Table 5-1a CCME
Predicted Pit Lake Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-	-	-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	-	-	-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-	-	-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions																																
Calcium	mg/L	-	-	-	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	mg/L	640	120	-	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	mg/L	0.12		l	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	mg/L	-		-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.36**	**0.36**
Potassium	mg/L	-		-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	mg/L	-		-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-		-	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	**2.0**	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	0.0017	**0.0028**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.003**	**0.003**	**0.0029**	**0.0029**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.003**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0032**	**0.0032**	**0.0032**
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0065	0.0014	0.003	0.005	0.0026	0.004	0.005	0.003	0.004	0.005	0.003	0.0036	0.004	0.0029	0.0033	0.0035	0.0032	0.0036	0.0039	0.003	0.0035	0.0039	0.0032	0.0036	0.0039	0.0033	0.0038	0.0041
Mercury	mg/L	0.000026		-	0.000005	0.0000033	0.0000049	0.0000051	0.0000047	0.000005	0.0000051	0.0000048	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00033	0.0005	0.00051	0.00049	0.00051	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.00001	0.000011	0.000011
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	mg/L	0.033	0.015	-	0.0001	0.000065	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00034	0.00052	0.00054	0.00049	0.00052	0.00052	0.0005	0.00051	0.00052	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																																
Aluminum	mg/L	0.005		f	0.052	0.016	0.019	0.028	0.012	0.015	0.028	0.011	0.013	0.018	0.011	0.012	0.014	0.01	0.011	0.013	0.01	0.011	0.012	0.009	0.01	0.011	0.009	0.01	0.011	0.009	0.01	0.011
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00017	0.00026	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00027	0.00027	0.00026	0.00027	0.00027	0.00026	0.00027	0.00027	0.00027	0.00027	0.00027
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0097	0.01	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.0000074	0.000012	0.000014	0.000012	0.000013	0.000014	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00034	0.0005	0.00053	0.00049	0.00051	0.00052	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.00049	0.0005
Cobalt	mg/L	-		-	0.00015	0.0001	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00019**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00034	0.0006	0.0007	0.00062	0.0007	0.0007	0.00065	0.0007	0.0007	0.00065	0.00068	0.0007	0.00065	0.00067	0.00068	0.00067	0.00069	0.00071	0.00067	0.00069	0.00071	0.00068	0.0007	0.00072	0.00069	0.00072	0.00073
Iron	mg/L	0.3		-	0.015	0.02	0.031	0.032	0.024	0.025	0.03	0.022	0.022	0.025	0.021	0.021	0.022	0.02	0.021	0.021	0.02	0.02	0.021	0.02	0.02	0.02	0.019	0.02	0.02	0.019	0.019	0.02
Lead	mg/L	0.001		j	0.00025	0.00017	0.00026	0.00027	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0065	0.0014	0.003	0.005	0.0026	0.004	0.005	0.003	0.004	0.005	0.003	0.0036	0.004	0.0029	0.0033	0.0035	0.0032	0.0036	0.0039	0.003	0.0035	0.0039	0.0032	0.0036	0.0039	0.0033	0.0038	0.0041
Mercury	mg/L	0.000026		-	0.000005	0.0000033	0.0000049	0.0000051	0.0000047	0.000005	0.0000051	0.0000048	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00033	0.0005	0.00051	0.00049	0.00051	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.00001	0.000011	0.000011
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	mg/L	0.033	0.015	-	0.0001	0.000065	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00034	0.00052	0.00054	0.00049	0.00052	0.00052	0.0005	0.00051	0.00052	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1a CCME
Predicted Pit Lake Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[c]	mg/L	-		-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																													
Calcium	mg/L	-		-	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	640	120	-	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.12		l	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L	-		-	0.24	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.36**	**0.34**	**0.35**	**0.35**
Potassium	mg/L	-		-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L	-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-		-	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0031**	**0.0032**	**0.0032**	**0.0029**	**0.003**	**0.0031**
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0048	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.0039	0.0036	0.0039	0.0041	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00048	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon	mg/L	-		-	-	4.2	4.3	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	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	0.00001	0.00001	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000098	0.0000099	0.0001
Vanadium	mg/L	-		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.052	0.009	0.009	0.01	0.009	0.009	0.01	0.009	0.01	0.01	0.009	0.01	0.01	0.0092	0.01	0.01	0.0093	0.01	0.01	0.0092	0.0098	0.01	0.0064	0.0065	0.0099
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00027	0.00027	0.00027	0.00026	0.00026	0.00027	0.00026	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00025	0.00026	0.00027
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0095	0.0097	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000099	0.00001	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00048	0.00049
Cobalt	mg/L	0.0008		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00069	0.00071	0.00073	0.00069	0.00071	0.00073	0.0007	0.00072	0.00073	0.00072	0.00073	0.00075	0.00072	0.00073	0.00075	0.0007	0.00072	0.00074	0.00059	0.00059	0.00071
Iron	mg/L	0.3		-	0.015	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.016	0.016	0.019
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0065	0.0033	0.0038	0.0041	0.0034	0.0037	0.004	0.0035	0.0038	0.004	0.0036	0.0039	0.0042	0.0036	0.004	0.0043	0.0036	0.0039	0.0042	0.0034	0.0037	0.004	0.0019	0.0019	0.0036
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000096	0.0000098	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000099	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1a BCWQ
Predicted Pit Lake Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	see notes			W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions																																	
Calcium	mg/L	see notes			W, t	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	mg/L	600	A	150	A	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	mg/L	-			-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.36**	**0.36**
Potassium	mg/L	-			-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	mg/L	-			-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-	-	128	A, f	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	2.0	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0017	0.0028	0.003	0.0029	0.0029	0.003	0.0029	0.0029	0.003	0.0029	0.003	0.003	0.0029	0.0029	0.0029	0.0029	0.003	0.003	0.003	0.0031	0.0031	0.0031	0.0031	0.0031	0.0032	0.0032	0.0032
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.35	A	-	-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0048	0.0012	0.003	0.005	0.0024	0.004	0.005	0.0029	0.004	0.005	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	mg/L	-			-	-	2.6	4.0	4.2	3.9	4.2	4.3	4.1	4.2	4.3	4.1	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.3	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.052	0.016	0.019	0.028	0.012	0.015	0.028	0.011	0.013	0.018	0.011	0.012	0.014	0.01	0.011	0.013	0.01	0.011	0.012	0.009	0.01	0.011	0.009	0.01	0.011	0.009	0.01	0.011
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00017	0.00026	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00027	0.00027	0.00026	0.00027	0.00027	0.00026	0.00027	0.00027	0.00027	0.00027	0.00027
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0097	0.01	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.0000074	0.000012	0.000014	0.000012	0.000013	0.000014	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00034	0.00051	0.00053	0.00049	0.00051	0.00052	0.0005	0.0005	0.00051	0.00049	0.0005	0.00051	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.0001	0.00017	0.00018	0.00017	0.00018	0.00018	0.00017	0.00018	0.00019	0.00017	0.00018	0.00018	0.00017	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00034	0.0006	0.0007	0.00062	0.0007	0.0007	0.00065	0.0007	0.0007	0.00065	0.00068	0.0007	0.00065	0.00067	0.00068	0.00067	0.00069	0.00071	0.00067	0.00069	0.00071	0.00068	0.0007	0.00072	0.00069	0.00072	0.00073
Iron	mg/L	1	A	-	-	0.015	0.02	0.031	0.032	0.024	0.025	0.03	0.022	0.022	0.025	0.021	0.021	0.022	0.02	0.021	0.021	0.02	0.02	0.021	0.02	0.02	0.02	0.019	0.02	0.02	0.019	0.019	0.02
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00017	0.00026	0.00027	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0014	0.003	0.005	0.0026	0.004	0.005	0.003	0.004	0.005	0.003	0.0036	0.004	0.0029	0.0033	0.0035	0.0032	0.0036	0.0039	0.003	0.0035	0.0039	0.0032	0.0036	0.0039	0.0033	0.0038	0.0041
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000033	0.0000049	0.0000051	0.0000047	0.000005	0.0000051	0.0000048	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00033	0.0005	0.00051	0.00049	0.00051	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.000011	0.00001	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000065	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00034	0.00052	0.00054	0.00049	0.00052	0.00052	0.0005	0.00051	0.00052	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123 (bold, underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1a BCWQ
Predicted Pit Lake Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[b]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[b]	mg/L	-		-	-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[c]	mg/L	see notes			W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																														
Calcium	mg/L	see notes			W, t	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	600	A	150	A	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L	-		-	-	0.24	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.36**	**0.34**	**0.35**	**0.35**
Potassium	mg/L	-		-	-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L	-		-	-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-	-	128	A, f	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)				-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0031	0.0032	0.0032	0.0029	0.003	0.0031
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000011	0.0000012	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000098	0.0000099	0.0000111
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-	-	-	-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0048	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0041	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00049	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.00001	0.00001	0.0000011	0.00001	0.00001	0.00001	0.0000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000096	0.0000098	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000098	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-	-	-	-	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.052	0.009	0.009	0.01	0.009	0.009	0.01	0.009	0.01	0.01	0.009	0.01	0.01	0.0092	0.01	0.01	0.0093	0.01	0.01	0.0092	0.0098	0.01	0.0064	0.0065	0.0099
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00027	0.00027	0.00027	0.00026	0.00027	0.00026	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00027	0.00025	0.00026	0.00027
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0095	0.0097	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000012	0.0000012	0.0000011	0.0000011	0.0000012	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000099	0.0000111	0.0000111
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00069	0.00071	0.00073	0.00069	0.00071	0.00073	0.0007	0.00072	0.00073	0.00072	0.00073	0.00075	0.00072	0.00074	0.00075	0.0007	0.00072	0.00074	0.00059	0.00059	0.00071			
Iron	mg/L	1	A	-	-	0.015	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.016	0.016	0.019
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-	-	-	-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0033	0.0038	0.0041	0.0034	0.0037	0.004	0.0035	0.0038	0.004	0.0036	0.0039	0.0042	0.0036	0.004	0.0043	0.0036	0.0039	0.0042	0.0034	0.0037	0.004	0.0019	0.0019	0.0036
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.00001	0.00001	0.0000011	0.00001	0.00001	0.00001	0.0000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000096	0.0000098	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000098	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-	-	-	-	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/L = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2)); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*ln(hardness)+5.274]}$

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1b CCME
Predicted Pit Lake Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-		-	36	25	**40**	**61**	26	35	**63**	27	32	**42**	27	30	34	26	28	31	25	27	29	24	26	27	24	25	26	23	24	25
Alkalinity[c]	mg/L	-		-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	8.0	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																																
Calcium[n]	mg/L	-		-	2.7	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**
Chloride[e]	mg/L	640	120	-	1.1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[b]	mg/L	0.12		l	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1.0	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[n]	mg/L	-		-	4.7	3.2	5.0	**5.5**	4.8	**5.6**	**5.9**	**5.5**	**5.9**	**6.1**	**5.6**	**5.7**	**5.9**	**5.5**	**5.6**	**5.7**	**5.3**	**5.4**	**5.6**	5.0	5.1	**5.2**	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[b]	mg/L (as N)	550	13	-	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[n]	mg/L	-	see notes	l	0.0084	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.071	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-		-	0.01	0.0076	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.000024	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.021	0.034	0.038	0.032	0.039	0.041	0.037	0.041	0.042	0.039	0.04	0.04	0.038	0.039	0.04	0.036	0.037	0.039	0.034	0.035	0.036	0.033	0.033	0.034	0.032	0.032	0.033
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0093	**0.022**	**0.037**	**0.042**	**0.035**	**0.045**	**0.047**	**0.044**	**0.048**	**0.05**	**0.046**	**0.048**	**0.048**	**0.044**	**0.045**	**0.046**	**0.041**	**0.041**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.035**	**0.037**	**0.033**	**0.033**	**0.035**
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[n]	mg/L	-		-	-	0.44	0.71	1.3	0.33	0.54	1.3	0.33	0.44	0.73	0.31	0.38	0.49	0.28	0.33	0.4	0.25	0.29	0.35	0.22	0.26	0.3	0.2	0.23	0.27	0.18	0.21	0.24
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.00001	0.0000011	0.0000011	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
Thallium	mg/L	0.0008		-	0.0001	0.0000064	0.0000097	0.0000099	0.0000095	0.0000099	0.0001	0.0000098	0.0000099	0.0001	0.0000098	0.0000098	0.00010	0.0000097	0.0000098	0.0000099	0.0000097	0.0000098	0.00010	0.0000097	0.0000098	0.0000099	0.0000097	0.0000098	0.00010	0.0000097	0.0000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	mg/L	0.033	0.015	-	0.0001	0.000065	0.00010	0.0001	0.000099	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00045	**0.00069**	**0.00075**	**0.00067**	**0.00071**	**0.00074**	**0.00069**	**0.0007**	**0.00072**	**0.0007**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00075**
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0026	0.0026	0.0026	0.0027	0.0027	0.0027	0.0028	0.0028	0.0027	0.0027	0.0028	0.0026	0.0027	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0026	0.0026	0.0026	0.0027	0.0026	0.0027	0.0027
Total Metals																																
Aluminum	mg/L	0.005		f	0.32	0.068	0.078	0.11	0.059	0.071	0.12	0.058	0.065	0.081	0.056	0.06	0.067	0.054	0.057	0.061	0.053	0.056	0.058	0.053	0.055	0.057	0.053	0.054	0.056	0.052	0.054	0.055
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00039	0.00062	0.00069	0.00058	0.00071	0.00075	0.00069	0.00075	0.00078	0.00072	0.00073	0.00074	0.00071	0.00071	0.00073	0.00067	0.00068	0.00071	0.00063	0.00064	0.00066	0.00061	0.00061	0.00062	0.00058	0.00059	0.0006
Barium	mg/L	-		-	0.01	0.0077	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.000031	0.00001	0.000015	0.000018	0.000014	0.000015	0.000018	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000014	0.000014	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00034	0.00051	0.00053	0.00049	0.00051	0.00052	0.0005	0.0005	0.00051	0.00049	0.0005	0.00051	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005
Cobalt	mg/L	-		-	0.00015	0.000099	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00019**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00034	0.0006	0.0007	0.00063	0.00068	0.00072	0.00067	0.0007	0.00074	0.00066	0.00069	0.00072	0.00066	0.00068	0.00069	0.00068	0.0007	0.00072	0.00067	0.0007	0.00072	0.00069	0.00071	0.00073	0.0007	0.00072	0.00074
Iron	mg/L	0.3		-	0.18	0.053	0.069	0.083	0.058	0.062	0.083	0.057	0.059	0.066	0.053	0.054	0.06	0.05	0.051	0.054	0.046	0.047	0.051	0.043	0.044	0.047	0.041	0.042	0.043	0.039	0.04	0.042
Lead	mg/L	0.001		j	0.00025	0.00017	0.00026	0.00027	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.011	**0.023**	**0.038**	**0.043**	**0.036**	**0.046**	**0.048**	**0.044**	**0.049**	**0.05**	**0.046**	**0.047**	**0.048**	**0.045**	**0.045**	**0.046**	**0.041**	**0.042**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.036**	**0.037**	**0.033**	**0.034**	**0.035**
Mercury	mg/L	0.000026		-	0.000005	0.0000033	0.0000049	0.0000051	0.0000047	0.000005	0.0000051	0.0000048	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	0.073		l	0.0005	0.00049	0.00077	0.00084	0.00074	0.00085	0.00089	0.00082	0.00088	0.00091	0.00085	0.00086	0.00088	0.00084	0.00085	0.00086	0.0008	0.00082	0.00084	0.00077	0.00078	0.0008	0.00075	0.00076	0.00077	0.00074	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00033	0.0005	0.00051	0.00049	0.00051	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000065	0.00001	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011	0.0000011
Thallium	mg/L	0.0008		-	0.0001	0.0000064	0.0000097	0.0000099	0.0000095	0.0000099	0.0001	0.0000098	0.0000099	0.0001	0.0000098	0.0000098	0.00010	0.0000097	0.0000098	0.0000099	0.0000097	0.0000098	0.00010	0.0000097	0.0000098	0.0000099	0.0000097	0.0000098	0.00010	0.0000097	0.0000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	mg/L	0.033	0.015	-	0.0001	0.000065	0.00010	0.0001	0.000099	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00045	**0.00069**	**0.00075**	**0.00067**	**0.00071**	**0.00074**	**0.00069**	**0.0007**	**0.00072**	**0.0007**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00075**
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0026	0.0026	0.0026	0.0027	0.0027	0.0027	0.0028	0.0028	0.0027	0.0027	0.0028	0.0026	0.0027	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0026	0.0026	0.0026	0.0027	0.0026	0.0027	0.0027

