

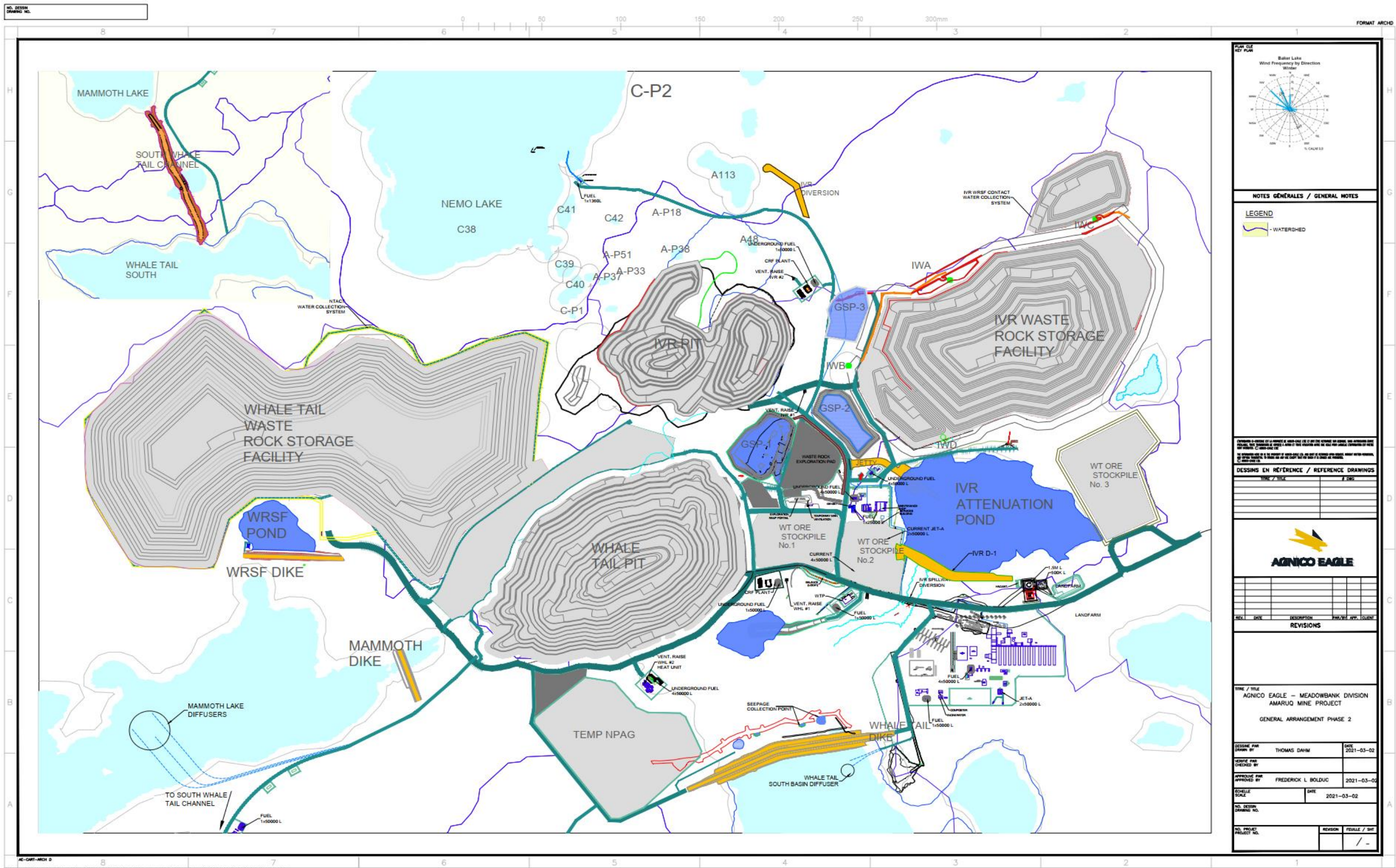
Legend

- Benthic Invertebrate & Sediment Chemistry Sampling Areas
- Kangislulik & Whale Tail Lake Diffusers
- Whale Tail Lake (South Basin)
- Amaruq Watersheds
- Regional Watersheds
- Haul Road



Client	Agnico Eagle Mines Limited Meadowbank Division
Figure 5-2	Whale Tail Study Area - 2023 Sediment and Benthic Invertebrate Monitoring Areas
Project	CREMP 2023 Meadowbank Complex
Date:	March 19, 2024
Datum:	NAD 83 UTM Zone 14N
Scale:	1:70,000
Software:	QGIS Version 3.22.11-Białowieża
By:	M. DiMauro, E. Franz, I. McIvor
REFERENCES: 1. Basemap Imagery from ESRI. 2. Mine plan and sub-watershed boundary layers from Agnico Eagle. 3. Watershed boundaries and watercourse from NRCan.	

Figure 5-3. Whale Tail mine plan showing the location of the Whale Tail Dike and other site infrastructure (Phase 2).



Limnology Tables and Figures

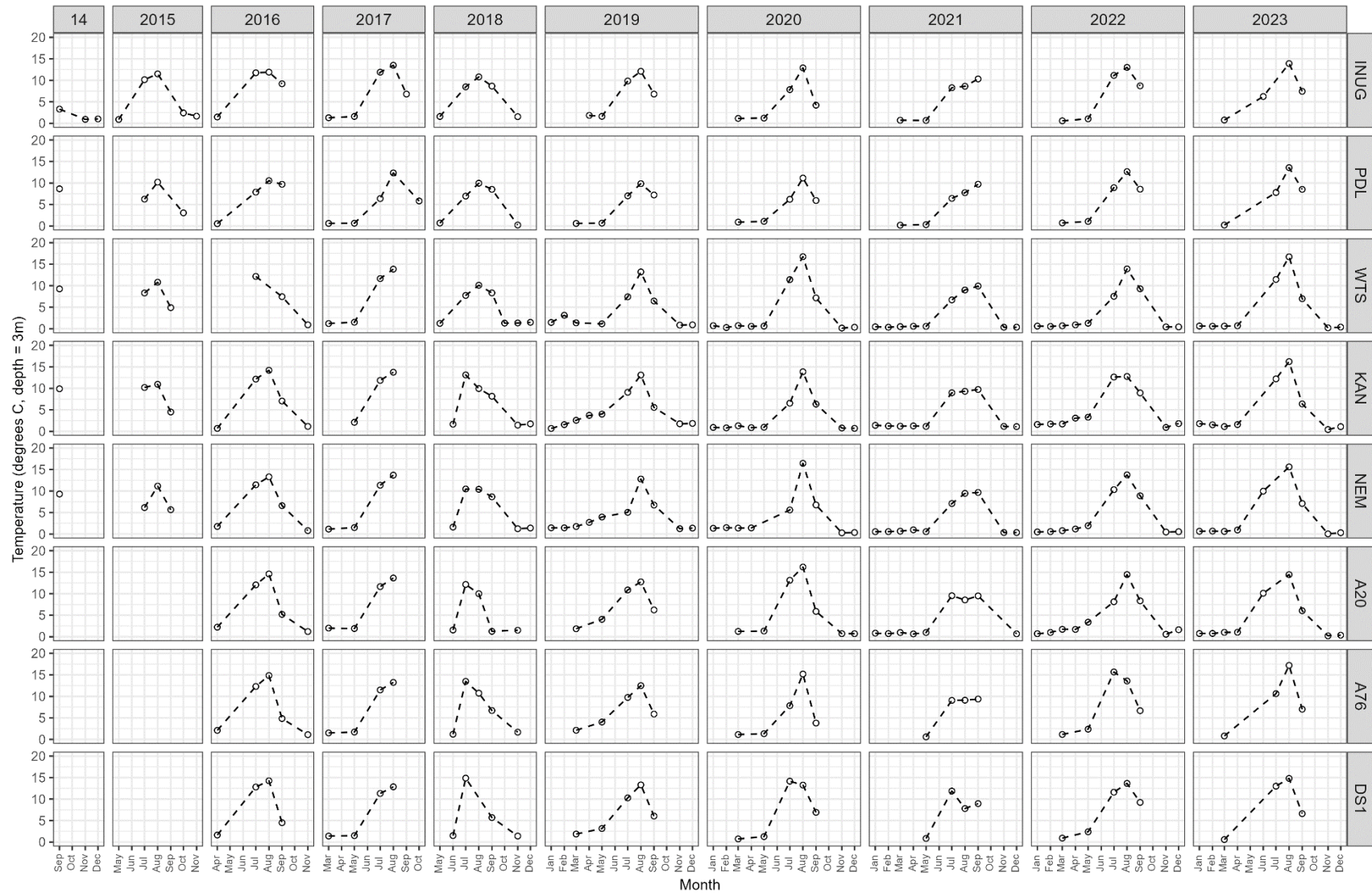
Figure 5-4. Mean monthly field-measured temperature (°C) at 3 m depth since 2014, Whale Tail study area lakes.

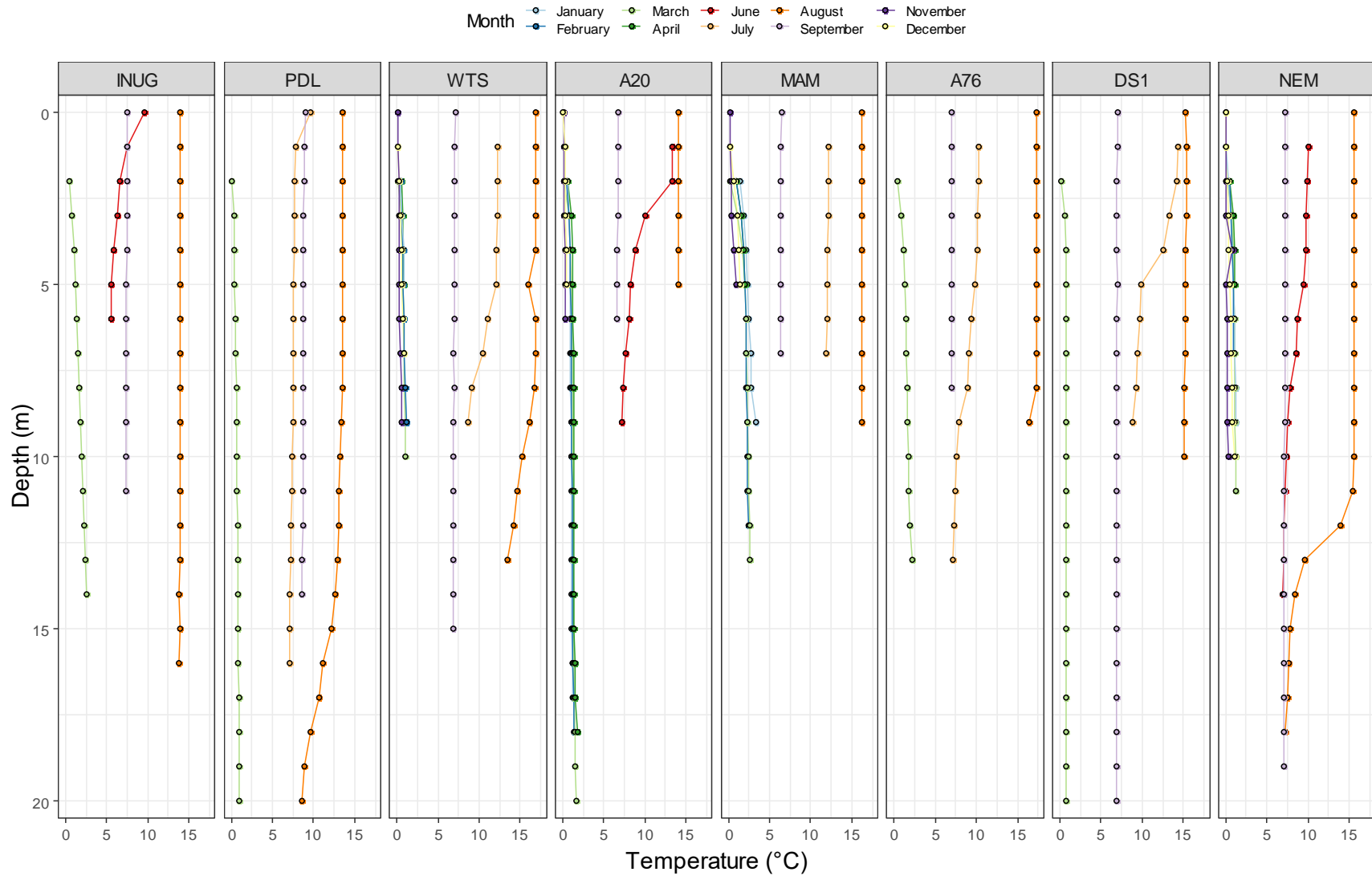
Figure 5-5. Whale Tail – Field-measured temperature profiles, 2023.

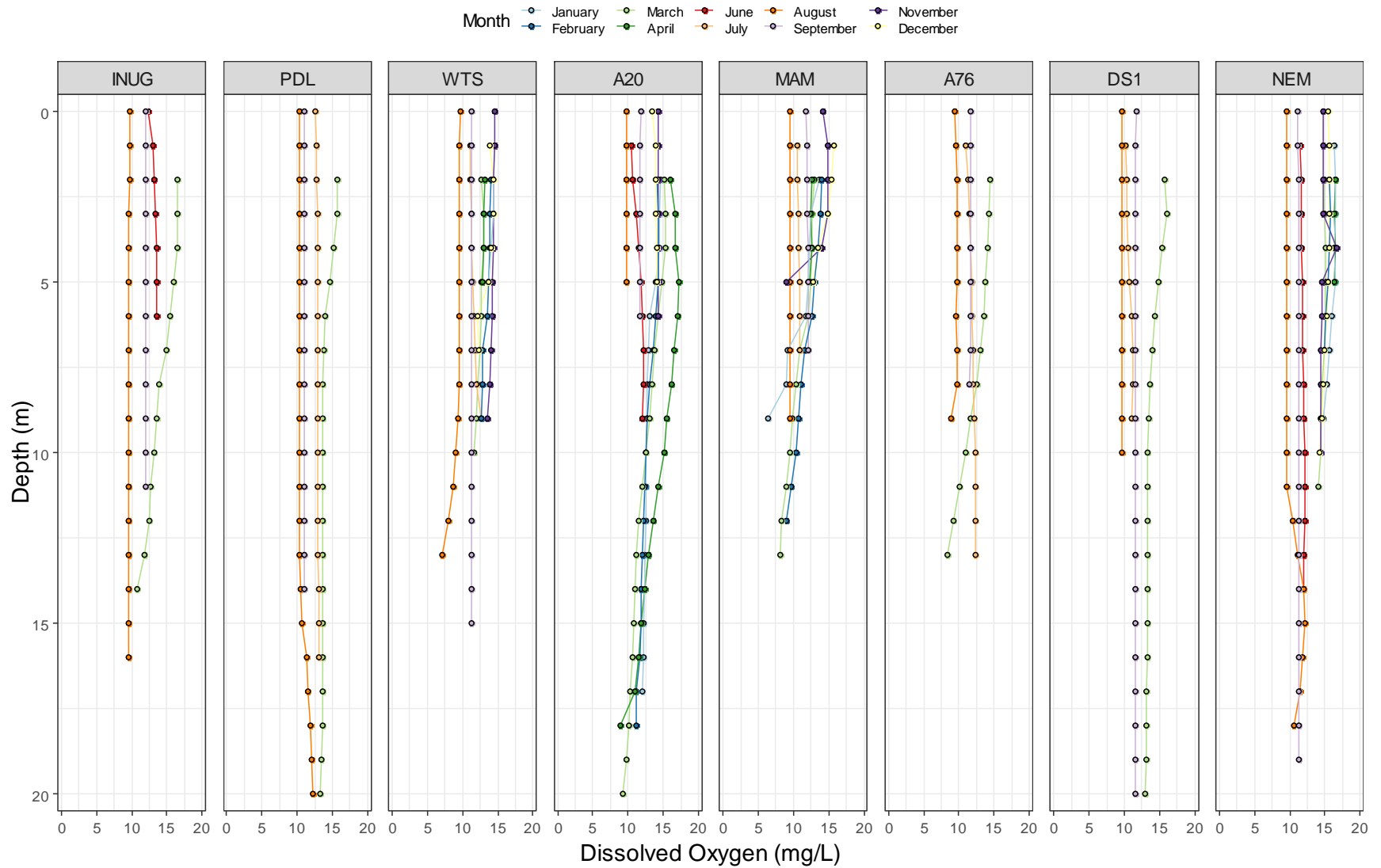
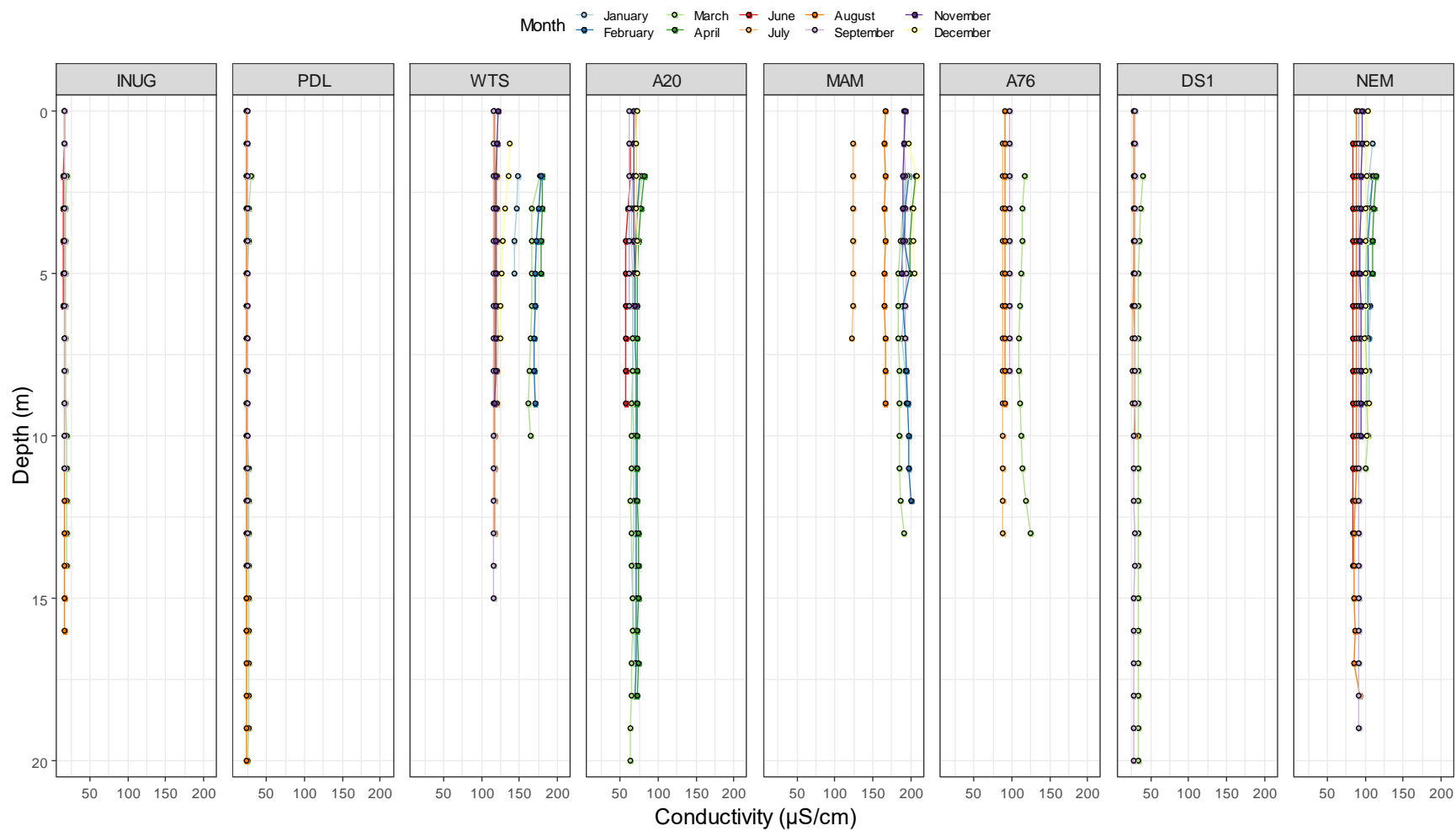
Figure 5-6. Whale Tail – Field-measured dissolved oxygen profiles, 2023.

Figure 5-7. Whale Tail – Field-measured conductivity profiles, 2023.

Water Chemistry Tables and Figures

Table 5-6. Screening process for water quality parameters, Whale Tail study area lakes, 2023.

Screening Level and Rule ¹					Screening Level and Rule ¹					Screening Level and Rule ¹				
Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity	Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity	Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	3 Pattern = Activity
CONVENTIONALS					TOTAL METALS					DISSOLVED METALS				
Conductivity	All stations except INUG and PDL	Yes			Aluminum	-	Yes			Aluminum	-	Yes		
TSS	-	Yes			Antimony	-	Yes			Antimony	-	Yes		
Hardness	All stations except INUG and PDL	Yes			Arsenic	-	Yes			Arsenic	-	Yes		
T-Alkalinity	All stations except INUG	Yes			Barium	-	Yes			Barium	-	Yes		
B-Alkalinity	All stations except INUG	Yes			Beryllium	-	No	No	No	Beryllium	-	No	No	No
C-Alkalinity	-	No	No	No	Boron	-	No	No	No	Boron	-	No	No	No
pH -Field	INUG and PDL	Yes			Cadmium	-	No	No	No	Cadmium	-	No	No	No
pH -Lab		Yes			Chromium	-	Yes			Chromium	-	No	No	No
TDS & MAJOR IONS					Copper	-	Yes			Copper	-	Yes		
TDS	WTS, KAN, A20, A76, and NEM	Yes			Iron	-	Yes			Iron	-	Yes		
Calcium	All stations except INUG and PDL	Yes			Lead	-	Yes			Lead	-	No	No	No
Chloride	-	Yes			Lithium	WTS and KAN	Yes			Lithium	WTS and KAN	Yes		
Fluoride	WTS and KAN	Yes			Manganese	-	Yes			Manganese	-	Yes		
Magnesium	All stations except INUG and PDL	Yes			Mercury	-	No	No	No	Mercury	-	No	No	No
Potassium	All stations except INUG and PDL	Yes			Molybdenum	-	Yes			Molybdenum	-	Yes		
Sodium	All stations except INUG and PDL	Yes			Nickel	-	Yes			Nickel	-	Yes		
Sulphate	-	Yes			Selenium	-	Yes			Selenium	-	No	Yes	
NUTRIENTS & OTHERS					Silicon	WTS, KAN, DS1	Yes			Silicon	WTS, KAN, DS1	Yes		
Ammonia-N	WTS and KAN	Yes			Silver	-	No	No	No	Silver	-	No	No	No
Nitrate-N	-	Yes			Strontium	-	Yes			Strontium	-	Yes		
Nitrite-N	-	Yes			Thallium	-	No	No	No	Thallium	-	No	No	No
TKN	WTS, KAN, A20, A76, DS1, PDL	Yes			Tin	-	No	No	No	Tin	-	No	No	No
T-phosphorus	WTS, KAN, A20, DS1, PDL	Yes			Titanium	INUG, WTS, DS1, NEM	Yes			Titanium	-	No	No	No
Ortho-phosphate	DS1	Yes			Uranium	-	Yes			Uranium	-	Yes		
DOC	All stations	Yes			Vanadium	-	No	No	No	Vanadium	-	No	No	No
TOC	All stations except INUG and PDL	Yes			Zinc	-	No	No	No	Zinc	A76 and NEM	Yes		
Reactive silica	KAN and DS1	Yes												
T-Cyanide	-	No	No	No										
Free Cyanide	-	No	No	No										

Notes:

1. A three-step assessment process was used to identify parameters to include in the formal temporal and spatial trend assessment ([Section 2.3.1](#) and [Section 4.3.2](#)). Parameters were assigned a "Yes" if the following assessment was true:

(1) **>DL ≥ 10% Frequency:** parameters that exceeded MDLs in at least 10% of the samples.

(2) **C-I > 0.1 Frequency:** parameters that were detected more often in impact areas and the proportion of detected values increased by 0.1 or more.

(3) **Pattern = Activity:** additional step to avoid screening out potentially important parameters. Based on the trend plots, is there a trend for infrequently detected parameters and/or are there values > 5 x DL in at least one sampling event at NF areas?

2. Indicates that a trigger exceedance occurred at the listed Whale Tail study area lakes in one or more sampling event.

Shaded parameters are included in the temporal and spatial trend assessment.

Plots for all individual parameters are presented in [Appendix B2](#).

Table 5-7. Water quality variables at the Whale Tail study area lakes for which 2023 mean concentrations exceeded the trigger.

Parameter	Trigger	Threshold	2023 Mean					
			WTS	MAM	NEM	A20	A76	DS1
			NF	NF	NF	MF	MF	FF
Conventionals								
Conductivity	48.6	-	129	166	92.6	71.1	99.0	-
Hardness	17.4	-	46.4	59.0	35.3	25.6	35.6	-
HCO ₃ alkalinity	9.6	-	20.1	21.1	13.1	13.7	14.4	-
Total alkalinity	9.6	-	20.1	21.1	13.1	13.7	14.4	-
TDS & Major Ions								
TDS	38.5	-	96.3	120	76.7	55.4	67.1	-
Calcium	4.6	-	12.7	17.0	10.4	6.9	9.9	-
Magnesium	1.4	-	3.6	4.0	2.3	2.0	2.6	-
Potassium	0.84	-	3.2	3.9	1.7	1.8	2.2	-
Sodium	0.97	-	2.8	3.3	-	1.7	1.8	1.2
Nutrients								
TKN	0.17	-	0.31	0.26	-	0.22	-	-
Total phosphorus	0.0045	0.01	0.0067	-	-	0.0051	-	-
TOC	2.4	-	3.3	2.7	-	3.3	-	2.9
DOC	2.4	-	3.4	2.5	-	3.2	-	2.9
Metals								
Lithium (T)	0.0020	-	0.0021	0.0028	-	-	-	-
Lithium (D)	0.0020	-	0.0022	0.0028	-	-	-	-
Silicon (D)	0.57	-	-	-	-	-	-	0.59

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean values are all in units of mg/L except for conductivity (µS/cm).

Table 5-8. Results of BACI tests for selected water variables at the Whale Tail study area lakes in 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value ¹	Proportional change		
							exp(Est)	LCI	UCI
Conventionals									
Conductivity	WTS	14	4	1.4	0.16	< 0.001	4.2	3.0	6.0
	MAM	15	4	1.4	0.17	< 0.001	3.9	2.8	5.7
	A20	13	4	1.4	0.075	< 0.001	4.2	3.6	4.9
	A76	13	4	1.00	0.097	< 0.001	2.7	2.2	3.3
	NEM	20	4	1.1	0	< 0.001	3.2	3.2	3.2
Hardness	WTS	14	4	1.4	0.15	< 0.001	4.2	3.1	5.8
	MAM	15	4	1.4	0.16	< 0.001	3.9	2.8	5.4
	A20	13	4	1.5	0.085	< 0.001	4.4	3.6	5.2
	A76	13	4	0.97	0.089	< 0.001	2.6	2.2	3.2
	NEM	20	4	1.1	0	< 0.001	3.2	3.2	3.2
HCO ₃ alkalinity	WTS	13	4	1.4	0.068	< 0.001	4.0	3.5	4.6
	MAM	14	4	1.3	0.085	< 0.001	3.7	3.1	4.4
	A20	13	4	0.90	0.089	< 0.001	2.5	2.0	3.0
	A76	13	4	0.74	0.058	< 0.001	2.1	1.8	2.4
	NEM	19	4	0.48	0.057	< 0.001	1.6	1.4	1.8
Total alkalinity	WTS	13	4	1.4	0.068	< 0.001	4.0	3.5	4.6
	MAM	14	4	1.3	0.085	< 0.001	3.7	3.1	4.4
	A20	13	4	0.90	0.089	< 0.001	2.5	2.0	3.0
	A76	13	4	0.74	0.058	< 0.001	2.1	1.8	2.4
	NEM	19	4	0.48	0.057	< 0.001	1.6	1.4	1.8
Nutrients & Others									
TKN	WTS	13	4	0.85	0.12	< 0.001	2.3	1.8	3.0
	MAM	14	4	0.76	0.098	< 0.001	2.1	1.7	2.6
	A20	13	4	0.73	0.13	< 0.001	2.1	1.6	2.8
Total phosphorus	WTS	14	4	0.59	0.25	0.015	1.8	1.1	3.0
	A20	13	4	0.36	0.17	0.026	1.4	1.0	2.1
TOC	WTS	14	4	0.32	0.067	< 0.001	1.4	1.2	1.6
	MAM	15	4	0.25	0.086	0.0060	1.3	1.1	1.5
	A20	13	4	0.50	0.090	< 0.001	1.7	1.4	2.0
	DS1	13	4	0.11	0.098	0.13	1.1	0.91	1.4
DOC	WTS	14	4	0.18	0.064	0.0070	1.2	1.0	1.4
	MAM	15	4	0.024	0.092	0.40	1.0	0.84	1.2
	A20	13	4	0.34	0.097	0.0020	1.4	1.1	1.7
	DS1	13	4	-0.013	0.11	0.55	0.99	0.79	1.2
TDS & Major Ions									
TDS	WTS	13	4	1.2	0.22	< 0.001	3.4	2.1	5.5
	MAM	14	4	1.2	0.24	< 0.001	3.2	1.9	5.3
	A20	13	4	1.1	0.17	< 0.001	3.2	2.2	4.6
	A76	13	4	0.78	0.16	< 0.001	2.2	1.6	3.1
	NEM	19	4	1.2	0.16	< 0.001	3.2	2.3	4.5
Calcium	WTS	14	4	1.5	0.20	< 0.001	4.4	2.9	6.7
	MAM	15	4	1.4	0.20	< 0.001	4.1	2.7	6.1
	A20	13	4	1.5	0.093	< 0.001	4.5	3.7	5.5
	A76	13	4	1.0	0.092	< 0.001	2.8	2.3	3.4
	NEM	20	4	1.4	0	< 0.001	4.0	4.0	4.0
Magnesium	WTS	14	4	1.3	0.12	< 0.001	3.8	3.0	4.9
	MAM	15	4	1.2	0.12	< 0.001	3.4	2.7	4.5
	A20	13	4	1.4	0.097	< 0.001	3.9	3.2	4.8
	A76	13	4	0.81	0.075	< 0.001	2.3	1.9	2.6
	NEM	20	4	0.64	0.048	< 0.001	1.9	1.7	2.1
Potassium	WTS	14	4	1.9	0.12	< 0.001	6.7	5.2	8.7
	MAM	15	4	1.7	0.12	< 0.001	5.6	4.3	7.2
	A20	13	4	1.5	0.11	< 0.001	4.5	3.6	5.6
	A76	13	4	1.1	0.078	< 0.001	3.0	2.5	3.5
	NEM	20	4	0.99	0.061	< 0.001	2.7	2.4	3.1
Sodium	WTS	14	4	1.5	0.096	< 0.001	4.3	3.5	5.3
	MAM	15	4	1.6	0.099	< 0.001	4.8	3.9	6.0
	A20	13	4	0.94	0.10	< 0.001	2.6	2.1	3.2
	A76	13	4	0.94	0.069	< 0.001	2.6	2.2	3.0
	DS1	13	4	0.27	0.12	0.021	1.3	1.0	1.7
Metals									
T. Lithium	WTS	14	4	0.66	0.079	< 0.001	1.9	1.6	2.3
	MAM	15	4	0.78	0.16	< 0.001	2.2	1.6	3.0
D. Lithium	WTS	14	4	0.73	0.052	< 0.001	2.1	1.9	2.3
	MAM	15	4	0.81	0.14	< 0.001	2.3	1.7	3.1
D. Silicon	DS1	13	4	-0.016	0.25	0.53	0.98	0.58	1.7

Notes:

1. **Bolded** P-values are statistically significant (p < 0.05).
Test area = area compared to control (INUG).
N(B) = number of paired months in the *before* period.
N(A) = number of paired months in the *after* period (i.e., in 2023).
Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.
SE = standard error of the estimate.
DF = degrees of freedom.
P-value = one-tailed test of the null hypothesis (no change or a decrease in mean [opposite for lower pH trigger]).
Exp(Est.) = estimated proportional change.
LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Table 5-9. Sampling effort and frequency assessment results for the Whale Tail study area lakes, 2023.

Areas	Area Designation	Triggers Exceeded?	Minor Changes ¹		Moderate Changes ²		Major Changes ³		Plan for 2024
		Yes/No	Yes/No	Parameters	Yes/No	Parameters	Yes/No	Parameters	
Sampling Strategy for Near-field Areas									
WTS	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO ₃ & Total), T.phosphorus, TKN, TOC, DOC, Ca, Mg, K, Na, T.&D. Lithium.	No	-	No	-	Full CREMP (near-field area)
MAM/KAN	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO ₃ & Total), TKN, TOC, DOC, Ca, Mg, K, Na, T.&D. Lithium.	No	-	No	-	Full CREMP (near-field area)
NEM	NF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO ₃ & Total), Ca, Mg, K.	No	-	No	-	Full CREMP (near-field area)
Sampling Strategy for Mid-field and Far-field Areas									
A20	MF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO ₃ & Total), T.phosphorus, TKN, TOC, DOC, Ca, Mg, K, Na.	No	-	No	-	Full water sampling
A76	MF	Yes	Yes	Cond., Hard., TDS, Alkalinity (HCO ₃ & Total), Ca, Mg, K, Na.	No	-	No	-	Full water sampling
DS1	FF	Yes	Yes	TOC, DOC, Na, D. Silicon.	No	-	No	-	Full water sampling

Notes:

1. Minor = exceedance of the early warning trigger values for parameters without effects-based threshold values.
 2. Moderate = exceedance of the early warning trigger values for parameters with effects-based thresholds.
 3. Major = exceedance of the effects-based threshold values.
- NA = MF and/or FF areas were not assessed using the formal BACI analysis in the current CREMP year.

Table 5-10. Number of monthly mean concentrations exceeding monthly FEIS screening predictions, annual mean trigger exceedances and trend directions for parameters in Kangislulik Lake and Whale Tail South in 2023.

Parameter	Number of Monthly Exceedances of FEIS Predictions ¹		Annual Mean Exceeds Trigger		Direction of Change ²	
	Whale Tail South	Kangislulik Lake	Whale Tail South	Kangislulik Lake	Whale Tail South	Kangislulik Lake
Conventional						
Total Alkalinity	5	5	<u>Yes</u>	<u>Yes</u>	=	↑
TDS & Major Ions						
TDS	5	5	<u>Yes</u>	<u>Yes</u>	=	=
Chloride	5	5	No	No	=	=
Fluoride	5	5	No	No	=	=
Calcium	5	5	<u>Yes</u>	<u>Yes</u>	=	=
Potassium	5	5	<u>Yes</u>	<u>Yes</u>	=	↑
Magnesium	5	5	<u>Yes</u>	<u>Yes</u>	↑	↑
Sodium	2	5	<u>Yes</u>	<u>Yes</u>	=	=
Sulphate	5	5	No	No	=	↑
Nutrients						
Ammonia (as N)	1	1	No	No	=	↓
Nitrate (as N)	2	2	No	No	=	=
Total Phosphorus	1	0	<u>Yes</u>	No	=	=
Total Metals						
Aluminum	5	4	No	No	↑	↓
Antimony	4	5	No	No	↓	=
Barium	5	5	No	No	=	=
Chromium	1	0	No	No	↓	=
Iron	2	0	No	No	↓	↓
Lithium	5	5	<u>Yes</u>	<u>Yes</u>	=	=
Molybdenum	5	5	No	No	↓	↓
Nickel	1	0	No	No	↓	=
Strontium	5	5	No	No	=	=
Uranium	0	1	No	No	=	↓
Total	79	78	-	-		

Notes:

1 In all cases, five months of data were available. May sampling was canceled due to unsafe ice conditions in 2023. An abbreviated sampling event was completed at WTS and KAN/MAM in November 2023.

2 Qualitative direction of trend according to 2023 water quality plots.

Shaded values indicate parameter exceeded FEIS prediction during all 2023 monthly sampling events.

Bolded and underlined values indicate yearly mean exceeded trigger.

Bolded arrows indicate parameter concentrations appeared to be increasing in last sampling events of 2023.

Figure 5-8. Flow chart showing sampling effort and frequency plan for mid-field and far-field sampling at the Whale Tail study area lakes in 2023.

Note: Blue-shaded cells show the linkage between 2023 CREMP results and the sampling effort and frequency for mid-field and far-field sampling in 2024. *Moderate changes* refer to statistically significant increased concentrations for parameters with effects-based threshold values that exceed the early warning trigger values. Refer to [Section 2.2.3](#) for more information.

