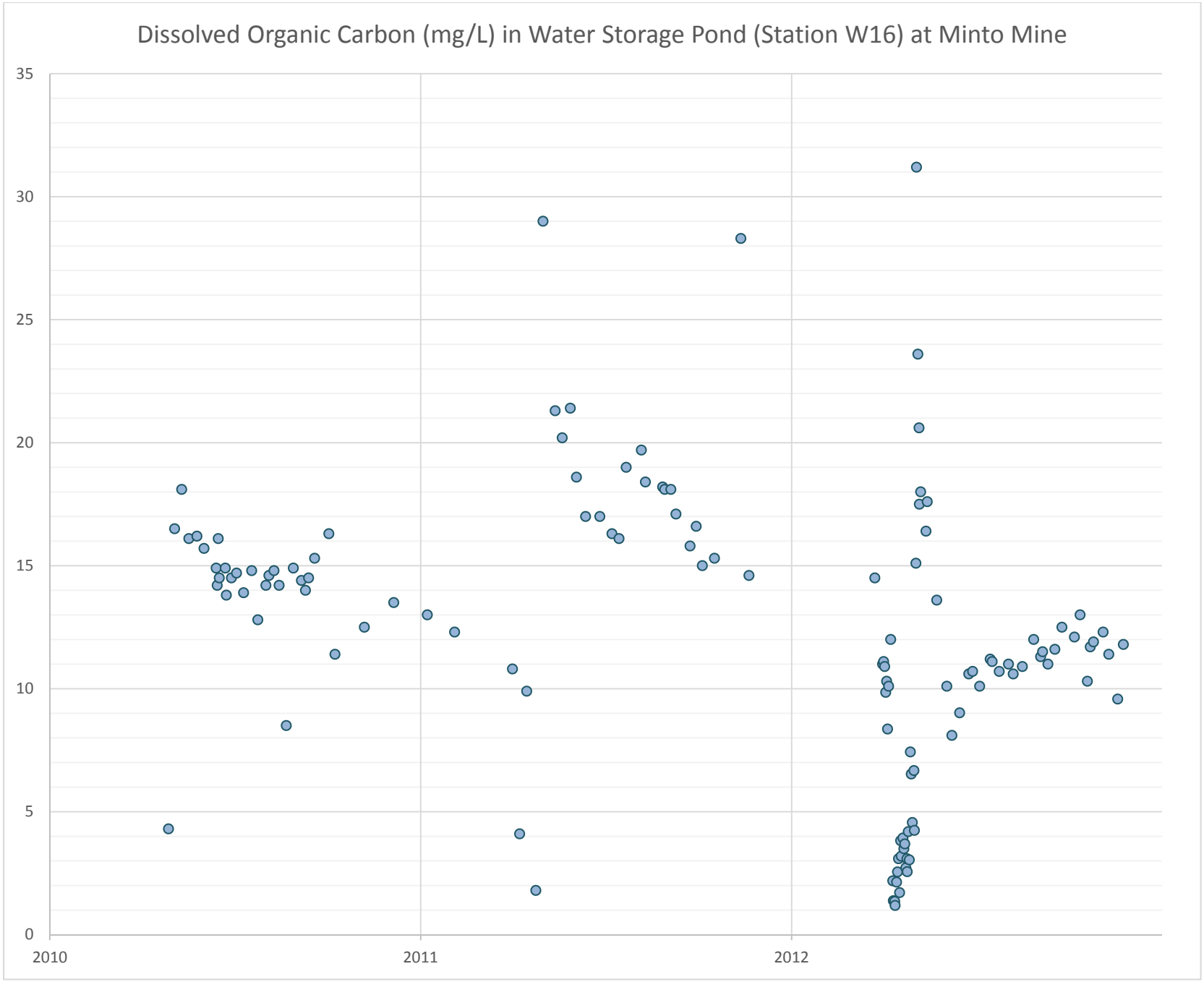
Source: X:\01_SITES\Minto\I020_Site_Wide_Data\Water_and_Load_Balance_Files\01_Project_Phases\07_Phase_5_6\Results\ Goldsim_Results_REV49_6_June_2013.xlsx
*: all concentrations are total concentrations


TSS Concentrations (mg/L) in Water Storage Pond (Station W16) at Minto Mine
100
10
1
0.1
2010
2011
2012


Total Phosphorus Concentrations (mg/L) in Water Storage Pond (Station W16) at Minto Mine
0.3
0.25
0.2
0.15
0.1
0.05
0
2010
2011
2012


Total Hardness Concentrations (mg/L) in Water Storage Pond (Station W16) at Minto Mine
450
400
350
300
250
200
150
100
50
0
2010
2011
2012


pH Concentrations (mg/L) in Water Storage Pond (Station W16) at Minto Mine
9
8.5
8
7.5
7
6.5
6
2010
2011
2012


Dissolved Organic Carbon (mg/L) in Water Storage Pond (Station W16) at Minto Mine
35
30
25
20
15
10
5
0
2010
2011
2012