Notes:

l = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1b CCME
Predicted Pit Lake Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L	-		-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	8.0	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																													
Calcium[n]	mg/L	-		-	2.7	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[n]	mg/L	640	120	-	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[n]	mg/L	0.12		l	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1.0	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[n]	mg/L	-		-	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.0025	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[e]	mg/L (as N)	550	13	-	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052	0.051	0.051	0.052
Total Phosphorus[c]	mg/L	-	see notes	l	0.0084	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.0079	0.008	0.0076	0.0077	0.0079
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.071	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-		-	0.01	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.011**
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.000024	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.015	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.03	0.03	0.031
Lead	mg/L	0.001		j	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0093	**0.031**	**0.032**	**0.033**	**0.031**	**0.032**	**0.033**	**0.032**	**0.033**	**0.033**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.033**	**0.028**	**0.029**	**0.032**
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025		k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon[n]	mg/L	-		-	-	0.17	0.19	0.22	0.17	0.18	0.2	0.16	0.18	0.19	0.16	0.17	0.18	0.16	0.17	0.18	0.16	0.16	0.17	0.15	0.16	0.17	0.14	0.14	0.16
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.32	0.052	0.053	0.054	0.052	0.053	0.054	0.052	0.052	0.053	0.052	0.052	0.053	0.051	0.052	0.052	0.051	0.051	0.052	0.051	0.051	0.051	0.048	0.048	0.051
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00056	0.00057	0.00058	0.00056	0.00057	0.00058	0.00057	0.00058	0.00058	0.00057	0.00057	0.00058	0.00057	0.00057	0.00058	0.00057	0.00057	0.00058	0.00057	0.00058	0.00058	0.00054	0.00054	0.00058
Barium	mg/L	-		-	0.01	**0.011**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.011**
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.000031	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.0007	0.00072	0.00074	0.0007	0.00072	0.00074	0.00071	0.00072	0.00074	0.00072	0.00072	0.00074	0.00072	0.00074	0.00076	0.00072	0.00074	0.00075	0.00071	0.00073	0.00074	0.00059	0.00059	0.00072
Iron	mg/L	0.3		-	0.18	0.037	0.038	0.04	0.038	0.038	0.038	0.038	0.038	0.038	0.037	0.038	0.038	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.033	0.033	0.037
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.0049
Manganese	mg/L	-		-	0.005	**0.00073**	**0.00074**	**0.00075**	**0.00073**	**0.00073**	**0.00075**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00072	0.00073	0.00073	0.00072	0.00073	0.00074	0.00072	0.00073	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00074	0.00072	0.00072	0.00074	0.00072	0.00073	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.00001	0.000011	0.00001	0.00001	0.00001	0.0000096	0.0000098	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000099	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	**0.00073**	**0.00074**	**0.00075**	**0.00073**	**0.00073**	**0.00075**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0027	0.0026	0.0027	0.0027	0.0026	0.0027	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1b BCWQ
Predicted Pit Lake Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional															
Total Dissolved Solids[b]	mg/L	-			-	36	25	**40**	**61**	26	35	**63**	27	32	**42**
Alkalinity[c]	mg/L	see notes			W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	8.0	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**
Major Ions															
Calcium[v]	mg/L	see notes			W, t	2.7	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**
Chloride[v]	mg/L	600	A	150	A	1.1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2
Fluoride[v]	mg/L	0.45 - 0.71	A, e	-	-	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026
Magnesium[v]	mg/L	-			-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**
Potassium[v]	mg/L	-			-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**
Sodium[v]	mg/L	-			-	1.0	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**
Sulphate[v]	mg/L	-	-	128	A, f	4.7	3.2	5.0	5.5	4.8	5.6	5.9	5.5	5.9	6.1
Nutrients															
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015
Nitrate[v]	mg/L (as N)	32.8	A	3	A	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059
Total Phosphorus[v]	mg/L	0.005-0.015 in lakes			A	0.0084	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087
Dissolved Metals															
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.071	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076
Barium	mg/L	-	-	1	W	0.01	0.0076	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.000024	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007
Iron	mg/L	0.35	A	-	-	0.015	0.021	0.034	0.038	0.032	0.039	0.041	0.037	0.041	0.042
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0093	0.022	0.037	0.042	0.035	0.045	0.047	0.044	0.048	0.05
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	mg/L	-			-	-	0.44	0.71	1.3	0.33	0.54	1.3	0.33	0.44	0.73
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.000098	0.0001	0.000098	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00068**	**0.00071**	**0.00067**	**0.00069**	**0.00071**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals															
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.32	0.068	0.078	0.11	0.059	0.071	0.12	0.058	0.065	0.081
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00039	0.00062	0.00069	0.00058	0.00071	0.00075	0.00069	0.00075	0.00078
Barium	mg/L	-	-	1	W	0.01	0.0077	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.000031	0.00001	0.000015	0.000018	0.000014	0.000015	0.000018	0.000014	0.000015	0.000016
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00034	0.00051	0.00053	0.00049	0.00051	0.00052	0.0005	0.0005	0.00051
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000099	0.00017	0.00018	0.00017	0.00018	0.00018	0.00017	0.00018	0.00019
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00034	0.0006	0.0007	0.00063	0.00068	0.00072	0.00067	0.0007	0.00074
Iron	mg/L	1	A	-	-	0.18	0.053	0.069	0.083	0.058	0.062	0.083	0.057	0.059	0.066
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00017	0.00026	0.00027	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.023	0.038	0.043	0.036	0.046	0.048	0.044	0.049	0.05
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000033	0.0000049	0.0000051	0.0000047	0.000005	0.0000051	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00077	0.00084	0.00074	0.00085	0.00089	0.00082	0.00088	0.00091
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00033	0.0005	0.00051	0.00049	0.00051	0.00051	0.0005	0.0005	0.00051
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000065	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0035	0.0054	**0.0056**	0.005	0.0052	0.0053	0.005	0.0051	0.0052
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000065	0.00010	0.0001	0.000099	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00045	**0.00069**	**0.00075**	**0.00067**	**0.00071**	**0.00074**	**0.00069**	**0.0007**	**0.00072**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0026	0.0026	0.0026	0.0027	0.0027	0.0027	0.0028	0.0028

Parameter	Year 4			Year 5			Year 6		
	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional									
Total Dissolved Solids[b]	27	30	34	26	28	31	25	27	29
Alkalinity[c]	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions									
Calcium[v]	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**
Chloride[v]	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Fluoride[v]	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025
Magnesium[v]	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**
Potassium[v]	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[v]	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**
Sulphate[v]	5.6	5.7	5.9	5.5	5.6	5.7	5.3	5.4	5.6
Nutrients									
Ammonia	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013
Nitrate[v]	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056
Total Phosphorus[v]	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084
Dissolved Metals									
Aluminum	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007
Barium	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.039	0.04	0.04	0.038	0.039	0.04	0.036	0.037	0.039
Lead	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.046	0.046	0.048	0.044	0.045	0.046	0.041	0.041	0.045
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	0.31	0.38	0.49	0.28	0.33	0.4	0.25	0.29	0.35
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.00068**	**0.00069**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.056	0.06	0.067	0.054	0.057	0.061	0.053	0.056	0.058
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00072	0.00073	0.00074	0.00071	0.00071	0.00073	0.00067	0.00068	0.00071
Barium	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000014	0.000014	0.000015	0.000013	0.000014	0.000014	0.000013	0.000013	0.000014
Chromium	0.00049	0.0005	0.00051	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00018	0.00018	0.00018	0.00018
Copper	0.00066	0.00069	0.00072	0.00066	0.00068	0.00069	0.00068	0.0007	0.00072
Iron	0.053	0.054	0.06	0.05	0.051	0.054	0.046	0.047	0.051
Lead	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.046	0.047	0.048	0.045	0.045	0.046	0.041	0.042	0.045
Mercury	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005
Molybdenum	0.00085	0.00086	0.00088	0.00084	0.00085	0.00086	0.0008	0.00082	0.00084
Nickel	0.0005	0.0005	0.00051	0.00049	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.005	0.0051	0.0051	0.005	0.005	0.0051	0.005	0.005	0.0051
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.0007**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**
Zinc	0.0027	0.0027	0.0028	0.0026	0.0027	0.0027	0.0026	0.0026	0.0027

Parameter	Year 7			Year 8			Year 9		
	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional									
Total Dissolved Solids[b]	24	26	27	24	25	26	23	24	25
Alkalinity[c]	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions									
Calcium[v]	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**
Chloride[v]	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[v]	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[v]	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[v]	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[v]	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[v]	5.0	5.1	5.2	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients									
Ammonia	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[v]	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[v]	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals									
Aluminum	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.012	0.012
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.034	0.035	0.036	0.033	0.033	0.034	0.032	0.032	0.033
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.037	0.038	0.04	0.035	0.035	0.037	0.033	0.033	0.035
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	0.22	0.26	0.3	0.2	0.23	0.27	0.18	0.21	0.24
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.053	0.055	0.057	0.053	0.054	0.056	0.052	0.054	0.055
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00063	0.00064	0.00066	0.00061	0.00061	0.00062	0.00058	0.00059	0.0006
Barium	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005
Cobalt	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00067	0.0007	0.00072	0.00069	0.00071	0.00073	0.0007	0.00072	0.00074
Iron	0.043	0.044	0.047	0.041	0.042	0.043	0.039	0.04	0.042
Lead	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.037	0.038	0.04	0.035	0.036	0.037	0.033	0.034	0.035
Mercury	0.0000049	0.0000049	0.000005	0.0000049	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	0.00077	0.00078	0.0008	0.00075	0.00076	0.00077	0.00074	0.00074	0.00075
Nickel	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.005	0.005	0.0051	0.005	0.005	0.0051	0.0049	0.005	0.0051
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00075**
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0027	0.0026	0.0027	0.0027

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

v) based on probabilistic model results.