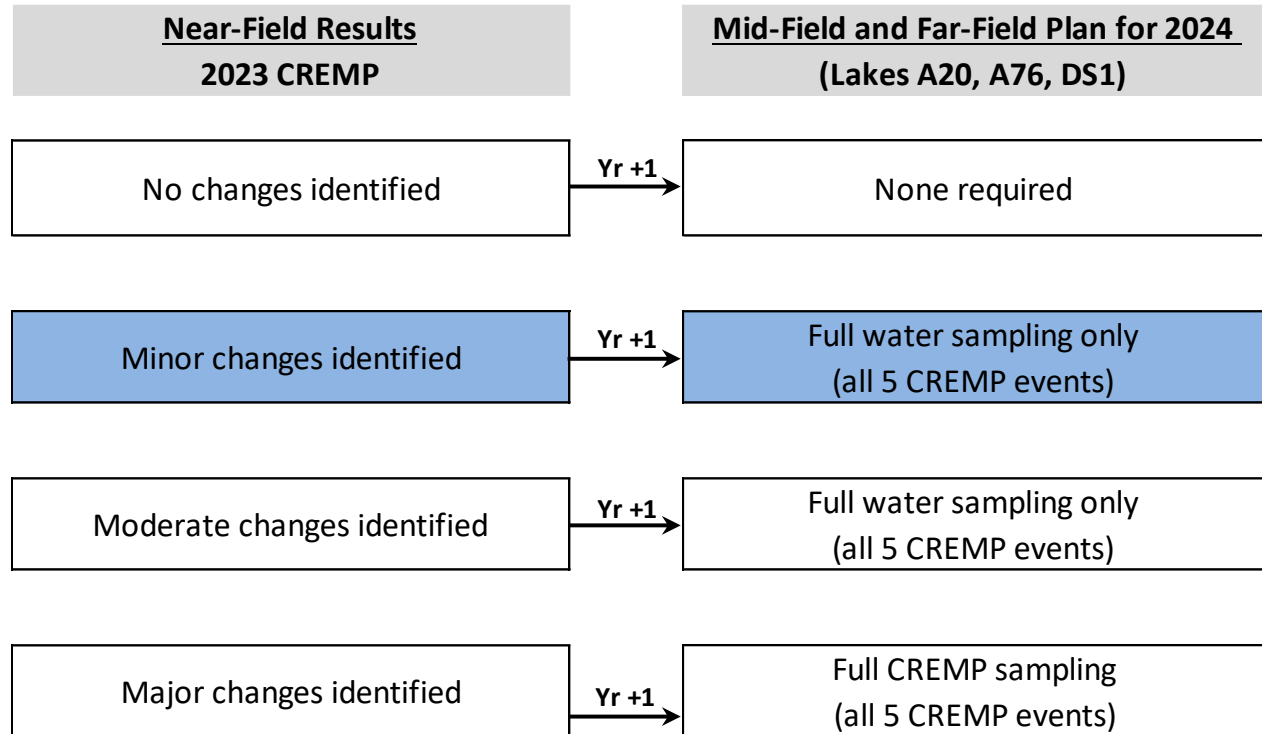


Figure 5-9. Conventional parameters measured in water samples from Whale Tail study area lakes since 2014.

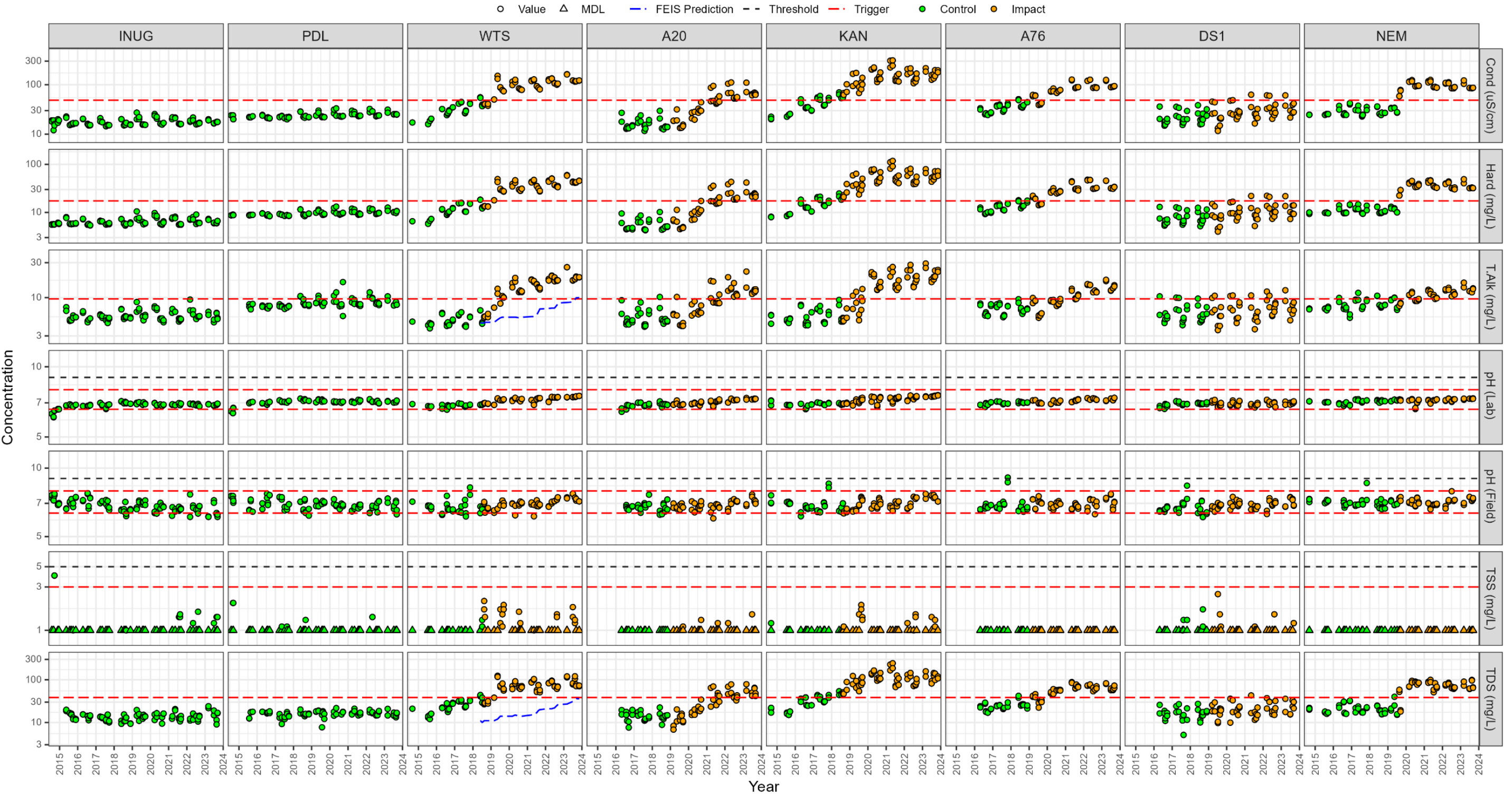


Figure 5-10. Major ions (mg/L) measured in water samples from Whale Tail study area lakes since 2014.

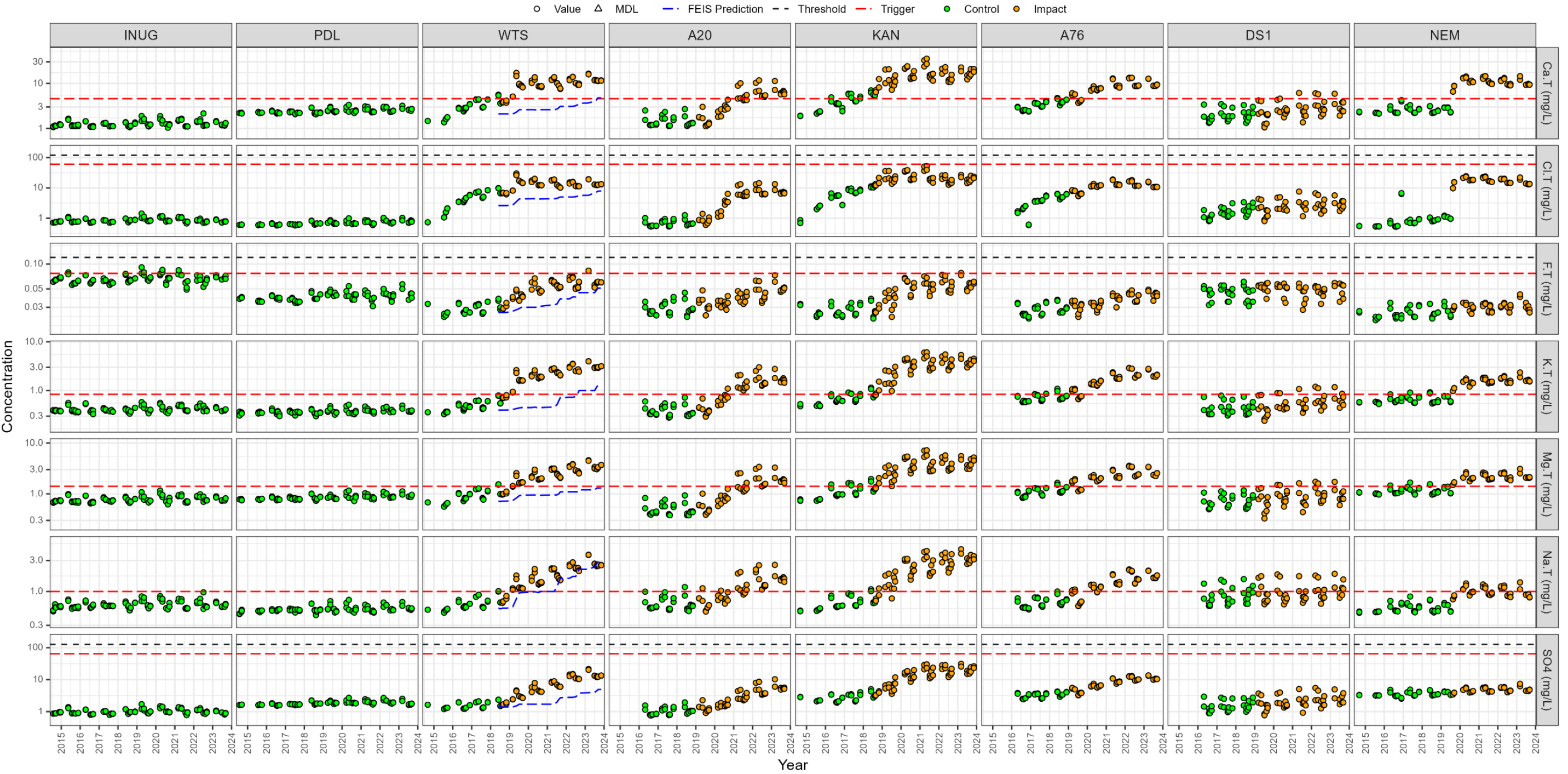


Figure 5-11. Nutrient parameters measured in water samples from Whale Tail study area lakes since 2014.

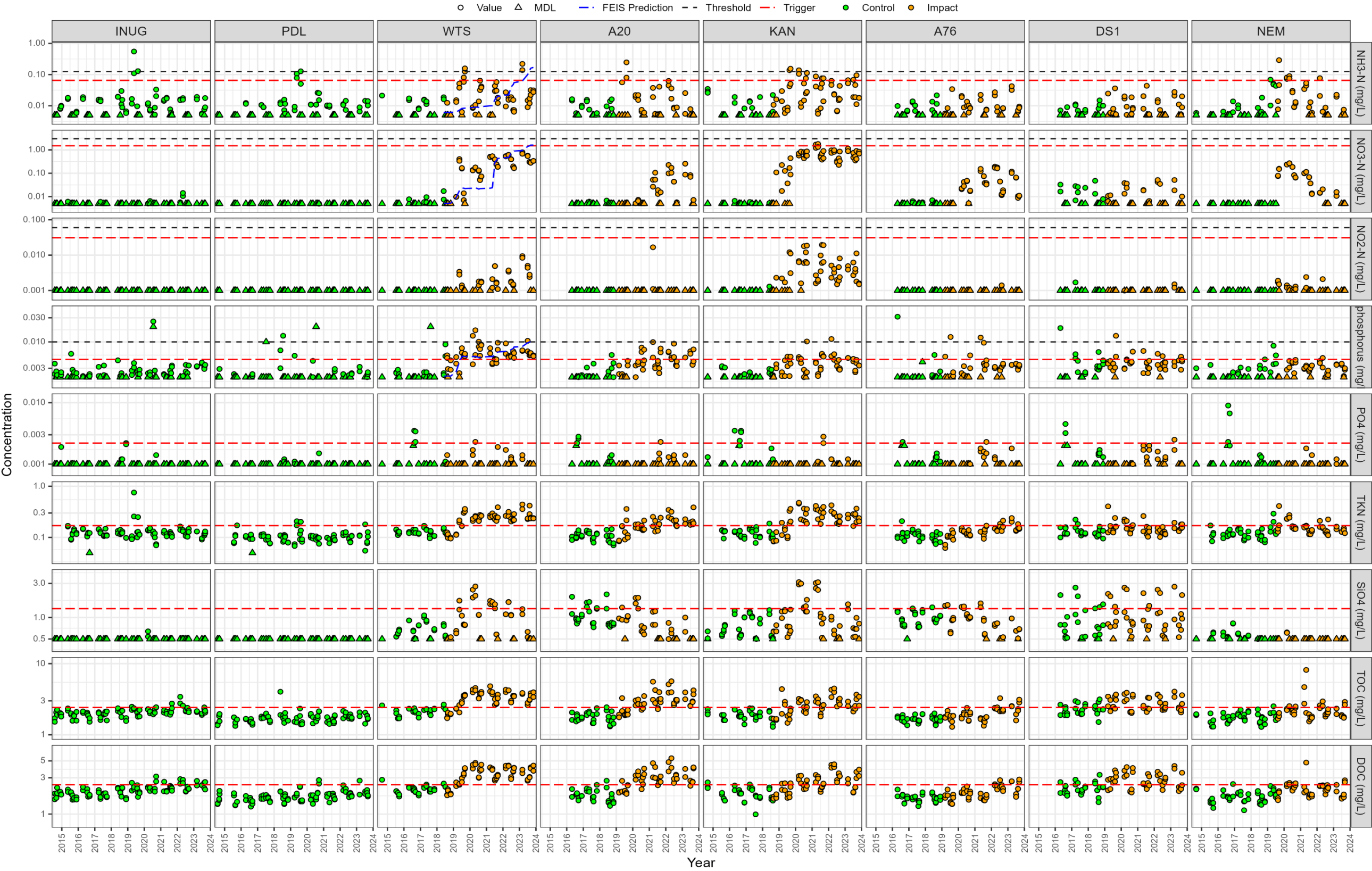


Figure 5-12. Metals measured in water samples from Whale Tail study area lakes since 2014.

Note: The detection limit for total chromium was adjusted from 0.0001 mg/L to 0.0005 mg/L for samples collected since May 2021.

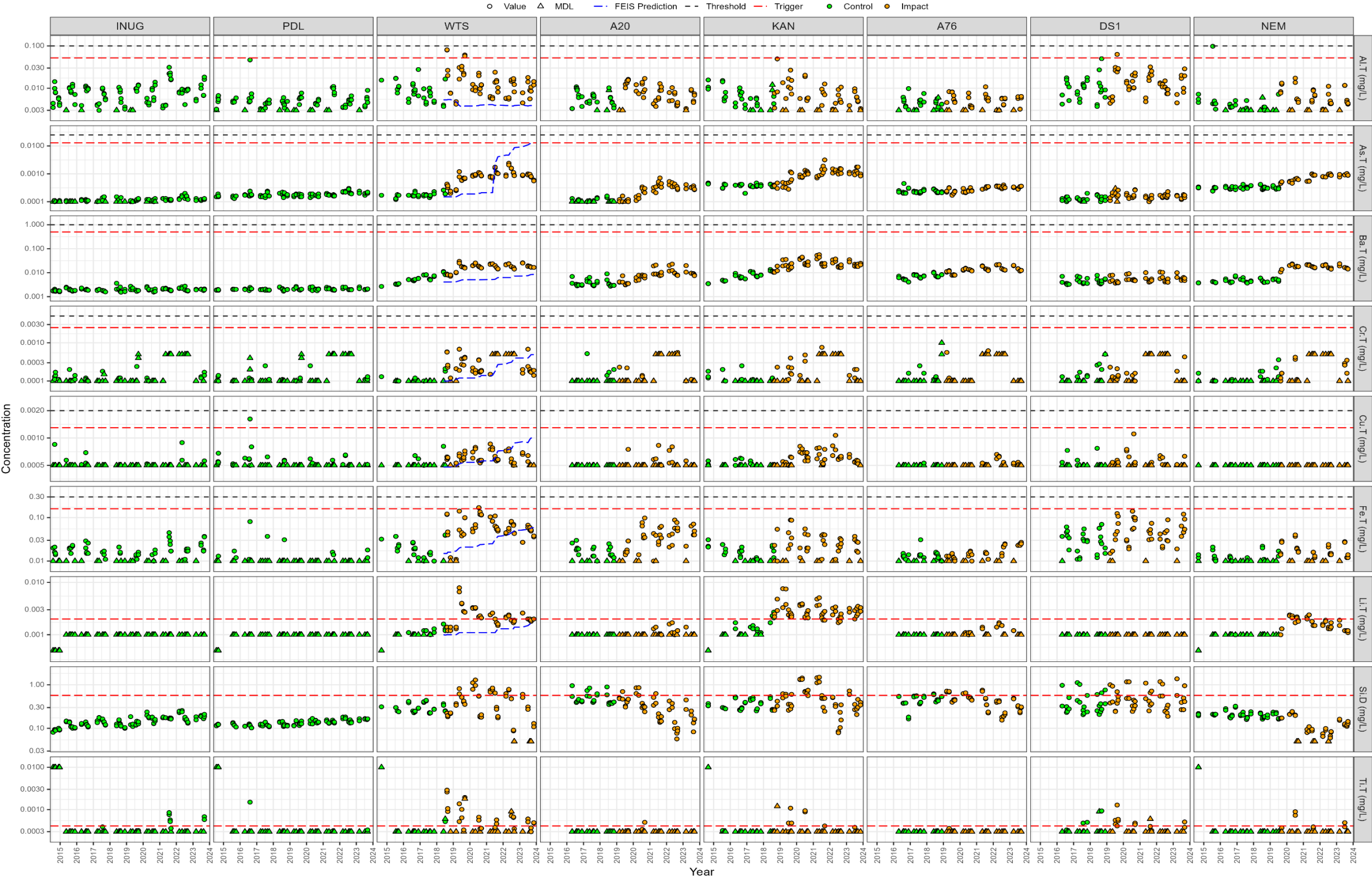
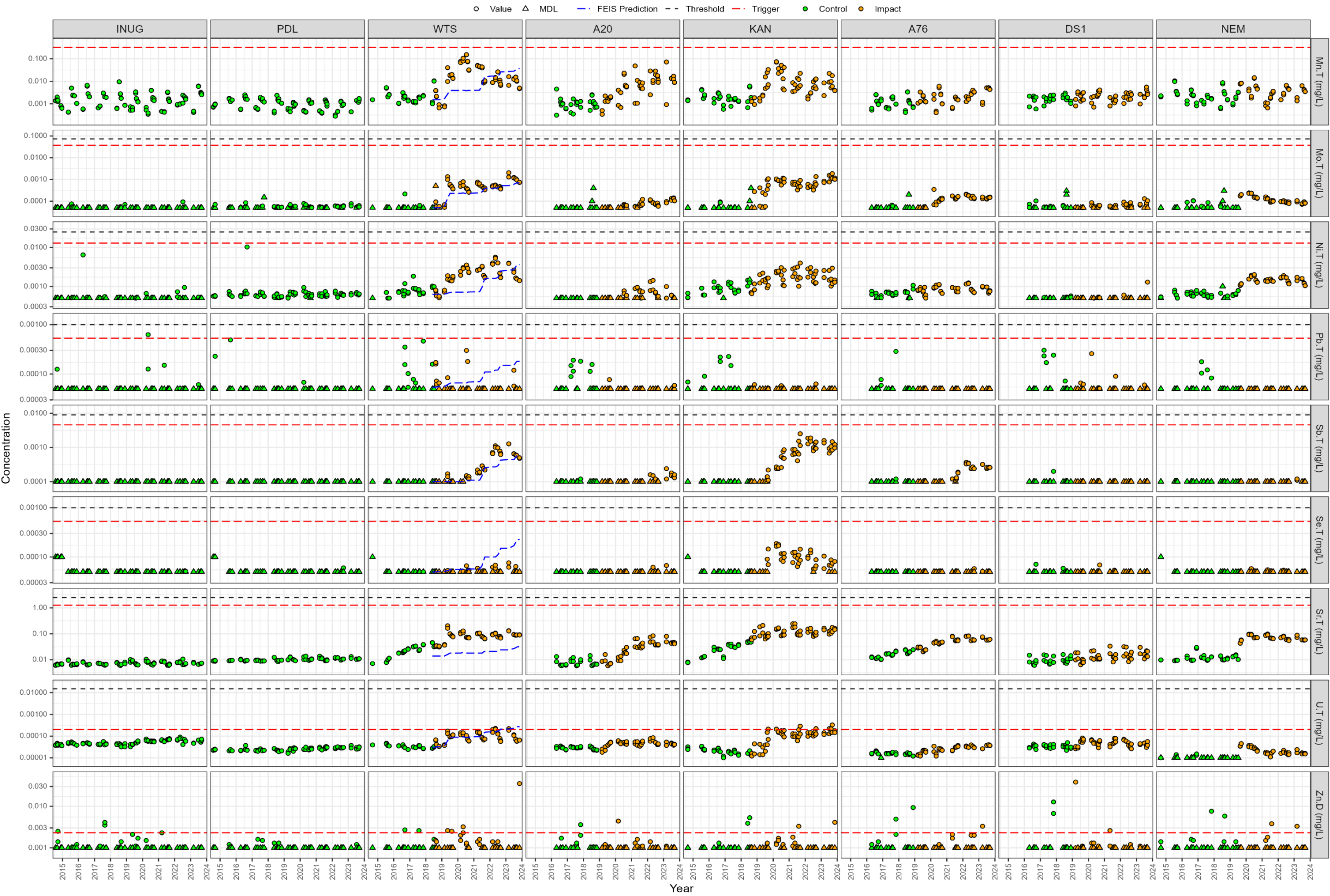


Figure 5-13. Metals measured in water samples from Whale Tail study area lakes since 2014.



Phytoplankton Tables and Figures

Table 5-11. Results of the BACI test for phytoplankton variables at Whale Tail study area lakes, 2023.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
Total Biomass	WTS	15	3	0.71	0.40	0.099	102	-14	375
	KAN	16	3	0.15	0.62	0.808	17	-69	334
	A20	14	3	1.23	0.61	0.062	243	-7	1157
	A76	14	3	-0.14	0.60	0.814	-13	-76	210
	DS1	14	3	-0.35	0.66	0.610	-29	-83	192
	NEM	21	3	0.17	0.50	0.734	19	-58	237
Taxa Richness	WTS	15	3	-0.06	0.12	0.627	-6	-26	21
	KAN	16	3	-0.20	0.22	0.357	-18	-48	28
	A20	14	3	0.13	0.22	0.558	14	-29	82
	A76	14	3	-0.29	0.20	0.163	-25	-51	14
	DS1	14	3	-0.11	0.17	0.518	-11	-38	29
	NEM	21	3	-0.20	0.14	0.180	-18	-39	11

Notes:

* **Bolded** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (INUG).

n(B) = number of months in the “before” period.

n(A) = number of months in the “after” period (i.e., in 2023).

Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., $100\% \times (\exp[\text{Estimate}] - 1)$).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

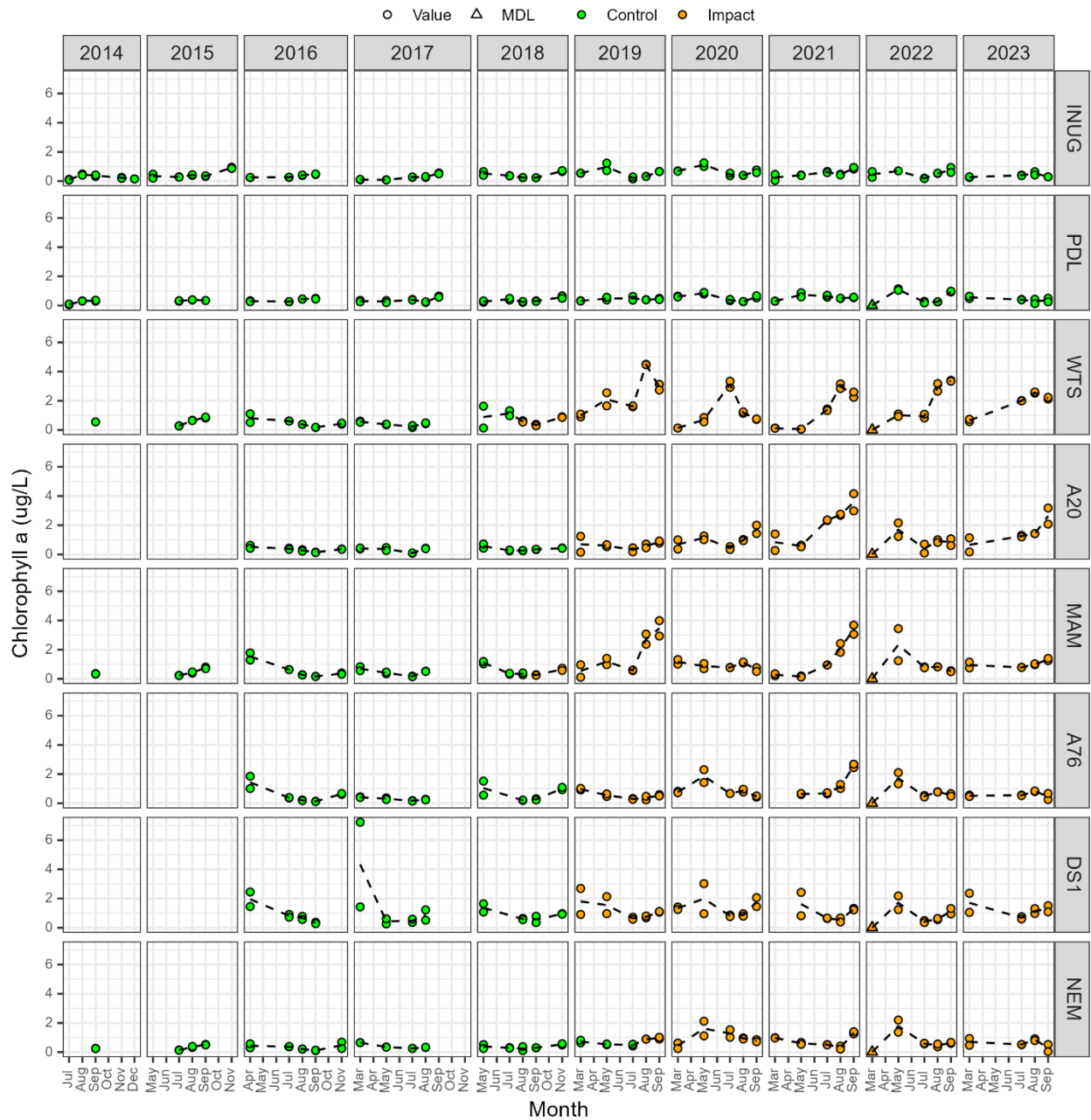
Figure 5-14. Chlorophyll-a ($\mu\text{g/L}$) in water samples from Whale Tail study area lakes since 2014.

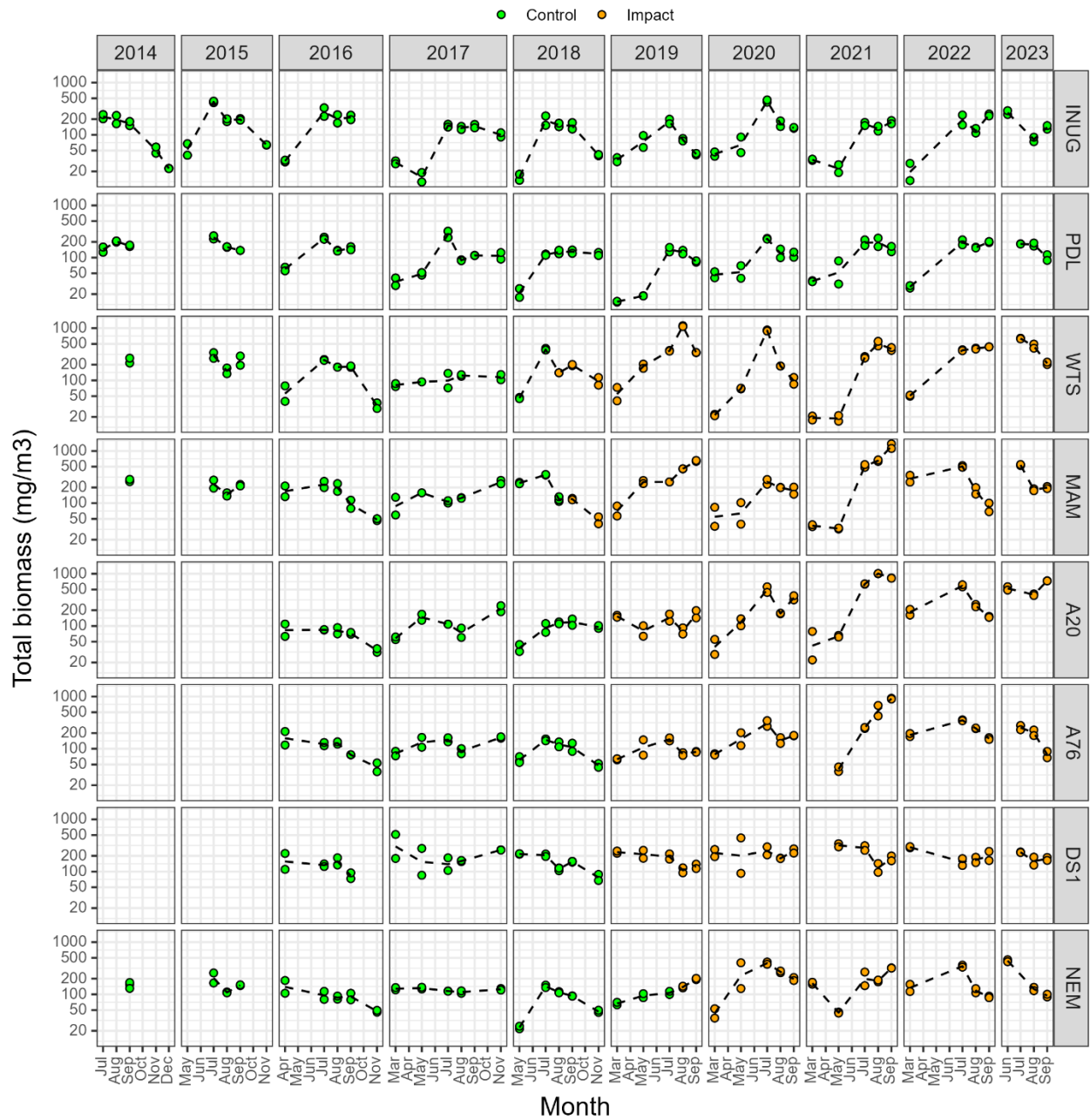
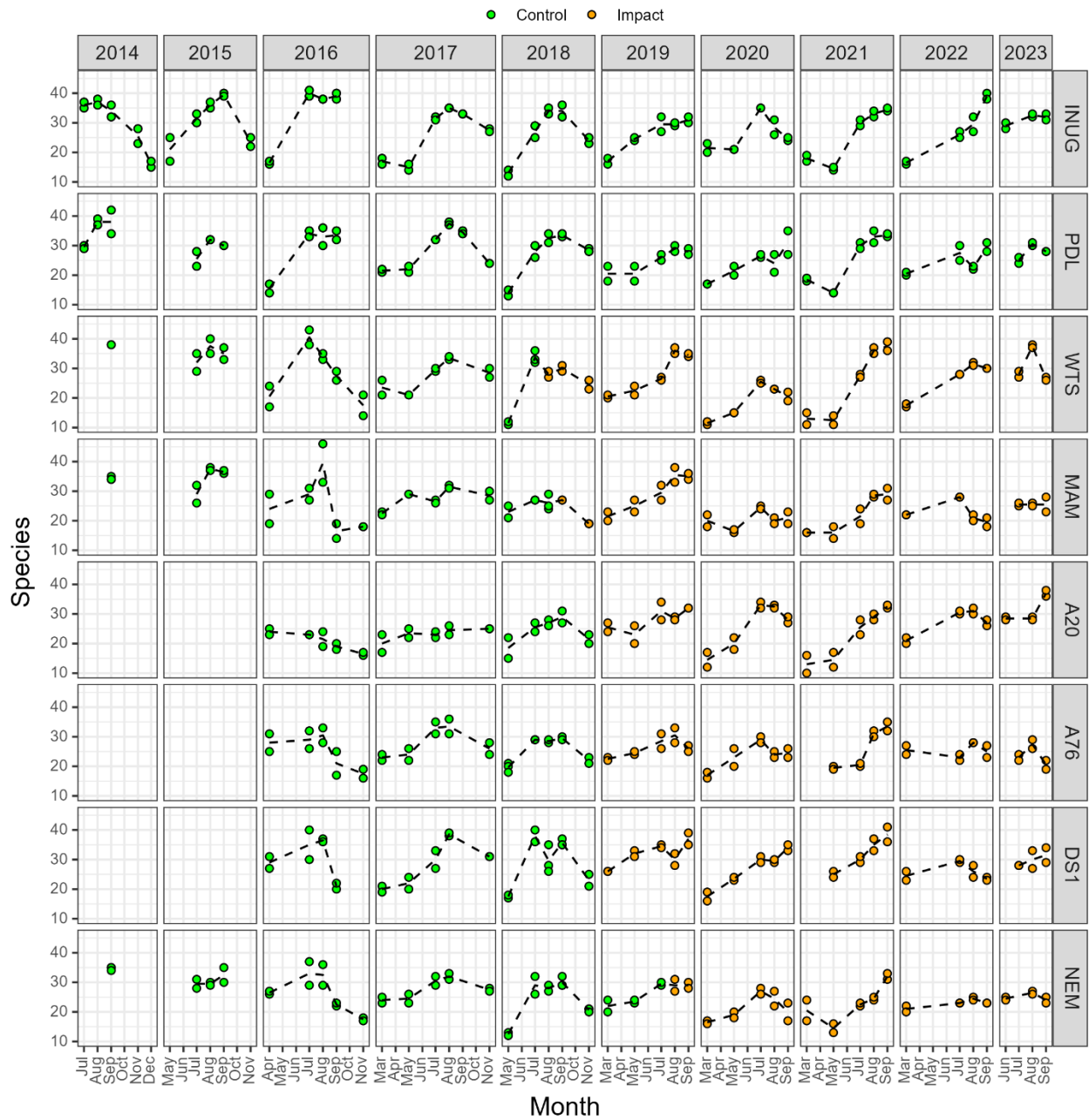
Figure 5-15. Total phytoplankton biomass (mg/m³) from Whale Tail study area lakes since 2014.

Figure 5-16. Phytoplankton biomass (mg/m³) by major taxa group from Whale Tail study area lakes since 2014.



Figure 5-18. Phytoplankton species richness from Whale Tail study area lakes since 2014.

Sediment Chemistry Tables and Figures

Table 5-12. Sediment core metals at the Whale Tail monitoring areas for which the 2023 mean concentration exceeded the trigger.

Parameter	Triggers						2023 Mean					
	WTS	MAM/KAN	A20	A76	DS1	NEM	WTS	MAM/KAN	A20	A76	DS1	NEM
							NF	NF	MF	MF	FF	NF
Aluminum							15090	21860	22410	17520	18490	10924
Arsenic	83	140	43	461	198	61	211	143	57	-	-	-
Cadmium	0.93	0.43	0.37	0.44	0.45	0.41	-	-	-	-	-	-
Chromium	81	194	53	103	80	130	106	201	58	-	-	-
Copper	49	77	42	76	26	43	-	-	45	-	-	-
Lead	24	26	25	26	26	22	-	-	-	-	-	-
Mercury	0.12	0.13	0.11	0.11	0.12	0.10	-	-	-	-	-	-
Zinc	196	139	103	112	101	89	-	-	-	-	-	-

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean values are all in units of mg/kg dw (mean of 10 replicate sediment core samples).

Table 5-13. Results of the before-after statistical analysis of sediment core chemistry data at the Whale Tail monitoring areas, 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value ¹	DF	Proportional change		
								exp(Est)	LCI	UCI
Arsenic	WTS	10	10	1.6	0.43	0.001	18	4.8	1.9	12.0
	MAM/KAN	10	10	0.29	0.18	0.061	18	1.3	0.92	1.9
	A20	10	10	0.55	0.31	0.044	18	1.7	0.91	3.3
Chromium	WTS	10	10	0.43	0.12	<0.001	18	1.5	1.2	2.0
	MAM/KAN	10	10	0.22	0.039	<0.001	18	1.2	1.1	1.4
	A20	10	10	0.24	0.054	<0.001	18	1.3	1.1	1.4
Copper	A20	10	10	0.22	0.065	0.002	18	1.2	1.1	1.4

Notes:

1. **Bolded** values are p-values < 0.05.

Test area in 2023 compared to the "before" period.

n(B) = number of paired months in the "before" period.

n(A) = number of paired months in the "after" period (i.e., in 2023).

Estimate = BA model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = one-tailed test of the null hypothesis of no change or a decrease in mean concentration.

Exp(Est.) = estimated proportional change in 2023 relative to the *before* period.

DF = degrees of freedom.

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Figure 5-19. TOC (%) in sediment from the Whale Tail study area lakes.

Note: In 2021, a batch of sediment samples were not analyzed due to a sample receipt error by the laboratory. Missing results in 2021 correspond to samples that were discarded prior to analysis.