123 (underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-1b BCWQ
Predicted Pit Lake Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[c]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[b]	mg/L		-		-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L		see notes		W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L		-		-	8.0	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																														
Calcium[d]	mg/L		see notes		W, t	2.7	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[e]	mg/L	600	A	150	A	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[f]	mg/L	0.45 - 0.71	A, e	-	-	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[d]	mg/L		-		-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[e]	mg/L		-		-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[e]	mg/L		-		-	1.0	**2.4**	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[f]	mg/L	-	-	128	A, f	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.6	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[g]	mg/L (as N)	32.8	A	3	A	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052
Total Phosphorus[i]	mg/L	0.005-0.015 in lakes			A	0.0084	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.008	0.008	0.0076	0.0077	0.0079
Dissolved Metals																														
Aluminum	mg/L	0.032	A, l	0.011	A, l	0.071	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-	-	1	W	0.01	0.011	0.011	0.012	0.011	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.000024	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.0007	0.00072	0.00074	0.0007	0.00072	0.00074	0.00071	0.00072	0.00074	0.00072	0.00074	0.00076	0.00072	0.00074	0.00075	0.00071	0.00073	0.00074	0.0007	0.00071	0.00073	0.00059	0.00059	0.00072
Iron	mg/L	1	A	-	-	0.18	0.037	0.038	0.04	0.038	0.038	0.038	0.038	0.038	0.038	0.037	0.038	0.038	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.033	0.033	0.037
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L		-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.031	0.032	0.033	0.031	0.032	0.033	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.029	0.029	0.032
Mercury	mg/L		-	0.00000125	A, o	0.0000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon[e]	mg/L		-		-		0.17	0.19	0.22	0.17	0.18	0.2	0.16	0.18	0.19	0.16	0.17	0.18	0.16	0.17	0.18	0.16	0.16	0.17	0.15	0.16	0.17	0.14	0.14	0.16
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.00010	0.00097	0.000098	0.000099	0.00097	0.000098	0.000099	0.00097	0.000098	0.000099	0.00097	0.00097	0.00099	0.00096	0.00097	0.000099	0.00096	0.00097	0.00098	0.00095	0.00096	0.00098
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000098	0.000099	0.0001
Vanadium	mg/L		-		-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, l	0.012	A, l	0.32	0.052	0.053	0.054	0.052	0.053	0.054	0.052	0.052	0.053	0.052	0.052	0.053	0.051	0.052	0.052	0.051	0.051	0.052	0.051	0.051	0.051	0.048	0.048	0.051
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00056	0.00057	0.00058	0.00056	0.00057	0.00058	0.00056	0.00057	0.00058	0.00056	0.00057	0.00058	0.00056	0.00057	0.00058	0.00057	0.00057	0.00058	0.00057	0.00058	0.00058	0.00054	0.00054	0.00058
Barium	mg/L	-	-	1	W	0.01	0.011	0.012	0.012	0.011	0.012	0.012	0.011	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.000031	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.0007	0.00072	0.00074	0.0007	0.00072	0.00074	0.00071	0.00072	0.00074	0.00072	0.00074	0.00076	0.00072	0.00074	0.00075	0.00071	0.00073	0.00074	0.0007	0.00071	0.00073	0.00059	0.00059	0.00072
Iron	mg/L	1	A	-	-	0.18	0.037	0.038	0.04	0.038	0.038	0.038	0.038	0.038	0.038	0.037	0.038	0.038	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.033	0.033	0.037
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L		-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.031	0.032	0.033	0.031	0.032	0.033	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.029	0.029	0.032
Mercury	mg/L		-	0.00000125	A, o	0.0000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00072	0.00073	0.00073	0.00072	0.00073	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00074	0.00072	0.00072	0.00074	0.00072	0.00072	0.00074	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.0000096	0.0000098	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.00010	0.00097	0.000098	0.000099	0.00097	0.000098	0.000099	0.00097	0.000098	0.000099	0.00097	0.00097	0.00099	0.00096	0.00097	0.000099	0.00096	0.00097	0.00098	0.00095	0.00096	0.00098
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.005	0.005	0.0049	0.0049	0.005	0.0049	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000099	0.0001	0.0001
Vanadium	mg/L		-		-	0.0005	**0.00073**	**0.00074**	**0.00075**	**0.00073**	**0.00073**	**0.00075**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00073**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0027	0.0026	0.0027	0.0027	0.0026	0.0027	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0027	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57
j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.01*ln(hardness)-5.276]}$; dissolved Cd guidelines were applied to total Cd.
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
u) based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
v) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2a CCME
Predicted MCF-1 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-	-	-	17	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Alkalinity[c]	mg/L	-	-	-	1.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-	-	-	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Major Ions																																
Calcium	mg/L	-	-	-	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Chloride	mg/L	640	120	-	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.12		l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Magnesium	mg/L	-		-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate	mg/L	-		-	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate	mg/L (as N)	550	13	-	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
Total Phosphorus	mg/L	-	see notes	l	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	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
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	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
Iron	mg/L	0.3		-	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	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
Zinc	mg/L	0.03		-	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	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
Total Metals																																
Aluminum	mg/L	0.005		f	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	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
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	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
Iron	mg/L	0.3		-	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	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
Zinc	mg/L	0.03		-	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	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

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-1.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2a CCME
Predicted MCF-1 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	17	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Alkalinity[c]	mg/L	-		-	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Major Ions																													
Calcium	mg/L	-		-	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Chloride	mg/L	640	120	-	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.12		l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Magnesium	mg/L	-		-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate	mg/L	-		-	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate	mg/L (as N)	550	13	-	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
Total Phosphorus	mg/L	-	see notes	l	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.3		-	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

l = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-1.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2a BCWQ
Predicted MCF-1 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	17	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Alkalinity[c]	mg/L	see notes			W, s	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Major Ions																																	
Calcium	mg/L	see notes			W, t	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Chloride	mg/L	600	A	150	A	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Magnesium	mg/L	-			-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate	mg/L	-	-	128	A, f	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate	mg/L (as N)	32.8	A	3	A	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000014	A, j	0.000015	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon	mg/L	-			-	-	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000014	A, j	0.000015	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	1	A	-	-	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-1.

123 (underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2a BCWQ
Predicted MCF-1 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L		-		-	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Alkalinity[c]	mg/L		see notes		W, s	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L		-		-	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Major Ions																													
Calcium	mg/L		see notes		W, t	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Chloride	mg/L	600	A	150	A	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Magnesium	mg/L		-		-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L		-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L		-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate	mg/L	-	-	128	A, f	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Nutrients																													
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate	mg/L (as N)	32.8	A	3	A	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
Dissolved Metals																													
Aluminum	mg/L	0.032	A, l	0.011	A, l	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000014	A, j	0.000015	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon	mg/L		-		-	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002	0.00002
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.032	A, l	0.012	A, l	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000014	A, j	0.000015	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	1	A	-	-	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH))+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{(0.736*ln(hardness)-4.943)}$; BC WQG short-term max (ug/L) = $2.718^{(1.023*ln(hardness)+1.274)}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-1.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2b CCME
Predicted MCF-1 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-		-	27	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Alkalinity[c]	mg/L	-		-	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																																
Calcium[n]	mg/L	-		-	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[n]	mg/L	640	120	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fluoride[n]	mg/L	0.12		l	0.01	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Magnesium[n]	mg/L	-		-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Potassium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate[n]	mg/L	-		-	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate[n]	mg/L (as N)	550	13	-	0.47	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Nitrite	mg/L (as N)	0.06		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.087	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
Total Phosphorus[n]	mg/L	-	see notes	l	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	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
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	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
Iron	mg/L	0.3		-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silicon[n]	mg/L	-		-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022
Vanadium	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	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
Zinc	mg/L	0.03		-	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	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
Total Metals																																
Aluminum	mg/L	0.005		f	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000016	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017
Chromium	mg/L	0.001		h	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	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
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	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
Iron	mg/L	0.3		-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	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
Zinc	mg/L	0.03		-	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	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

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-1.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2b CCME
Predicted MCF-1 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	27	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Alkalinity[c]	mg/L	-		-	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																													
Calcium[n]	mg/L	-		-	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[n]	mg/L	640	120	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fluoride[n]	mg/L	0.12		l	0.01	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Magnesium[n]	mg/L	-		-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Potassium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate[n]	mg/L	-		-	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate[n]	mg/L (as N)	550	13	-	0.47	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Nitrite	mg/L (as N)	0.06		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.087	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
Total Phosphorus[n]	mg/L	-	see notes	l	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.3		-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000016	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.002		i	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.3		-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	0.000026		-	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-1.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2b BCWQ
Predicted MCF-1 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	27	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Alkalinity[c]	mg/L	see notes			W, s	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																																	
Calcium[v]	mg/L	see notes			W, t	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[v]	mg/L	600	A	150	A	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fluoride[v]	mg/L	0.4	A, e	-	-	0.01	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Magnesium[v]	mg/L	-			-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Potassium[v]	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[v]	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate[v]	mg/L	-	-	128	A, f	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate[v]	mg/L (as N)	32.8	A	3	A	0.47	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.087	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
Total Phosphorus[v]	mg/L	0.005-0.015 in lakes			A	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon[v]	mg/L	-			-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022	0.00022
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000016	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	1	A	-	-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6

BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-1.

v) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-2b BCWQ
Predicted MCF-1 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L		-		-	27	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
Alkalinity[c]	mg/L		see notes		W, s	1.0	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L		-		-	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																														
Calcium[c]	mg/L		see notes		W, t	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[e]	mg/L	600	A	150	A	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fluoride[e]	mg/L	0.4	A, e	-	-	0.01	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Magnesium[c]	mg/L		-		-	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Potassium[c]	mg/L		-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[c]	mg/L		-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulphate[f]	mg/L	-	-	128	A, f	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate[e]	mg/L (as N)	32.8	A	3	A	0.47	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	0.087	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
Total Phosphorus[e]	mg/L	0.005-0.015 in lakes			A	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039	0.0039
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085	0.0000085
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon[c]	mg/L		-		-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000016	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017	0.000017
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, 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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Iron	mg/L	1	A	-	-	0.069	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Mercury	mg/L	-	-	0.00000125	A, o	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	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Vanadium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.716*ln(hardness)-4.944]}$; BC WQG short-term max (ug/L) = $2.718^{[0.919*ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg_t = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-1.

v) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3a CCME
Predicted MCF-7 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																															
Total Dissolved Solids[b]	mg/L	-		-	5	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Alkalinity[c]	mg/L	-		-	2.5	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	2.0	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
Major Ions																															
Calcium	mg/L	-		-	0.8	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Chloride	mg/L	640	120	-	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.12		l	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Magnesium	mg/L	-		-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-		-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Sodium	mg/L	-		-	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Sulphate	mg/L	-		-	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Nutrients																															
Ammonia	mg/L (as N)	0.41		e	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L (as N)	550	13	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrite	mg/L (as N)	0.06		-	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus	mg/L	-	see notes	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Dissolved Metals																															
Aluminum	mg/L	0.005		f	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	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	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
Arsenic	mg/L	0.005		-	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Beryllium	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	29	1.5	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000011	0.00004	g	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Chromium	mg/L	0.001		h	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	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
Cobalt	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	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
Copper	mg/L	0.002		i	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	0.3		-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026
Lead	mg/L	0.001		j	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	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
Manganese	mg/L	-		-	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00051
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-		-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.03		-	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	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
Total Metals																															
Aluminum	mg/L	0.005		f	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087
Antimony	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	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
Arsenic	mg/L	0.005		-	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-		-	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Beryllium	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	29	1.5	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000011	0.00004	g	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015
Chromium	mg/L	0.001		h	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	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
Cobalt	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	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
Copper	mg/L	0.002		i	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	0.3		-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026
Lead	mg/L	0.001		j	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	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
Manganese	mg/L	-		-	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.00051
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	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	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
Selenium	mg/L	0.001		-	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	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
Silver	mg/L	0.0001		-	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	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
Thallium	mg/L	0.0008		-	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-		-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.03		-	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	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

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-7.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3a CCME
Predicted MCF-7 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	5	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Alkalinity[c]	mg/L	-		-	2.5	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	2.0	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
Major Ions																													
Calcium	mg/L	-		-	0.8	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Chloride	mg/L	640	120	-	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.12		l	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Magnesium	mg/L	-		-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-		-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Sodium	mg/L	-		-	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Sulphate	mg/L	-		-	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L (as N)	550	13	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrite	mg/L (as N)	0.06		-	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus	mg/L	-	see notes	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Beryllium	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	29	1.5	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000011	0.00004	g	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.002		i	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Mercury	mg/L	0.000026		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-		-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	0.033	0.015	-	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-		-	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Beryllium	mg/L	-		-	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	29	1.5	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000011	0.00004	g	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.002		i	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	0.3		-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.026
Lead	mg/L	0.001		j	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.00051
Mercury	mg/L	0.000026		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	0.001		-	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silver	mg/L	0.0001		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	0.0008		-	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-		-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	0.033	0.015	-	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-7.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3a BCWQ
Predicted MCF-7 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[w]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	5	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Alkalinity[c]	mg/L	see notes			W, s	2.5	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	2.0	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
Major Ions																																	
Calcium	mg/L	see notes			W, t	0.8	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Chloride	mg/L	600	A	150	A	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.4	A, e	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Magnesium	mg/L	-			-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-			-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Sodium	mg/L	-			-	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Sulphate	mg/L	-	-	128	A, f	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L (as N)	32.8	A	3	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-	-	1	W	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Beryllium	mg/L	-	-	0.00013	W	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	-	-	1.2	A	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000012	A, j	0.000013	A, j	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	0.35	A	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silicon	mg/L	-			-	-	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-			-	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	-	-	0.0085	W	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-			-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-	-	1	W	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Beryllium	mg/L	-	-	0.00013	W	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	-	-	1.2	A	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000012	A, j	0.000013	A, j	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	1	A	-	-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L	-			-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	-	-	0.0085	W	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L	-			-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6

BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-7.

123 (bold, underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3a BCWQ
Predicted MCF-7 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[uu]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-			-	5	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Alkalinity[c]	mg/L	see notes			W, s	2.5	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	2.0	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
Major Ions																													
Calcium	mg/L	see notes			W, t	0.8	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Chloride	mg/L	600	A	150	A	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Fluoride	mg/L	0.4	A, e	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Magnesium	mg/L	-			-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Potassium	mg/L	-			-	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Sodium	mg/L	-			-	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Sulphate	mg/L	-	-	128	A, f	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Nutrients																													
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate	mg/L (as N)	32.8	A	3	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Dissolved Metals																													
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-	-	1	W	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Beryllium	mg/L	-	-	0.00013	W	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	-	-	1.2	A	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000012	A, j	0.000013	A, j	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	1	A	-	-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.026
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.00051
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L		-		-	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	-	-	0.0085	W	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L		-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023	0.00023
Barium	mg/L	-	-	1	W	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Beryllium	mg/L	-	-	0.00013	W	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Boron	mg/L	-	-	1.2	A	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Cadmium	mg/L	0.000012	A, j	0.000013	A, j	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045
Iron	mg/L	1	A	-	-	0.025	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.025	0.026	0.025	0.026
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0005	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.0005	0.00051	0.0005	0.00051
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	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	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	mg/L	-	-	0.0008	W	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038	0.000038
Tin	mg/L		-		-	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Titanium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Uranium	mg/L	-	-	0.0085	W	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Vanadium	mg/L		-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{(0.736*ln(hardness)-4.943)}$; BC WQG short-term max (ug/L) = $2.718^{(1.01*ln(hardness)-5.274)}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-7.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3b CCME
Predicted MCF-7 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-		-	27	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
Alkalinity[c]	mg/L	-		-	5.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																																
Calcium[n]	mg/L	-		-	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[n]	mg/L	640	120	-	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Fluoride[n]	mg/L	0.12		l	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Magnesium[n]	mg/L	-		-	0.18	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Potassium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[n]	mg/L	-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Sulphate[n]	mg/L	-		-	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Nitrate[n]	mg/L (as N)	550	13	-	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Nitrite	mg/L (as N)	0.06		-	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	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
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Total Phosphorus[n]	mg/L	-	see notes	l	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027
Chromium	mg/L	0.001		h	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	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
Cobalt	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	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
Copper	mg/L	0.002		i	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074
Iron	mg/L	0.3		-	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	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
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Mercury	mg/L	0.000026		-	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	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
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068
Selenium	mg/L	0.001		-	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	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
Silicon[h]	mg/L	-		-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	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
Zinc	mg/L	0.03		-	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	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
Total Metals																																
Aluminum	mg/L	0.005		f	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Antimony	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	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
Arsenic	mg/L	0.005		-	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	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
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	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
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034
Chromium	mg/L	0.001		h	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	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
Cobalt	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	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
Copper	mg/L	0.002		i	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Iron	mg/L	0.3		-	0.042	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043
Lead	mg/L	0.001		j	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	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
Lithium	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	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
Manganese	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Mercury	mg/L	0.000026		-	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014
Molybdenum	mg/L	0.073		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	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
Nickel	mg/L	0.025		k	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	mg/L	0.001		-	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	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
Silver	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	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
Thallium	mg/L	0.0008		-	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	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
Tin	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	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
Titanium	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	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
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	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
Zinc	mg/L	0.03		-	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-7.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3b CCME
Predicted MCF-7 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	27	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
Alkalinity[c]	mg/L	-		-	5.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.9	3.8	3.8	3.9	3.8	3.8	3.9
Major Ions																													
Calcium[n]	mg/L	-		-	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[n]	mg/L	640	120	-	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Fluoride[n]	mg/L	0.12		l	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Magnesium[n]	mg/L	-		-	0.18	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Potassium[n]	mg/L	-		-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[n]	mg/L	-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Sulphate[n]	mg/L	-		-	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Nitrate[n]	mg/L (as N)	550	13	-	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Nitrite	mg/L (as N)	0.06		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Total Phosphorus[n]	mg/L	-	see notes	l	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.002		i	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074
Iron	mg/L	0.3		-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Mercury	mg/L	0.000026		-	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon[n]	mg/L	-		-		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.03		-	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Antimony	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	0.005		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-		-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	29	1.5	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.000011	0.00004	g	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034
Chromium	mg/L	0.001		h	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.002		i	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Iron	mg/L	0.3		-	0.042	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	-		-	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Mercury	mg/L	0.000026		-	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014
Molybdenum	mg/L	0.073		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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025		k	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	mg/L	0.001		-	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	0.0008		-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	0.033	0.015	-	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.03		-	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051

Notes:
l = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-7.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3b BCWQ
Predicted MCF-7 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	27	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
Alkalinity[c]	mg/L	see notes			W, s	5.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Major Ions																																	
Calcium[v]	mg/L	see notes			W, t	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[v]	mg/L	600	A	150	A	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Fluoride[v]	mg/L	0.4	A, e	-	-	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Magnesium[v]	mg/L	-			-	0.18	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Potassium[v]	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[v]	mg/L	-			-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Sulphate[v]	mg/L	-	-	128	A, f	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Nitrate[v]	mg/L (as N)	32.8	A	3	A	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Total Phosphorus[v]	mg/L	0.005-0.015 in lakes			A	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074
Iron	mg/L	0.35	A	-	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon[v]	mg/L	-			-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Iron	mg/L	1	A	-	-	0.042	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Mercury	mg/L	-	-	0.00000125	A, o	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-7.

v) based on probabilistic model results.

<u>123</u>	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-3b BCWQ
Predicted MCF-7 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[w]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[b]	mg/L	-			-	27	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
Alkalinity[c]	mg/L	see notes			W, s	5.0	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.9	3.8	3.8	3.9	3.8	3.8	3.9
Major Ions																														
Calcium[t]	mg/L	see notes			W, t	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Chloride[e]	mg/L	600	A	150	A	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Fluoride[e]	mg/L	0.4	A, e	-	-	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Magnesium[e]	mg/L	-			-	0.18	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Potassium[e]	mg/L	-			-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium[e]	mg/L	-			-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Sulphate[e]	mg/L	-	-	128	A, f	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Nitrate[h]	mg/L (as N)	32.8	A	3	A	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Kjeldhal Nitrogen	mg/L (as N)	-	-	-	-	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Total Phosphorus[x]	mg/L	0.005-0.015 in lakes			-	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027	0.000027
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074	0.00074
Iron	mg/L	0.35	A	-	-	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	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0015	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Mercury	mg/L	-	-	0.00000125	A, o	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	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	-	-	0.025	W, p	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068	0.00068
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silicon[v]	mg/L	-	-	-	-	-	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.033	A, r	0.0075	A, r	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Antimony	mg/L	-	-	0.009	W	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Arsenic	mg/L	-	-	0.005	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Barium	mg/L	-	-	1	W	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium	mg/L	0.00002	A, j	0.000019	A, j	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034	0.000034
Chromium	mg/L	-	-	0.001	W, k	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cobalt	mg/L	0.11	A	0.004	A	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Iron	mg/L	1	A	-	-	0.042	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042	0.043
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Mercury	mg/L	-	-	0.00000125	A, o	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014	0.0000014
Molybdenum	mg/L	2	A	≤1	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Nickel	mg/L	0.025	W, p	-	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Selenium	mg/L	-	-	0.002	A	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	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thallium	mg/L	-	-	0.0008	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Titanium	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	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Uranium	mg/L	-	-	0.0085	W	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Vanadium	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	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl-<2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl-<2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57
j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.01*ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness >50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.011102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
u) Baseline data is based on monitoring data at MCF-7.
v) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4a CCME
Predicted MCF-6 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																															
Total Dissolved Solids[b]	mg/L	-		-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	-		-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions																															
Calcium	mg/L	-		-	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	mg/L	640	120	-	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	mg/L	0.12		l	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	mg/L	-		-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**
Potassium	mg/L	-		-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	mg/L	-		-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-		-	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	**2.0**	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients																															
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	0.0017	**0.0028**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.003**	**0.003**	**0.0029**	**0.0029**	**0.0029**	**0.0029**	**0.003**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0032**	**0.0032**	**0.0032**
Dissolved Metals																															
Aluminum	mg/L	0.005		f	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0065	0.0012	0.003	0.005	0.0025	0.004	0.005	0.0029	0.004	0.005	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																															
Aluminum	mg/L	0.005		f	0.052	0.0051	0.0072	0.013	0.0043	0.0061	0.013	0.0043	0.0053	0.0078	0.0042	0.0049	0.0057	0.0041	0.0046	0.0051	0.0039	0.0044	0.0048	0.0038	0.0042	0.0045	0.0037	0.0041	0.0043	0.0037	0.0039	0.0042
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.0099	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0065	0.0012	0.003	0.005	0.0025	0.004	0.005	0.0029	0.004	0.005	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4a CCME
Predicted MCF-6 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[c]	mg/L	-		-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																													
Calcium	mg/L	-		-	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	640	120	-	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.12		l	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L	-		-	0.24	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.36**	**0.34**	**0.35**	**0.35**
Potassium	mg/L	-		-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L	-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-		-	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0031**	**0.0032**	**0.0032**	**0.0029**	**0.003**	**0.0031**
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.052	0.0036	0.0038	0.004	0.0036	0.0038	0.0039	0.0036	0.0037	0.0038	0.0036	0.0037	0.0038	0.0036	0.0037	0.0038	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0034	0.0036	0.0043
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00058	0.00068
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0026

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^{1.016*log(hardness)-1.71})/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4a BCWQ
Predicted MCF-6 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional															
Total Dissolved Solids[b]	mg/L	-			-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	see notes			W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**
Major Ions															
Calcium	mg/L	see notes			W, t	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**
Chloride	mg/L	600	A	150	A	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01
Magnesium	mg/L	-			-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**
Potassium	mg/L	-			-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	-			-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-	-	128	A, f	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	2.0
Nutrients															
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0017	0.0028	0.003	0.0029	0.0029	0.003	0.0029	0.0029	0.003
Dissolved Metals															
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007
Iron	mg/L	0.35	A	-	-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0048	0.0012	0.003	0.005	0.0024	0.004	0.005	0.0029	0.004	0.005
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	mg/L	-			-	-	2.6	4.0	4.2	3.9	4.2	4.3	4.1	4.2	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals															
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.052	0.0051	0.0072	0.013	0.0043	0.0061	0.013	0.0043	0.0053	0.0078
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007
Iron	mg/L	1	A	-	-	0.015	0.0099	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.016
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0012	0.003	0.005	0.0025	0.004	0.005	0.0029	0.004	0.005
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 4			Year 5			Year 6		
	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional									
Total Dissolved Solids[b]	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**
Major Ions									
Calcium	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**
Chloride	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75
Fluoride	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**
Potassium	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1
Sulphate	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9
Nutrients									
Ammonia	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	0.0029	0.003	0.003	0.0029	0.0029	0.0029	0.0029	0.003	0.003
Dissolved Metals									
Aluminum	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	4.1	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.0042	0.0049	0.0057	0.0041	0.0046	0.0051	0.0039	0.0044	0.0048
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038
Mercury	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 7			Year 8			Year 9		
	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional									
Total Dissolved Solids[b]	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions									
Calcium	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.36**	**0.36**
Potassium	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients									
Ammonia	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	0.003	0.0031	0.0031	0.0031	0.0031	0.0031	0.0032	0.0032	0.0032
Dissolved Metals									
Aluminum	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.3	4.3
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.0038	0.0042	0.0045	0.0037	0.0041	0.0043	0.0037	0.0039	0.0042
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6

BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2)); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123 (underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4a BCWQ
Predicted MCF-6 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[c]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[b]	mg/L		-		-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[j]	mg/L		see notes		W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L		-		-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																														
Calcium	mg/L		see notes		W, t	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	600	A	150	A	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L		-		-	0.24	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**
Potassium	mg/L		-		-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L		-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-	-	128	A, f	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0031	0.0032	0.0032	0.0029	0.003	0.0031
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, l	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00058	0.00068
Iron	mg/L	1	-	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-	-	-	-	0.0025	0.0024	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	-	-	0.00001125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon	mg/L	-	-	-	-	-	4.2	4.3	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-	-	-	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-	-	-	-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, l	0.052	0.0036	0.0038	0.004	0.0036	0.0038	0.0039	0.0036	0.0037	0.0038	0.0036	0.0037	0.0038	0.0036	0.0037	0.0038	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0034	0.0036	0.0043
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00058	0.00068
Iron	mg/L	1	-	-	-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-	-	-	-	0.0025	0.0024	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	-	-	0.00001125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-	-	-	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-	-	-	-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0026