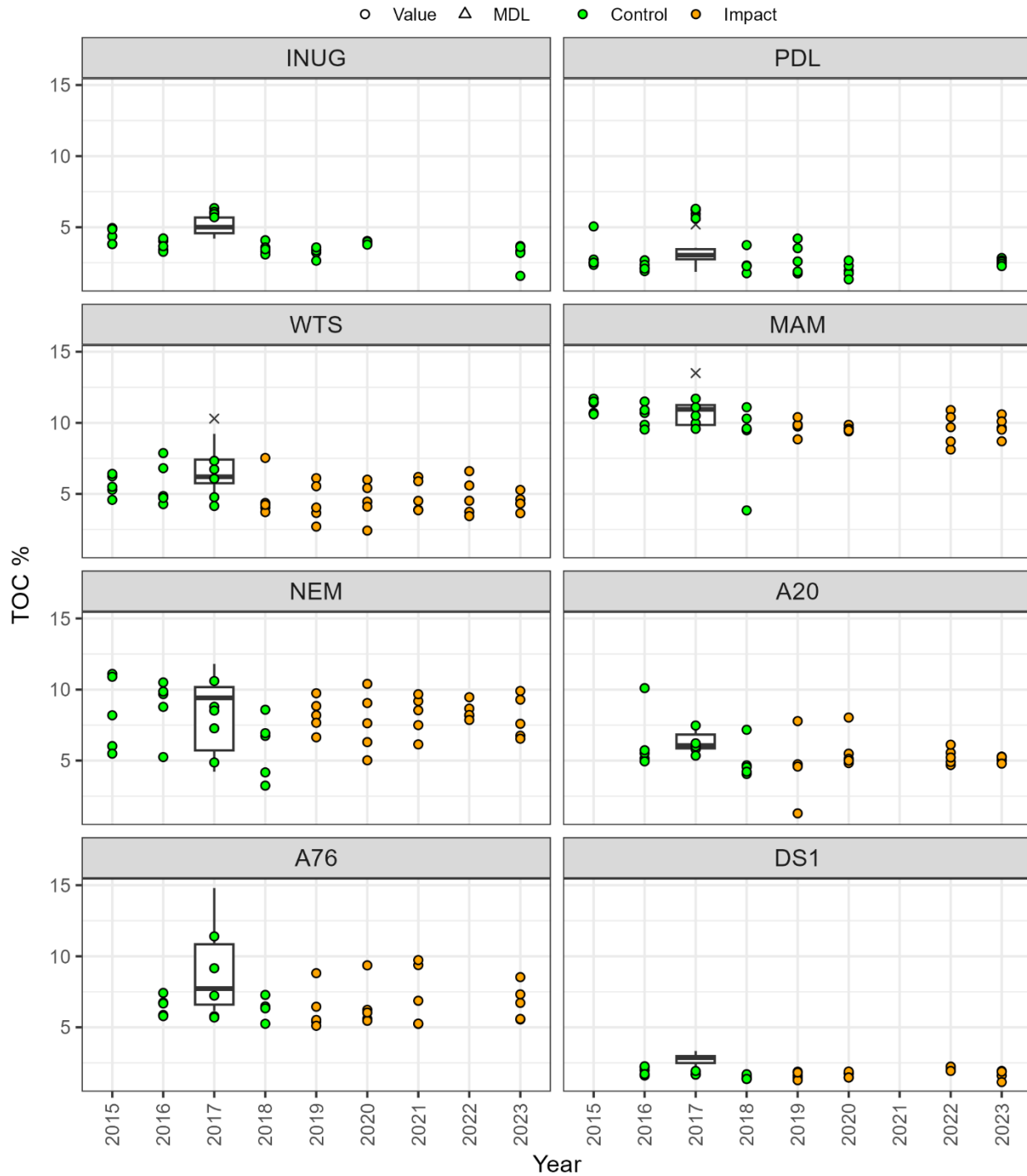


Figure 5-20. Grain size composition in sediment from the Whale Tail study area lakes since 2015.

Note: In 2021, a batch of sediment samples were not analyzed due to a sample receipt error by the laboratory. Missing results in 2021 correspond to samples that were discarded prior to analysis. In 2022, samples collected at INUG, PDL, and A76 had high water content so grain size composition could not be completed.

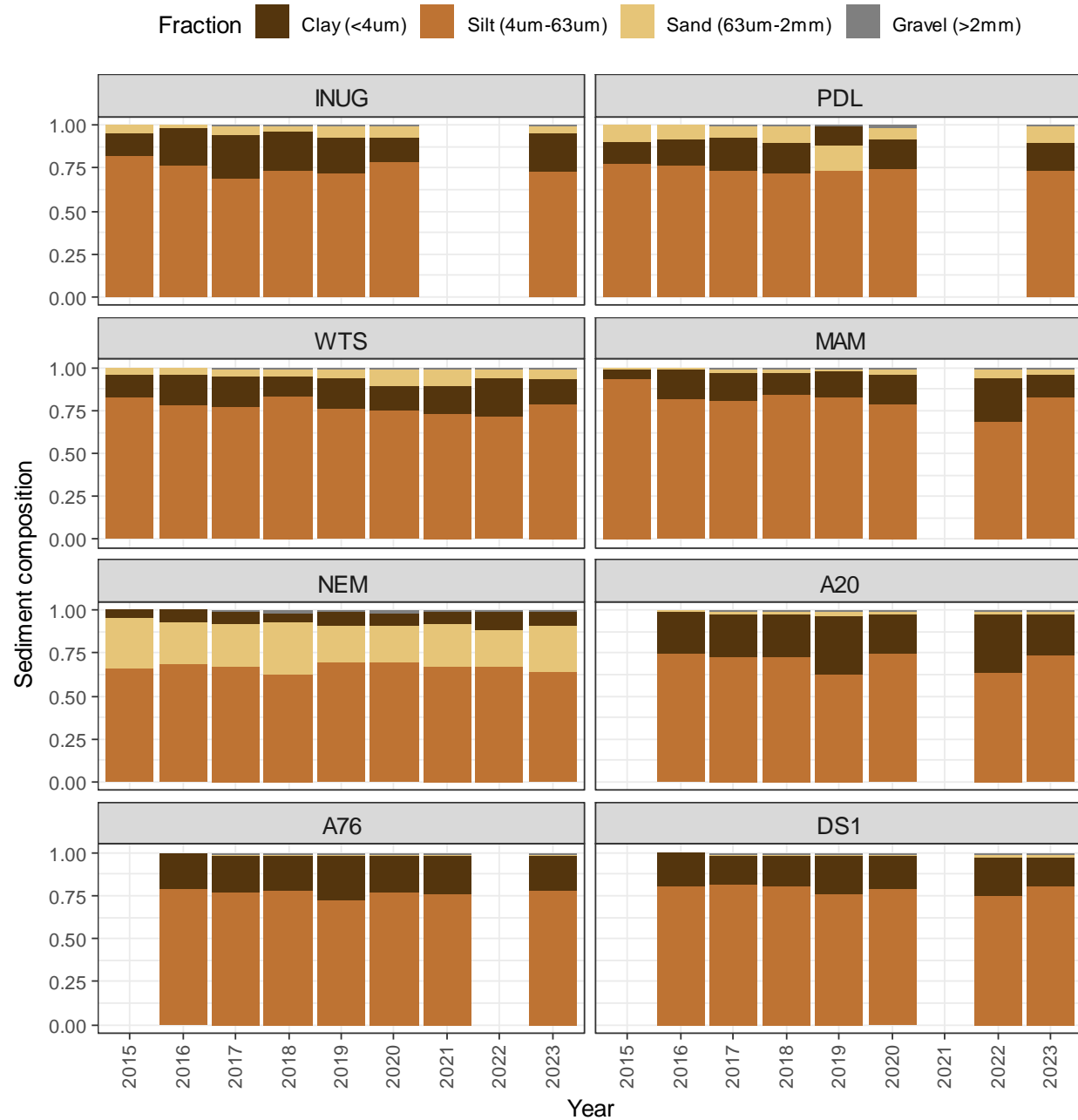


Figure 5-21. Aluminum (mg/kg dw) in sediment samples (grabs & cores) from Whale Tail study area lakes since 2015.

Note: Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

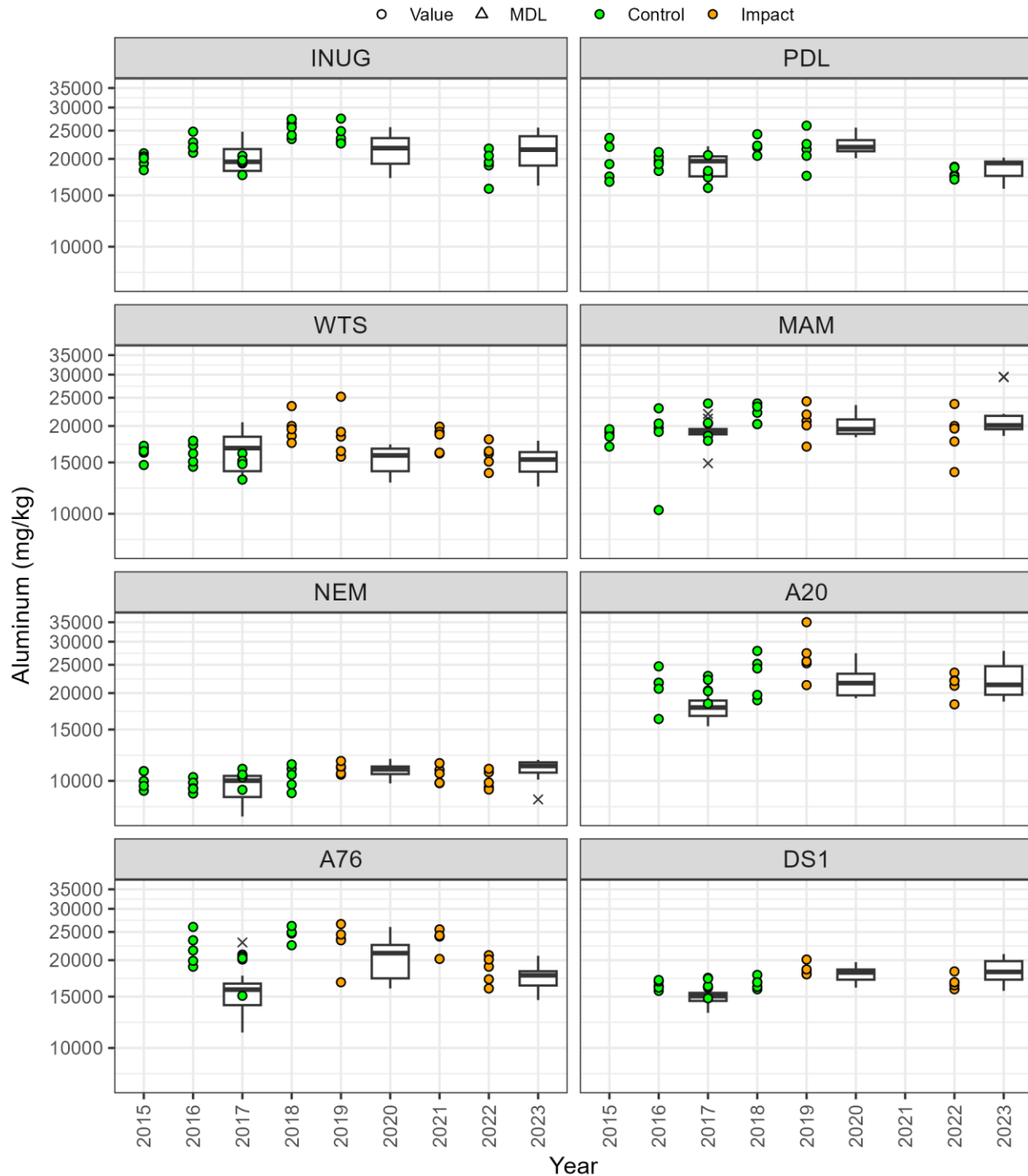


Figure 5-22. Arsenic (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

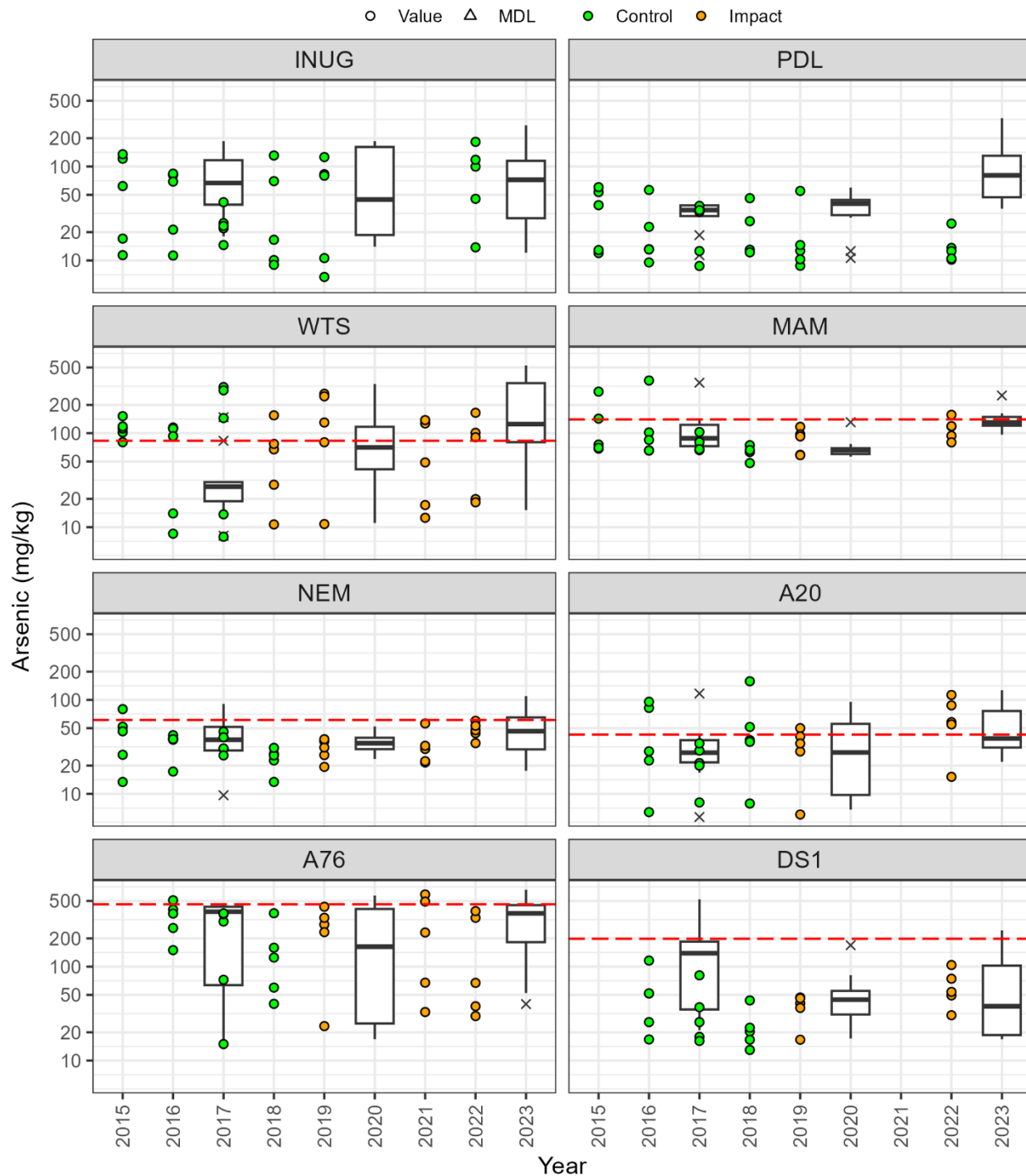


Figure 5-23. Cadmium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

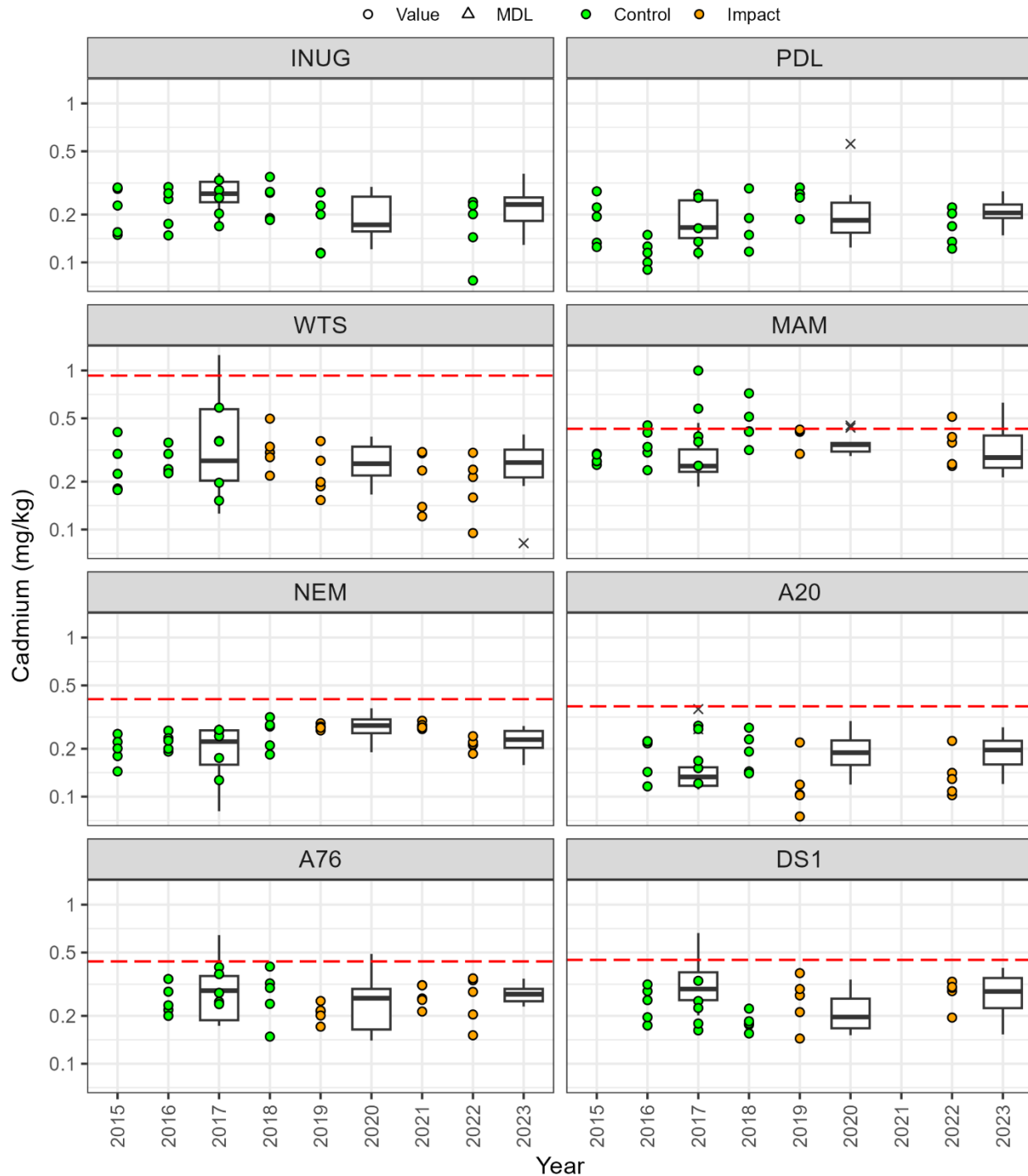


Figure 5-24. Chromium (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

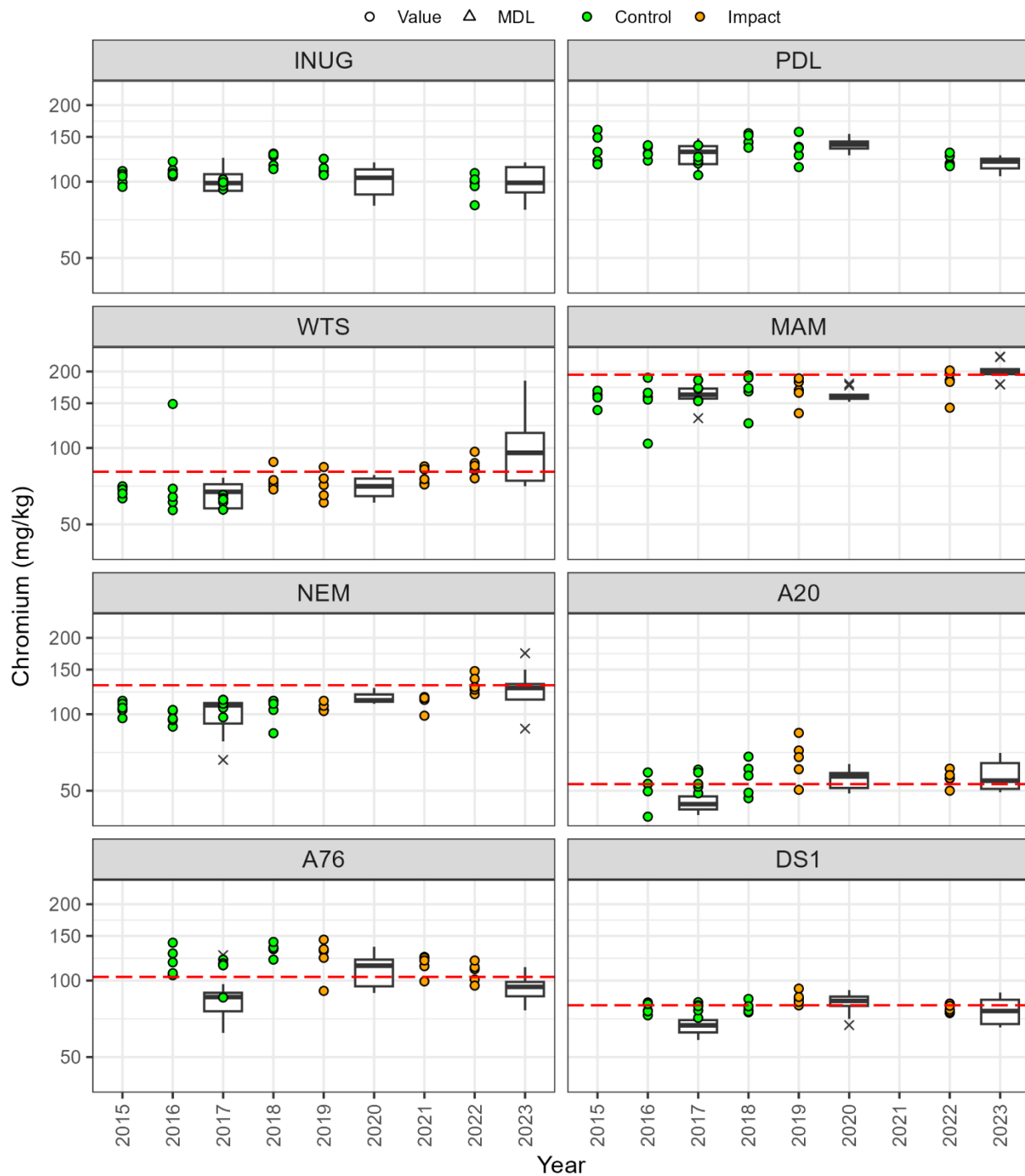


Figure 5-25. Copper (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

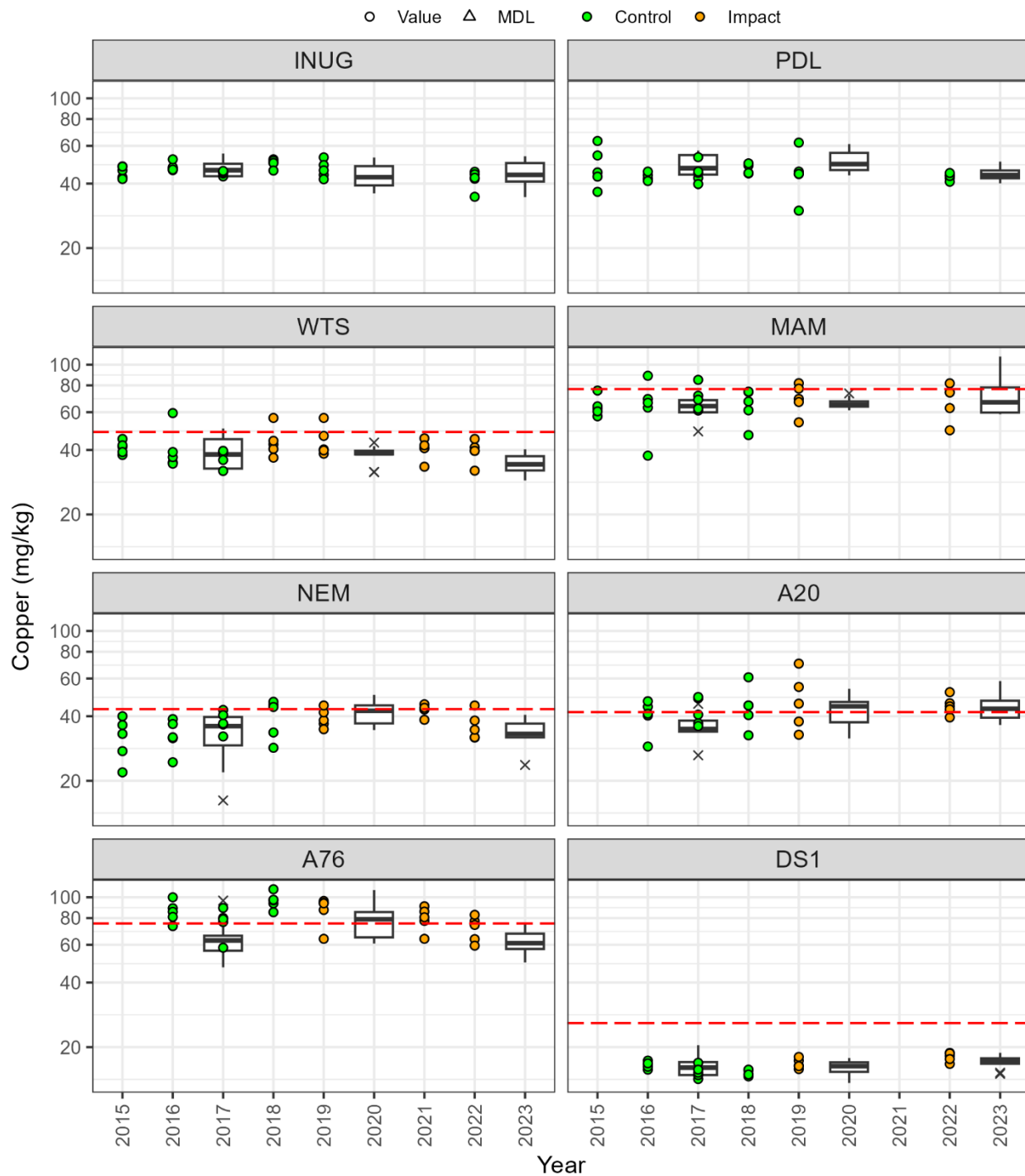


Figure 5-26. Lead (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

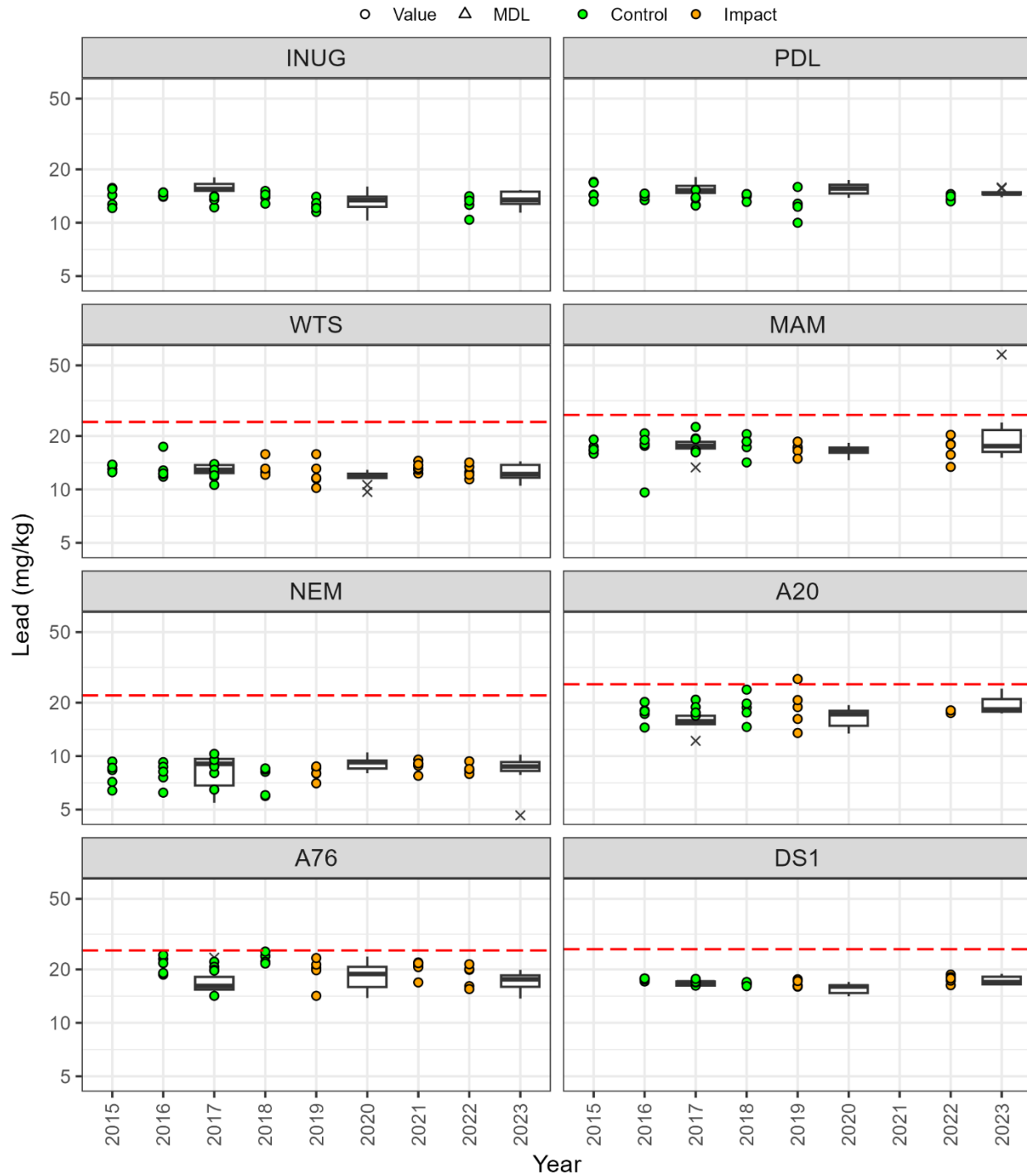


Figure 5-27. Mercury (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.

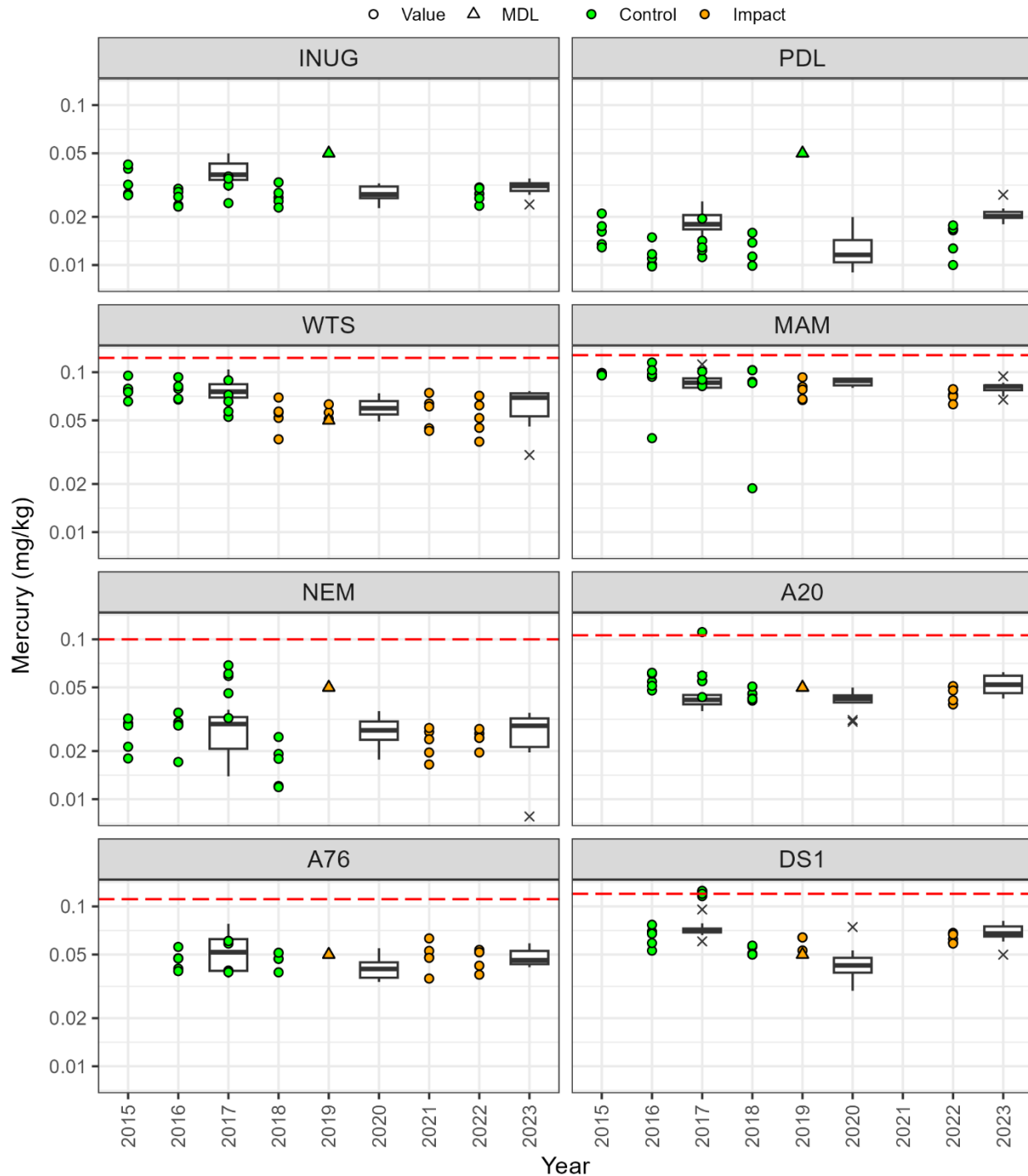
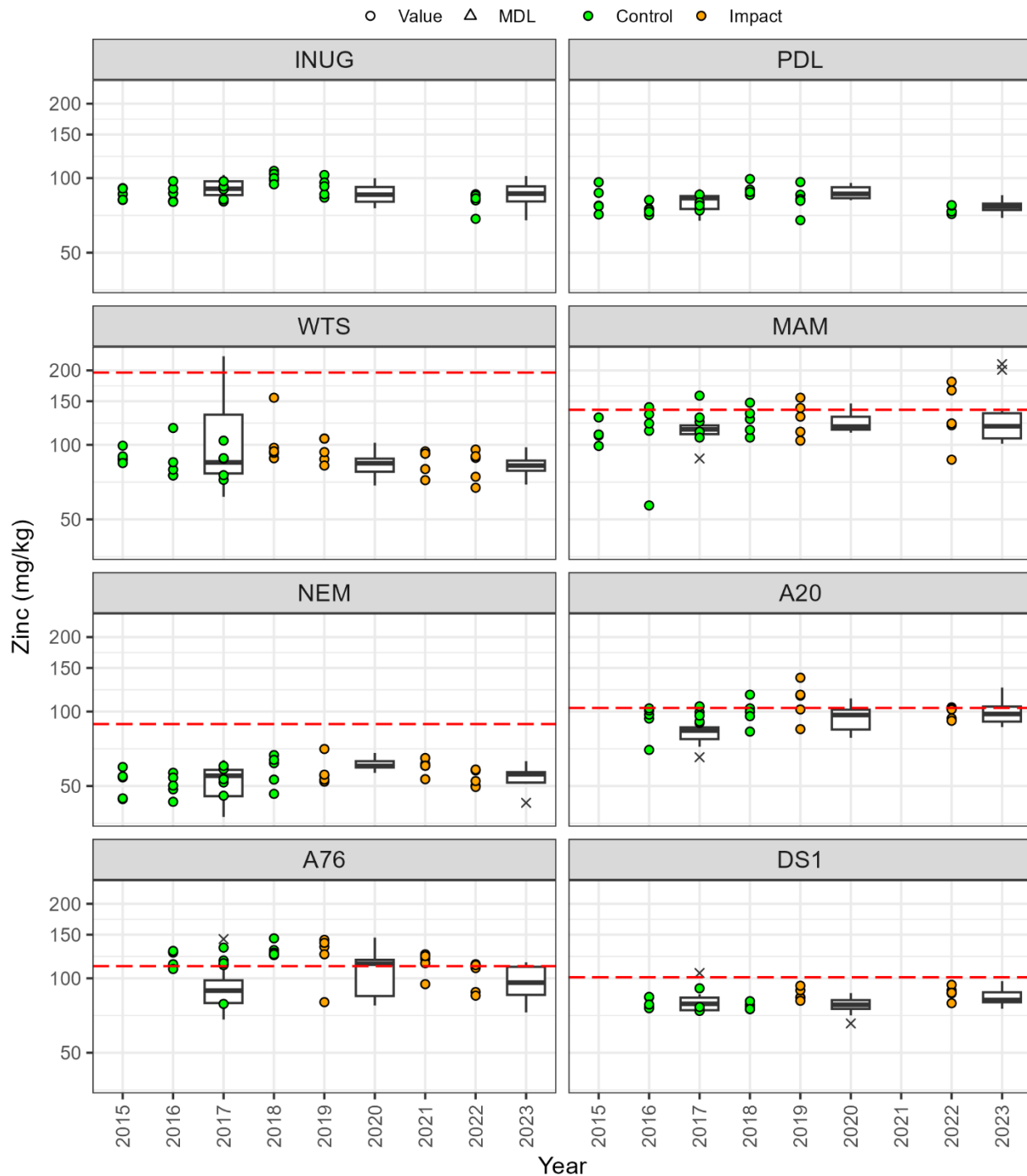


Figure 5-28. Zinc (mg/kg dw) in sediment samples (grab & cores) from Whale Tail study area lakes since 2015.

Note: The red dashed line represents the trigger value for the Whale Tail study area lakes. Cores samples = box and whisker. Box and whisker plots are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines extend to either the maximum and/or minimum concentrations or up to 1.5 times the interquartile range, with 'x's for any points outside that range.



Benthic Invertebrate Tables and Figures

Table 5-14. Geometric means for total abundance and total richness, Whale Tail study area lakes since 2015.

Geometric means for total abundance ¹										
Control/Impact	Test Area	2015	2016	2017	2018	2019	2020	2021	2022	2023
Control	INUG	1648 (5)	2100 (1)	1712 (3)	1497 (6)	1452 (7)	2055 (2)	1398 (8)	1070 (9)	1656 (4)
	PDL	1127 (2)	1373 (1)	748 (9)	779 (8)	990 (4)	951 (6)	829 (7)	963 (5)	1045 (3)
Impact	WTS	1675 (9)	2102 (7)	3546 (4)	4005 (3)	2757 (5)	2356 (6)	1911 (8)	5017 (2)	5047 (1)
	MAM/KAN	3964 (6)	3050 (9)	4236 (5)	3444 (8)	7235 (3)	6133 (4)	3878 (7)	13066 (1)	9285 (2)
	A20	NA	2562 (6)	4246 (2)	2793 (4)	2546 (7)	2662 (5)	2146 (8)	3353 (3)	4274 (1)
	A76	NA	2525 (7)	6312 (2)	3094 (4)	2823 (5)	2794 (6)	2269 (8)	12072 (1)	3192 (3)
	DS1	NA	3090 (2)	1919 (7)	2564 (5)	2205 (6)	2619 (4)	3095 (1)	2969 (3)	1822 (8)
	NEM	2897 (5)	2744 (5)	1712 (8)	2708 (6)	5278 (1)	3945 (3)	2374 (7)	4619 (2)	5087 (2)

Geometric means for total richness										
Control/Impact	Test Area	2015	2016	2017	2018	2019	2020	2021	2022	2023
Control	INUG	13 (7)	16 (2)	14 (4)	15 (3)	14 (5)	17 (1)	13 (6)	13 (8)	12 (9)
	PDL	9 (3)	11 (1)	10 (2)	6 (9)	9 (6)	8 (7)	7 (8)	9 (4)	9 (5)
Impact	WTS	15 (5)	15 (4)	15 (7)	18 (1)	13 (8)	15 (6)	11 (9)	15 (3)	17 (2)
	MAM/KAN	13 (9)	14 (8)	15 (5)	15 (7)	15 (6)	19 (1)	17 (4)	18 (3)	19 (2)
	A20	NA	14 (7)	13 (8)	15 (5)	15 (6)	18 (1)	17 (2)	16 (4)	16 (3)
	A76	NA	16 (4)	17 (2)	15 (7)	15 (6)	17 (3)	15 (5)	18 (1)	14 (8)
	DS1	NA	12 (6)	15 (2)	14 (4)	14 (5)	10 (8)	11 (7)	16 (1)	15 (3)
	NEM	12 (7)	12 (5)	10 (9)	10 (8)	12 (6)	13 (4)	14 (2)	13 (3)	15 (1)

Notes:1. Total abundance in organisms/m².

Rank order of abundance and richness shown in parentheses.

Red vertical lines mark the year that area designations switched from *control* to *impact*.

NA = Benthic invertebrate sampling was not completed for the given area/year.

Table 5-15. Results of the BACI tests for benthic invertebrate abundance from Whale Tail study area lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect Size (%)		
							ES	LCI	UCI
2023	WTS	3	1	0.87	0.47	0.21	138	-68	1690
	MAM/KAN	4	1	0.98	0.33	<u>0.06</u>	166	-7	654
	A20	3	1	0.37	0.37	0.42	45	-70	609
	A76	3	1	-0.08	0.59	0.90	-8	-93	1064
	DS1	3	1	-0.25	0.30	0.49	-22	-78	180
	NEM	4	1	0.77	0.31	<u>0.09</u>	115	-20	482
2022-23	WTS	3	2	1.08	0.34	<u>0.05</u>	195	-1	781
	MAM/KAN	4	2	1.37	0.25	<u>0.01</u>	292	96	683
	A20	3	2	0.47	0.28	0.19	60	-34	284
	A76	3	2	0.80	0.65	0.30	123	-71	1641
	DS1	3	2	0.21	0.33	0.56	24	-57	252
	NEM	4	2	0.94	0.23	<u>0.02</u>	155	33	389
2021-23	WTS	3	3	0.74	0.42	0.15	110	-34	572
	MAM/KAN	4	3	1.00	0.34	<u>0.03</u>	172	13	557
	A20	3	3	0.26	0.30	0.43	30	-43	196
	A76	3	3	0.45	0.60	0.50	57	-71	736
	DS1	3	3	0.29	0.27	0.35	34	-37	185
	NEM	4	3	0.68	0.28	<u>0.06</u>	98	-4	308
2020-23	WTS	3	4	0.53	0.39	0.24	70	-38	367
	MAM/KAN	4	4	0.84	0.31	<u>0.04</u>	131	7	398
	A20	3	4	0.12	0.29	0.70	12	-46	134
	A76	3	4	0.23	0.54	0.69	26	-68	400
	DS1	3	4	0.19	0.26	0.49	21	-38	136
	NEM	4	4	0.59	0.26	<u>0.06</u>	80	-4	237

Notes:* **Bolded & underlined** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (INUG).

n(B) = number of years in the “before” period.

n(A) = number of years in the “after” period.

Estimate = BACI model estimate of the after-period change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., $100\% * (\exp[\text{Estimate}] - 1)$).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Table 5-16. Results of the BACI tests for benthic invertebrate taxa richness from Whale Tail study area lakes.

After Period	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect Size (%)		
							ES	LCI	UCI
2023	WTS	3	1	0.30	0.14	0.16	34	-25	140
	MAM/KAN	4	1	0.44	0.13	<u>0.04</u>	56	4	132
	A20	3	1	0.31	0.13	0.14	36	-23	141
	A76	3	1	0.10	0.15	0.59	10	-43	113
	DS1	3	1	0.31	0.17	0.21	36	-34	180
	NEM	4	1	0.46	0.13	<u>0.04</u>	59	6	138
2022-23	WTS	3	2	0.23	0.10	0.11	26	-10	75
	MAM/KAN	4	2	0.41	0.09	<u>0.01</u>	51	16	96
	A20	3	2	0.29	0.11	<u>0.07</u>	34	-5	89
	A76	3	2	0.20	0.12	0.20	22	-17	79
	DS1	3	2	0.33	0.11	<u>0.06</u>	39	-3	98
	NEM	4	2	0.41	0.09	<u>0.01</u>	50	16	94
2021-23	WTS	3	3	0.09	0.14	0.57	9	-26	60
	MAM/KAN	4	3	0.36	0.08	<u>0.01</u>	43	16	77
	A20	3	3	0.29	0.10	<u>0.04</u>	34	2	75
	A76	3	3	0.14	0.11	0.27	15	-15	57
	DS1	3	3	0.18	0.15	0.32	19	-22	82
	NEM	4	3	0.38	0.08	<u>0.01</u>	46	17	81
2020-23	WTS	3	4	0.03	0.14	0.87	3	-29	48
	MAM/KAN	4	4	0.30	0.09	<u>0.01</u>	36	10	67
	A20	3	4	0.26	0.09	<u>0.03</u>	29	4	62
	A76	3	4	0.09	0.11	0.42	10	-16	44
	DS1	3	4	0.02	0.18	0.93	2	-37	64
	NEM	4	4	0.28	0.10	<u>0.04</u>	32	3	71

Notes:* **Bolded & underlined** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (INUG).

n(B) = number of years in the “before” period.

n(A) = number of years in the “after” period.

Estimate = BACI model estimate of the after-period change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., $100\% * (\exp[\text{Estimate}] - 1)$).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Figure 5-29. Benthic invertebrate total abundance ($\#/m^2$) from Whale Tail study area lakes since 2015.

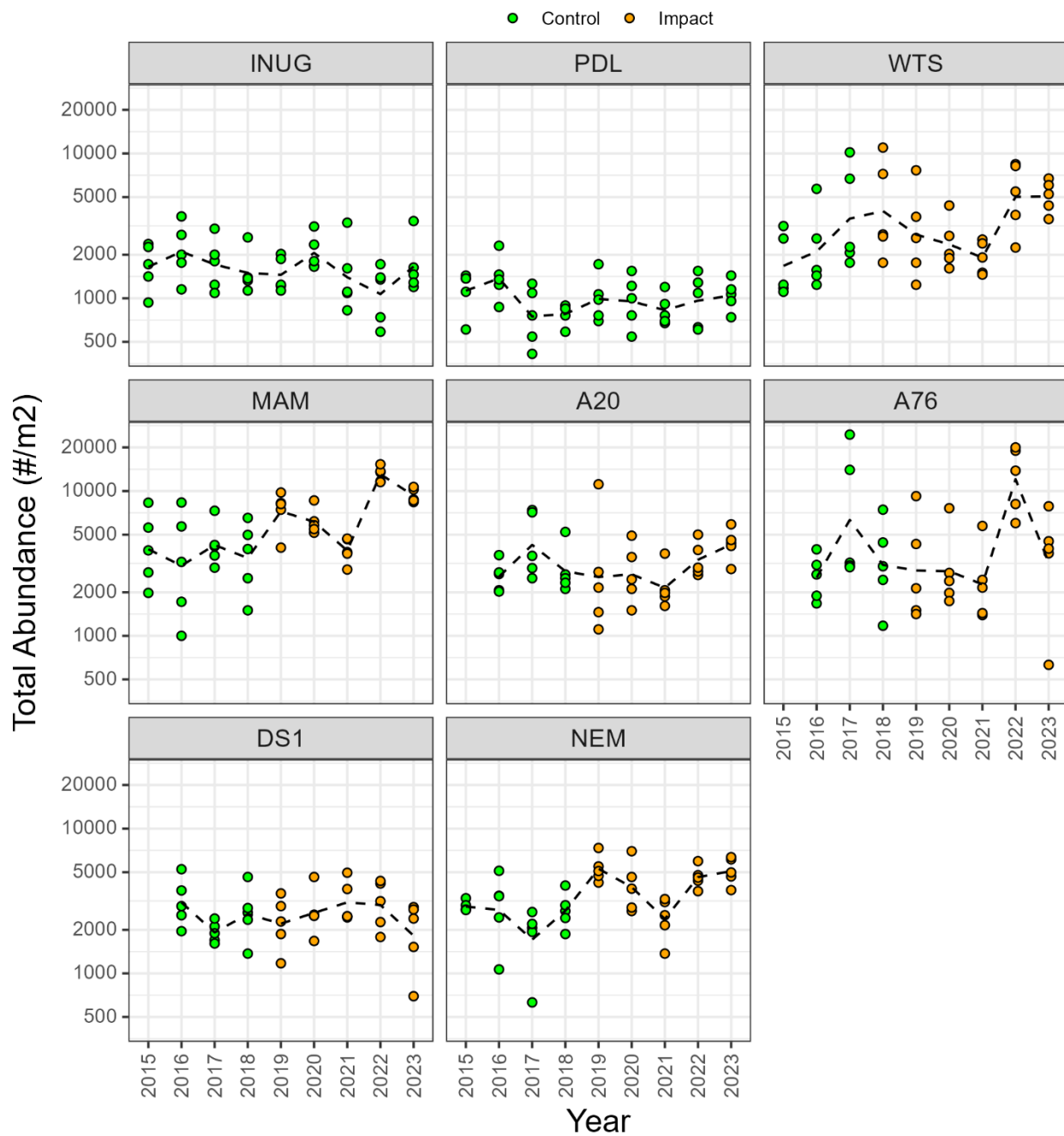


Figure 5-30. Benthic invertebrate abundance (#/m²) by major taxa group from Whale Tail study area lakes since 2015.



Figure 5-31. Benthic invertebrate relative abundance by major taxa from Whale Tail study area lakes since 2015.

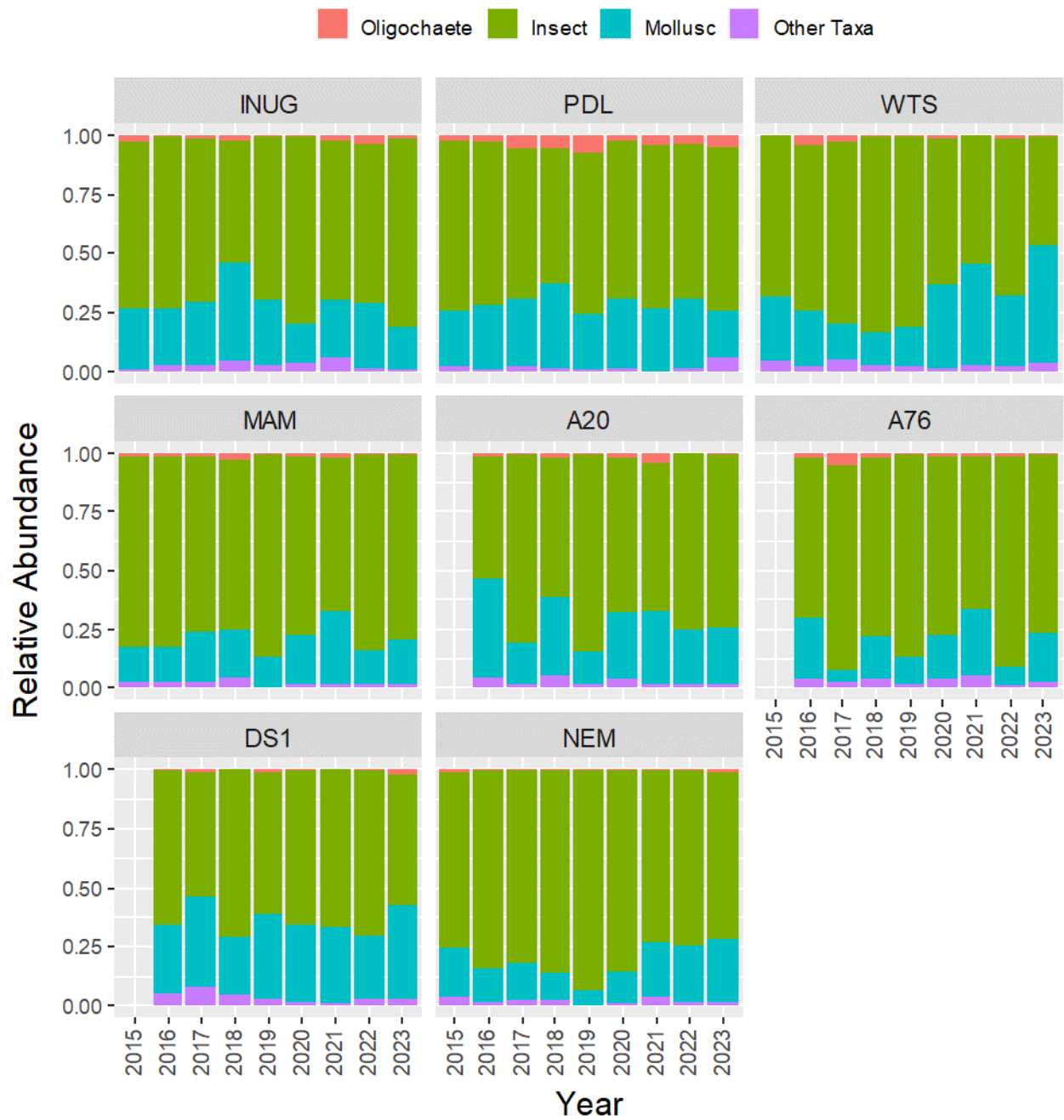


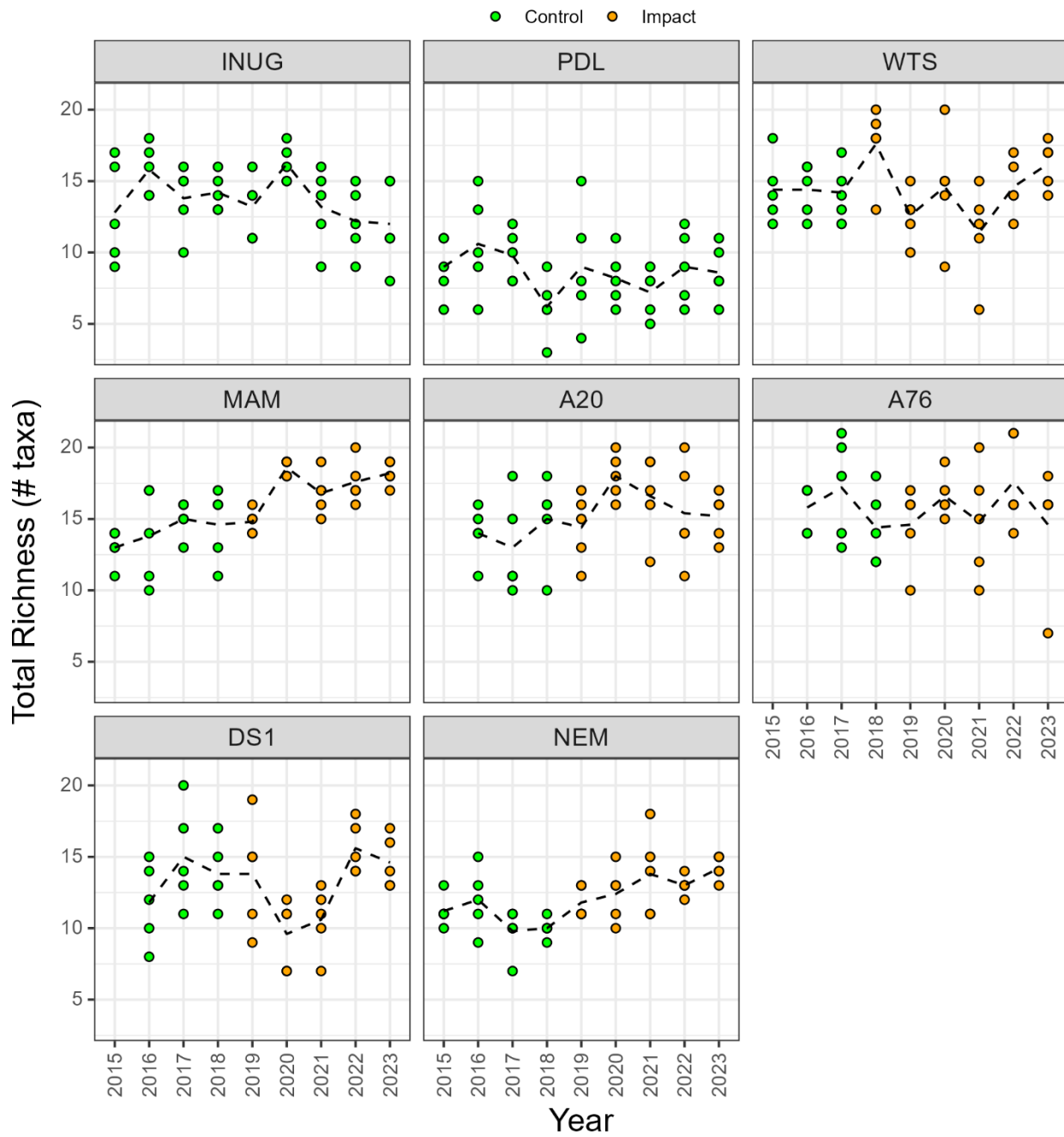
Figure 5-32. Benthic invertebrate total richness (# taxa) from Whale Tail study area lakes since 2015.

Figure 5-33. Benthic invertebrate richness (# taxa) by major taxa group from Whale Tail study area lakes since 2015.

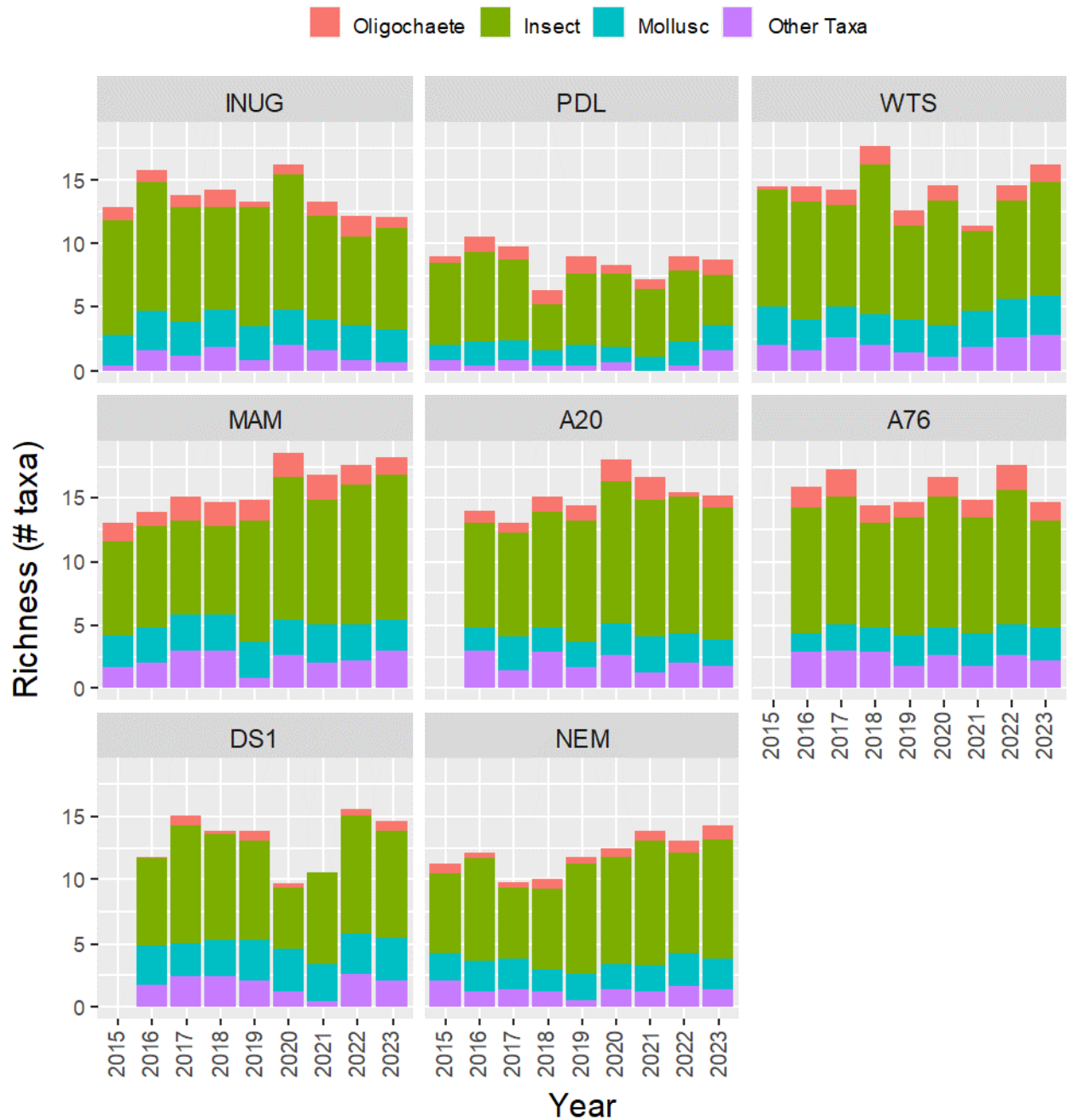
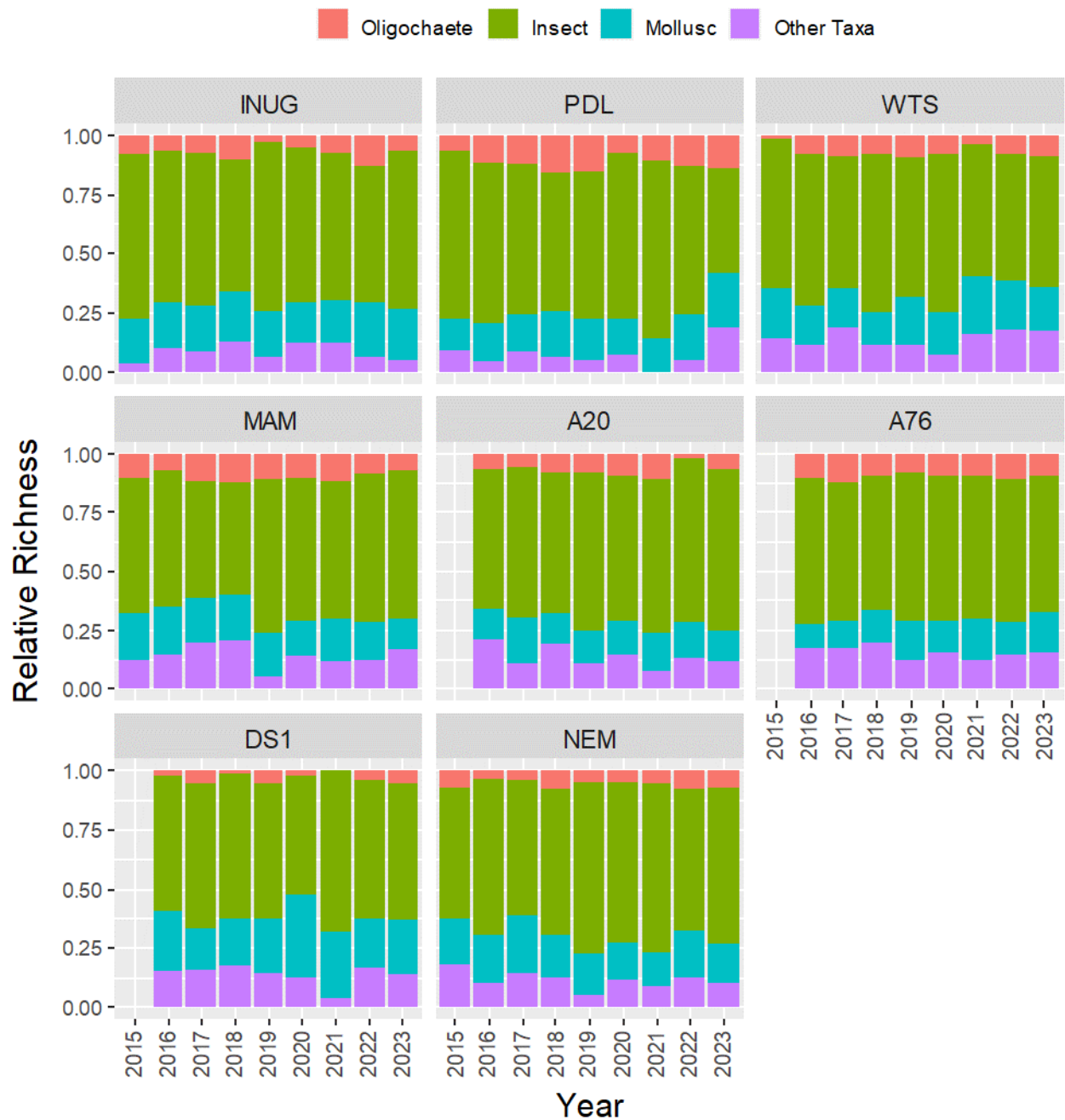


Figure 5-34. Benthic invertebrate relative richness by major taxa from Whale Tail study area lakes since 2015.



6 BAKER LAKE

6.1 Overview of the Baker Lake CREMP

This section summarizes the 2023 CREMP results for water chemistry and the phytoplankton community in Baker Lake. 2023 was a year in which sediment chemistry and benthos sampling was completed as per the *CREMP Plan Update* (Azimuth, 2022b). These results are also reported on below.

Baker Lake monitoring was added to the core program in 2008 to ensure activities related primarily to barge traffic and shipping in the area were tracked (**Table 1-1**). There are two near-field impact areas, one targeting the hamlet's barge landing area (BBD) and the other Agnico Eagle's fuel storage facility (BPJ). The initial (since 2008) reference area (BAP) is several kilometers to the east of the hamlet along the north shore of the lake. A second reference area (BES) was added in 2011 to provide a broader perspective for temporal patterns in sediment chemistry and benthic community structure (it is not monitored for water quality or phytoplankton community). Sampling locations are shown in **Figure 6-1**.

Barge trips from Chesterfield Inlet to Baker Lake in 2023 numbered 35 for general cargo and 32 for fuel (**Figure 6-2**). With the expansion at the Whale Tail mine, traffic increased in 2018 and 2019 compared to previous years (e.g., from < 40 in 2016 and 2017 to ~ 55 in 2018). Trips were down in 2020 due to COVID 19, but increased sharply in 2021 and remained similar through 2023.

Since monitoring began in 2008, there has been no evidence of impacts to water, sediment, phytoplankton, or benthic communities attributed to barge traffic or other Agnico activities in Baker Lake. As such, sediment chemistry and benthos sampling has been reduced to occur on a three-year cycle, which coincides with the EEM program. Sediment chemistry and benthos sampling took place in 2023 and the next event is planned for 2026.

6.2 Limnology

6.2.1 General Observations

Baker Lake is large with much greater wind fetch than the Meadowbank or Whale Tail study area lakes and has a unique set of limnological characteristics. Factors that contribute to the unique limnology include the lake's proximity to the tidally-influenced Chesterfield Inlet, the influence of the Thelon River, and deep water that is naturally elevated in dissolved solids. These natural complexities interact, leading to the *competing* influences of Thelon River water, which is less-saline and Baker Lake water, which is more-saline. Freshet on the Thelon River coupled with shifts in north/south wind speed and direction lead to variable degrees of horizontal and vertical mixing of the water column. When sampling near the north shore, these factors may combine to confound the detection of potential subtle changes in water

quality related to barge activity, with the *signal* getting lost in the *noise* of natural variability in this dynamic location.

Parameters associated with more-saline or higher conductivity water that appears to be present in deep water (>10–15 m) and which demonstrate considerable fluctuations within and between years include conductivity, hardness, calcium, chloride, magnesium, sodium, and TDS. Other parameters that have a high level of natural variability and appear to be correlated with these deep-water parameters in Baker Lake include ammonia, nitrate, TKN, total phosphorus, and sulphate. A deep limnology survey was conducted in August 2012 to explore this situation specifically. While it provided a single *snapshot* of this dynamic limnological process, all parameters measured (temperature, conductivity, dissolved oxygen, pH, total dissolved solids, and salinity) showed a strong and abrupt stratification from 8–12 m depth at areas BBD 1 and 2, and BPJ. For example, conductivity increased from <20 $\mu\text{S}/\text{cm}$ in shallow, near-shore water, to >200 $\mu\text{S}/\text{cm}$ between 8 and 12 m, depending on location. Conductivity remained uniformly high to the maximum depth sampled (40 m). The implication of this is that results for any event will reflect the relative influence of the deeper, brackish Baker Lake water and the less-saline Thelon River water on the day of the event.

6.2.2 Temporal and Spatial Trends

In addition to the Thelon-Baker influence, several other factors have potential to affect the limnology. Seasonal barge traffic is the major mine-related activity in the area, occurring during the summer months when Baker Lake is ice-free. The hamlet of Baker Lake's sewage lagoons and landfill are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ. And locally, propeller wash may cause vertical mixing in very discrete areas when there is active traffic. Otherwise, except for spills and occasional discharge from commercial vessels etc., no other activities have the potential for altering limnological parameters.

Limnological conditions at Baker Lake are similar to the Meadowbank study area lakes, except that water temperatures are cooler, typically reaching no more than 10°C in mid-summer. Mean temperatures at all locations ranged between 4.4 and 14.2°C (**Figure 6-3**).

In 2023, summer stratification is visible to varying degrees in August at each of the Baker Lake sampling areas. The August profile from BBD demonstrated the strongest thermal and saline stratification patterns due to its proximity to the Thelon River, similar to previous years. Warmer freshwater transitioned to colder saline water over a thermocline at approximately 6 m. This pattern progressively diminishes moving away from the river mouth at BPJ and BAP (**Figure 6-4**).

Although vertical stratification was absent from the July profiles, the relative influence of low salinity Thelon River water and Baker Lake deep water can be observed throughout the open-water season

(Figure 6-4). In September, the Thelon River influence is mostly isolated to BBD, with less stratification at BPJ and no stratification at BAP (furthest east from the Thelon River outflow).

6.3 Water Chemistry

6.3.1 Key Findings from the 2023 Water Chemistry Monitoring Program

- In 2023, there were trigger exceedances for total phosphorus, TOC, DOC, and pH (field measured) exceeded trigger values in at least one sample at Baker Lake sampling areas. Total phosphorus, only marginally exceeded the trigger during one sampling event in September at BPJ. Mean annual DOC exceeded the trigger values at both impact areas (BBD, BPJ) and reference (BAP) in 2023. For all other parameters, mean annual concentrations were below the triggers at Baker Lake.
- In 2023, for the first year since 2009, mean annual pH (field measured) fell below the lower trigger value (6.55) at reference location BAP.
- There was no statistically significant change in DOC concentrations compared to baseline/reference. This was expected since DOC concentrations at reference have increased in parallel to the exposure locations since 2008.

6.3.2 General Observations

As discussed in Section 6.2, Baker Lake is large and exposed to high winds and wind-generated currents. Adding to the complexity, monitoring areas along the north shore are exposed to two different water masses: the less-saline Thelon River, which discharges into Baker Lake at its western end, and the saline-influenced deeper water in Baker Lake. Depending on wind speed and direction, water from these two sources (e.g., individually or mixed) can strongly influence some surface water chemistry parameters (conductivity, salts, and dissolved solids). Consequently, certain parameters can display pronounced spatial (horizontal and vertical) and temporal variability. This variability is evident mainly in the *conventional* parameters (described above); in contrast, concentrations of metals in the Baker Lake samples are typically below laboratory MDLs.

On June 3rd 2023, a turbid water runoff release occurred from the Marshalling Facilities that reached the shore of Baker Lake. Silt fences and wood-chip booms, were utilized to intercept flows, while maritime curtains were used to contain the TSS plume in the receiving environment.

6.3.3 Temporal and Spatial Trends

CREMP monitoring results since 2008 were used to assess temporal and spatial trends related to mining activities (Table 1-1). The general rationale for assessing these trends discussed in Section 1.5 was tailored slightly for the water chemistry assessment in Baker Lake, as described below.

Baker Lake water chemistry results for 2023, screened against site-specific triggers and effects-based thresholds, are tabulated in [Appendix B3](#). Most water quality parameters in Baker Lake, across all years, are routinely below laboratory MDLs, similar to the results for the Meadowbank study lakes. Data screening at Baker Lake followed the same methodology as Meadowbank and Whale Tail ([Section 2.3.1](#)) except that matching patterns in mining activity was not conducted as it is not relevant to this study area.

The results for all parameters that were screened into the assessment process are summarized in [Table 6-1](#) and plotted in [Figure 6-5](#) through [Figure 6-9](#). The red dashed line in each of these figures is the trigger value specific to Baker Lake for that parameter³⁴. All parameters not retained for the trend assessment were assumed to have no spatial or temporal trends related to barge activities or to natural variability and were excluded from further consideration (for completeness and transparency, plots for these parameters are included in [Appendix B3](#)).

During the three sampling events in 2023 (July, August, September) total phosphorus, TOC, DOC, and pH (field measured) exceeded trigger values in at least one sample. However, total phosphorus only marginally exceeded the trigger during one sampling event in September at BPJ with the paired sample showing no trigger exceedance. Mean annual DOC concentrations exceeded their respective trigger values at both impact areas (BBD, BPJ) and reference (BAP) in 2023 ([Figure 6-7](#)). For the first year since 2009, mean annual pH (field measured) fell below the lower trigger value (6.55) at reference location BAP. For all other parameters, mean annual concentrations were below the triggers at Baker Lake. The BACI analysis showed that increases in DOC were not significantly different from reference area BAP. This is expected since DOC concentrations at reference have increased in parallel to the exposure locations since 2008 ([Table 6-3](#)).

Across all three areas (BBD, BPJ, BAP), similar temporal trends occurred for the carbon parameters (TOC/DOC) in 2023. TOC concentrations at each sampling area peaked at a similar concentration (~4.75 mg/L) in August with DOC at each location also peaking in August. Since 2008, annual patterns in TOC/DOC concentrations have been notably similar between reference and exposure locations. The common patterns suggest that the carbon parameters are being influenced by regional environmental factors. If local anthropogenic activities were impacting TOC/DOC a distinct signature would be expected at impact areas (BBD, BPJ) compared to the reference area BAP.

Mean annual TOC/DOC concentrations have increased at all three Baker Lake sampling areas since 2018 and more broadly since sampling began in 2008. There are indications that longer term increasing trends are occurring. Similar patterns also exist between Baker Lake and the Meadowbank study area lakes ([Figure 4-9](#)). In 2012, a peak in TOC and DOC at all three Baker Lake areas corresponded to peaks across

³⁴ See Appendix I in the 2019 CREMP report (Azimuth, 2020a) for details on trigger updates and derivation for Baker Lake.

the Meadowbank study area lakes. The similar patterns observed across the study areas suggests that regional climactic factors, rather than mining activity, may be responsible for changes in TOC/DOC concentrations. The idea of a regional change is supported by various studies examining the effects of climate change on organic carbon fluxes in Arctic rivers and lakes. Permafrost thawing, primary production, increased precipitation, and atmospheric deposition have all been identified as contributing to enhanced organic carbon flux (Nguyen et al., 2022; Stolpmann et al., 2021).