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2)); minimum baseline surface water pH = 5.57
j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{(0.736*ln(hardness)-4.943)}$; BC WQG short-term max (ug/L) = $2.718^{(1.01*ln(hardness)-5.276)}$; dissolved Cd guidelines were applied to total Cd.
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness >50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4b CCME
Predicted MCF-6 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-		-	36	25	**40**	**61**	26	35	**63**	27	32	**42**	27	30	34	26	28	31	25	27	29	24	26	27	24	25	26	23	24	25
Alkalinity[c]	mg/L	-		-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	8	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																																
Calcium[n]	mg/L	-		-	3	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[n]	mg/L	640	120	-	1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[n]	mg/L	0.12		I	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[n]	mg/L	-		-	4.7	3.2	5.0	**5.5**	4.8	**5.6**	**5.9**	**5.5**	**5.9**	**6.1**	**5.6**	**5.7**	**5.9**	**5.5**	**5.6**	**5.7**	**5.3**	**5.4**	**5.6**	5.0	5.1	**5.2**	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	0.003	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[o]	mg/L (as N)	550	13	-	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[c]	mg/L	-	see notes	I	0.008	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.07	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-		-	0.01	0.0076	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00002	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.02	0.021	0.034	0.038	0.032	0.039	0.041	0.037	0.041	0.042	0.039	0.04	0.04	0.038	0.039	0.04	0.036	0.037	0.039	0.034	0.035	0.036	0.033	0.033	0.034	0.032	0.032	0.033
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.011	**0.022**	**0.037**	**0.042**	**0.035**	**0.045**	**0.047**	**0.044**	**0.048**	**0.05**	**0.046**	**0.046**	**0.048**	**0.044**	**0.045**	**0.046**	**0.041**	**0.041**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.035**	**0.037**	**0.033**	**0.033**	**0.035**
Mercury	mg/L	0.000026		-	0.0000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		I	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00069**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.0007**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																																
Aluminum	mg/L	0.005		f	0.3	0.028	0.041	0.042	0.04	0.041	0.042	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.041	0.041	0.042	0.042	0.042	0.042	0.043	0.042	0.043	0.043	0.043	0.043	0.044
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.0003	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-		-	0.01	0.0076	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00003	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	-		-	0.0002	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.2	0.022	0.034	0.038	0.033	0.039	0.042	0.038	0.041	0.043	0.04	0.04	0.041	0.039	0.039	0.04	0.037	0.037	0.039	0.035	0.035	0.036	0.033	0.034	0.034	0.032	0.033	0.033
Lead	mg/L	0.001		j	0.0003	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.011	**0.022**	**0.037**	**0.042**	**0.035**	**0.045**	**0.047**	**0.044**	**0.048**	**0.05**	**0.046**	**0.046**	**0.048**	**0.044**	**0.045**	**0.046**	**0.041**	**0.041**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.035**	**0.037**	**0.033**	**0.033**	**0.035**
Mercury	mg/L	0.000026		-	0.0000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		I	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00069**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.0007**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4b CCME
Predicted MCF-6 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-	-	-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L	-	-	-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-	-	-	8	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																													
Calcium[n]	mg/L	-	-	-	3	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[n]	mg/L	640	120	-	1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[n]	mg/L	0.12		l	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[n]	mg/L	-		-	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.6	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.003	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[n]	mg/L (as N)	550	13	-	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-	-	-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052
Total Phosphorus[o]	mg/L	-	see notes	l	0.008	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.0079	0.008	0.0076	0.0077	0.0079
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.07	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-		-	0.01	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.011**
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00002	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00058	0.00068
Iron	mg/L	0.3		-	0.02	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.031	0.031	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.03	0.031	0.031
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Manganese	mg/L	-		-	0.011	**0.031**	**0.032**	**0.033**	**0.031**	**0.032**	**0.032**	**0.032**	**0.033**	**0.033**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.033**	**0.028**	**0.029**	**0.032**
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025		k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon[n]	mg/L	-		-	-	0.17	0.19	0.22	0.17	0.18	0.2	0.16	0.18	0.19	0.16	0.17	0.18	0.16	0.17	0.18	0.16	0.16	0.17	0.15	0.16	0.17	0.14	0.14	0.16
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4b BCWQ
Predicted MCF-6 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a] Maximum	notes	30-Day Average	notes	Baseline Surface Water Concentrations[u] 95th Percentile	Year 1 Minimum	Year 1 Median	Year 1 Maximum	Year 2 Minimum	Year 2 Median	Year 2 Maximum	Year 3 Minimum	Year 3 Median	Year 3 Maximum
Conventional															
Total Dissolved Solids[b]	mg/L	-			-	36	25	**40**	**61**	26	35	**63**	27	32	**42**
Alkalinity[c]	mg/L	see notes			W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	8	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**
Major Ions															
Calcium[v]	mg/L	see notes			W, t	3	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**
Chloride[v]	mg/L	600	A	150	A	1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2
Fluoride[v]	mg/L	0.45 - 0.71	A, e	-	-	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026
Magnesium[v]	mg/L	-			-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**
Potassium[v]	mg/L	-			-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**
Sodium[v]	mg/L	-			-	1	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**
Sulphate[v]	mg/L	-	-	128	A, f	4.7	3.2	5.0	5.5	4.8	5.6	5.9	5.5	5.9	6.1
Nutrients															
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.003	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015
Nitrate[v]	mg/L (as N)	32.8	A	3	A	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059
Total Phosphorus[v]	mg/L	0.005-0.015 in lakes			A	0.008	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087
Dissolved Metals															
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.07	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076
Barium	mg/L	-	-	1	W	0.01	0.0076	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000062-0.0002	A, j	0.000042-0.000068	A, j	0.00002	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007
Iron	mg/L	0.35	A	-	-	0.02	0.021	0.034	0.038	0.032	0.039	0.041	0.037	0.041	0.042
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0093	0.022	0.037	0.042	0.035	0.045	0.047	0.044	0.048	0.05
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	mg/L	-			-	-	0.44	0.71	1.3	0.33	0.54	1.3	0.33	0.44	0.73
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.000098	0.0001	0.000098	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00068**	**0.00071**	**0.00067**	**0.00069**	**0.00071**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals															
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.3	0.028	0.041	0.042	0.04	0.041	0.042	0.04	0.04	0.041
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.0003	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076
Barium	mg/L	-	-	1	W	0.01	0.0076	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000062-0.0002	A, j	0.000042-0.000068	A, j	0.00003	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.0002	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007
Iron	mg/L	1	A	-	-	0.2	0.022	0.034	0.038	0.033	0.039	0.042	0.038	0.041	0.043
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.0003	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.022	0.037	0.042	0.035	0.045	0.047	0.044	0.048	0.05
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.005
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.000098	0.0001	0.000098	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00069**	**0.00071**	**0.00067**	**0.00069**	**0.00071**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 4 Minimum	Year 4 Median	Year 4 Maximum	Year 5 Minimum	Year 5 Median	Year 5 Maximum	Year 6 Minimum	Year 6 Median	Year 6 Maximum
Conventional									
Total Dissolved Solids[b]	27	30	34	26	28	31	25	27	29
Alkalinity[c]	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions									
Calcium[v]	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**
Chloride[v]	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Fluoride[v]	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025
Magnesium[v]	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**
Potassium[v]	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[v]	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**
Sulphate[v]	5.6	5.7	5.9	5.5	5.6	5.7	5.3	5.4	5.6
Nutrients									
Ammonia	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013
Nitrate[v]	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056
Total Phosphorus[v]	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084
Dissolved Metals									
Aluminum	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007
Barium	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.039	0.04	0.04	0.038	0.039	0.04	0.036	0.037	0.039
Lead	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.046	0.046	0.048	0.044	0.045	0.046	0.041	0.041	0.045
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	0.31	0.38	0.49	0.28	0.33	0.4	0.25	0.29	0.35
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.00068**	**0.00069**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.04	0.041	0.041	0.04	0.041	0.041	0.041	0.042	0.042
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007
Barium	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.04	0.04	0.041	0.039	0.039	0.04	0.037	0.037	0.039
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.046	0.046	0.048	0.044	0.045	0.046	0.041	0.041	0.045
Mercury	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.00068**	**0.0007**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 7 Minimum	Year 7 Median	Year 7 Maximum	Year 8 Minimum	Year 8 Median	Year 8 Maximum	Year 9 Minimum	Year 9 Median	Year 9 Maximum
Conventional									
Total Dissolved Solids[b]	24	26	27	24	25	26	23	24	25
Alkalinity[c]	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions									
Calcium[v]	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**
Chloride[v]	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[v]	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[v]	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[v]	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[v]	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[v]	5.0	5.1	5.2	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients									
Ammonia	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[v]	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[v]	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals									
Aluminum	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.012	0.012
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.034	0.035	0.036	0.033	0.033	0.034	0.032	0.032	0.033
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.037	0.038	0.04	0.035	0.035	0.037	0.033	0.033	0.035
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	0.22	0.26	0.3	0.2	0.23	0.27	0.18	0.21	0.24
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.042	0.042	0.043	0.042	0.043	0.043	0.043	0.043	0.044
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.012	0.012
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.035	0.035	0.036	0.033	0.034	0.034	0.032	0.033	0.033
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.037	0.038	0.04	0.035	0.035	0.037	0.033	0.033	0.035
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	**0.0007**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57
j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
v) based on probabilistic model results.

123 (bold, underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-4b BCWQ
Predicted MCF-6 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[w]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[b]	mg/L		-		-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L		see notes			W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L		-		-	-	8	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																														
Calcium[e]	mg/L		see notes			W, t	3	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[h]	mg/L	600	A	150	A	-	1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[e]	mg/L	0.45 - 0.71	A, e	-	-	-	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[d]	mg/L		-		-	-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[d]	mg/L		-		-	-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[d]	mg/L		-		-	-	1	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[d]	mg/L		-		128	A, f	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.6	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	-	0.003	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[e]	mg/L (as N)	32.8	A	3	A	-	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06	-	0.02	A, h	-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052
Total Phosphorus[v]	mg/L		0.005-0.015 in lakes			A	0.008	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.008	0.008	0.0079	0.0079	0.008	0.0076	0.0077	0.0079
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, i	-	0.07	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-	-	0.009	W	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	-	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-	-	1	W	-	0.01	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.0002	A, j	0.000042-0.000068	A, j	-	0.00002	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	-	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	-	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.35	A	-	-	-	0.02	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.03	0.03	0.031
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	-	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-	-	-	-	-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	-	0.0093	0.031	0.032	0.033	0.031	0.032	0.032	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.032	0.032	0.033	0.028	0.029	0.032
Mercury	mg/L	-	-	0.0000125	A, o	-	0.00005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	-	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	-	-	0.025	W, p	-	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon[e]	mg/L		-		-	-	-	0.17	0.19	0.2	0.17	0.18	0.2	0.16	0.17	0.19	0.16	0.17	0.18	0.16	0.16	0.17	0.15	0.16	0.17	0.14	0.14	0.16			
Silver	mg/L	0.0001	A, q	0.00005	A, q	-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L		-		-	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	-	0.005	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L		-		-	-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r	-	0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0026
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, i	-	0.3	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.044
Antimony	mg/L	-	-	0.009	W	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	-	0.0003	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00057	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-	-	1	W	-	0.01	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.0002	A, j	0.000042-0.000068	A, j	-	0.00003	0.000012	0.000012	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	-	0.0002	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	-	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00058	0.00068
Iron	mg/L	1	A	-	-	0.2	0.031	0.031	0.031	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.031	0.031	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.03	0.031	0.032
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	-	0.0003	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-	-	-	-	-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	-	0.011	0.031	0.032	0.033	0.031	0.032	0.032	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.032	0.032	0.033	0.028	0.029	0.032
Mercury	mg/L	-	-	0.0000125	A, o	-	0.00005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	-	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025	W, p	-	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L		-		-	-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	-	0.005	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L		-		-	-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r	-	0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0026

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log[hardness])*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)]); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP[1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57
j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = 2.718$^{(0.736*ln(hardness)-4.943)}$; BC WQG short-term max (ug/L) = 2.718$^{(1.016*ln(hardness)-5.274)}$; dissolved Cd guidelines were applied to total Cd.
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
v) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5a CCME
Predicted MCF-12 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																															
Total Dissolved Solids[b]	mg/L	-		-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	-		-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-		-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions																															
Calcium	mg/L	-		-	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	mg/L	640	120	-	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	mg/L	0.12		l	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	mg/L	-		-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**
Potassium	mg/L	-		-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	mg/L	-		-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-		-	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	**2.0**	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients																															
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	0.0017	**0.0028**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.0029**	**0.003**	**0.0029**	**0.003**	**0.003**	**0.0029**	**0.0029**	**0.0029**	**0.0029**	**0.003**	**0.003**	**0.003**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0031**	**0.0032**	**0.0032**	**0.0032**
Dissolved Metals																															
Aluminum	mg/L	0.005		f	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0048	0.0012	0.003	0.005	0.0024	0.004	0.005	0.0029	0.004	0.005	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.005	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																															
Aluminum	mg/L	0.005		f	0.052	0.0052	0.0073	0.013	0.0042	0.006	0.013	0.0042	0.0052	0.0077	0.0041	0.0048	0.0056	0.004	0.0045	0.005	0.0038	0.0043	0.0047	0.0037	0.0041	0.0044	0.0036	0.0039	0.0042	0.0036	0.0038	0.0041
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	mg/L	-		-	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.015	0.011	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.015	0.016	0.015	0.015	0.016
Lead	mg/L	0.001		j	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.0065	0.0012	0.003	0.005	0.0025	0.004	0.005	0.0029	0.004	0.005	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001	0.000097	0.000098	0.0001
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.005	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.03		-	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:
I = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545[ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5a CCME
Predicted MCF-12 Water Quality under the Base Case Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a] Short-term	CCME Guidelines[a] Long-term	notes	Baseline Surface Water Concentrations[m] Median	Year 10 Minimum	Year 10 Median	Year 10 Maximum	Year 11 Minimum	Year 11 Median	Year 11 Maximum	Year 12 Minimum	Year 12 Median	Year 12 Maximum	Year 13 Minimum	Year 13 Median	Year 13 Maximum	Year 14 Minimum	Year 14 Median	Year 14 Maximum	Year 15 Minimum	Year 15 Median	Year 15 Maximum	Year 16 Minimum	Year 16 Median	Year 16 Maximum	Closure Minimum	Closure Median	Closure Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-	-	-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[c]	mg/L	-	-	-	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-	-	-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																													
Calcium	mg/L	-	-	-	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	640	120	-	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.12		l	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L	-		-	0.24	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**
Potassium	mg/L	-		-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L	-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-		-	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	550	13	-	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	-	see notes	l	0.0025	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0032**	**0.0031**	**0.0032**	**0.0032**	**0.0029**	**0.003**	**0.0031**
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000011	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.015	0.015
Lead	mg/L	0.001		j	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0048	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0041	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.052	0.0035	0.0037	0.0039	0.0035	0.0037	0.0038	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0034	0.0035	0.0036	0.0034	0.0035	0.0036	0.0033	0.0034	0.0035
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-		-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0001-0.0002	0.00004	g	0.000012	0.0000011	0.000012	0.0000012	0.000011	0.000012	0.000012	0.0000011	0.000012	0.0000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.015	0.015	0.015	0.016	0.015	0.016	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.015
Lead	mg/L	0.001		j	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.03		-	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025

Notes:

I = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18˚C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^{1.016*log(hardness)-1.71)}/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5a BCWQ
Predicted MCF-12 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a] Maximum	notes	30-Day Average	notes	Baseline Surface Water Concentrations[u] Median	Year 1 Minimum	Year 1 Median	Year 1 Maximum	Year 2 Minimum	Year 2 Median	Year 2 Maximum	Year 3 Minimum	Year 3 Median	Year 3 Maximum
Conventional															
Total Dissolved Solids[b]	mg/L	-			-	22	17	**24**	**26**	**24**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	mg/L	see notes			W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L	-			-	6.4	5.3	**8.3**	**8.9**	**8.1**	**8.8**	**9**	**8.6**	**8.9**	**9.1**
Major Ions															
Calcium	mg/L	see notes			W, t	2.2	1.8	**2.8**	**3.0**	**2.7**	**3.0**	**3.1**	**2.9**	**3.0**	**3.1**
Chloride	mg/L	600	A	150	A	0.79	0.42	0.7	0.9	0.7	0.8	0.9	0.8	0.8	0.9
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0064	0.0096	0.01	0.0094	0.01	0.01	0.0096	0.0098	0.01
Magnesium	mg/L	-			-	0.24	0.2	**0.33**	**0.34**	**0.32**	**0.34**	**0.35**	**0.34**	**0.34**	**0.35**
Potassium	mg/L	-			-	1.0	0.64	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	-			-	1.0	0.64	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	mg/L	-	-	128	A, f	1.8	1.2	1.8	1.9	1.9	1.9	2.0	1.9	2.0	2.0
Nutrients															
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0016	0.0025	0.0025	0.0024	0.0025	0.0025	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.071	0.092	0.11	0.089	0.092	0.11	0.089	0.09	0.096
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.05	0.019	0.026	0.029	0.026	0.026	0.029	0.026	0.026	0.027
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0017	0.0028	0.003	0.0029	0.0029	0.003	0.0029	0.0029	0.003
Dissolved Metals															
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.023	0.0049	0.0071	0.012	0.0041	0.0059	0.012	0.004	0.005	0.0075
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007
Iron	mg/L	0.35	A	-	-	0.015	0.0096	0.015	0.015	0.014	0.015	0.015	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0048	0.0012	0.003	0.005	0.0024	0.004	0.005	0.0029	0.004	0.005
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	mg/L	-			-	-	2.6	4.0	4.2	3.9	4.2	4.3	4.1	4.2	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals															
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.052	0.0052	0.0073	0.013	0.0042	0.006	0.013	0.0042	0.0052	0.0077
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00016	0.00025	0.00025	0.00025	0.00025	0.00026	0.00025	0.00026	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0064	0.01	0.01	0.009	0.01	0.01	0.01	0.01	0.01
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.0000068	0.000011	0.000013	0.000012	0.000012	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.0006	0.0007	0.0006	0.0006	0.0007	0.00063	0.0007	0.0007
Iron	mg/L	1	A	-	-	0.015	0.011	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0012	0.003	0.005	0.0025	0.004	0.005	0.0029	0.004	0.005
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.005	0.0047	0.0049	0.005	0.0048	0.0049	0.005
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 4 Minimum	Year 4 Median	Year 4 Maximum	Year 5 Minimum	Year 5 Median	Year 5 Maximum	Year 6 Minimum	Year 6 Median	Year 6 Maximum
Conventional									
Total Dissolved Solids[b]	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	**8.8**	**8.9**	**9.1**	**8.8**	**8.9**	**9.0**	**8.7**	**8.8**	**9.0**
Major Ions									
Calcium	**2.9**	**3.0**	**3.1**	**2.9**	**3.0**	**3.0**	**2.9**	**3.0**	**3.0**
Chloride	0.73	0.8	0.8	0.71	0.72	0.73	0.73	0.74	0.75
Fluoride	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**	**0.34**	**0.35**	**0.35**
Potassium	0.97	1.0	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1
Sulphate	1.9	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.9
Nutrients									
Ammonia	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	0.087	0.088	0.09	0.086	0.086	0.088	0.084	0.085	0.086
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	0.0029	0.003	0.003	0.0029	0.0029	0.0029	0.0029	0.003	0.003
Dissolved Metals									
Aluminum	0.0039	0.0046	0.0054	0.0038	0.0043	0.0048	0.0037	0.0041	0.0045
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	4.1	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.0041	0.0048	0.0056	0.004	0.0045	0.005	0.0038	0.0043	0.0047
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049
Cadmium	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
Chromium	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018
Copper	0.00063	0.00066	0.0007	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068
Iron	0.015	0.016	0.016	0.015	0.016	0.016	0.015	0.016	0.016
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.0029	0.0035	0.004	0.0028	0.0032	0.0034	0.0031	0.0035	0.0038
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.000011	0.000011	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000098	0.0001	0.0001	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026

Parameter	Year 7 Minimum	Year 7 Median	Year 7 Maximum	Year 8 Minimum	Year 8 Median	Year 8 Maximum	Year 9 Minimum	Year 9 Median	Year 9 Maximum
Conventional									
Total Dissolved Solids[b]	**25**	**25**	**26**	**25**	**25**	**26**	**25**	**25**	**26**
Alkalinity[c]	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	**8.7**	**8.8**	**8.9**	**8.7**	**8.8**	**8.9**	**8.6**	**8.7**	**8.9**
Major Ions									
Calcium	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**	**2.9**	**3.0**
Chloride	0.72	0.73	0.75	0.73	0.74	0.75	0.74	0.75	0.76
Fluoride	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Magnesium	**0.35**	**0.35**	**0.36**	**0.35**	**0.35**	**0.36**	**0.35**	**0.36**	**0.36**
Potassium	0.97	0.98	1.0	0.97	0.98	1.0	0.97	0.98	1.0
Sodium	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.1
Sulphate	1.7	1.7	1.8	1.7	1.7	1.7	1.6	1.6	1.7
Nutrients									
Ammonia	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Nitrate	0.083	0.083	0.084	0.081	0.082	0.082	0.08	0.081	0.081
Nitrite	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Total Phosphorus	0.003	0.0031	0.0031	0.0031	0.0031	0.0031	0.0032	0.0032	0.0032
Dissolved Metals									
Aluminum	0.0036	0.0039	0.0043	0.0035	0.0038	0.0041	0.0034	0.0037	0.0039
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.3	4.3
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals									
Aluminum	0.0037	0.0041	0.0044	0.0036	0.0039	0.0042	0.0036	0.0038	0.0041
Antimony	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026
Barium	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099
Beryllium	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012
Chromium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	0.015	0.016	0.016	0.015	0.015	0.016	0.015	0.015	0.016
Lead	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Lithium	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	0.003	0.0034	0.0038	0.0032	0.0035	0.0038	0.0033	0.0037	0.004
Mercury	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Nickel	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Thallium	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.0001
Tin	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Zinc	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123 (underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5a BCWQ
Predicted MCF-12 Water Quality under the Base Case Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[w]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	Median	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L		-		-	22	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**24**	**25**	**25**
Alkalinity[t]	mg/L		see notes		W, s	4.4	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**	**5.4**
Hardness[d]	mg/L		-		-	6.4	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.6**	**8.7**	**8.8**	**8.5**	**8.6**	**8.7**
Major Ions																													
Calcium	mg/L		see notes		W, t	2.2	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.8**	**2.9**	**2.9**
Chloride	mg/L	600	A	150	A	0.79	0.74	0.76	0.77	0.74	0.76	0.77	0.74	0.75	0.76	0.74	0.75	0.76	0.74	0.75	0.76	0.73	0.74	0.74	0.7	0.72	0.73	0.6	0.61	0.7
Fluoride	mg/L	0.4	A, e	-	-	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098
Magnesium	mg/L		-		-	0.24	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.36**	**0.36**	**0.35**	**0.35**	**0.36**	**0.34**	**0.35**	**0.35**
Potassium	mg/L		-		-	1.0	0.97	0.98	1.0	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.98	0.99	0.97	0.97	0.99	0.96	0.97	0.98
Sodium	mg/L		-		-	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	0.98	0.99	1.0
Sulphate	mg/L	-	-	128	A, f	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6
Nutrients																													
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0025	0.0026
Nitrate	mg/L (as N)	32.8	A	3	A	0.17	0.079	0.08	0.08	0.079	0.079	0.08	0.079	0.079	0.08	0.078	0.079	0.08	0.078	0.079	0.079	0.078	0.078	0.079	0.078	0.078	0.079	0.077	0.078	0.079
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)		-		-	0.05	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.026	0.025	0.025	0.026
Total Phosphorus	mg/L	0.005-0.015 in lakes			A	0.0025	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032	0.0031	0.0032	0.0032	0.0029	0.003	0.0031
Dissolved Metals																													
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.023	0.0034	0.0036	0.0038	0.0033	0.0035	0.0037	0.0033	0.0035	0.0036	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0033	0.0034	0.0035	0.0032	0.0032	0.0034
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000011	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.007	0.00067	0.00068	0.007	0.00067	0.00069	0.007	0.00069	0.007	0.00071	0.00069	0.007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.007	0.00057	0.00057	0.00068
Iron	mg/L	1	A	-	-	0.015	0.015	0.015	0.016	0.015	0.016	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L		-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	-	-	0.0000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon	mg/L		-		-	-	4.2	4.3	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.3
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.0000997	0.0000998	0.0001	0.0000997	0.0000998	0.0000999	0.0000997	0.0000998	0.0000999	0.0000997	0.0000997	0.0000999	0.0000996	0.0000997	0.0000999	0.0000996	0.0000997	0.0000998	0.0000996	0.0000997	0.0000998	0.0000995	0.0000996	0.0000998
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000098	0.0000099	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.052	0.0035	0.0037	0.0039	0.0035	0.0037	0.0038	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0035	0.0036	0.0037	0.0034	0.0035	0.0036	0.0034	0.0035	0.0036	0.0033	0.0034	0.0035
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00026	0.00025	0.00025	0.00026	0.00025	0.00025	0.00026
Barium	mg/L	-	-	1	W	0.01	0.0097	0.0098	0.0099	0.0097	0.0098	0.0099	0.0097	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0099	0.0096	0.0097	0.0098	0.0096	0.0097	0.0098	0.0095	0.0096	0.0098
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000029-0.00005	A, j	0.000024-0.000036	A, j	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000012	0.000012	0.000011	0.000011	0.000012	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.0000098	0.0000099	0.000011
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.007	0.00067	0.00068	0.007	0.00067	0.00069	0.007	0.00069	0.007	0.00071	0.00069	0.007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.007	0.00057	0.00057	0.00068
Iron	mg/L	1	A	-	-	0.015	0.015	0.015	0.016	0.015	0.016	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.016	0.015	0.015	0.015	0.015	0.015	0.016	0.015	0.015	0.015
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L		-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0065	0.0033	0.0037	0.004	0.0033	0.0037	0.004	0.0034	0.0037	0.004	0.0036	0.0039	0.0042	0.0036	0.0039	0.0042	0.0035	0.0038	0.0041	0.0033	0.0037	0.004	0.0019	0.0019	0.0035
Mercury	mg/L	-	-	0.0000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W	0.0001	0.0000997	0.0000998	0.0001	0.0000997	0.0000998	0.0000999	0.0000997	0.0000998	0.0000999	0.0000997	0.0000997	0.0000999	0.0000996	0.0000997	0.0000999	0.0000996	0.0000997	0.0000998	0.0000996	0.0000997	0.0000998	0.0000995	0.0000996	0.0000998
Tin	mg/L		-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-	0.005	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000098	0.0000099	0.0001
Vanadium	mg/L	-	-	-	-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 3.7, otherwise 0.009 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2)); minimum baseline surface water pH = 5.57
j) hardness dependent Cd guideline: BC WQG (mg/L) = 10^(0.86(log(hardness))-3.2)/1000
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
w) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5b CCME
Predicted MCF-12 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																
Total Dissolved Solids[b]	mg/L	-		-	36	25	**40**	**61**	26	35	**63**	27	32	**42**	27	30	34	26	28	31	25	27	29	24	26	27	24	25	26	23	24	25
Alkalinity[c]	mg/L	-		-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	8	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																																
Calcium[n]	mg/L	-		-	3	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**
Chloride[n]	mg/L	640	120	-	1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[n]	mg/L	0.12		l	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[n]	mg/L	-		-	4.7	3.2	5.0	**5.5**	4.8	**5.6**	**5.9**	**5.5**	**5.9**	**6.1**	**5.6**	**5.7**	**5.9**	**5.5**	**5.6**	**5.7**	**5.3**	**5.4**	**5.6**	5.0	5.1	**5.2**	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients																																
Ammonia	mg/L (as N)	0.41		e	0.003	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[e]	mg/L (as N)	550	13	-	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[n]	mg/L	-	see notes	l	0.008	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals																																
Aluminum	mg/L	0.005		f	0.07	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-		-	0.01	0.0076	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00002	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	-		-	0.00015	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.2	0.022	0.035	0.039	0.033	0.04	0.042	0.038	0.042	0.043	0.04	0.041	0.041	0.039	0.04	0.041	0.037	0.038	0.039	0.035	0.036	0.037	0.034	0.034	0.035	0.032	0.033	0.033
Lead	mg/L	0.001		j	0.0003	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.011	**0.022**	**0.037**	**0.042**	**0.035**	**0.045**	**0.047**	**0.044**	**0.048**	**0.05**	**0.046**	**0.046**	**0.048**	**0.044**	**0.045**	**0.046**	**0.041**	**0.041**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.035**	**0.037**	**0.033**	**0.033**	**0.035**
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00068**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.00069**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																																
Aluminum	mg/L	0.005		f	0.3	0.028	0.041	0.042	0.039	0.041	0.042	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.041	0.041	0.042	0.042	0.042	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.044
Antimony	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	0.005		-	0.0003	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-		-	0.01	0.0076	**0.012**	**0.012**	**0.012**	**0.012**	**0.013**	**0.012**	**0.013**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.013**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.012**	**0.011**	**0.012**	**0.012**
Beryllium	mg/L	-		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00003	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	0.001		h	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	-		-	0.0002	0.000096	0.00016	**0.00018**	**0.00017**	**0.00017**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00017**	**0.00017**	**0.00017**	**0.00018**	**0.00018**	**0.00017**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.3		-	0.2	0.022	0.035	0.039	0.033	0.04	0.042	0.038	0.042	0.043	0.04	0.041	0.041	0.039	0.04	0.041	0.037	0.038	0.039	0.035	0.036	0.037	0.034	0.034	0.035	0.032	0.033	0.033
Lead	mg/L	0.001		j	0.0003	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	-		-	0.011	**0.022**	**0.037**	**0.042**	**0.035**	**0.045**	**0.047**	**0.044**	**0.048**	**0.05**	**0.046**	**0.046**	**0.048**	**0.044**	**0.045**	**0.046**	**0.041**	**0.041**	**0.045**	**0.037**	**0.038**	**0.04**	**0.035**	**0.035**	**0.037**	**0.033**	**0.033**	**0.035**
Mercury	mg/L	0.000026		-	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025		k	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	0.001		-	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001		-	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	0.0008		-	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-		-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-		-	0.005	0.0032	0.0048	0.005	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	0.033	0.015	-	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-		-	0.0005	0.00043	**0.00066**	**0.0007**	**0.00064**	**0.00069**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.00069**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.0007**	**0.00071**	**0.00072**	**0.0007**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00073**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:
I = interim guideline
a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0
f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)
g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^{1.016*log(hardness)-1.71})/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037
h) guideline is for Cr(VI)
i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000
j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007
k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15
l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1
m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5b CCME
Predicted MCF-12 Water Quality under the Conservative Scenario compared to CCME Guidelines
McNab Aggregate Project, BC