Inversely to TOC/DOC concentrations, pH (field measured) appears to show a decreasing trend since 2009 across all Baker Lake areas (**Figure 6-5**). A similar pattern can be seen at the Meadowbank reference lakes (INUG and PDL; **Figure 4-7**) and even at lakes close to mining activities where alkalinity has stabilized (e.g. WAL; **Figure 4-7**). On the Wager Bay Plateau, lakes and other surface water bodies are distinctly characterised by their ultra-oligotrophic/oligotrophic status and low levels of TDS. The buffering capacity of the surface water is low, as evidenced by total alkalinity concentrations typically below 6 mg/L. Though influenced by a wide range of factors, there is evidence in the literature that increasing DOC concentrations can contribute to reductions in lake pH at a regional scale. Work by Erlandsson et al. (2010) on similarly weakly buffered northern lakes found that 1.4-fold DOC increases from 1990 to 2008 had increased acidity (reduced pH) by a median of 0.13 pH units and up to 1 pH unit in individual lakes. Thus, the increases of TOC/DOC observed at Baker Lake and across the broader region are unrelated to mining activity and may be influencing regional trends in pH. There are no follow-up measures for management beyond routine CREMP water quality sampling during the open-water season.

6.4 Phytoplankton Community

6.4.1 Key Findings from the 2023 Phytoplankton Monitoring Program

- There was an apparent increase in total biomass at NF areas BPJ and BBD along with richness at BBD, however this may be attributed to the decrease observed at reference area BAP.
- The phytoplankton community in Baker Lake was similar to previous years and has not exhibited any changes attributable to Agnico Eagle's activities in Baker Lake.

6.4.2 General Observations

The phytoplankton community of Baker Lake is relatively similar to the Meadowbank study area lakes, despite some seasonal differences in water quality due to the competing influences of less saline water from the Thelon River and more saline water from the deeper portion of Baker Lake (see **Section 6.2**). Taxonomic composition and biomass in Baker Lake were similar to the Meadowbank study lakes, with chrysophytes (golden algae, e.g., *Chrysococcus*, *Kephyrion*, *Dinobryon*) having been the dominant

taxonomic group since monitoring began in 2008. Mean summer phytoplankton biomass in Baker Lake is generally similar to the Meadowbank study area lakes, reaching a maximum between 200 to 300 mg/m³.

6.4.3 Temporal and Spatial Trends

Sampling at the Baker Lake areas is only conducted during the summer open-water period, which coincides with barge activity. Because of Baker Lake's large size, it is unlikely that barge traffic (in the absence of a substantial fuel or chemical spill) could influence the phytoplankton community of the whole lake.

The 2023 density and biomass results for phytoplankton are tabulated in [Appendix D3](#). The results for the BACI model statistical tests of the 2023 results against baseline/reference conditions are provided in [Table 6-4](#). Major findings at Baker Lake areas in 2023 for chlorophyll-a, total biomass, taxa richness, and group composition of major taxa were as follows:

- **Chlorophyll-a** – Concentrations at reference area BAP historically ranged between 0.4 to 1.5 µg/L ([Figure 6-10](#)). In 2023, the range and pattern of chlorophyll-a concentrations at the three Baker Lake areas were similar relative to previous years. Though concentrations appear to have generally declined since 2021, they remain within historical ranges.
- **Total biomass** – Annual patterns in biomass generally co-varies between the areas and in 2023, the lowest biomass was observed in September which has been seen historically. However, in 2023, September biomass at BAP and BPJ was lower than at any other time since monitoring began in 2008 ([Figure 6-11](#) to [Figure 6-13](#)). Because of a higher drop proportionately at BAP, the BACI analysis identified a statistically significant (p-value < 0.1) apparent increase in phytoplankton biomass at impact areas BBD and BPJ, both of which had effect sizes greater than 20% ([Table 6-4](#)). However, given that biomass at both impact areas was within historical levels and was the lowest ever seen at reference area BAP, this *change* is more reflective of natural variability at the reference area than of local activities at the impact areas.
- **Major taxa composition** – There were no apparent differences in relative composition of phytoplankton communities between BAP and impact areas BBD and BPJ in 2023, except that Chrysophytes were generally more dominant at BBD and BPJ ([Figure 6-13](#)). In September 2023, biomass was more evenly distributed across three taxa (chrysophytes, diatoms, cryptophytes) at BBD and BPJ. Chrysophytes are typically the dominant taxa at all sampling areas, making up from 46 to 60% of the total phytoplankton biomass in each area. diatoms and cryptophytes generally make up about 25 and 10%, respectively. The remainder of the biomass is made up of chlorophytes and dinoflagellates ([Appendix D3](#)).
- **Taxa richness** – Richness in Baker Lake phytoplankton samples was generally lower than historical ranges at both the impact and reference areas ([Figure 6-14](#)). However, mean richness

across the three open water sampling events showed little difference between BBD and BPJ relative to BAP in 2023. Results from 2023 BACI analysis ([Table 6-4](#)) showed an increase of 17% for BBD, which was statistically significant ($p\text{-value} < 0.1$), and an increase of 4% BPJ, which was not statically significant ($p\text{-value} < 0.1$).

Phytoplankton biomass will continue to be monitored for potential temporal trends, but no follow-up measures other than routine monitoring is recommended for 2024.

6.5 Sediment Chemistry

6.5.1 Key Findings from the 2023 Sediment Chemistry Monitoring Program

- The mean sediment core concentration of arsenic exceeded the trigger at BPJ in 2023, however this exceedance was not found to be statistically significant when compared to baseline conditions using the BA statistical model.
- No evidence was found to suggest that Agnico Eagle's activities are influencing sediment quality at Baker Lake.

6.5.2 General Observations

Baker Lake has multiple confounding influences with potential to affect water quality. These confounding influences include potential inputs from the hamlet of Baker Lake's sewage lagoons and landfill, which are situated in a watershed that discharges seasonally into Baker Lake between BBD and BPJ. Shipping-related influence on concentrations of metals in sediment would be limited to ship propeller wash disturbing bottom sediments and possibly from introducing contaminants (e.g., discharges, leaks, or spills). In 2023, one spill was observed on August 27 at Baker Lake near shore at the Marshalling Facilities and Oil Handling Facility during a fuel transfer. It was estimated that less than 2L of fuel was spilled. A spill response plan was activated and absorbent booms and pads were used to clean up the spill.

Sediment core chemistry and grab chemistry data were collected from BAP, BES, BPJ, and BBD at the same time the benthic invertebrate samples were taken. Ten replicate core samples and five replicate grab samples were collected at each area. The sediment sampling areas are depicted in [Figure 6-1](#).

Note that past sampling at Baker Lake has included sediment grab samples (at BBD, BPJ, BAP) on an annual basis and sediment coring (at BAP, BES, BPJ, BBD) on a 3-year cycle. Starting in 2022, sediment/benthos sampling was shifted to a three-year cycle. The first cycle was in 2023 to coincide with the sediment coring and EEM sampling program (Azimuth, 2022b).

6.5.3 Temporal and Spatial Trends

The 2023 sediment core chemistry and grab particle size and moisture content results for Baker Lake, screened relative to the lake-specific trigger values, are presented in [Appendix C3](#).

To help interpret long-term temporal and spatial trends, concentrations of individual metals have been plotted in [Figure 6-16](#) to [Figure 6-23](#). Metals concentrations are shown by area for the different sampling methods (grab [data points] vs core samples [box and whisker plots]). The red dashed line in each sediment metals figure is the Baker Lake trigger value. The box and whisker plots illustrate the

statistical distribution of core samples within each area. Data interpretation for the box and whisker plots is as follows:

- The horizontal line inside the box represents the median concentration.
- The upper and lower margins of the box represent the upper (75th) and lower (25th) percentile concentrations, respectively (the interquartile range).
- The vertical lines represent maximum and/or minimum concentrations (provided at least one value falls outside the box but is within 1.5 times the interquartile range).
- 'x's that occur beyond the maximum or minimum lines represent concentrations greater than 1.5 times the interquartile distance and indicate outlier concentrations that are real, but do not fit within the distribution of the rest of the data.

Baker Lake sediment chemistry results for all metals show no obvious temporal trends since 2008 (**Figure 6-16 to Figure 6-23**). Consistent with previous years, arsenic concentrations at BPJ exceeded the Baker-specific trigger values in 2023 (**Table 6-5**). However, the lack of any temporal trend suggests that this reflects a combination of localized mineralization and an unrepresentative trigger value (set based on conditions at BAP) rather than changes to sediment quality at BPJ. This is corroborated by the results of the BA statistical analysis conducted in 2017 (Azimuth 2018c) and in 2023 on the core sample results, which confirmed that arsenic concentrations were not trending higher (**Table 6-6**).

As in previous years, concentrations of hydrocarbons and PAHs in the composite sediment samples were below their respective MDLs at the reference and exposure areas (**Appendix C3**).

There continues to be no evidence of any barge-related impacts to sediment metals or organics concentrations at impact areas in Baker Lake. Most of the barge traffic's influence would be disturbing and re-settling existing sediment particles. Although sediment grain size is inherently different between exposure and reference areas, there was no pattern of change for any metal over time that would suggest metals contamination (e.g., from anti-fouling paint on the barge hulls).

6.6 Benthos Community

Summary results for abundance and richness of major taxa in 2023 are presented in **Appendix E3**, along with supplemental plots showing abundance and richness at the major taxonomic group level since the start of baseline sampling.

6.6.1 Key Findings from the 2023 Benthos Community Monitoring Program

- There was an increase in richness at BBD in 2023 and 2021-2023 time periods. There was an increase in both abundance and richness at BBD and BPJ across all years since 2020.

- There has been a decline in both abundance and richness at reference areas BAP and BES since 2020. The increases at BBD and BPJ may reflect the decreases in abundance and richness at the reference locations.
- There is no indication that Agnico Eagle's activities are influencing the benthic community at Baker Lake.

6.6.2 General Observations

Benthic invertebrates have been collected from Baker Lake annually in August since 2008. In 2023, the benthic invertebrate and sediment monitoring frequency changed from annual to every three years (Azimuth, 2022b). Baker Lake monitoring is included in the core program to ensure that mining activities in that area related primarily to barge traffic and shipping were tracked. Sampling occurs at the same near-field (BBD, BPJ) and reference areas (BAP, BES) used for sediment chemistry and outlined in [Section 6.1](#).

Abundance and species composition of benthic invertebrate communities at Baker Lake are strongly affected by various parameters, including grain size, water depth, and sediment organic content (as discussed for the Meadowbank lakes in [Section 4.6.1](#)). Investigations in the Meadowbank study lakes and Baker Lake have targeted habitats of similar depth and grain size (i.e., dominated by silt/clay with a small [$<5\%$] sand fraction). Unlike the Meadowbank study lakes, sediment grain size in Baker Lake has tended to be more variable and less predictable at all locations, with consistently coarser grain size (due to more sand) than Meadowbank lakes (see [Appendix E3](#) as an example of the variability within and between areas). Higher sand content is typically associated with a lower TOC concentration, which in turn influences the type of benthic community.

Like Meadowbank study lakes, the Baker Lake benthic community is characterized by relatively low abundance and taxa richness, although benthic invertebrate community abundance at Baker Lake often exceeds 2,000 organisms/m² ([Figure 6-24](#)), which is higher than typically-reported abundance at the Meadowbank study area lakes ([Figure 4-28](#)). Annual variability is sometimes high, as seen at BBD (e.g., from 2008 to 2009). There have also been consistent spatial differences in abundance between areas (e.g., BBD and BPJ have generally had lower abundance than BAP). Taxa richness historically ranged from 5–19 in exposure areas and from 15–22 in reference areas, although considerable within-area variability in taxa richness has been documented, particularly at the exposure areas BBD and BPJ (e.g., [Figure 6-27](#) and [Figure 6-28](#)).

The benthic invertebrate community in Baker Lake is dominated by the aquatic larval stages of insects, especially chironomids (family Chironomidae), both in terms of abundance ([Figure 6-24](#) to [Figure 6-26](#)) and taxa richness ([Figure 6-27](#) to [Figure 6-29](#)). The next most abundant group is typically Mollusca (clams) especially, *Cyclocalyx*/*Neopisidium*, genera of the family Sphaeriidae (fingernail clams).

Oligochaete worms can also be relatively abundant in the lake sediments, possibly because of higher sand content; generally, at least one oligochaete taxon was present for most area/year combinations.

6.6.3 Temporal and Spatial Trends

Benthic invertebrate abundance and richness results are tabulated in [Appendix E3](#). Details regarding historical trends are discussed in the 2011 CREMP (Azimuth, 2012a). The 2023 report focuses on recent results and on trends over the last three years. Statistical test results for abundance and richness are presented in [Table 6-7](#) and [Table 6-8](#), respectively. Note that because sampling started in 2008 after development-related activities started, there is no true before period, and a series of BACI tests are run that compare control and impact areas over a range of after periods (see [Section 2.3.3](#) for more details).

Summary results for abundance and richness of major taxa in 2023 are presented in [Appendix E3](#), along with supplemental plots showing abundance and richness at the major taxonomic group level since the start of sampling. Time-series plots showing total abundance and richness endpoints were used to assess spatial and temporal trends for the Baker Lake study areas ([Figure 6-24](#) and [Figure 6-27](#)). Key results are presented for taxa abundance and richness in sections that follow.

Abundance (Density)

Mean abundance was generally consistent with 2020 and 2021 at all Baker Lake areas, except for reference area BAP which showed a large drop in 2023 ([Figure 6-24](#)). Overall, there are no obvious temporal trends in total abundance at impact areas BBD and BPJ, and none of the BACI after period groupings showed statistically significant changes had occurred at the impact areas ([Table 6-7](#)). While the results were not statistically significant, the effect sizes for abundance at both BBD and BPJ were above 100% relative to before/reference conditions ([Table 6-7](#)), and this trend persists across all four after periods (i.e., up to four years in the after period) except at BPJ in the 2020-23 period (effect size 94%). The lower abundance at BAP in 2023 contributed to the higher relative effect sizes at BBD and BPJ. All of the observed trends are consistent with natural variability in the community.

As discussed previously, the benthic invertebrate communities at reference and impact areas in Baker Lake are comprised primarily of chironomid larvae. However, the relative proportion of different taxa is different for the impact areas BBD and BPJ compared to reference area BAP (apart from 2008; [Figure 6-25](#) and [Figure 6-26](#)). Since 2009, approximately 25 to 60% of individuals at BAP have been oligochaetes, compared to less than 10% at the impact areas and reference area BES (which was added in 2011 to provide a reference area with more similar characteristics to the exposure areas). The differences observed in major taxa composition between the two reference areas, and likely both NF areas, appear to be natural.

Taxa Richness

Mean taxa richness in 2023 was generally consistent with 2020 and 2021 across all Baker Lake areas except for reference area BAP which showed a big reduction (**Figure 6-27**). Due to the relative reduction in richness at BAP, the BACI model results showed positive and statistically significant ($p\text{-value} < 0.1$) effects sizes for total richness in 2023 and the 2021-23 time periods for BBD. BPJ results were similar in magnitude, but not statistically significant ($p\text{-value} > 0.1$) for all time periods (**Table 6-8**). All of the observed trends are consistent with natural variability in the benthic community.

Insects dominate the benthos the communities at the control and impact areas (**Figure 6-28** and **Figure 6-29**). There were no apparent trends in species composition, indicating the barge operations are not adversely affecting the community.

At present there is no evidence that shipping and other development-related activities near Baker Lake are adversely affecting the benthic invertebrate community, especially given there are no apparent barge-related effects on water quality and sediment chemistry.

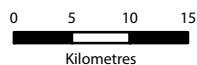
6.7 Baker Lake Tables and Figures

The tables and figures for the Baker Lake CREMP are provided in this section except for the large tabulated datasets and figures for parameters that are not included in the detailed analysis (see in-text references to appropriate Appendices). Subsections are provided for each of the CREMP components (e.g., limnology, water chemistry, sediment chemistry, phytoplankton, and benthos).



Legend

- Water Sampling Point
- Sediment/Benthic Invertebrate Quality Sampling Station
- All-Weather Access Road
- Whale Tail Haul Road



Projection: UTM Zone 14 NAD83

Data Sources:
 Natural Resources Canada, GeoBase®
 National Topographic Database
 Agnico-Eagle Mines Limited.
 Azimuth Consulting Group Inc.

**Figure 6-1. Baker Lake – 2023
 water, sediment, and benthic
 invertebrate sampling areas**

Meadowbank Gold Project

Prepared for:



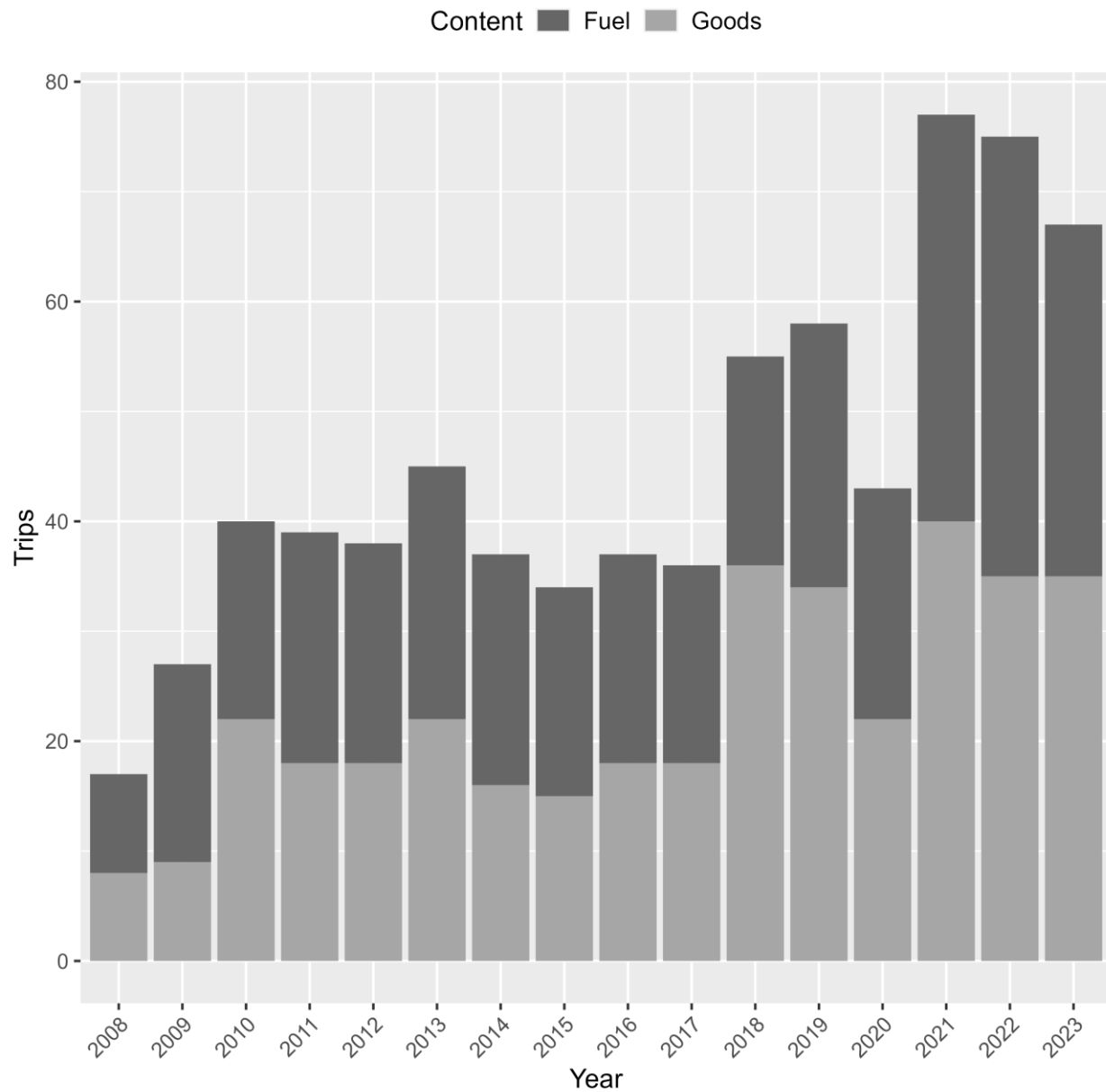
AGNICO EAGLE

By:



**CASLYS
 CONSULTING**

February 2024

Figure 6-2. Baker Lake barge traffic from Chesterfield Inlet since 2008.

Limnology Tables and Figures

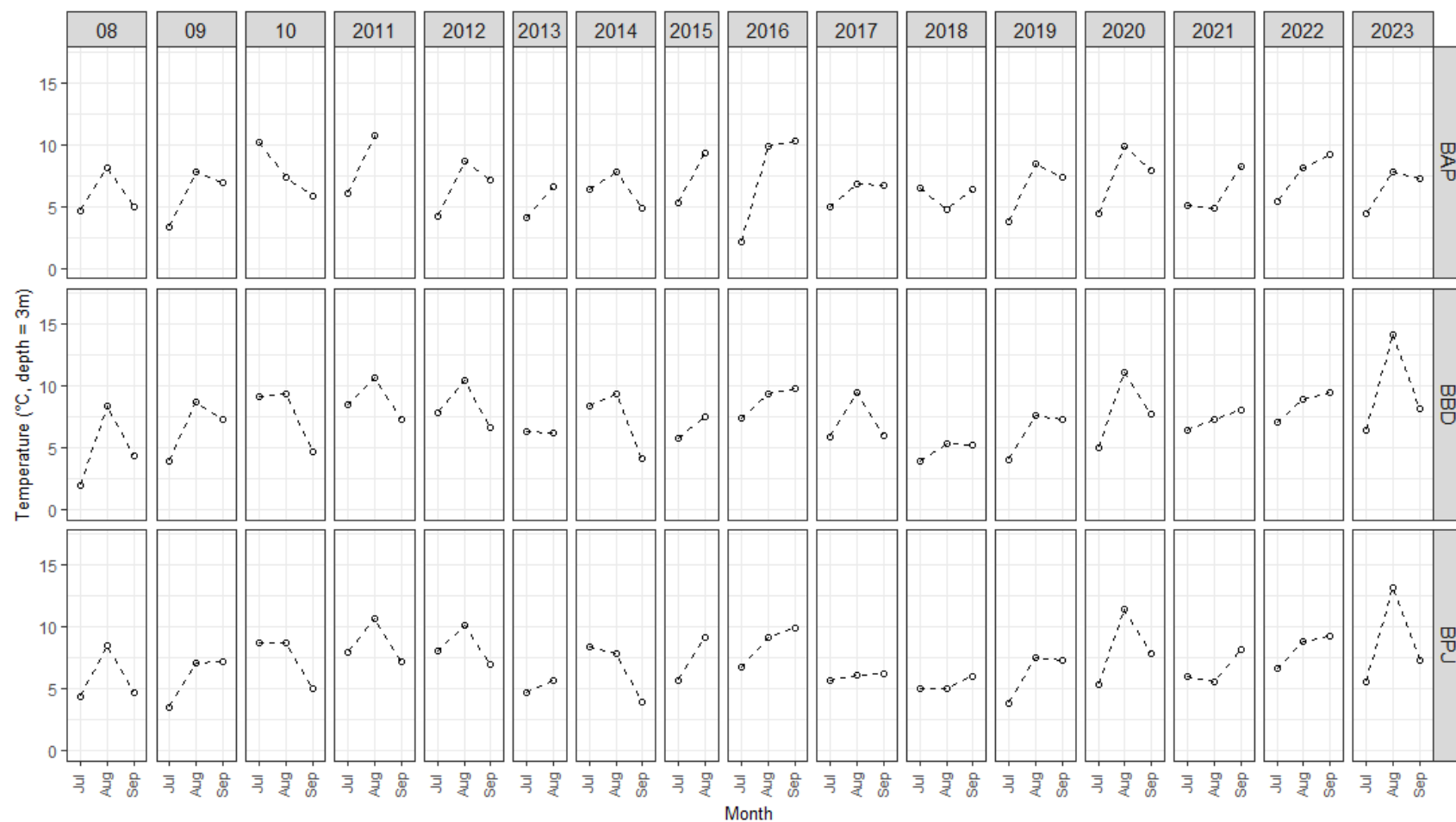
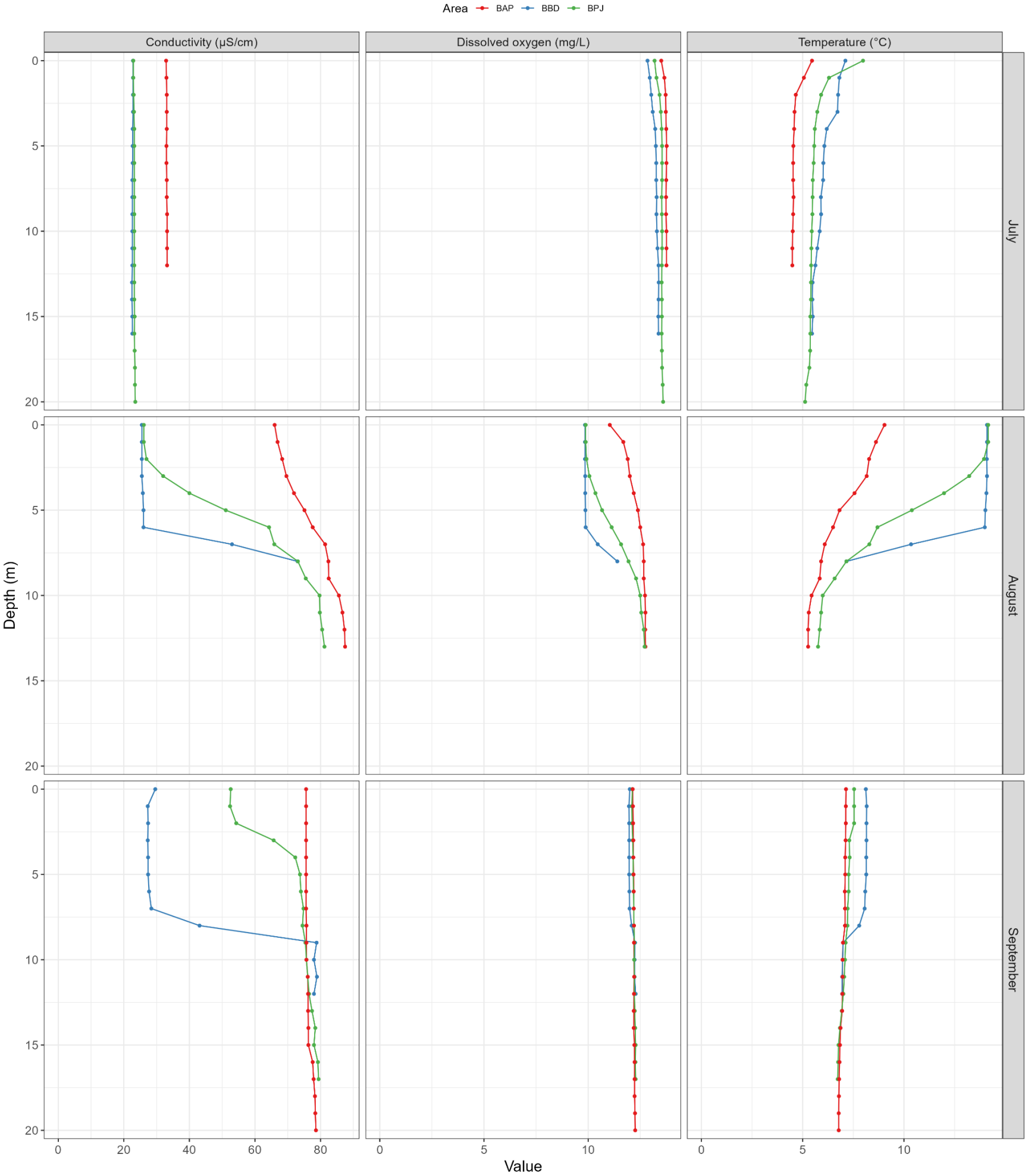
Figure 6-3. Mean monthly field-measured temperature (°C) at 3 m depth since 2008, Baker Lake.

Figure 6-4. Baker Lake – Field-measured conductivity, dissolved oxygen, and temperature profiles, 2023.

Note: Only the field measured values up to 20 m depth shown in figure.



Water Chemistry Tables and Figures

Table 6-1. Screening process for water quality parameters, Baker Lake, 2023.

Screening Level and Rule ¹				Screening Level and Rule ¹				Screening Level and Rule ¹			
Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency	Parameters	Trigger Exceedance ²	1 >DL ≥ 10% Frequency	2 C-I > 0.1 Frequency
CONVENTIONALS				TOTAL METALS				DISSOLVED METALS			
Conductivity	-	Yes		Aluminum	-	Yes		Aluminum	-	Yes	
TSS	-	Yes		Antimony	-	No	No	Antimony	-	No	No
Hardness	-	Yes		Arsenic	-	Yes		Arsenic	-	Yes	
T-Alkalinity	-	Yes		Barium	-	Yes		Barium	-	Yes	
B-Alkalinity	-	Yes		Beryllium	-	No	No	Beryllium	-	No	No
C-Alkalinity	-	No	No	Boron	-	Yes		Boron	-	Yes	
pH-Field	BAP, BPJ	Yes		Cadmium	-	No	No	Cadmium	-	No	No
pH-Lab	-	Yes		Chromium	-	Yes		Chromium	-	No	No
MAJOR IONS				Copper	-	Yes		Copper	-	Yes	
TDS	-	Yes		Iron	-	Yes		Iron	-	Yes	
Calcium	-	Yes		Lead	-	No	No	Lead	-	No	No
Chloride	-	Yes		Lithium	-	Yes		Lithium	-	Yes	
Fluoride	-	Yes		Manganese	-	Yes		Manganese	-	Yes	
Magnesium	-	Yes		Mercury	-	No	No	Mercury	-	No	No
Potassium	-	Yes		Molybdenum	-	Yes		Molybdenum	-	Yes	
Sodium	-	Yes		Nickel	-	No	No	Nickel	-	No	No
Sulphate	-	Yes		Selenium	-	No	No	Selenium	-	No	No
NUTRIENTS & OTHERS				Silicon	-	Yes		Silicon	-	Yes	
Ammonia-N	-	Yes		Silver	-	No	No	Silver	-	No	No
Nitrate-N	-	Yes		Strontium	-	Yes		Strontium	-	Yes	
Nitrite-N	-	No	No	Thallium	-	No	No	Thallium	-	No	No
TKN	BAP	Yes		Tin	-	No	No	Tin	-	No	No
T-Phosphorus	BPJ	Yes		Titanium	-	Yes		Titanium	-	No	No
Ortho-phosphate	-	Yes		Uranium	-	Yes		Uranium	-	Yes	
DOC	BAP, BBD, BPJ	Yes		Vanadium	-	No	No	Vanadium	-	No	No
TOC	BAP, BBD, BPJ	Yes		Zinc	-	No	No	Zinc	-	No	No
Reactive Silica	-	Yes									
T-Cyanide	Not measured since 2019										
Free Cyanide	Not measured since 2019										

Notes:

1. A three-step assessment process was used to identify parameters to include in the formal temporal and spatial trend assessment ([Section 2.3.1](#) and [Section 4.3.2](#)). Parameters were assigned a "Yes" if the following assessment was true:

(1) **>DL ≥ 10% Frequency:** parameters that exceeded MDLs in at least 10% of the samples.

(2) **C-I > 0.1 Frequency:** parameters that were detected more often in impact areas and the proportion of detected values increased by 0.1 or more.

(3) **Pattern = Activity:** additional step to avoid screening out potentially important parameters. Based on the trend plots, is there a trend for infrequently detected parameters and/or are there values > 5 x DL in at least one sampling event at NF areas?

2. Indicates that a trigger exceedance occurred at the listed Whale Tail study area lakes in one or more sampling event.

Shaded parameters are included in the temporal and spatial trend assessment.

Plots for all individual parameters are presented in [Appendix B3](#).

Table 6-2. Water quality variables at the Bake Lake monitoring areas for which 2023 mean concentration exceeded the trigger.

Parameter	Trigger	2023 Mean		
		BAP	BBD	BPJ
		Ref	NF	NF
DOC	3.9	4.1	3.9	4.0
Field pH (lower)	6.55	6.52	-	-

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean concentrations are all in units of mg/L.

Table 6-3. Results of BACI tests for selected water variables at Baker Lake monitoring areas in 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value ¹	Proportional change		
							exp(Est)	LCI	UCI
DOC	BBD	42	3	-0.058	0.037	0.94	0.94	0.87	1.0
	BPJ	42	3	-0.032	0.031	0.85	0.97	0.91	1.0

Notes:

Bolded P-values are statistically significant < 0.05.

Test area = area compared to control (BAP).

n(B) = number of paired months in the “before” period.

n(A) = number of paired months in the “after” period (i.e., in 2023).

Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = one-tailed test of the null hypothesis (no change or a decrease in mean [opposite for lower pH trigger]).

Exp(Est.) = estimated proportional change.

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Figure 6-5. Conventional parameters in water samples from Baker Lake since 2008.

Note: Laboratory-measured conductivity data from 2014 should be interpreted with caution, particularly at low concentrations (see Azimuth, 2015c for details).

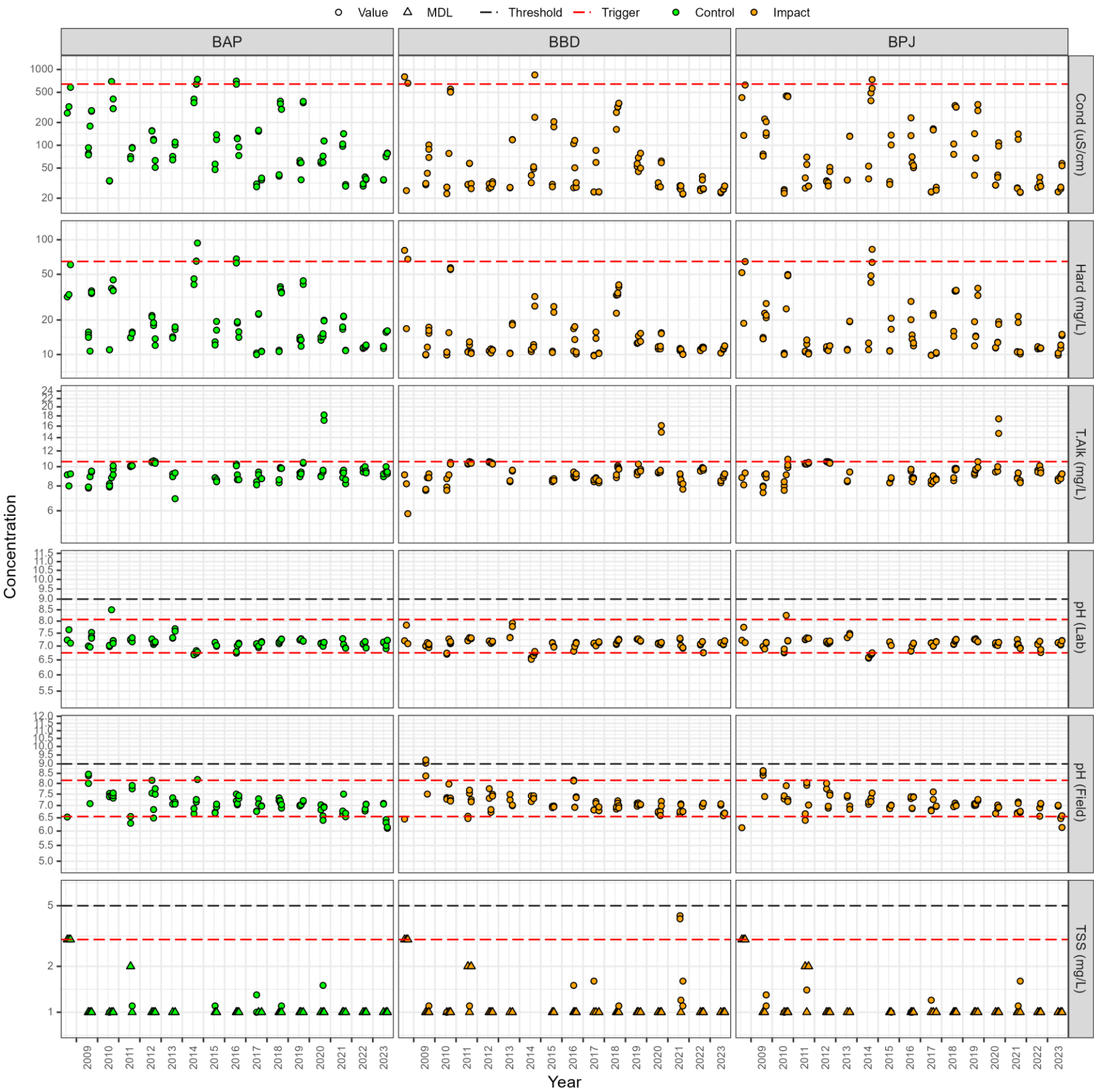


Figure 6-6. Major ions in water samples from Baker Lake since 2008.

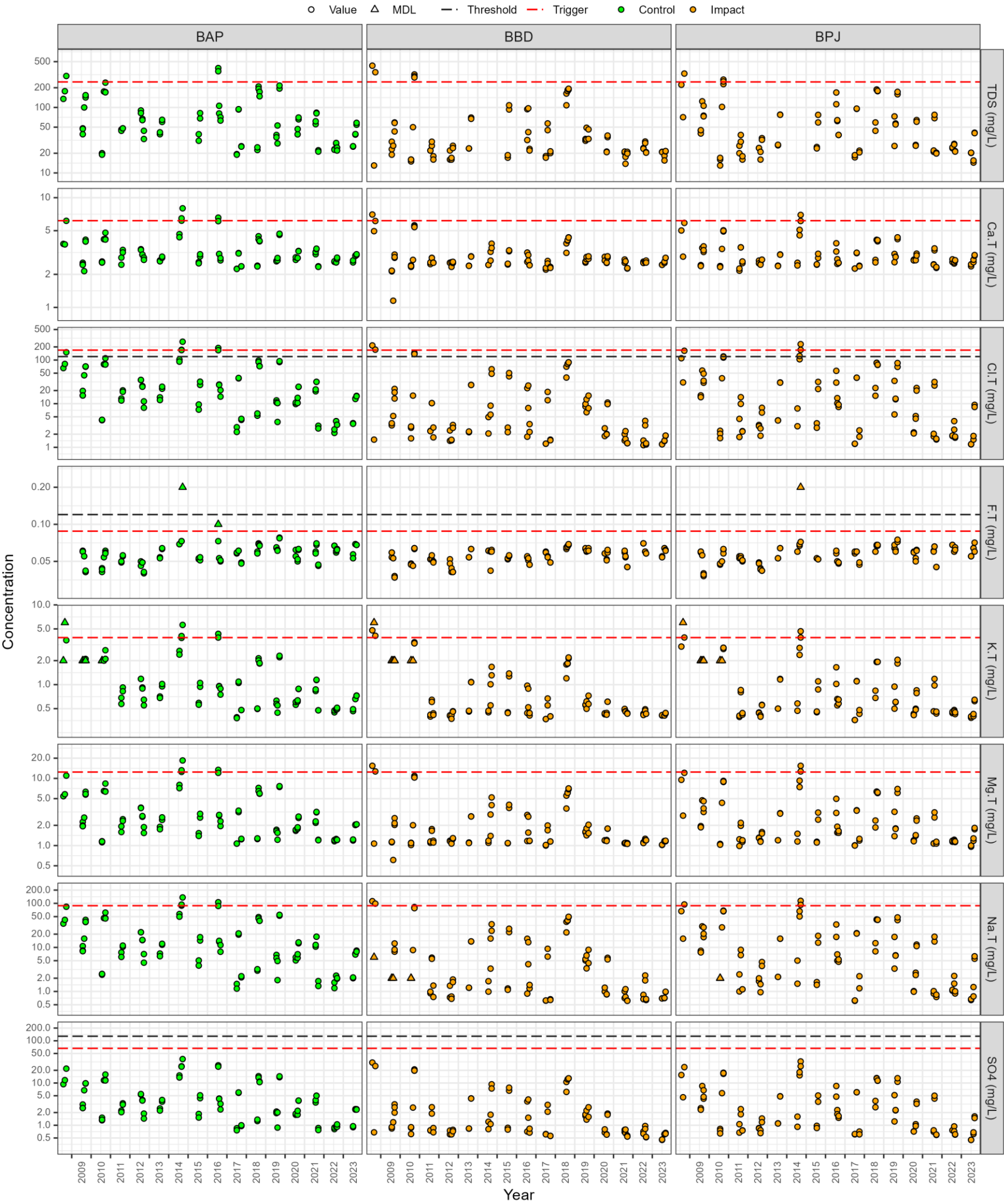


Figure 6-7. Nutrients in water samples from Baker Lake since 2008.

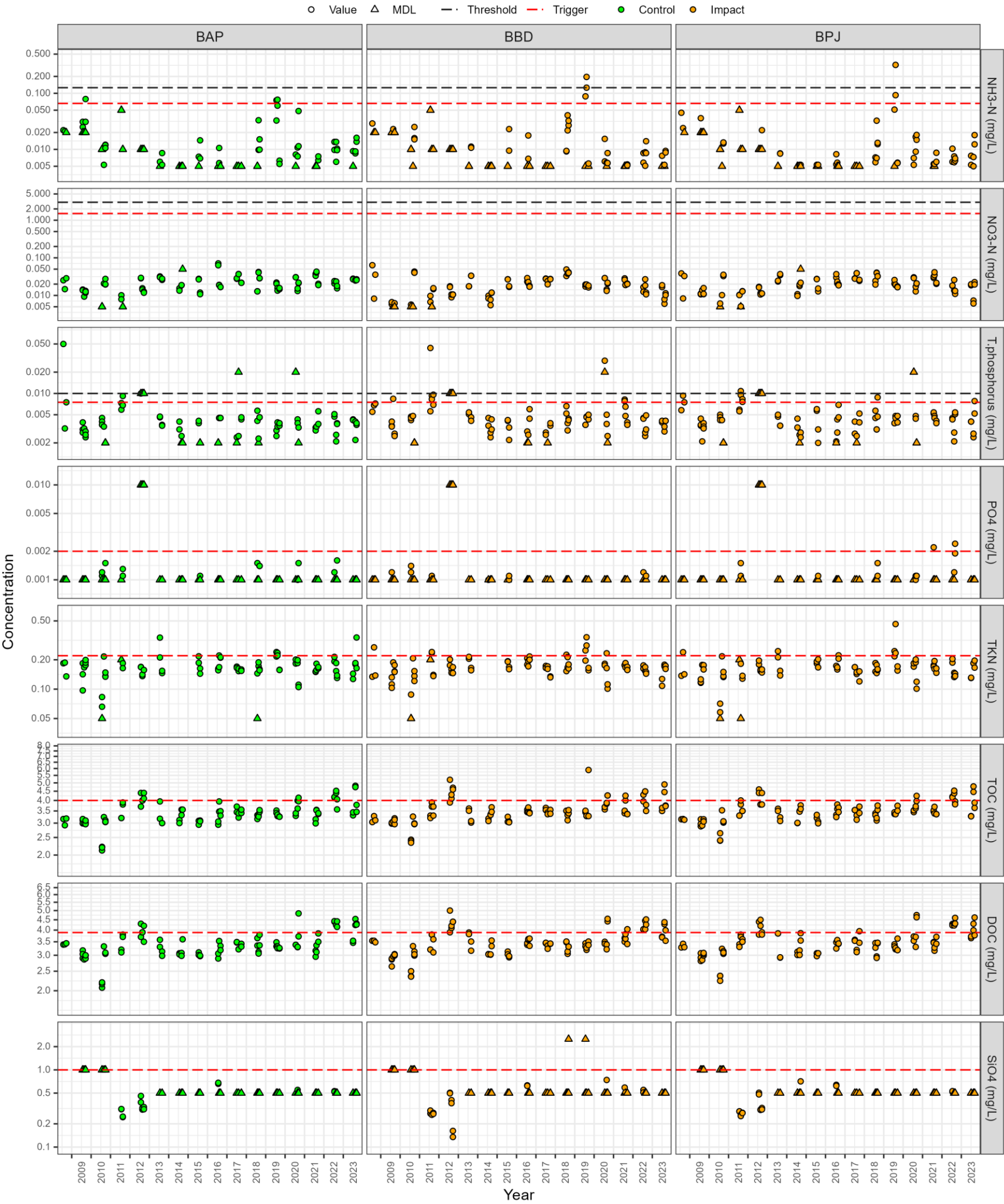


Figure 6-8. Metals in water samples from Baker Lake since 2008.

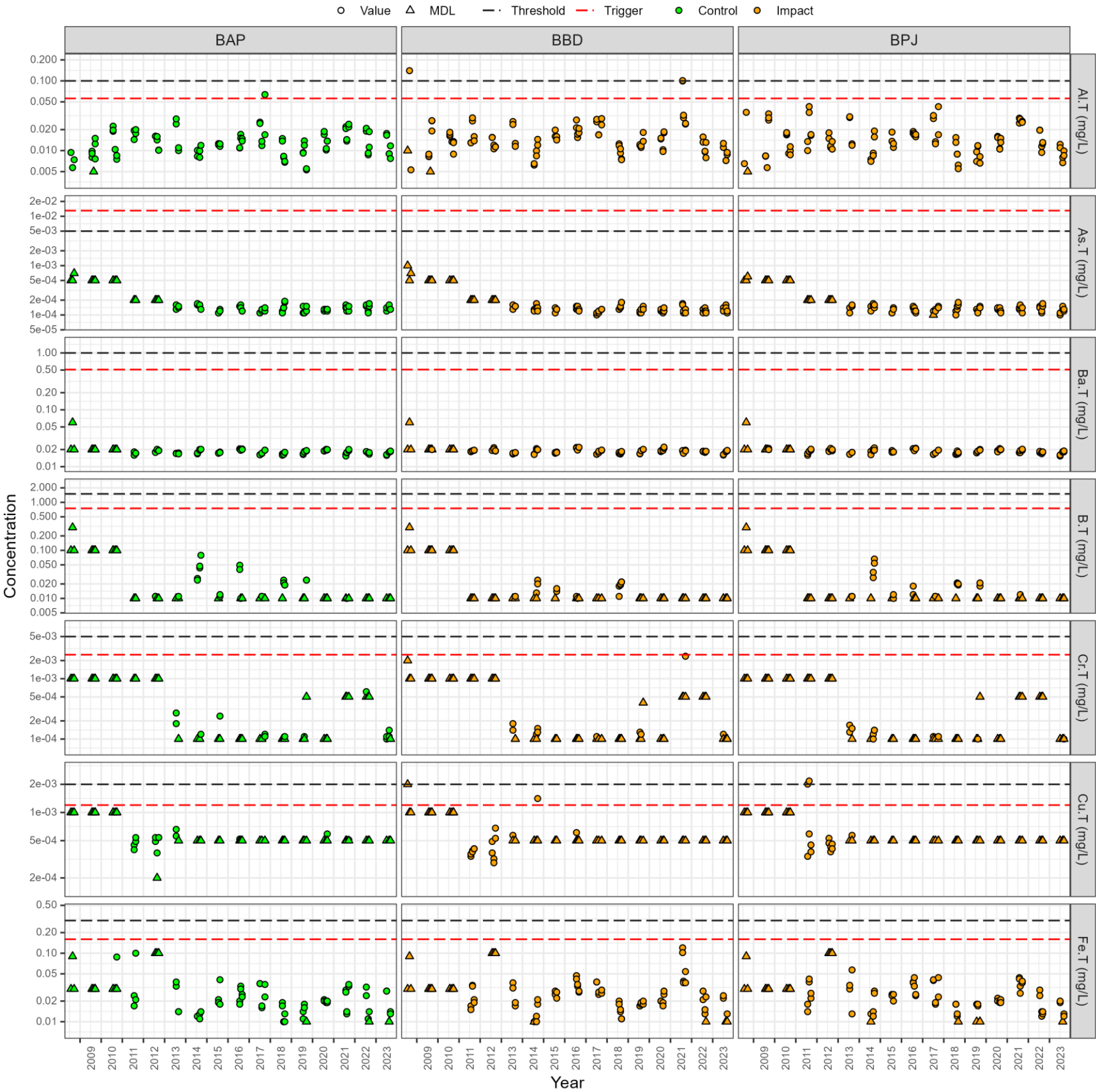
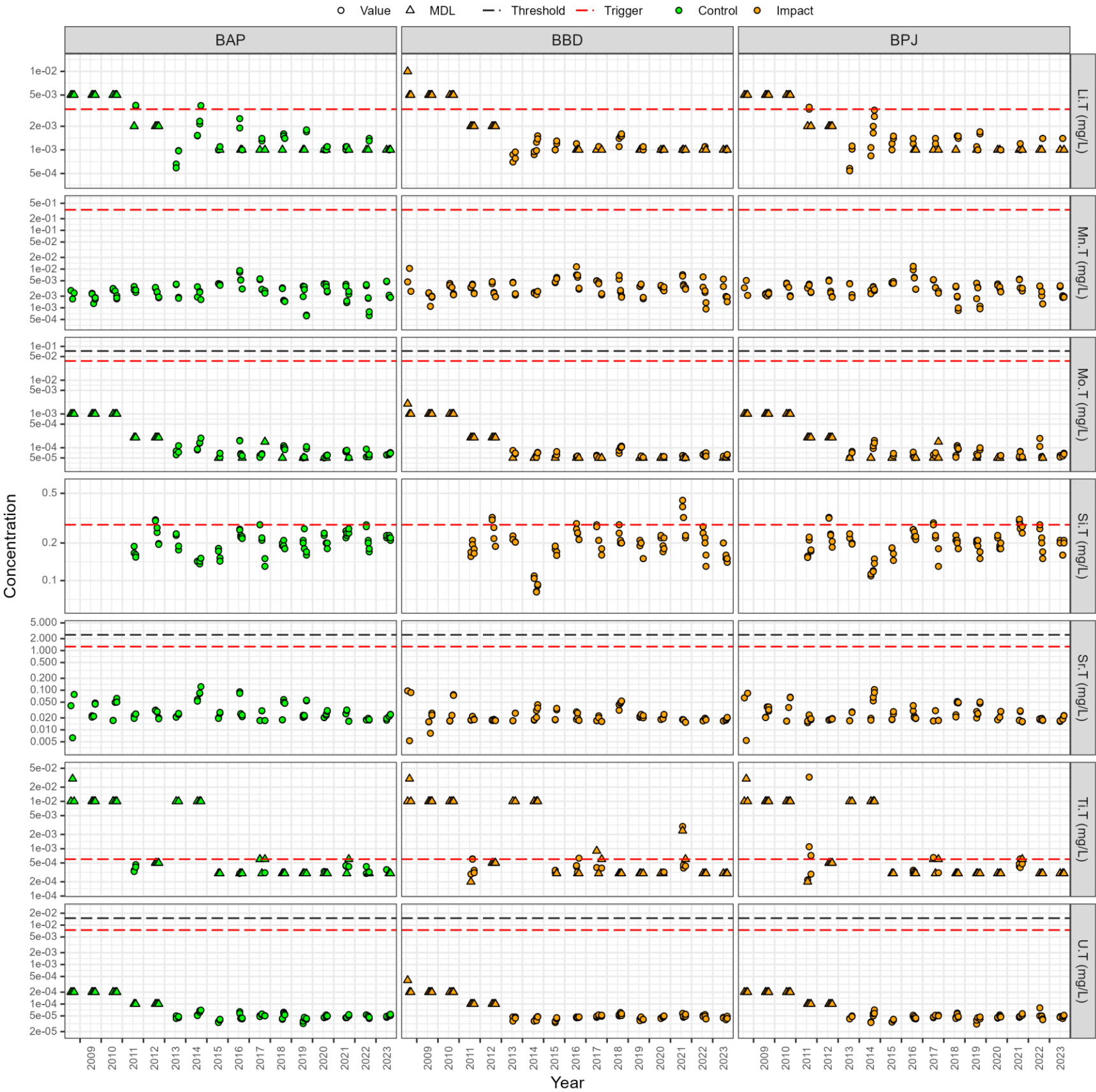


Figure 6-9. Metals in water samples from Baker Lake since 2008.



Phytoplankton Tables and Figures

Table 6-4. Results of the BACI tests for phytoplankton variables at Baker Lake areas, 2023.

Parameter Measured	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect Size (%)		
							ES	LCI	UCI
Total Biomass	BBD	42	3	0.44	0.25	0.084	56	-6	159
	BPJ	42	3	0.31	0.17	0.070	37	-3	93
Species	BBD	42	3	0.15	0.06	0.018	17	3	32
	BPJ	42	3	0.04	0.06	0.474	4	-7	17

Notes:

* **Bolded** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (BAP).

n(B) = number of months in the “before” period.

n(A) = number of months in the “after” period (i.e., in 2023).

Estimate = BACI model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., $100\% \times (\exp[\text{Estimate}] - 1)$).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

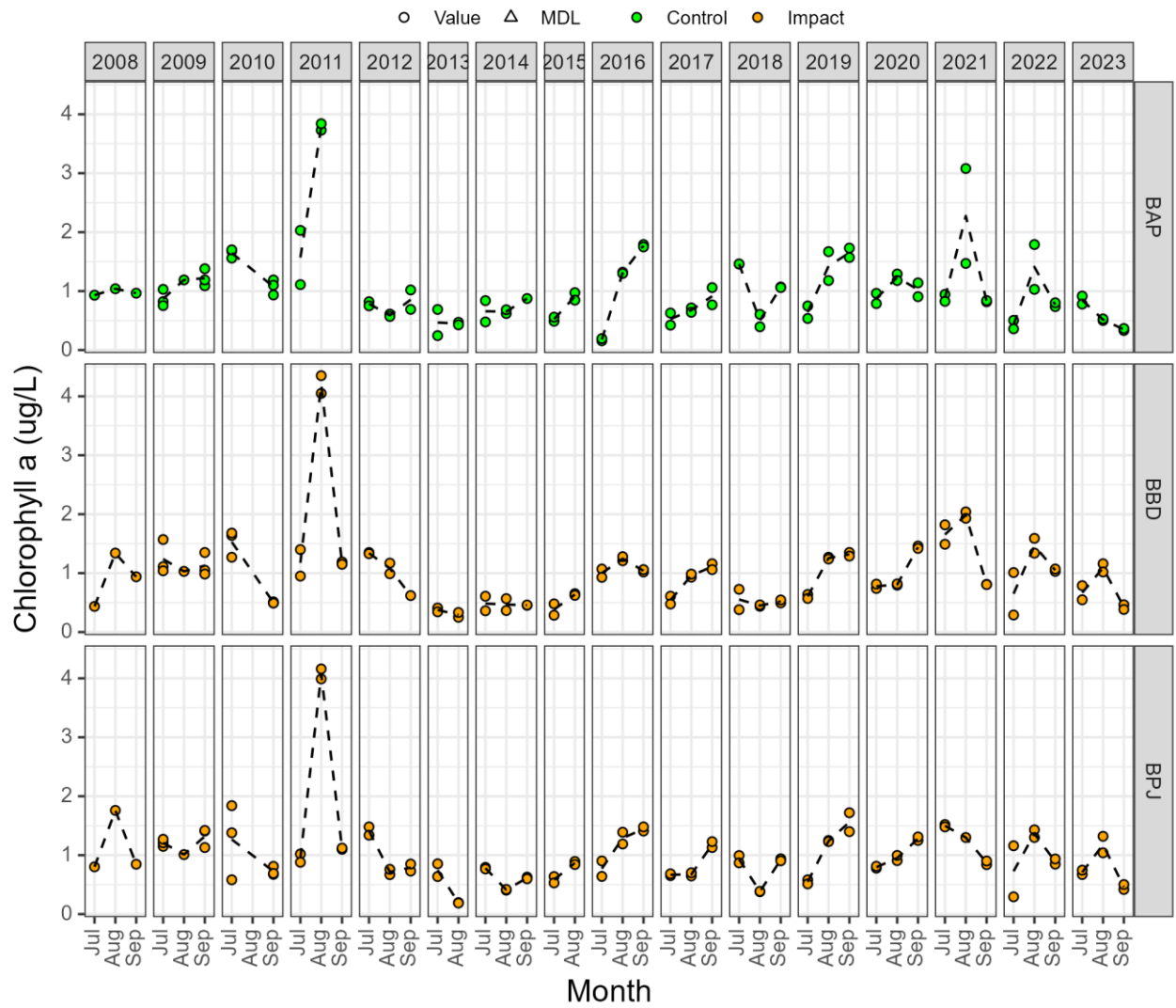
Figure 6-10. Chlorophyll-a ($\mu\text{g/L}$) in water samples from Baker Lake since 2008.

Figure 6-11. Total phytoplankton biomass (mg/m³) from Baker Lake since 2008.

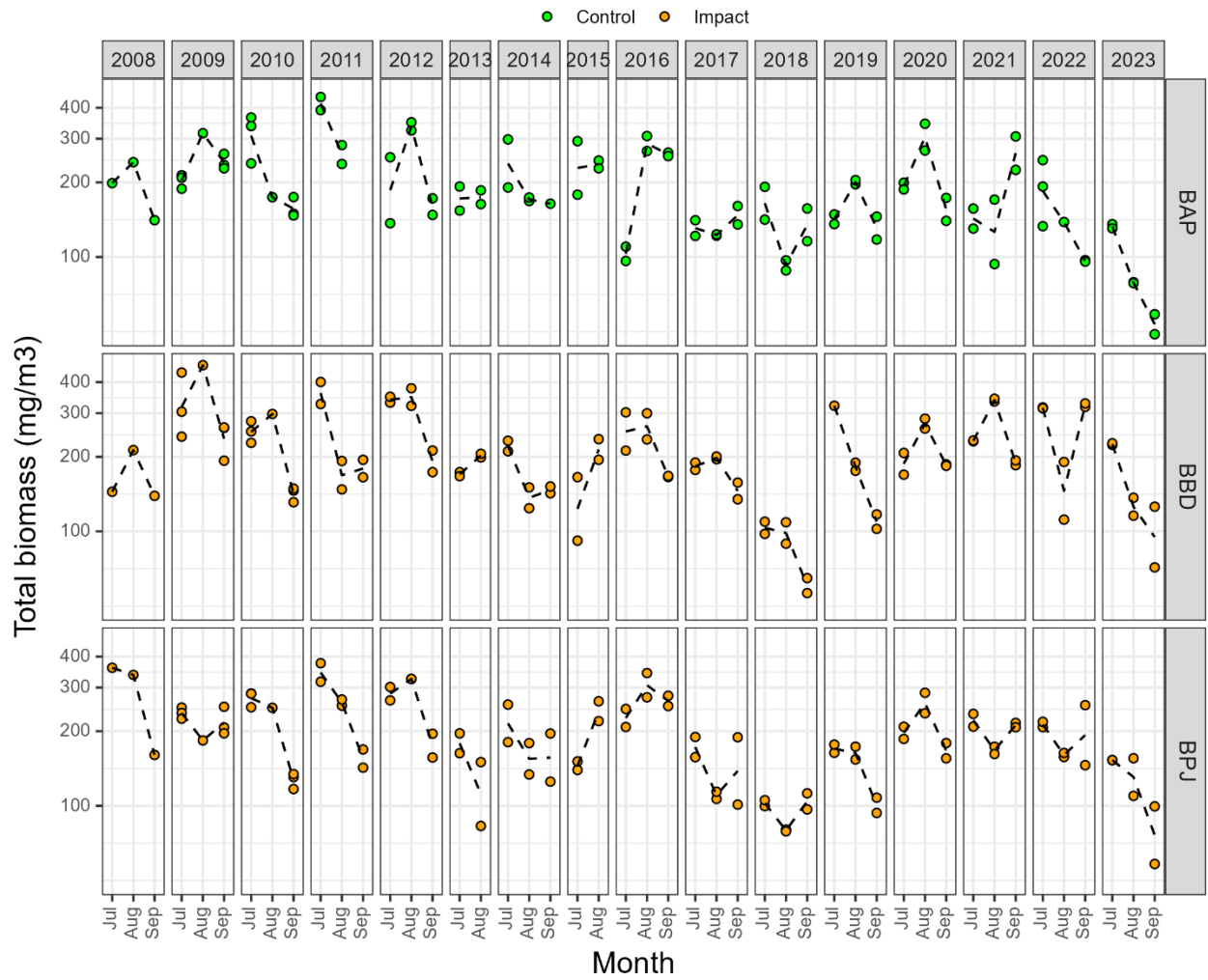


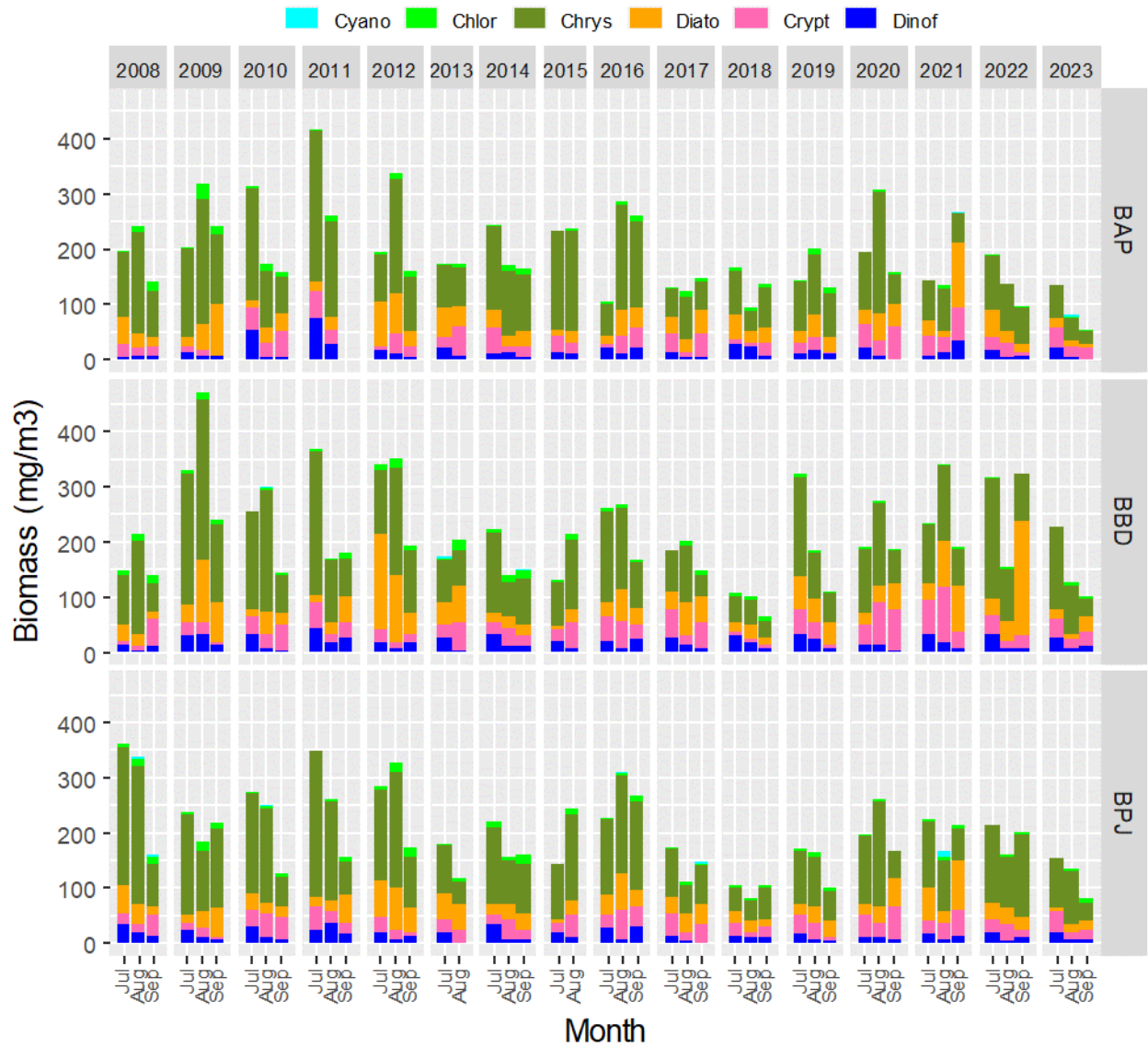
Figure 6-12. Phytoplankton biomass (mg/m³) by major taxa from Baker Lake since 2008.

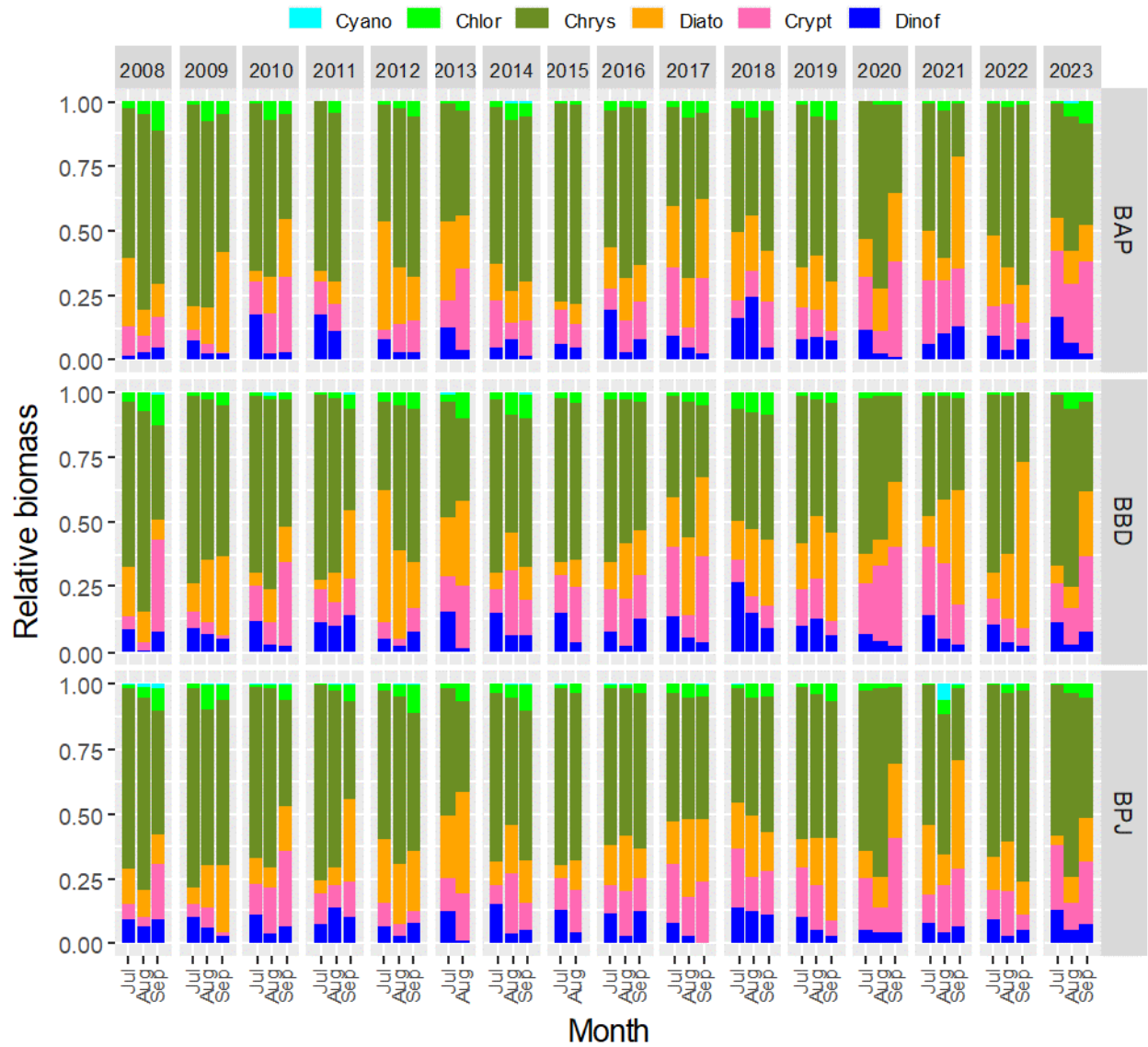
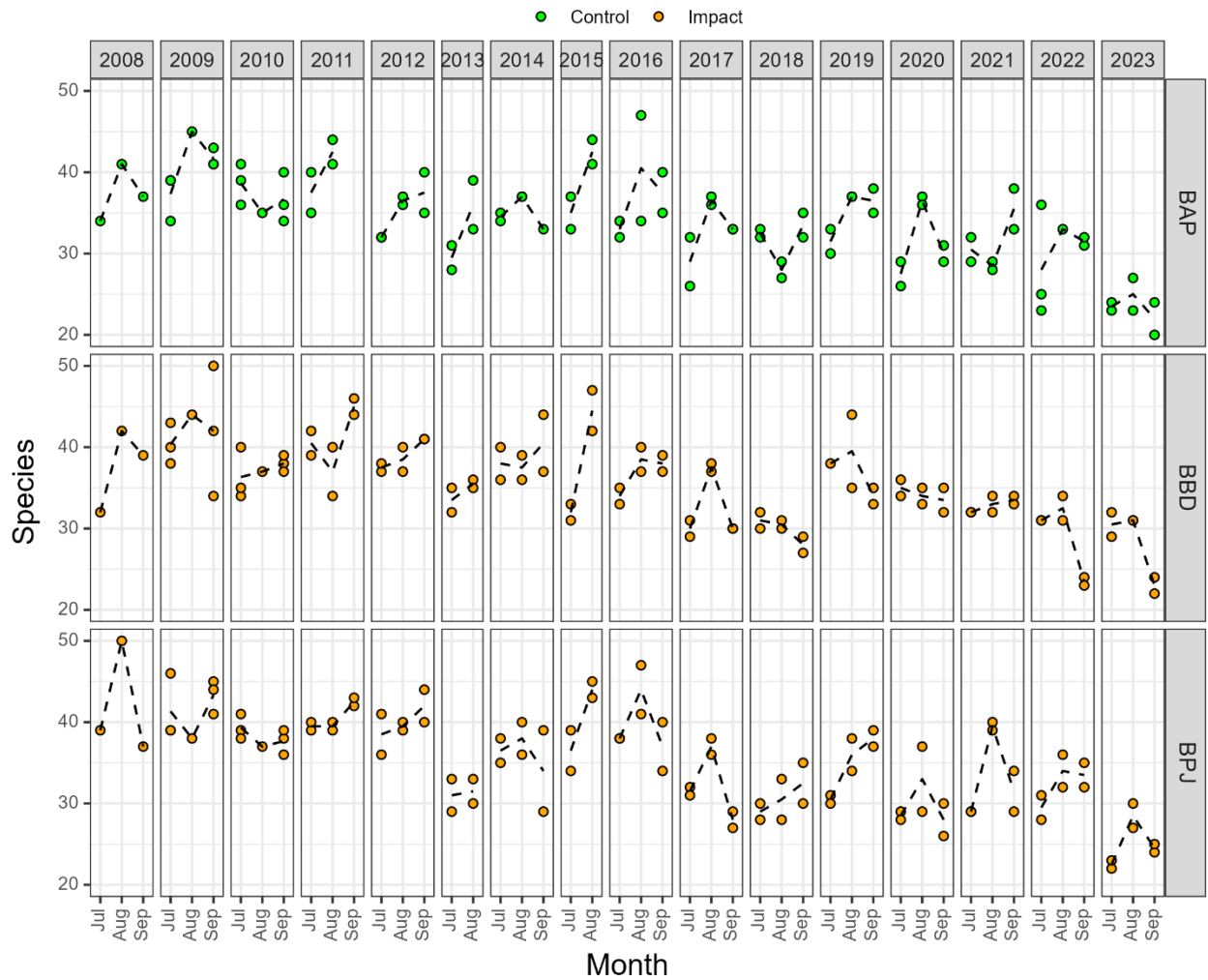
Figure 6-13. Relative phytoplankton biomass by major taxa from Baker Lake since 2008.

Figure 6-14. Phytoplankton species richness from Baker Lake since 2008.

Sediment Chemistry Tables and Figures

Table 6-5. Sediment core metals at the Baker Lake areas for which the 2023 mean concentration exceeded the trigger.

Parameter	Trigger	2023 Mean	
		BPJ	BBD
Arsenic	7.6	17.00	-
Cadmium	0.32	-	-
Chromium	27	-	-
Copper	20	-	-
Lead	19	-	-
Mercury	0.088	-	-
Zinc	73	-	-

Notes:

"-" indicates mean annual concentration was < the trigger value.

Reported mean values are all in units of mg/kg dw (mean of 10 replicate sediment core samples).

Table 6-6. Results of the before-after statistical analysis of sediment core chemistry data at Baker Lake areas, 2023.

Parameter	Test Area	n(B)	n(A)	Estimate	SE	P-value ¹	DF	Proportional change		
								exp(Est)	LCI	UCI
Arsenic	BPJ	45	10	-0.44	0.27	0.94	53	0.6	0.4	1.1

Notes:

1. **Bolded** values are p-values < 0.05.

Test area in 2023 compared to the “before” period.

n(B) = number of paired months in the “before” period.

n(A) = number of paired months in the “after” period (i.e., in 2023).

Estimate = BA model estimate of the 2023 change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = one-tailed test of the null hypothesis of no change or a decrease in mean concentration.

Exp(Est.) = estimated proportional change in 2023 relative to the *before* period.

DF = degrees of freedom.

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

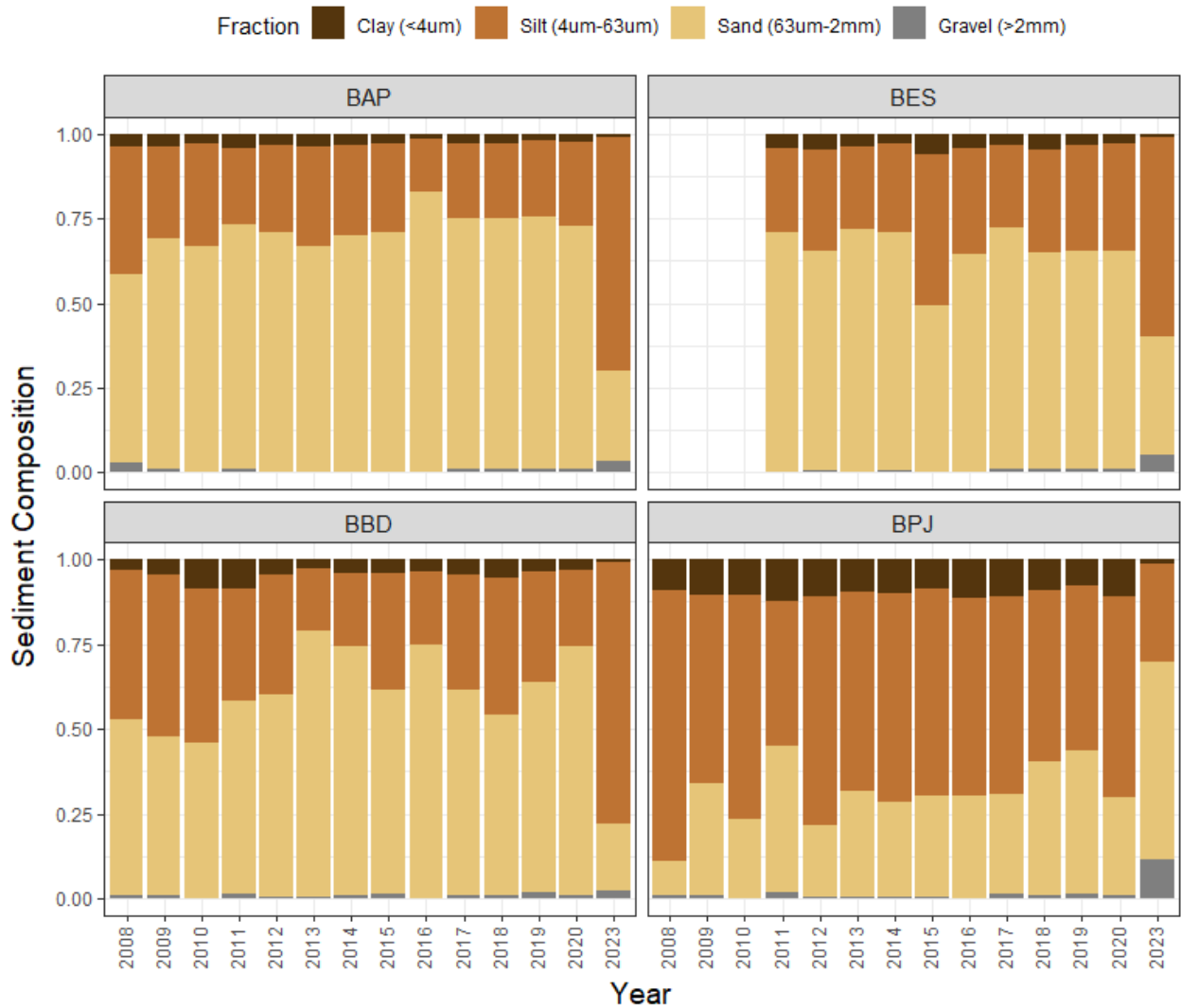
Figure 6-15. Sediment grain size composition in sediment samples from Baker Lake since 2008.