Parameter	Units	CCME Guidelines[a]			Baseline Surface Water Concentrations[m]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Short-term	Long-term	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																													
Total Dissolved Solids[b]	mg/L	-		-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L	-		-	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-		-	8	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																													
Calcium[n]	mg/L	-		-	3	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[n]	mg/L	640	120	-	1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[n]	mg/L	0.12		l	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[n]	mg/L	-		-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[n]	mg/L	-		-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[n]	mg/L	-		-	1	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[n]	mg/L	-		-	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.6	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																													
Ammonia	mg/L (as N)	0.41		e	0.003	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[o]	mg/L (as N)	550	13	-	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06		-	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-		-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052	0.051	0.051	0.052
Total Phosphorus[p]	mg/L	-	see notes	l	0.008	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.0079	0.008	0.0076	0.0077	0.0079
Dissolved Metals																													
Aluminum	mg/L	0.005		f	0.07	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-		-	0.01	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.011**
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00002	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.00015	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00071	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.02	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.031	0.031	0.032	0.03	0.03	0.031
Lead	mg/L	0.001		j	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	0.00024	0.00025
Lithium	mg/L	-		-	0.025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.0093	**0.031**	**0.032**	**0.033**	**0.031**	**0.032**	**0.033**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.033**	**0.028**	**0.029**	**0.032**
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025		k	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																													
Aluminum	mg/L	0.005		f	0.3	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.044
Antimony	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	0.005		-	0.0003	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00057	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-		-	0.01	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.012**	**0.011**	**0.011**	**0.011**
Beryllium	mg/L	-		-	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	29	1.5	-	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.0002-0.0012	0.00005-0.0001	g	0.00003	0.000012	0.000012	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	0.001		h	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	-		-	0.0002	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	**0.00018**	0.00016	0.00016	**0.00018**
Copper	mg/L	0.002		i	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.0007	0.00071	0.00069	0.0007	0.00072	0.00068	0.0007	0.00071	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	0.3		-	0.2	0.031	0.032	0.032	0.031	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.032	0.032	0.032	0.03	0.031	0.032
Lead	mg/L	0.001		j	0.0003	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L	-		-	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	-		-	0.011	**0.031**	**0.032**	**0.033**	**0.031**	**0.032**	**0.032**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.033**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.032**	**0.033**	**0.028**	**0.029**	**0.032**
Mercury	mg/L	0.000026		-	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	0.073		l	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025		k	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	0.001		-	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001		-	0.00001	0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.0000096	0.0000097	0.00001
Thallium	mg/L	0.0008		-	0.0001	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000097	0.000099	0.000096	0.000097	0.000099	0.000096	0.000097	0.000098	0.000095	0.000096	0.000098
Tin	mg/L	-		-	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L	-		-	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	0.033	0.015	-	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-		-	0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00074**
Zinc	mg/L	0.03		-	0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025

Notes:

l = interim guideline

a) Canadian Council of Ministers of the Environment (CCME). Guidelines for the protection of freshwater aquatic life.

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) pH and temperature dependent ammonia guideline: based on maximum baseline temperature of 18°C and pH of 8.0

f) pH dependent Al guideline: CCME Al (mg/L) = 0.005 at pH<6.5, CCME Al (mg/L)= 0.1 at pH ≥6.5 (minimum observed baseline surface water pH = 5.57)

g) hardness dependent Cd guideline: CCME Short-term Guideline (mg/L) = 0.00011 at hardness <5.3 mg/L, at hardness ≥5.3 to ≤360 mg/L = (10^(1.016*log(hardness)-1.71))/1000, at hardness >360 mg/L = 0.0077
CCME Long-term Guideline (mg/L) = 0.00004 at hardness <17 mg/L, at hardness ≥17 to ≤280 mg/L = 10^(0.83(log(hardness))-2.46)/1000, at hardness >280 mg/L = 0.00037

h) guideline is for Cr(VI)

i) hardness dependent Cu guideline: CCME (mg/L) = 0.002 at hardness <82 mg/L , at hardness ≥82 to ≤180 mg/L = (0.2*EXP(0.8545(ln(hardness))-1.465))/1000

j) hardness dependent Pb guideline: CCME (mg/L) = 0.001 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = (EXP(1.273(ln(hardness))-4.705))/1000, at hardness >180 mg/L = 0.007

k) hardness dependent Ni guideline: CCME (mg/L) = 0.025 at hardness ≤60 mg/L, at hardness >60 to ≤180 mg/L = EXP(0.76*(ln(hardness))+1.06)/1000, at hardness >180 mg/L = 0.15

l) CCME guidance framework trigger values (mg/L): ultra-oligotrophic <0.004, oligotrophic 0.004-0.01, mesotrophic 0.01-0.02, meso-eutrophic 0.02-0.035, eutrophic 0.035-0.1, hyper-eutrophic >0.1

m) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

n) based on probabilistic model results

123	Indicates concentration exceeding the CCME short-term guideline and baseline plus 10%.
123	Indicates concentration exceeding the CCME long-term guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5b BCWQ
Predicted MCF-12 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[u]	Year 1			Year 2			Year 3			Year 4			Year 5			Year 6			Year 7			Year 8			Year 9		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																																	
Total Dissolved Solids[b]	mg/L	-			-	36	25	**40**	**61**	26	35	**63**	27	32	**42**	27	30	34	26	28	31	25	27	29	24	26	27	24	25	26	23	24	25
Alkalinity[c]	mg/L	see notes			W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardness[d]	mg/L	-			-	8	**11**	**18**	**20**	**17**	**20**	**21**	**19**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																																	
Calcium[v]	mg/L	see notes			W, t	3	**3.8**	**6.0**	**6.8**	**5.7**	**6.7**	**7.1**	**6.5**	**6.9**	**7.2**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.1**	**6.8**	**6.9**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**7.0**	**6.7**	**6.8**	**6.9**
Chloride[v]	mg/L	600	A	150	A	1	0.61	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3
Fluoride[v]	mg/L	0.45 - 0.71	A, e	-	-	0.01	0.014	0.022	0.025	0.021	0.024	0.026	0.023	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.026	0.024	0.025	0.025	0.024	0.024	0.025	0.024	0.024	0.025	0.024	0.024	0.024
Magnesium[v]	mg/L	-			-	0.31	**0.41**	**0.68**	**0.78**	**0.63**	**0.75**	**0.79**	**0.71**	**0.76**	**0.79**	**0.74**	**0.78**	**0.8**	**0.77**	**0.79**	**0.81**	**0.78**	**0.81**	**0.83**	**0.81**	**0.82**	**0.84**	**0.82**	**0.83**	**0.85**	**0.83**	**0.84**	**0.85**
Potassium[v]	mg/L	-			-	1.0	0.98	**1.5**	**1.6**	**1.5**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.6**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[v]	mg/L	-			-	1	**11**	**19**	**37**	**6.9**	**13**	**38**	**6.3**	**9.8**	**19**	**5.9**	**8.1**	**11**	**5.1**	**6.7**	**8.7**	**4.5**	**5.8**	**7.2**	**4.0**	**5.1**	**6.1**	**3.7**	**4.5**	**5.4**	**3.4**	**4.1**	**4.7**
Sulphate[v]	mg/L	-	-	128	A, f	4.7	3.2	5.0	5.5	4.8	5.6	5.9	5.5	5.9	6.1	5.6	5.7	5.9	5.5	5.6	5.7	5.3	5.4	5.6	5.0	5.1	5.2	4.8	4.9	5.0	4.6	4.7	4.8
Nutrients																																	
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.003	0.0069	0.011	0.013	0.01	0.013	0.014	0.013	0.014	0.015	0.013	0.014	0.014	0.013	0.013	0.014	0.012	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Nitrate[v]	mg/L (as N)	32.8	A	3	A	0.43	0.12	0.17	0.19	0.18	0.18	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.18	0.16	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)	-			-	0.11	0.041	0.057	0.063	0.057	0.058	0.063	0.057	0.058	0.059	0.057	0.057	0.058	0.056	0.056	0.057	0.055	0.055	0.056	0.054	0.054	0.055	0.053	0.053	0.054	0.053	0.053	0.053
Total Phosphorus[v]	mg/L	0.005-0.015 in lakes			A	0.008	0.0046	0.0074	0.0082	0.0072	0.0082	0.0086	0.008	0.0085	0.0087	0.0083	0.0084	0.0086	0.0083	0.0084	0.0086	0.0083	0.0084	0.0084	0.0081	0.0082	0.0083	0.008	0.0081	0.0082	0.008	0.008	0.0081
Dissolved Metals																																	
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.07	0.027	0.04	0.042	0.039	0.041	0.042	0.04	0.04	0.04	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.042	0.041	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-	-	1	W	0.01	0.0076	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.012	0.012
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.00002	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00064	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	0.35	A	-	-	0.02	0.021	0.034	0.038	0.032	0.039	0.041	0.037	0.041	0.042	0.039	0.04	0.04	0.038	0.039	0.04	0.036	0.037	0.039	0.034	0.035	0.036	0.033	0.033	0.034	0.032	0.032	0.033
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.00025	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0093	0.022	0.037	0.042	0.035	0.045	0.047	0.044	0.048	0.05	0.046	0.046	0.048	0.044	0.045	0.046	0.041	0.041	0.045	0.037	0.038	0.04	0.035	0.035	0.037	0.033	0.033	0.035
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silicon[v]	mg/L	-			-	-	0.44	0.71	1.3	0.33	0.54	1.3	0.33	0.44	0.73	0.31	0.38	0.49	0.28	0.33	0.4	0.25	0.29	0.35	0.22	0.26	0.3	0.2	0.23	0.27	0.18	0.21	0.24
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.0049	0.0047	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00043	**0.00065**	**0.0007**	**0.00064**	**0.00068**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.00069**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.00069**	**0.00071**	**0.00072**	**0.0007**	**0.00071**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Total Metals																																	
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.3	0.028	0.041	0.042	0.039	0.041	0.042	0.04	0.04	0.041	0.04	0.041	0.041	0.04	0.041	0.041	0.041	0.042	0.042	0.042	0.042	0.043	0.042	0.043	0.043	0.042	0.043	0.044
Antimony	mg/L	-	-	0.009	W	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Arsenic	mg/L	-	-	0.005	A	0.0003	0.00038	0.00061	0.00068	0.00057	0.0007	0.00074	0.00067	0.00074	0.00076	0.00071	0.00072	0.00073	0.0007	0.00071	0.00072	0.00066	0.00067	0.0007	0.00062	0.00063	0.00065	0.0006	0.0006	0.00061	0.00057	0.00058	0.00059
Barium	mg/L	-	-	1	W	0.01	0.0076	0.012	0.012	0.012	0.012	0.013	0.012	0.013	0.013	0.012	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.012	0.012
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.032	0.048	0.049	0.047	0.049	0.05	0.048	0.049	0.05	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.049	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.00076 - 0.00093			W, j	0.00003	0.0000094	0.000014	0.000017	0.000014	0.000015	0.000017	0.000014	0.000015	0.000016	0.000014	0.000014	0.000015	0.000013	0.000013	0.000014	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000012	0.000013	0.000013	0.000012	0.000013	0.000013
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00032	0.00049	0.0005	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Cobalt	mg/L	0.11	A	0.004	A	0.0002	0.000096	0.00016	0.00018	0.00017	0.00017	0.00018	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00018	0.00018	0.00017	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00032	0.00057	0.00067	0.0006	0.00064	0.00068	0.00063	0.00066	0.0007	0.00063	0.00066	0.00068	0.00063	0.00064	0.00065	0.00065	0.00066	0.00068	0.00065	0.00066	0.00068	0.00066	0.00067	0.00069	0.00067	0.00069	0.0007
Iron	mg/L	1	A	-	-	0.2	0.022	0.035	0.039	0.033	0.04	0.042	0.038	0.042	0.043	0.04	0.041	0.041	0.039	0.04	0.041	0.037	0.038	0.039	0.035	0.036	0.037	0.034	0.034	0.035	0.032	0.033	0.033
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.0003	0.00016	0.00024	0.00025	0.00024	0.00025	0.00025	0.00024	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	0.00025	0.00025	0.00025	0.00025
Lithium	mg/L	-			-	0.0025	0.0016	0.0024	0.0025	0.0023	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.022	0.037	0.042	0.035	0.045	0.047	0.044	0.048	0.05	0.046	0.046	0.048	0.044	0.045	0.046	0.041	0.041	0.045	0.037	0.038	0.04	0.035	0.035	0.037	0.033	0.033	0.035
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000032	0.0000048	0.0000049	0.0000047	0.0000049	0.000005	0.0000048	0.0000049	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00049	0.00076	0.00083	0.00074	0.00084	0.00088	0.00081	0.00087	0.0009	0.00084	0.00085	0.00087	0.00083	0.00084	0.00086	0.0008	0.00081	0.00083	0.00077	0.00078	0.00079	0.00075	0.00076	0.00077	0.00073	0.00074	0.00075
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00032	0.00049	0.0005	0.00048	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.00049	0.0005	0.00049	0.0005	0.0005	0.00049	0.0005	0.0005
Selenium	mg/L	-	-	0.002	A	0.0005	0.00032	0.00048	0.00049	0.00047	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005
Silver	mg/L	0.0001	A, q	0.00005	A, q	0.00001	0.0000064	0.00001	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.000011	0.00001	0.000011	0.000011	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
Thallium	mg/L	-	-	0.0008	W	0.0001	0.000064	0.000097	0.000099	0.000095	0.000099	0.0001	0.000098	0.000099	0.0001	0.000098	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.000098	0.000099	0.000097	0.000098	0.00010
Tin	mg/L	-			-	0.00025	0.00016	0.00024	0.00025	0.00023	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025
Titanium	mg/L	-			-	0.005	0.0032	0.0048	0.005	0.0047	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0049	0.0048	0.0049	0.0049
Uranium	mg/L	-	-	0.0085	W	0.0001	0.000064	0.000098	0.0001	0.000098	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	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium	mg/L	-			-	0.0005	0.00043	**0.00066**	**0.0007**	**0.00064**	**0.00069**	**0.00071**	**0.00067**	**0.00069**	**0.00071**	**0.00068**	**0.0007**	**0.00071**	**0.00069**	**0.0007**	**0.00071**	**0.0007**	**0.00071**	**0.00072**	**0.0007**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00073**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r	0.003	0.0016	0.0025	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0025	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026

Notes:

A = approved guideline, W = working guideline

a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life

b) calculated value: calculated TDS based on standard methods (APHA, 2005)

c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS

d) calculated hardness based on concentrations of calcium and magnesium

e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))*0.01; equation was only applied when the hardness was ≥ 10, otherwise 0.4 was used.

f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water

g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0

h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6

BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2

i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2); minimum baseline surface water pH = 5.57

j) hardness dependent dissolved Cd guideline: BC WQG Long-term average (ug/L) = $2.718^{[0.736*\ln(hardness)-4.943]}$; BC WQG short-term max (ug/L) = $2.718^{[1.03*\ln(hardness)-5.274]}$; dissolved Cd guidelines were applied to total Cd.

k) guideline is for Cr(VI)

l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000

m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP((1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L

n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605

o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline

p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15

q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015

r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000

s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.

t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.

u) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.

v) based on probabilistic model results.