Figure 6-16. Total aluminum (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

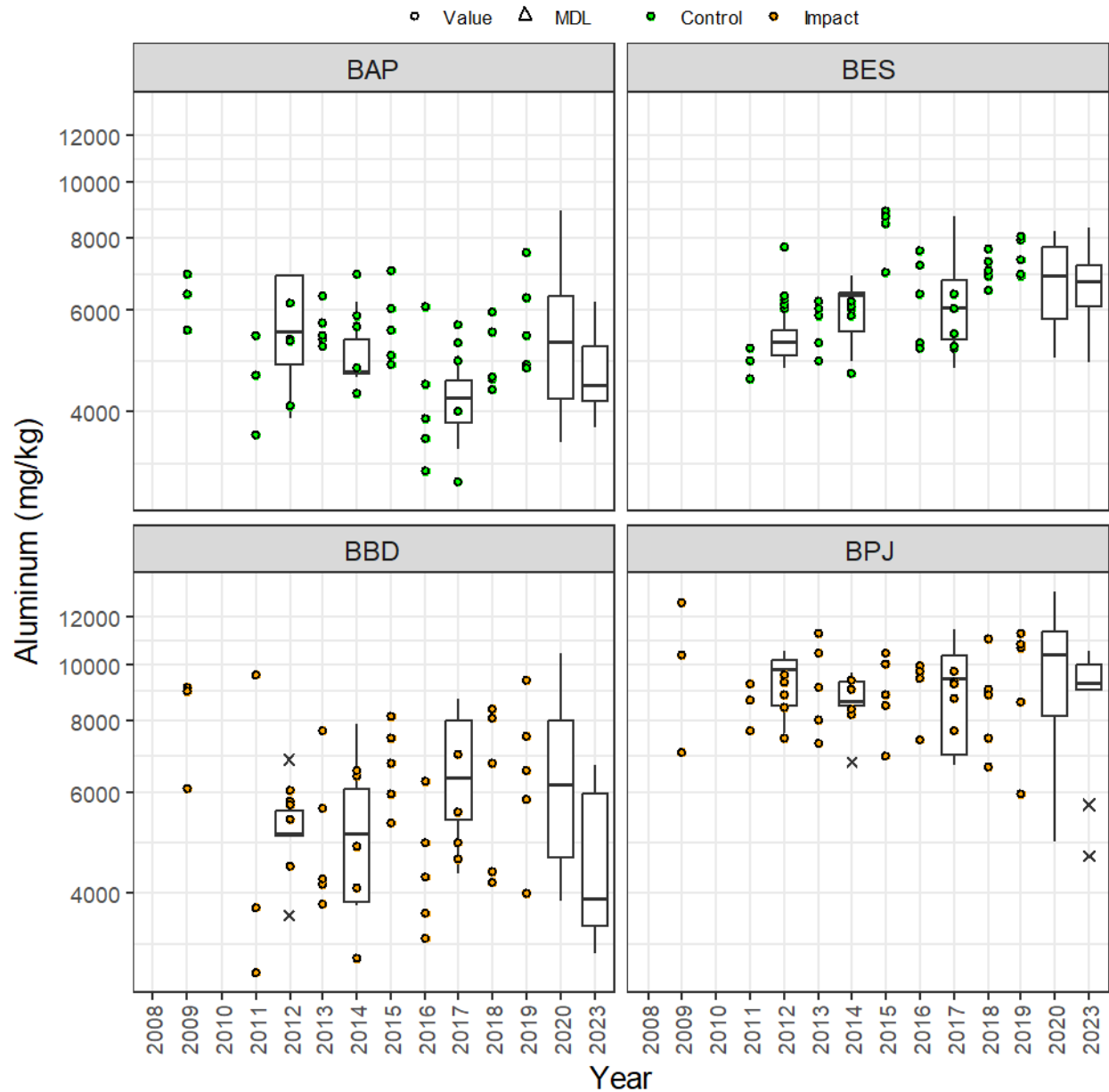


Figure 6-17. Total arsenic (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

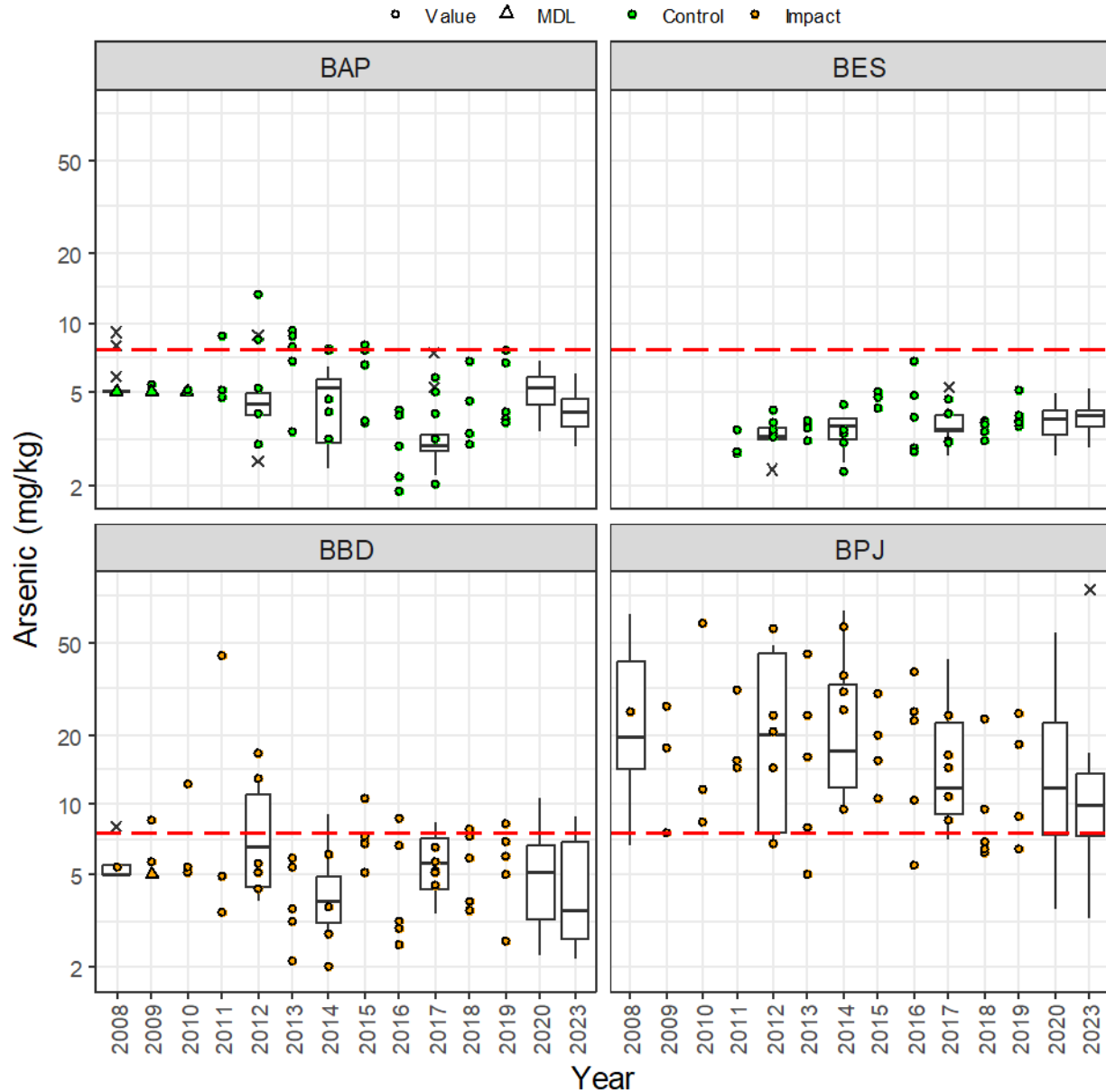


Figure 6-18. Total cadmium (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

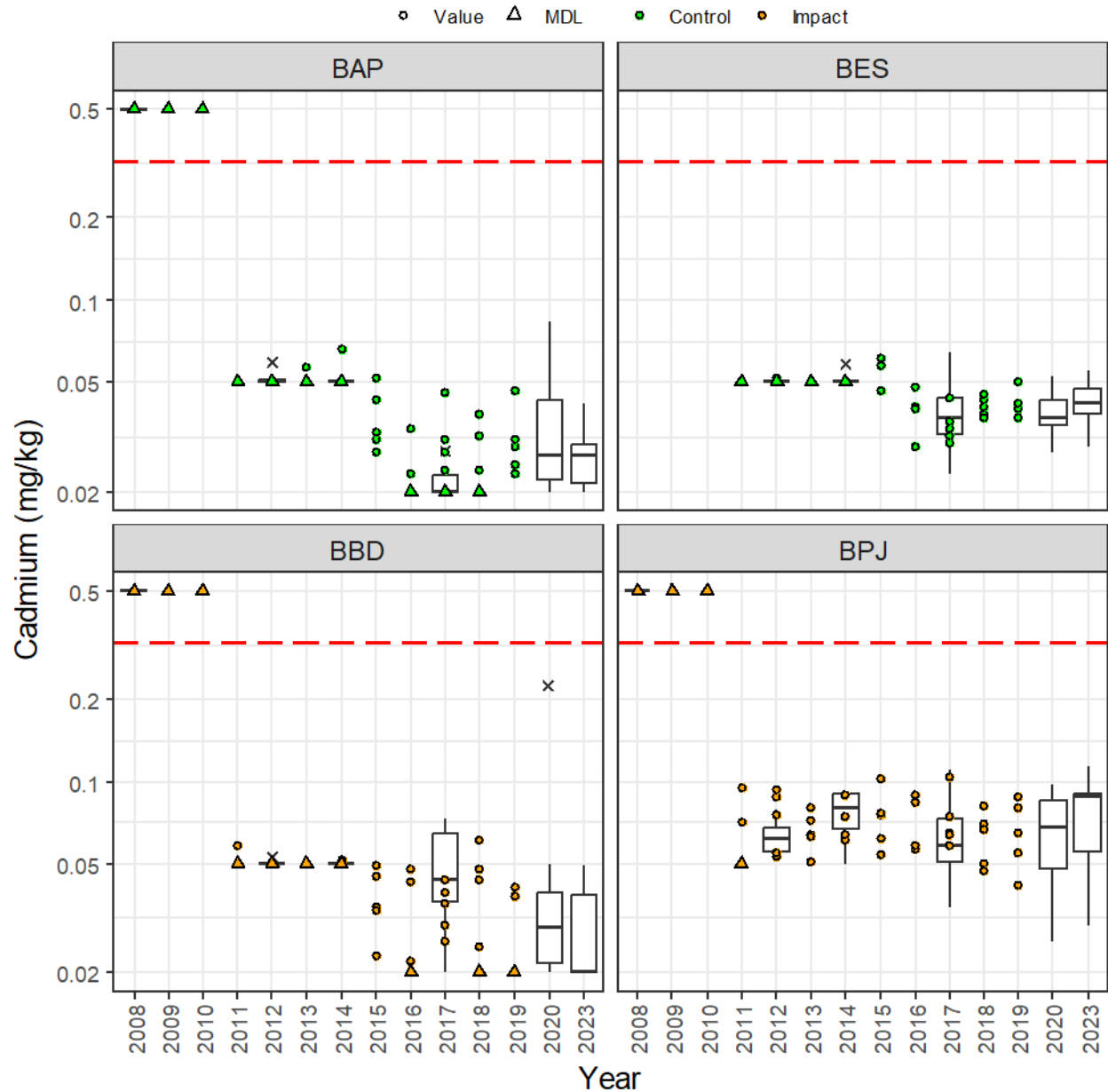


Figure 6-19. Total chromium (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

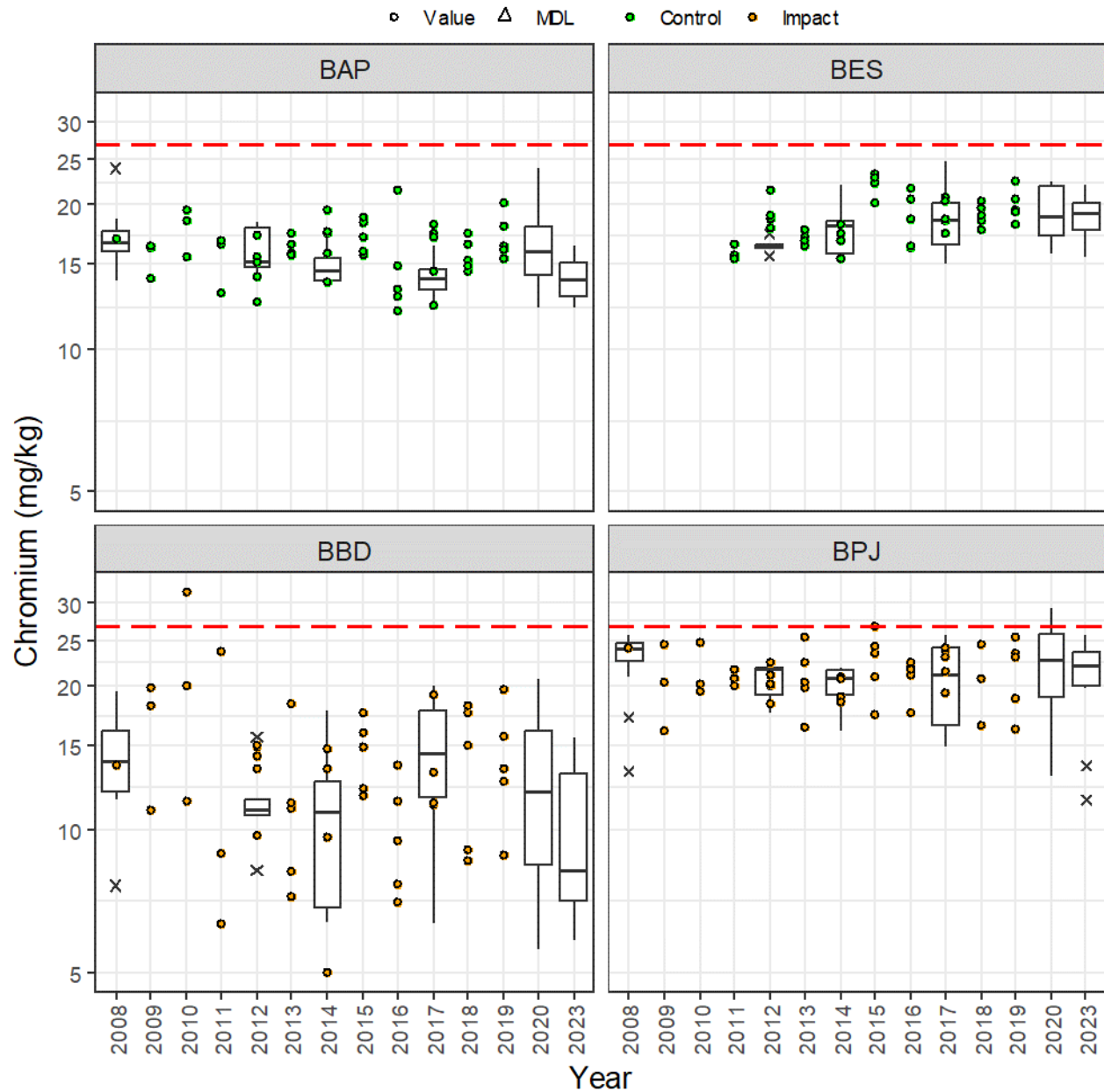


Figure 6-20. Total copper (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

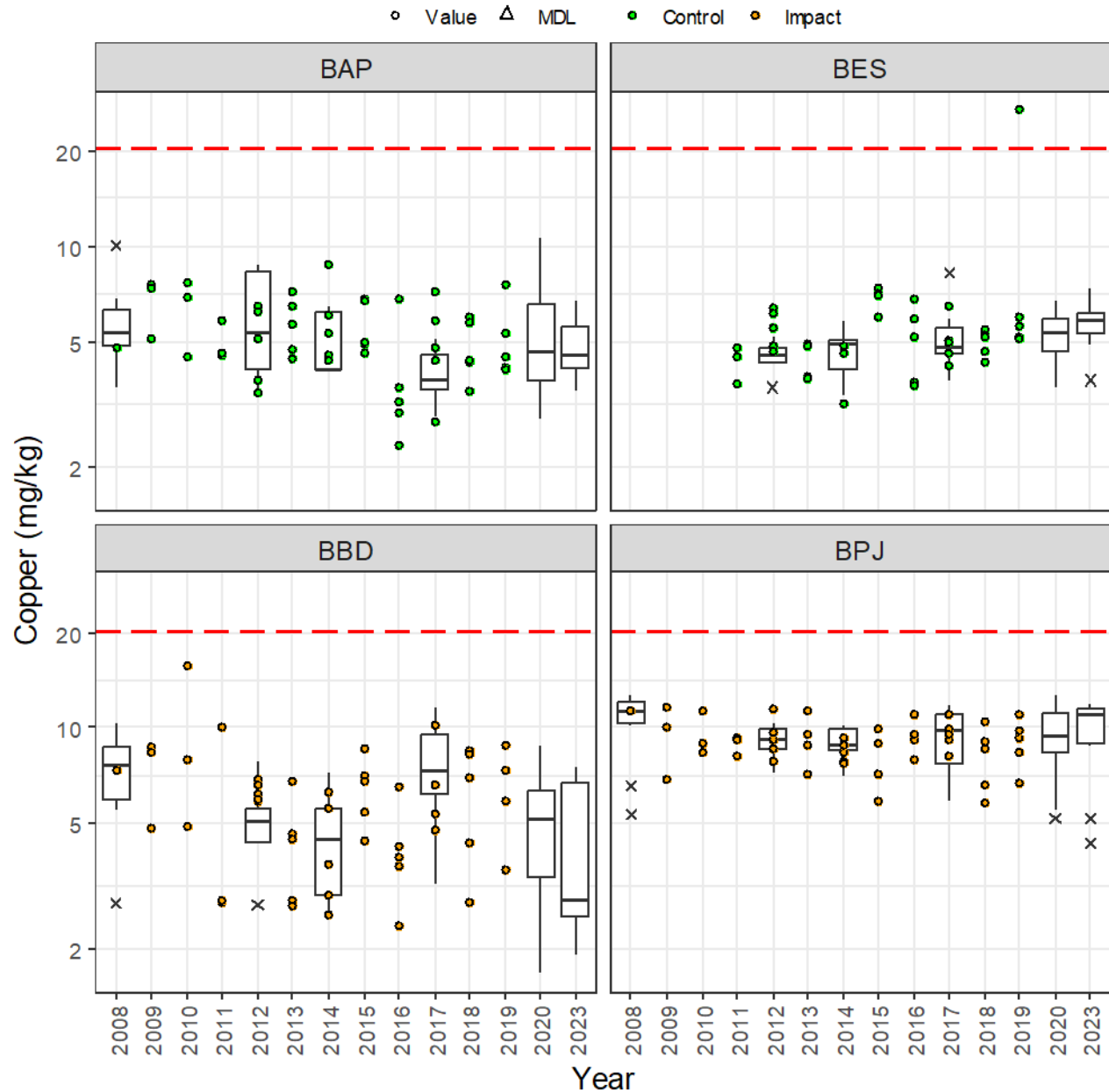


Figure 6-21. Total lead (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

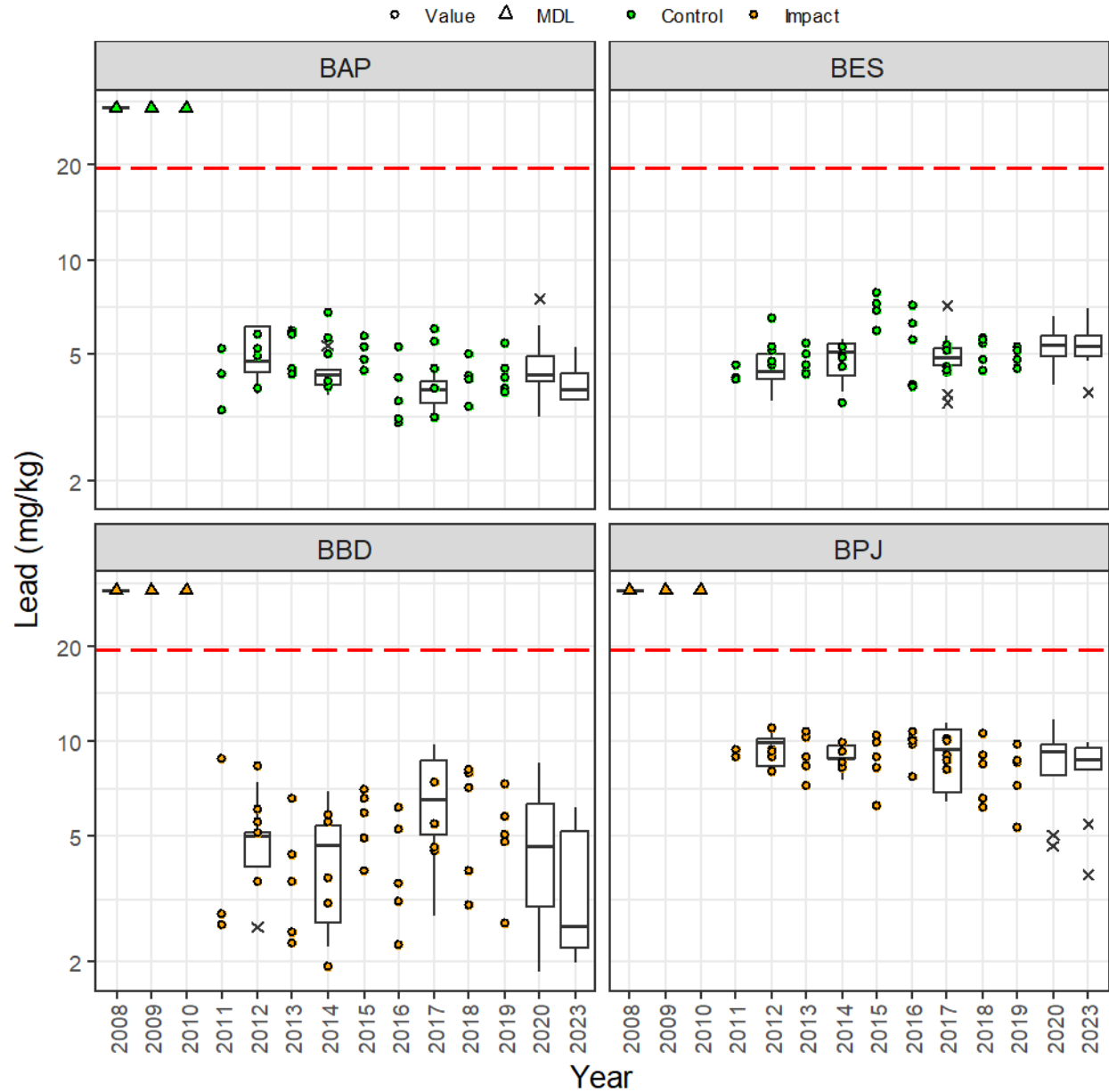


Figure 6-22. Total mercury (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.

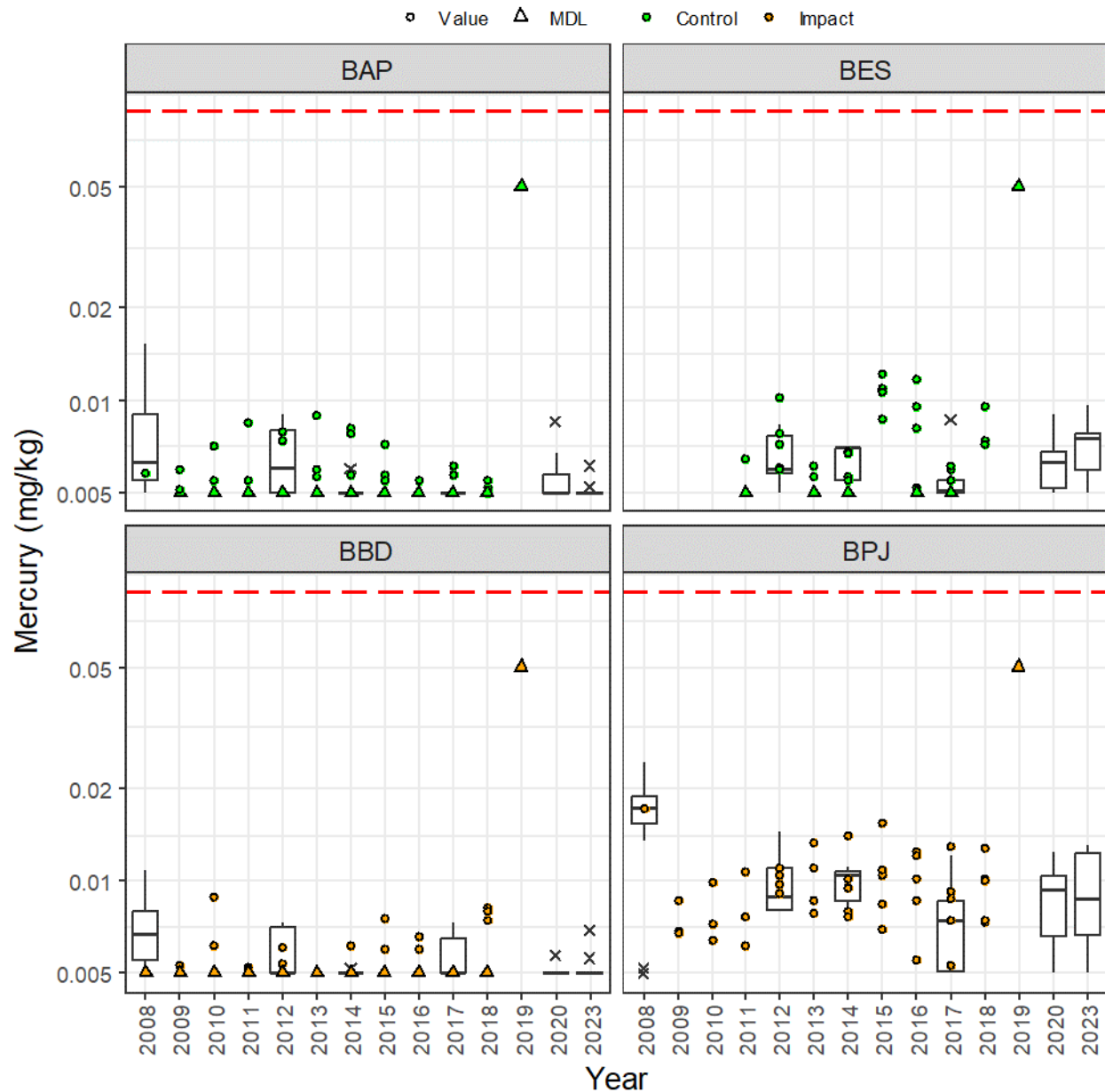
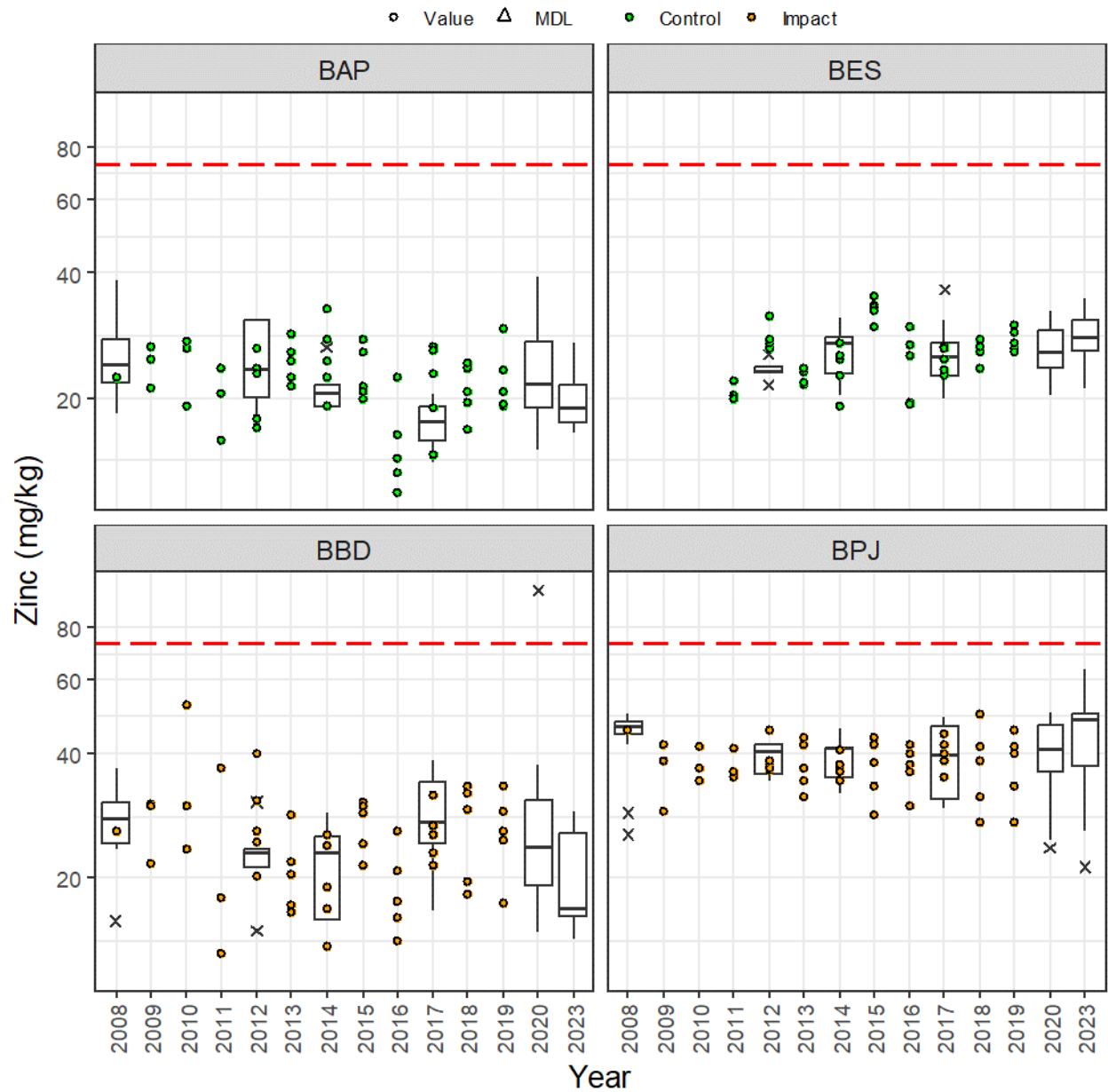


Figure 6-23. Total zinc (mg/kg dw) in sediment samples (grabs & cores) from Baker Lake since 2008.

Note: Grab samples = dots; Core samples = box and whisker. Box and whisker are interpreted as follows: horizontal line in the box = median concentration, upper and lower margins = upper (75th) and lower (25th) percentile concentrations or the interquartile range, vertical lines are maximum and/or minimum concentrations, 'x's beyond vertical lines are outlier concentrations.



Benthic Invertebrate Tables and Figures

Table 6-7. Results of BACI tests benthic invertebrate abundance at Baker Lake areas.

After Period ¹	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2023	BBD	14	1	0.97	0.91	0.31	163	-63	1,785
	BPJ	14	1	0.88	0.89	0.34	141	-65	1,549
2021-23	BBD	13	2	0.8	0.67	0.27	117	-49	829
	BPJ	13	2	0.8	0.64	0.25	118	-45	773
2020-23	BBD	12	3	0.8	0.56	0.18	122	-34	643
	BPJ	12	3	0.66	0.55	0.25	94	-40	531

Notes:

¹ No benthic invertebrate samples collected in 2022.

* **Bolded & underlined** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (BAP).

n(B) = number of years in the “before” period.

n(A) = number of years in the “after” period.

Estimate = BACI model estimate of the after-period change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., $100\% \times (\exp[\text{Estimate}] - 1)$).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

Table 6-8. Results of BACI tests benthic invertebrate taxa richness at Baker Lake areas.

After Period ¹	Test Area	n(B)	n(A)	Estimate	SE	P-value*	Effect size (%)		
							ES	LCI	UCI
2023	BBD	14	1	0.43	0.19	<u>0.04</u>	54	2	132
	BPJ	14	1	0.42	0.39	0.31	52	-35	256
2021-23	BBD	13	2	0.29	0.14	<u>0.07</u>	33	-3	82
	BPJ	13	2	0.36	0.28	0.23	43	-22	165
2020-23	BBD	12	3	0.17	0.13	0.23	18	-11	58
	BPJ	12	3	0.19	0.25	0.46	21	-30	108

Notes:

¹ No benthic invertebrate samples collected in 2022.

* **Bolded & underlined** values are P-values < 0.1.

Shaded cells indicate positive (increased) or negative (reduced) effect sizes of 20% or more.

Test area = area compared to control (BAP).

n(B) = number of years in the “before” period.

n(A) = number of years in the “after” period.

Estimate = BACI model estimate of the after-period change in mean for log-transformed data.

SE = standard error of the estimate.

P-value = two-tailed test of the null hypothesis of no change.

ES = estimated effect size (i.e., 100%*(exp[Estimate]-1)).

LCI = lower 95% confidence interval; UCI = upper 95% confidence interval.

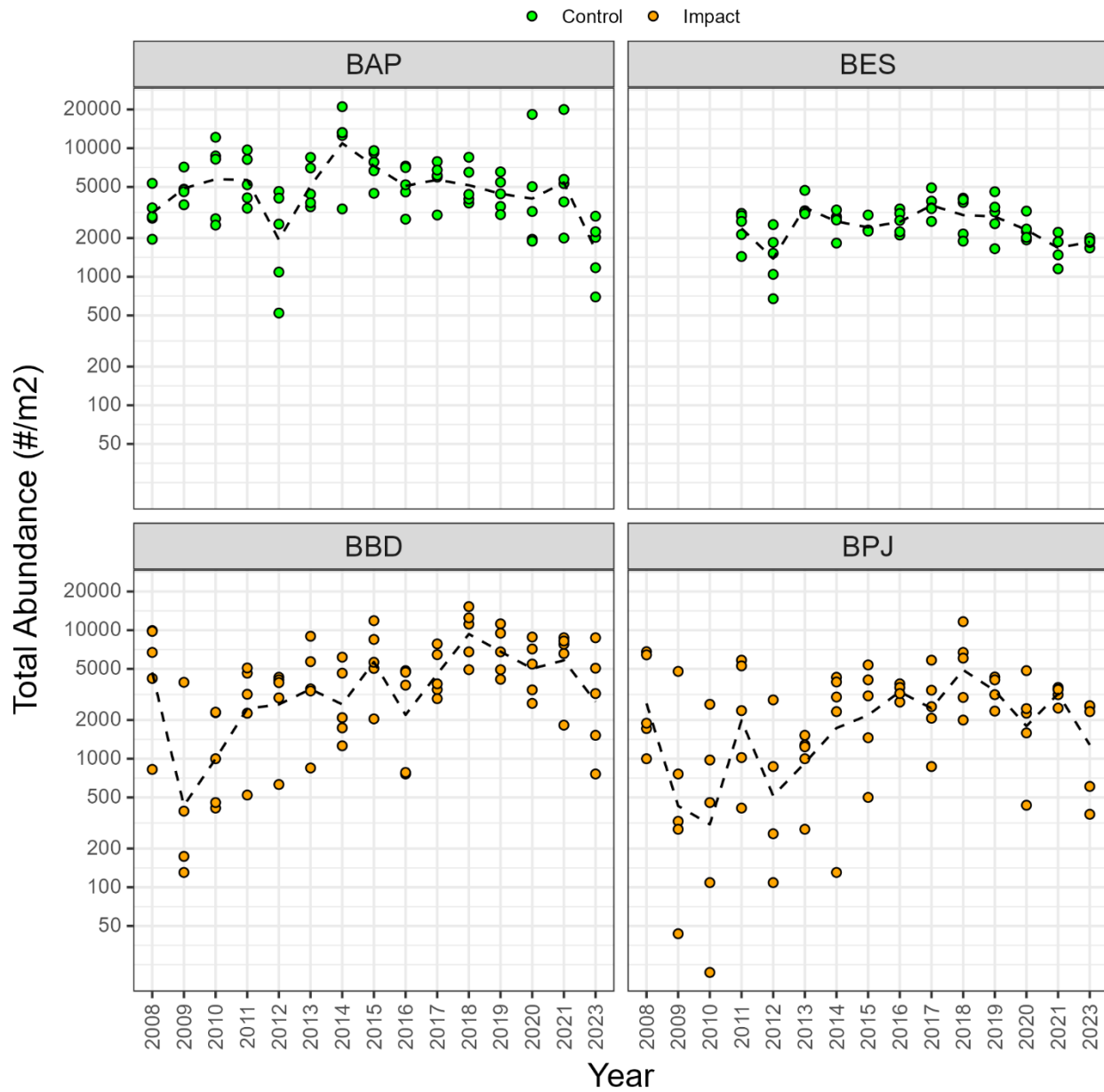
Figure 6-24. Benthic invertebrate total abundance ($\#/m^2$) from Baker Lake since 2008.