123 (underlined)	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123 (shaded)	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.

Table 5-5b BCWQ
Predicted MCF-12 Water Quality under the Conservative Scenario compared to BCWQ Guidelines for the Protection of Aquatic Life
McNab Aggregate Project, BC

Parameter	Units	BC Water Quality Guidelines for the Protection of Freshwater Aquatic Life[a]				Baseline Surface Water Concentrations[w]	Year 10			Year 11			Year 12			Year 13			Year 14			Year 15			Year 16			Closure		
		Maximum	notes	30-Day Average	notes	95th Percentile	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Conventional																														
Total Dissolved Solids[a]	mg/L		-		-	36	23	23	24	22	23	24	22	23	24	22	23	23	22	22	23	22	22	23	22	22	23	21	22	22
Alkalinity[c]	mg/L		see notes		W, s	6.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Hardiness[d]	mg/L		-		-	8	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**	**20**	**20**	**21**
Major Ions																														
Calcium[c]	mg/L		see notes		W, t	3	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**	**6.7**	**6.8**	**6.9**
Chloride[e]	mg/L	600	A	150	A	1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3
Fluoride[e]	mg/L	0.45 - 0.71	A, e	-	-	0.01	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.023	0.024	0.024
Magnesium[c]	mg/L		-		-	0.31	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.86**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.83**	**0.84**	**0.85**	**0.82**	**0.84**	**0.85**
Potassium[c]	mg/L		-		-	1.0	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**	**1.6**	**1.7**	**1.7**
Sodium[c]	mg/L		-		-	1	**3.2**	**3.7**	**4.3**	**3.0**	**3.4**	**3.9**	**2.8**	**3.1**	**3.5**	**2.7**	**2.9**	**3.2**	**2.6**	**2.8**	**2.9**	**2.5**	**2.6**	**2.8**	**2.3**	**2.4**	**2.6**	**2.4**	**2.6**	**2.7**
Sulphate[e]	mg/L	-	-	128	A, f	4.7	4.5	4.5	4.6	4.4	4.5	4.6	4.5	4.6	4.7	4.5	4.6	4.6	4.5	4.5	4.6	4.5	4.6	4.6	4.5	4.6	4.7	4.3	4.4	4.6
Nutrients																														
Ammonia	mg/L (as N)	5.61	A, g	0.878	A, g	0.003	0.01	0.011	0.011	0.01	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.01	0.01	0.011
Nitrate[e]	mg/L (as N)	32.8	A	3	A	0.43	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.16	0.15	0.15	0.15
Nitrite	mg/L (as N)	0.06	A, h	0.02	A, h	0.0005	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Total Kjeldhal Nitrogen	mg/L (as N)				-	0.11	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.052	0.052	0.051	0.051	0.052
Total Phosphorus[a]	mg/L	0.005-0.015 in lakes			A	0.008	0.0079	0.008	0.008	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.0081	0.0079	0.008	0.008	0.0079	0.0079	0.008	0.0076	0.0077	0.0079
Dissolved Metals																														
Aluminum	mg/L	0.032	A, i	0.011	A, i	0.07	0.043	0.043	0.044	0.043	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043	0.042	0.043	0.043
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.00025	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00056	0.00058	0.00056	0.00056	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057
Barium	mg/L	-	-	1	W	0.01	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.000062-0.00012	A, j	0.000042-0.000068	A, j	0.00002	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.00015	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.00071	0.00072	0.00068	0.00069	0.00071	0.00068	0.00069	0.00071	0.00068	0.00069	0.00071	0.00057	0.00057	0.00068
Iron	mg/L	1	A	-	-	0.2	0.031	0.032	0.032	0.031	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.032	0.032	0.032	0.03	0.031	0.032
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.0003	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L					0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.0093	0.031	0.032	0.033	0.031	0.032	0.032	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.033	0.028	0.029	0.032
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	-	-	0.025	W, p	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silicon[c]	mg/L		-		-		0.17	0.19	0.22	0.17	0.18	0.2	0.16	0.18	0.19	0.16	0.17	0.18	0.16	0.16	0.17	0.15	0.16	0.17	0.15	0.16	0.17	0.14	0.14	0.16
Silver	mg/L	0.0001	A, q	0.00005	A, q		0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W		0.00097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.00098	0.00099	0.00097	0.00098	0.00099	0.00097	0.00097	0.00099	0.000096	0.00097	0.00098	0.00096	0.00097	0.00098	0.00095	0.00096	0.00098
Tin	mg/L		-		-		0.00025	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-		0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049	0.0047	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W		0.0003	0.0003	0.0003	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	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-	-		-		0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**	**0.00071**	**0.00072**	**0.00073**
Zinc	mg/L	0.033	A, r	0.0075	A, r		0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025
Total Metals																														
Aluminum	mg/L	0.032	A, i	0.012	A, i	0.3	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.044	0.043	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.044
Antimony	mg/L	-	-	0.009	W	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024
Arsenic	mg/L	-	-	0.005	A	0.0003	0.00055	0.00056	0.00057	0.00055	0.00056	0.00057	0.00056	0.00057	0.00058	0.00056	0.00057	0.00057	0.00056	0.00056	0.00057	0.00056	0.00057	0.00058	0.00053	0.00054	0.00057	0.00053	0.00054	0.00057
Barium	mg/L	-	-	1	W	0.01	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.012	0.011	0.011	0.011	0.011	0.011	0.011
Beryllium	mg/L	-	-	0.00013	W	0.0005	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049	0.00047	0.00048	0.00049
Boron	mg/L	-	-	1.2	A	0.05	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049	0.048	0.048	0.049
Cadmium	mg/L	0.00076 - 0.00093			W, j	0.00003	0.000012	0.000012	0.000013	0.000012	0.000012	0.000013	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012	0.000011	0.000011	0.000012
Chromium	mg/L	-	-	0.001	W, k	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049	0.00048	0.00048	0.00049
Cobalt	mg/L	0.11	A	0.004	A	0.0002	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00018	0.00016	0.00016	0.00018
Copper	mg/L	0.0025-0.0029	A, l	0.002	A, l	0.0005	0.00067	0.00069	0.0007	0.00067	0.00068	0.0007	0.00067	0.00069	0.0007	0.00069	0.00071	0.00072	0.00068	0.00069	0.00071	0.00068	0.00069	0.0007	0.00067	0.00069	0.0007	0.00057	0.00057	0.00068
Iron	mg/L	1	A		-	0.2	0.031	0.032	0.032	0.031	0.032	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.031	0.032	0.032	0.031	0.032	0.032	0.032	0.032	0.032	0.03	0.031	0.032
Lead	mg/L	0.003-0.0039	A, m	0.0034	A, m	0.0003	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	0.00025	0.00025	0.00025	0.00025	0.00025	0.00024	0.00025	0.00025
Lithium	mg/L					0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
Manganese	mg/L	0.6-0.64	A, n	0.63-0.65	A, n	0.011	0.031	0.032	0.033	0.031	0.032	0.033	0.032	0.033	0.033	0.032	0.032	0.033	0.032	0.032	0.032	0.032	0.032	0.033	0.032	0.032	0.033	0.028	0.029	0.032
Mercury	mg/L	-	-	0.00000125	A, o	0.000005	0.0000048	0.0000049	0.0000049	0.0000048	0.0000049	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049	0.0000048	0.0000048	0.0000049
Molybdenum	mg/L	2	A	≤1	A	0.0005	0.00072	0.00072	0.00073	0.00071	0.00072	0.00074	0.00072	0.00073	0.00074	0.00072	0.00072	0.00073	0.00071	0.00072	0.00073	0.00071	0.00072	0.00073	0.00072	0.00072	0.00074	0.0007	0.00071	0.00072
Nickel	mg/L	0.025	W, p	-	-	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00049	0.00049	0.0005	0.00048	0.00049	0.00049
Selenium	mg/L	-	-	0.002	A	0.0005	0.00048	0.00049	0.0005	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00049	0.00049	0.00048	0.00048	0.00049
Silver	mg/L	0.0001	A, q	0.00005	A, q		0.00001	0.00001	0.000011	0.00001	0.00001	0.000011	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	0.000096	0.0000097	0.00001
Thallium	mg/L	-	-	0.0008	W		0.00097	0.000098	0.00010	0.000097	0.000098	0.000099	0.000097	0.00098	0.00099	0.00097	0.00098	0.00099	0.00097	0.00097	0.00099	0.000096	0.00097	0.00098	0.00096	0.00097	0.00098	0.00095	0.00096	0.00098
Tin	mg/L		-		-		0.00025	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00025	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024	0.00024
Titanium	mg/L		-		-		0.005	0.0048	0.0049	0.005	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049	0.0048	0.0048	0.0049
Uranium	mg/L	-	-	0.0085	W		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	0.0001	0.0001	0.0001	0.0001	0.0001	0.000098	0.000099	0.0001
Vanadium	mg/L	-	-		-		0.0005	**0.00072**	**0.00073**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00074**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00073**	**0.00072**	**0.00072**	**0.00074**
Zinc	mg/L	0.033	A, r	0.0075	A, r		0.003	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0024	0.0025	0.0025

Notes:
A = approved guideline, W = working guideline
a) BC Water Quality (BCWQ) guidelines for the protection of freshwater aquatic life
b) calculated value: calculated TDS based on standard methods (APHA, 2005)
c) assumed alkalinity based on mean of shake flask extraction test, used for calculation of TDS
d) calculated hardness based on concentrations of calcium and magnesium
e) hardness dependent F guideline: BC Max WQG (mg/L) = (-51.73 + 92.57 *log(hardness))^0.01; equation was only applied when the hardness was ≥ 3.7, otherwise 0.009 was used.
f) hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water
g) pH and temperature dependent ammonia guideline: values selected from Tables 3 and 4 in BC WQG based on maximum baseline temperature of 18°C and pH 8.0
h) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6
BC 30-d WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2
i) pH dependent dissolved Al guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)); BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = EXP(1.6-3.327*(median pH)+0.402*(median pH^2)); minimum baseline surface water pH = 5.57
j) hardness dependent Cd guideline: BC WQG (mg/L) = 10^(0.86(log(hardness))-3.2)/1000
k) guideline is for Cr(VI)
l) hardness dependent Cu guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L , at hardness ≥50 mg/L = 0.04*hardness/1000
m) hardness dependent Pb guideline: BC Max WQG (mg/L) = 0.003 at hardness ≤8 mg/L, at hardness >8 mg/L = (EXP(1.273*ln(hardness))-1.46))/1000; BC 30-d WQG (mg/L) = (3.31+EXP(1.273(ln(hardness))-4.704))/1000 at hardness >8 mg/L, no guideline at hardness ≤8 mg/L
n) hardness dependent Mn guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-d WQG (mg/L) = 0.0044*hardness+0.605
o) BC 30-d WQG (mg/L) = 0.00002 when methylmercury (MeHg) is 0.5% of total Hg, = 0.00001 at 1% MeHg, = 0.00000125 at 8% MeHg; applied most conservative guideline
p) hardness dependent Ni guideline: BC Max WQG = 0.025 at hardness <60 mg/L, at hardness 60-120 mg/L =0.065, at hardness 120-180 mg/L = 0.11, at hardness >180 mg/L = 0.15
q) hardness dependent Ag guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015
r) hardness dependent Zn guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000
s) up to 10 - highly sensitive to acid inputs; 10 to 20 - moderately sensitive; over 20 - low sensitivity. Refer to calcium regarding sensitivity to acid inputs, the more restrictive of calcium or alkalinity is applicable.
t) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity. Refer to alkalinity, the more restrictive of calcium or alkalinity applies.
w) Baseline data is based on monitoring data at MCF-2, MCF-3, MCF-4, MCF-5, and MCF-6.
y) based on probabilistic model results.

123	Indicates concentration exceeding the BC Max WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding the BC 30-d WQ Guideline and baseline plus 10%.
123	Indicates concentration exceeding baseline plus 10% where there is no guideline value.