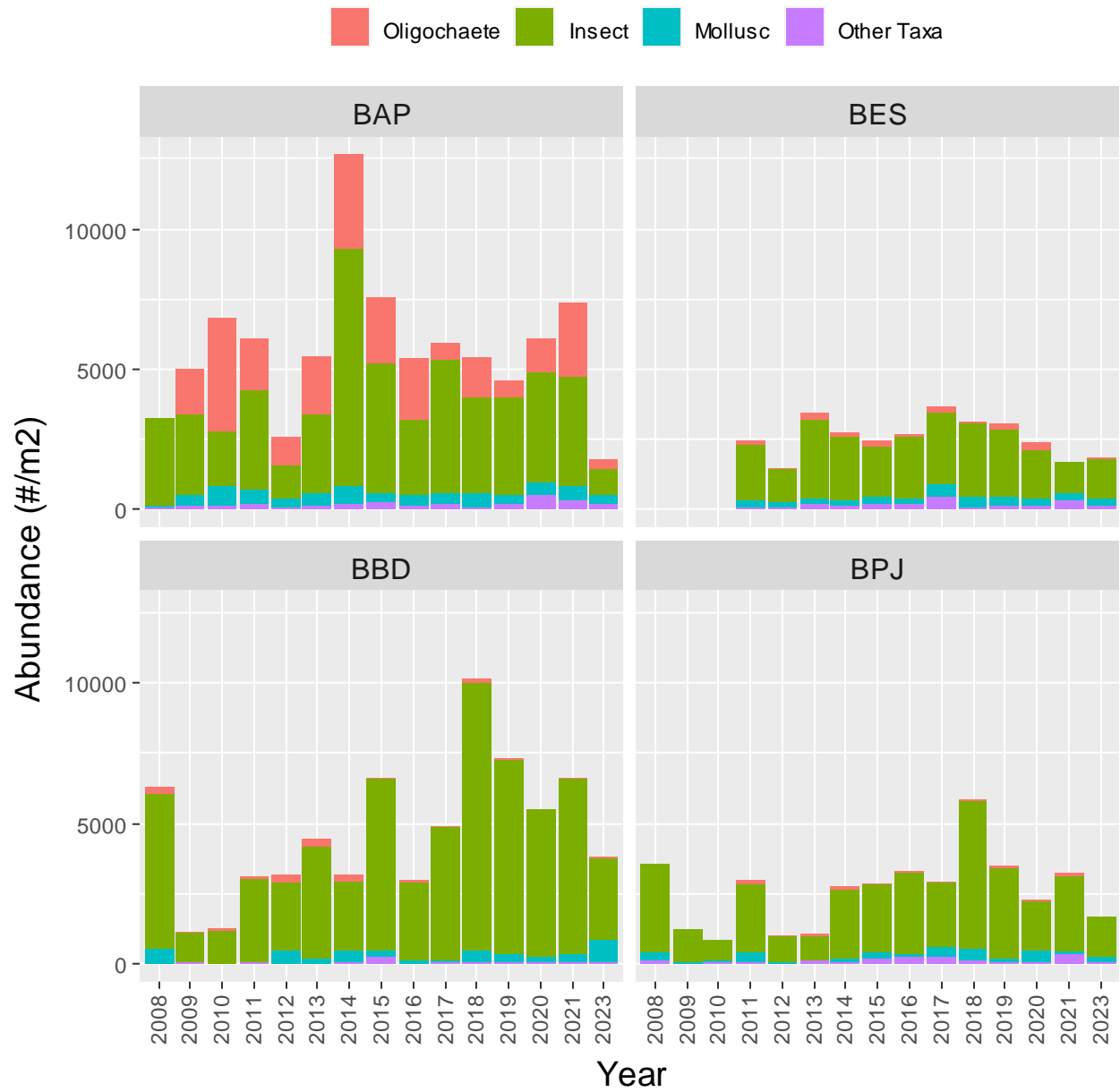
Figure 6-25. Benthic invertebrate total abundance ($\#/m^2$) by major taxa from Baker Lake since 2008.

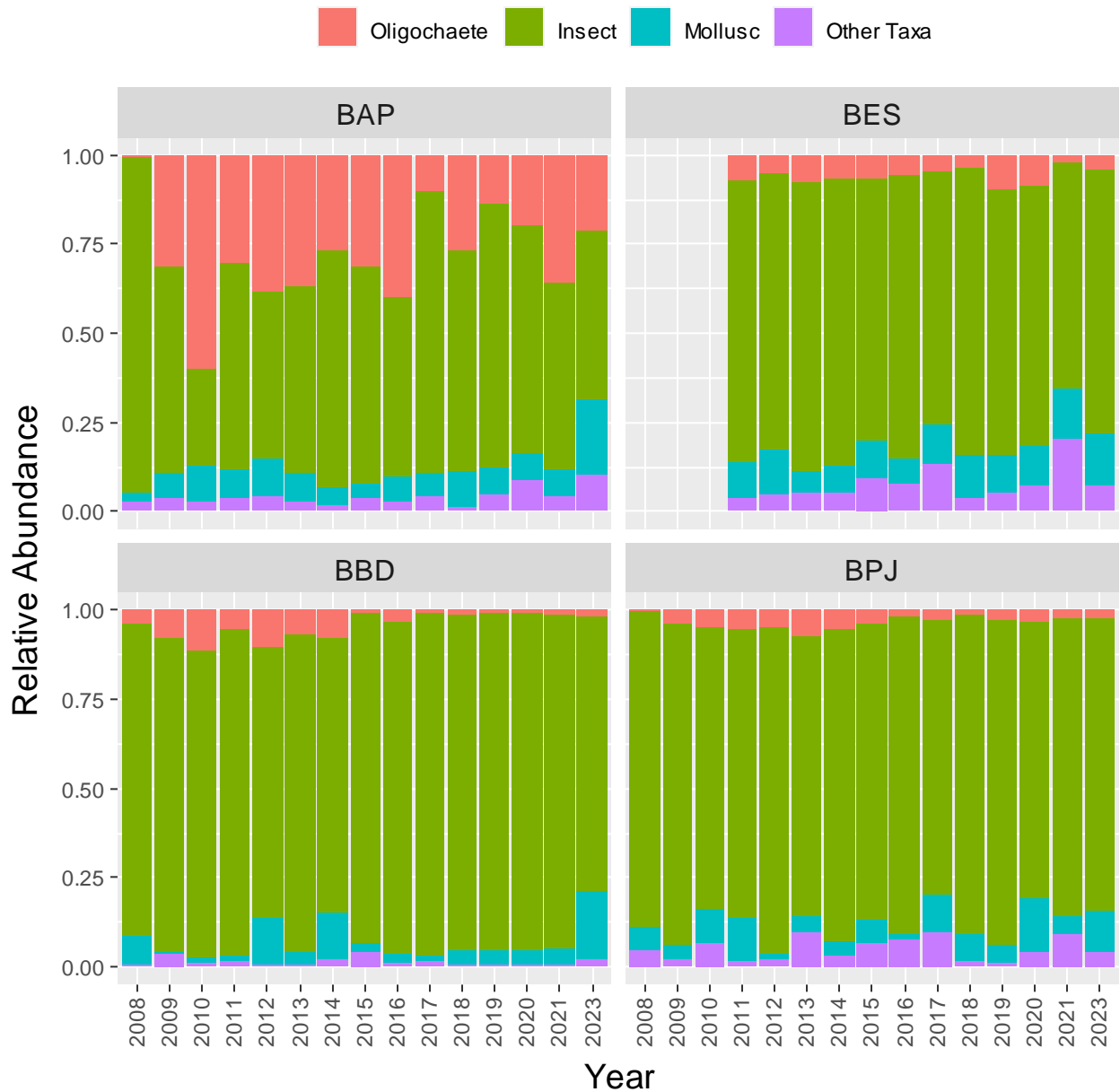
Figure 6-26. Benthic invertebrate relative abundance by major taxa from Baker Lake since 2008.

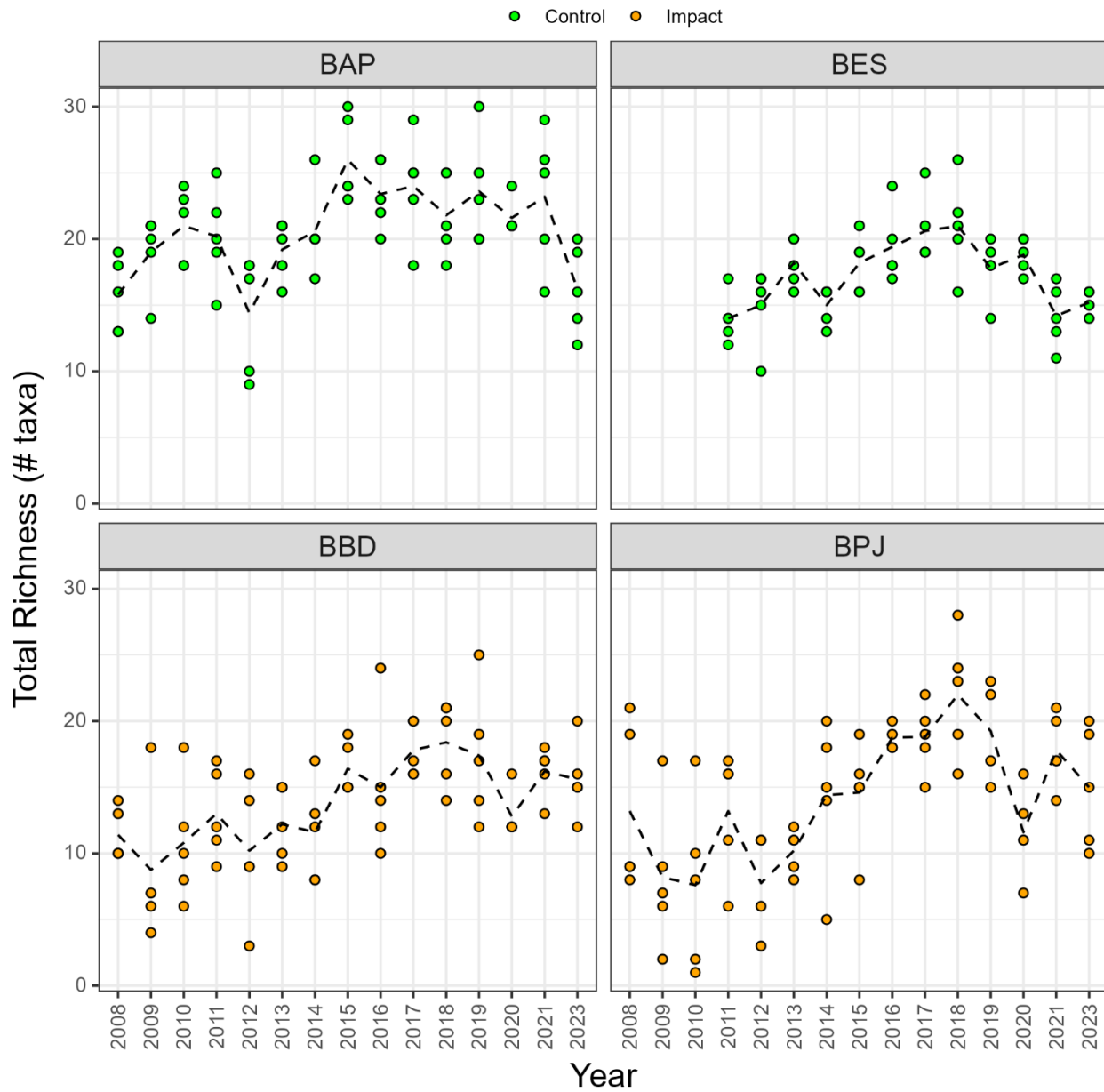
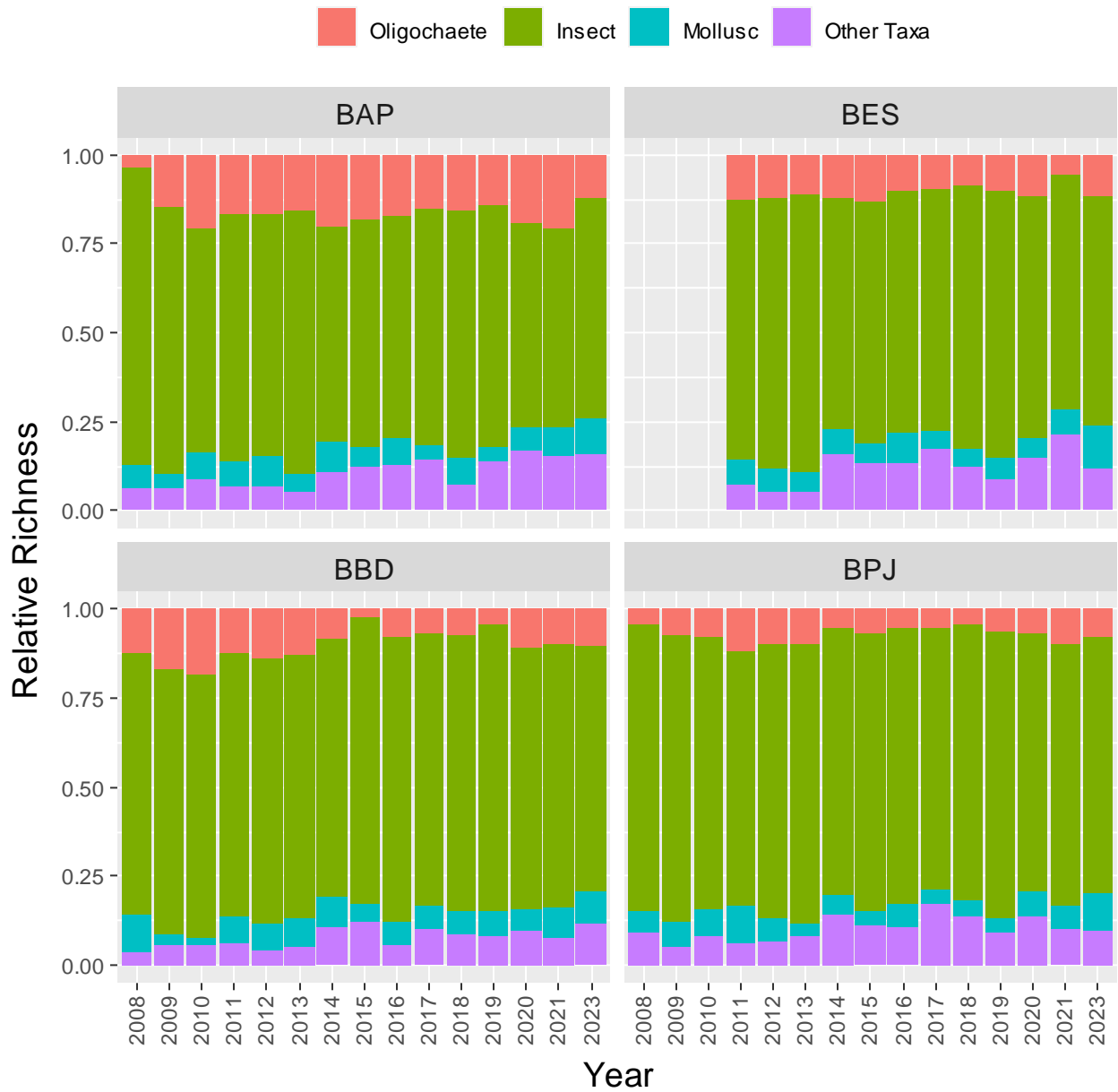
Figure 6-27. Benthic invertebrate total richness (# taxa) from Baker Lake since 2008.

Figure 6-28. Benthic invertebrate total richness (# taxa) by major taxa from Baker Lake since 2008.

Figure 6-29. Benthic invertebrate relative richness by major taxa from Baker Lake since 2008.

7 SCOPE OF THE 2024 CREMP

The CREMP focuses on identifying changes in limnology, water, and sediment chemistry, and primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. This is accomplished by applying a temporal/spatial trend assessment that includes applying quantitative decision criteria (i.e., early warning *triggers* and action *thresholds*) to facilitate making immediate and objective decisions about appropriate management actions. CREMP results are integrated annually into the Aquatic Ecosystem Monitoring Program (AEMP) for holistic environmental management and decision making. Recommendations for the scope of the 2024 CREMP are provided for Meadowbank, Whale Tail, and Baker Lake based on the 2023 monitoring results discussed in [Sections 4, 5, and 6](#), respectively.

7.1 Meadowbank

Based on the 2023 results and the annual decision framework for the sampling strategy ([Section 2.2.3](#)), the components and schedule for the 2024 CREMP for the Meadowbank study area is summarized in [Table 7-1](#). The scope of work proposed for 2024 includes:

- Water quality – Water sampling for three open-water and two through-ice sampling events is recommended at the NF and reference areas. Through-ice limnology and water chemistry sampling at TPS, TE, and TEFF will be suspended unless monitoring data from NF areas suggest there are “moderate changes” in water quality³⁵. In addition, contingency water samples may need to be collected during the limnology-only, through-ice sampling event(s) at the NF areas, if anomalous *in-situ* limnology results are observed.
- Phytoplankton – Routine sampling at the NF areas, at the same time as the three open-water and two through-ice sampling events. Winter phytoplankton samples will be archived and may be submitted for analysis depending on the results from the open-water sampling events. Sampling at MF and FF areas is not required.
- Sediment chemistry – Sediment chemistry samples will be collected by grab sampler with benthos samples at all NF and reference areas.
- Benthos – Routine benthos samples and supporting habitat data (TOC and grain size) will be collected by grab sampler at the NF and reference areas.

³⁵ “Moderate changes” in water quality are defined as statistically significant increases exceeding the early warning trigger for parameters with effects-based thresholds (i.e., CCME FWAL).

7.2 Whale Tail

Timing of the field sampling at the Whale Tail study area lakes matches the schedule for Meadowbank because of share-reference area sampling at INUG and PDL. The frequency of sampling and study components at each area are outlined in [Table 7-2](#). The scope of work proposed for Whale Tail study area lakes in 2024 includes:

- Water quality – The full CREMP program (through-ice and open-water) is recommended at the NF, MF, FF, and reference areas. Through-ice limnology profiles are recommended at KAN/MAM, WTS, and NEM in the months when water sampling is not completed. In addition, contingency water samples may need to be collected during the limnology-only, through-ice sampling event(s), if anomalous *in-situ* limnology results are observed.
- Phytoplankton – Routine sampling with the full water quality sampling program.
- Sediment chemistry – Sediment chemistry samples will be collected by grab sampler with benthos at all NF areas and reference.
- Benthos – Benthos samples and supporting habitat data (TOC and grain size) will be collected by grab sampler at the NF, MF, FF, and reference areas on the same schedule as the Meadowbank study area lakes. Sampling at NF areas (WTS and KAN/MAM) to monitor for changes in the community due to construction and discharge. Sampling at NEM to monitor potential changes related to the temporary authorized discharge into the Nemo Lake watershed in 2019. Sampling at A20 to monitor potential changes related to the connectivity with WTS since the impoundment. Sampling at areas A76 and DS1 to provide more information on the range of normal conditions to support future BACI-style analysis.

7.3 Baker Lake

The scope of the 2024 Baker Lake CREMP is presented in [Table 7-3](#). Monthly water quality monitoring is planned for July, August, and September consistent with previous years. Sediment chemistry and benthos sampling are currently planned for completion in August 2024. Sediment chemistry and benthos monitoring is not planned for 2024. Sediment chemistry and benthos monitoring frequency for this area will occur on a three-year cycle as per the *CREMP Plan Update* (Azimuth, 2022b).

Table 7-1. Monitoring components planned for 2024 Meadowbank CREMP.

Area ID	Through-Ice					Open-Water			Through-Ice	
	Jan	Feb	Mar	April	May	Jul	Aug	Sep	Nov	Dec
Reference Areas										
INUG			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
PDL			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Near-Field Areas										
TPE	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
TPN	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
SP	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
WAL	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Mid- and Far-Field Areas										
TPS, TE, and TEFF			Suspended ¹							

Notes:
1. Monitoring at MF and FF areas TPE, TE, and TEFF is only required if *moderate* changes are detected upstream at the NF locations consistent with the *CREMP Plan Update* (Azimuth, 2022b).
No sampling in June and October due to unsafe ice conditions.
Limno: 1 limno depth profile should be collected at key near-field areas (TPN, TPE, SP, and WAL) during the winter months; water chemistry will also be collected if profiling shows unusual results.
WQ: water quality - 2 replicate samples from 3 m depth and limno profiles at each location.
Phyto: 2 replicate samples from 3 m depth; same locations as limno.
Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, grain size, moisture); 10 replicates for core chemistry (metals, TOC, moisture).
Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

Table 7-2. Monitoring components planned for 2024 Whale Tail CREMP.

Area ID	Through-Ice					Open-Water			Through-Ice	
	Jan	Feb	Mar	April	May	Jul	Aug	Sep	Nov	Dec
Near-Field Areas										
WTS	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
MAM	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
NEM	Limno	Limno	WQ	Limno	WQ	WQ	WQ	WQ	Limno	Limno
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
Mid- and Far-Field Areas										
A20			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
A76			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			
DS1			WQ		WQ	WQ	WQ	WQ		
			Phyto		Phyto	Phyto	Phyto	Phyto		
							Sed			
							Benthos			

Notes:

No sampling in June and October due to unsafe ice conditions.

Limno: 1 limno depth profile should be collected at key near-field areas (MAM and WTS) to reduce uncertainty regarding the potential occurrence of changes over winter; water chemistry will also be collected if profiling shows unusual results.

WQ: water quality - 2 replicate samples from 3 m depth and limno profiles at each location.

Phyto: 2 replicate samples from 3 m depth; same locations as limno.

Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, grain size, moisture); 10 replicates for core chemistry (metals, TOC, moisture).

Coring: 10 replicate sediment core samples (+1 duplicate) for metals and TOC.

Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

Table 7-3. Monitoring components planned for 2024 Baker Lake CREMP.

Area ID	Open-Water		
	July	August	September
BBD	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BPJ	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BAP	WQ	WQ	WQ
	Phyto	Phyto	Phyto
BES	No sampling planned for 2024		

Notes:

WQ: water quality 2 replicate samples from 3 m depth and limno profiles at each location.

Phyto: 2 replicate samples from 3 m depth; same locations as limno.

Sed: 1 composite of grabs for organics (LEPH, HEPH, PAH (low), Mineral Oil and Grease); 5 replicates for grab physical (TOC, Grain Size, Moisture); 10 replicates for core chemistry (metals, TOC, Moisture).

Coring: 10 replicate sediment core samples (+1 duplicate) for metals and TOC.

Benthos: 5 replicate samples (2 grab composite/sample); same locations as sediment.

8 REFERENCES

The references section is organized into three sections: Annual CREMP Reports, guidance documents related to the CREMP, and other literature cited in the report, including peer-reviewed studies and technical reports.

Annual CREMP Reports and Baseline Studies

- Azimuth. 2023a. 2022 Core Receiving Environment Monitoring Program, Meadowbank Complex. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March 2023.
- Azimuth. 2022a. 2021 Core Receiving Environment Monitoring Program, Meadowbank Complex. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. March 2022.
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APPENDICES

APPENDIX A

QUALITY ASSURANCE / QUALITY CONTROL ASSESSMENT

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A.1 INTRODUCTION

A.1.1 Quality Assurance / Quality Control

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical and biological data are representative of the material or populations being sampled, are of known quality, have sufficient laboratory precision to be highly repeatable, are properly documented, and are scientifically defensible. Data quality was assured throughout sample collection and analysis using specified standardized procedures, by employing laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

Quality assurance and quality control practices are briefly described here.

- *Quality Assurance* (QA) are the practices used to collect scientifically defensible samples meeting pre-defined data quality objectives (DQOs). For example, employing experienced field staff, standard operating procedures (SOPs), field data sheets, and certified laboratories.
- *Quality Control* (QC) are measures taken to verify that the specific DQOs are met.

The 2023 CREMP QA/QC program was completed at the Meadowbank, Baker Lake, and Whale Tail sampling areas. The QA/QC program is completed at each area to refine the sample procedures and QA/QC protocols and ensure consistency between Meadowbank and Whale Tail Environment teams. An overview of the QA/QC program for each component is provided below; refer to the *CREMP 2022 Plan Update* (Azimuth, 2022) for a complete description.

The QA/QC results presented below for the 2023 CREMP program are summarized in [Section 3](#) of the main report.

Sample Integrity

The first step in the QC program involved documenting any issues with the sample submission. This step applies to all sampling components (e.g., water chemistry, sediment chemistry, phytoplankton, benthic invertebrates). ALS Environmental was the analytical laboratory used for water and sediment chemistry and who reported concerns surrounding sample submission as “Sample Integrity” issues in the Sample receipt confirmation (SRC) email after the samples were received. Plankton-R-Us Inc. (phytoplankton) and Zaranko Environmental Assessment Services (ZEAS; benthic invertebrates) also reported sample integrity concerns via email. For ALS reports, the results were typically recorded in the sample integrity assessment for one of three reasons: (1) samples were damaged during transport, (2) the temperature inside the cooler was above 10°C when received by the laboratory, or (3) the recommended hold time was exceeded prior to analysis. Sample integrity issues do not necessarily mean the data were unusable;

rather, this information is meant to help the client make an informed decision on how to proceed with analysis and use the results.

Data Quality Objectives - Duplicates

Quality control results of the laboratory and field duplicates were assessed by measuring the relative percent difference (RPD) as a percentage between original and duplicate measurements. The RPD serves as a measure of precision by the laboratory and the magnitude of variability between original and field duplicate samples, respectively. The variability in field duplicates may be attributed to sampling procedures but may also be attributed to natural conditions (i.e., spatial heterogeneity in the sampling media). The equation used to calculate the RPD is:

$$RPD = \frac{(A - B)}{\left(\frac{A + B}{2}\right)} \times 100$$

where: A = analytical result; B = duplicate result.

Laboratory duplicate DQOs were parameter-specific and depended on the concentration in the sample. Laboratory duplicates were completed for water chemistry, sediment chemistry, phytoplankton, and benthic invertebrates. Field duplicate samples were collected for water and sediment chemistry, and phytoplankton. DQOs for the duplicate samples are discussed below.

The DQOs for field duplicates are equal to 1.5 times the laboratory RPDs. The laboratory RPDs for water and sediment chemistry for most analytes is 20% and the DQOs for field duplicate samples were $\pm 30\%$. For parameters without a laboratory RPD DQO (e.g., for chlorophyll-a where the laboratory does not run duplicates), the field duplicate DQO was set to $\pm 40\%$ by default. Field DQOs were adjusted above laboratory RPD levels to reflect that field duplicates are inherently more variable compared to laboratory duplicates. This is partly because field duplicate samples are collected from a large sample volume (i.e., the lake or stream) as opposed to a small, well mixed sample volume (i.e., the single sample container in the laboratory). The use of a 1.5 times multiplier for field duplicates is based on guidance from the Canadian Council of Ministers of the Environment (CCME) that states that acceptance limits for field-based QC are broader than laboratory QC and are typically 1.5 to 2 times the laboratory QC limits (CCME, 2016).

The uncertainty in concentrations increases near to the detection limit and the acceptance criteria are relaxed for parameters measured < 5 -times the DL. For parameters with concentrations measured at < 5 -times the DL, the DQO is an absolute difference between duplicates < 2 -times the DL (referred to in the tables as DIFF).

The RPD and DIFF values may be either positive or negative and ideally should provide a mix of the two, clustered around zero. RPDs and DIFF values are not calculated when one of the samples (i.e., either A

or B above) is below detection and the other is not. If an RPD or DIFF value falls outside the field duplicate DQO it is flagged for review. The importance of reduced precision becomes more important when concentrations are near regulatory guidelines (CCME, 2016). Laboratory precision is reduced close to the DLs as smaller concentrations of analytes per volume tends to magnify variability between the original sample and the duplicate. These occurrences were still flagged, however, given the inherent analytical effects on precision, they were not weighted as heavily unless unusual RPD patterns were observed (e.g., relatively high percentage of RPD values not meeting DQOs or very high RPD values). Analyte concentrations that were greater than 10X DL and did not meet the DQOs were given more weight in the QA/QC assessment.

Phytoplankton DQOs did not change in 2023. The laboratory did not calculate RPD values though they did run duplicate samples. The DQOs for phytoplankton laboratory duplicates were less than $\pm 25\%$ RPD and for field duplicates were less than $\pm 50\%$ RPD.

There were no benthic invertebrate field duplicates and RPDs were not calculated for laboratory duplicates. For laboratory duplicates, ZEAS calculated the re-sort and re-count percent recovery (the difference between the original sorting and a second sorting from the same sample) with DQOs of 90% or better.

A.1.2 Overview

QA/QC procedures consisted of careful field collection and sample handling, collecting field duplicate samples and analyzing laboratory replicates and standard reference materials. A discussion of sample shipping and handling procedures is provided upfront, followed by a discussion of the results pertaining to the various components of the CREMP.

Sample Shipping and Handling

Sample shipping and handling concerns documented in previous CREMP reports have largely been rectified in recent years. The Meadowbank and Whale Tail Environment departments plan water sampling events to minimize the amount of time that samples are in transit between Site, Val d'Or, and ALS in Burnaby. The remote location of the mine will always present challenges with some analytes meeting recommended hold times but the effect of slightly exceeding hold times on the quality of the results is considered negligible. Correspondence with the laboratory regarding hold time exceedance has not led to establishing definitive benchmarks for data quality. ALS recommends using *professional judgement* when interpreting chemistry data for parameters that exceeded hold times for analysis.

The sample shipping and handling QA/QC for 2023 was similar to 2022. There were a few discrepancies between samples submitted and the chain of custodies (CoCs) but most were rectified without impacting the analytical results. **Table A-1** summarizes the sample integrity observations (e.g., broken

sample containers, mislabeled containers), the temperature in the shipping coolers upon arrival to the laboratory, and the parameters that exceeded their recommended hold times for analysis.

The target temperature for samples arriving at ALS is between 5°C and 10°C. The temperatures reported in 2023 ranged from a low of 1°C in March to a high of 21°C in July. This range was similar to past years and reflects the seasonal ambient temperatures. The effect on preserved samples is considered negligible, but for chlorophyll-a samples, the increase in temperature means samples may have arrived thawed. Keeping the chlorophyll-a samples frozen is a recurring challenge for this program given the logistics of shipping samples from Nunavut to Vancouver in a timely fashion.

There were no broken containers or samples that spilled in 2023.

There were several incidents of CoC discrepancies – mislabeled samples or samples either submitted and not included on the CoC or included on the CoC but not submitted. CoC discrepancies were identified and forwarded to CREMP project managers immediately after the laboratory received the samples. As such, these types of errors were often rectified shortly after ALS received the samples. The discrepancies are listed in [Table A-1](#).

Recommended hold times were provided by the laboratory for analytes and water quality parameters. The times varied from a low of 0.25 days for pH to six months for metals. Hold times for water samples were routinely exceeded for alkalinity, turbidity, laboratory pH, nitrate, nitrite, total dissolved solids (TDS), total suspended solids (TSS), and dissolved orthophosphate (as P). Very occasionally hold times were exceeded for cyanides (free and total). Hold times for sediments were exceeded for pH, mercury, and methylmercury. Samples were generally shipped very soon after collection and though shipping from the Meadowbank Mine has improved in recent years, the distances and logistics make it impossible to meet short hold times. However, it is highly unlikely that results were affected for those parameters or analytes where hold times were not met in 2023.

A.2 WATER CHEMISTRY

A.2.1 Field Methods

The standard field QA procedures included flushing the flexible tubing and pump to prevent cross-contamination between areas and thoroughly rinsing the sample containers with site water prior to sample collection. Field QC procedures included collecting and analyzing field duplicates, and three types of *blank* samples: travel blanks, de-ionized water (DI) blanks, and equipment blanks. Collecting blank samples, particularly equipment blank samples, required careful planning, attention to detail, focus on the importance of cleanliness. Collecting blank samples also provided a good opportunity to assess QA procedures.

Blank samples were collected once per sample event and submitted *blind* to the laboratory to ensure they were treated the same as field-collected samples during analysis. Results from both the equipment and travel blanks were examined for detectable concentrations of any of the parameters measured; no parameter in either blank should exceed laboratory method DLs. If an analyte was detected in a blank, the results for the batch of samples submitted with the blank were compared to the measured concentration in the blank. Results that were less than five times the detected analyte concentration in the equipment blank were flagged to examine the potential for cross-contamination to affect the results. Results carried forward in the QA/QC assessment received either a cautionary flag or an unreliable flag. Cautionary flags were applied to sample results if the analyte was detected in the blank but the effect of potential cross-contamination was considered minor (e.g., the concentration in the equipment blank was a small percentage of the concentration in the samples). Unreliable data flags were applied to water quality results that were unrepresentative of the water quality (e.g., elevated metal concentrations in a sample that were not observed in other replicate sample(s) collected during the same event). The water chemistry data with *cautionary* and *unreliable* data flags were provided in [Appendix B](#) for clarity on which results should be examined further and/or excluded from decision-making.

A.2.2 Laboratory Methods

ALS is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Performance evaluations are conducted under CALA's accreditation program for laboratory methods, protocols, and QC samples. There are four types of QC samples components of the water chemistry laboratory QC program to assess analytical precision, bias, and completeness:

Laboratory Duplicate – duplicates provided insight into the precision of laboratory analyses. The laboratory randomly chose samples to re-run as duplicates. Duplicate aliquots were taken from the same sample and run through the laboratory analytical process. The difference between the concentrations in the two samples is a measure of the variability associated with duplicate analyses of the same sample in the laboratory.

Method Blank (MB) – samples were analyzed to assess background interference or contamination in the analytical system that could lead to elevated concentrations or false positive data. An analyte-free matrix, such as de-ionized water, was subjected to the entire analytical process to demonstrate that the analytical system itself did not introduce contamination.

Matrix Spike (MS) / Matrix Duplicate (MD) – a known amount of a compound that is chemically similar to the target analyte, was added to samples to ascertain any matrix effects on recoveries and to determine the accuracy and precision of the method in this matrix.

Laboratory Control Sample (LCS) – an LCS is a well-characterized sample of known analytes and concentrations. An LCS may be reference material (i.e., certified reference material) containing certified amounts of target analytes. Percent recovery of the target analytes in the LCS was compared to established control limits which helped determine whether the methodology was in control and whether the laboratory could make accurate and precise measurements at the required reporting limit.

Laboratory QC results are included in each laboratory report for CREMP water quality samples.

A.2.3 Results and Discussion

Field duplicates, laboratory duplicates, and blank samples were analyzed as part of the QA/QC program in each sampling event in 2023. The blank results and field duplicate samples have been fully integrated for all CREMP study areas. Similar to previous years, to better identify potential QA/QC weakness, each team (i.e., Meadowbank Environment and Whale Tail Environment) took turns collecting blank samples, and the field duplicate samples were split evenly between the Meadowbank/Baker Lake study areas and the Whale Tail study area. This approach ensured both teams were familiar with the QA/QC process and better appreciated the nuances of sample collection and handling methods. Blank sample collection, particularly equipment blank samples, required careful planning, attention to detail, focus on the importance of cleanliness, and generally provided an opportunity to assess QA procedures.

Results of the QA/QC analysis are discussed below, along with a discussion on the implications of the QA/QC assessment on the 2023 sample results.

Travel Blanks

Travel blanks should be included in sample bottle shipments, arrive directly from the analytical laboratory, and be stored in a cool place (e.g., refrigerator). A travel blank was submitted for each sampling event. Except for a detectable concentration of total organic carbon (TOC) in the August travel blank, there were no detectable concentrations of analytes.

Travel blank results are summarized in **Table A-2** and complete results are provided in **Table A-4**.

De-ionized Blanks

The goal of collecting de-ionized (DI) blanks was to test the quality of the DI water batch and variability in laboratory analytical methods. DI blanks with the full suite of analyses were submitted for each sampling event in 2023; results are reported in **Table A-4**.

In the DI blanks, there were no detectable concentrations of any analytes in September. In March, total dissolved phosphorus was detected above DL in the DI blank but not in the equipment blank. In July and

August, ammonia as N was detected in the DI blank and equipment blank. None of the parameters were detected above 10 times the DL.

Equipment Blanks

Equipment blanks (EBs) represent a good opportunity to assess the water sampling equipment and also the QA procedures employed by the sampling teams. Collecting these samples requires careful planning and close attention to detail in the sample collection methods which are updated yearly but underwent a notable review in 2015 (Azimuth, 2015).

Several analytes were detected for at least one of the EBs submitted in 2023; results are provided in **Table A-4**. In general, results were very good for most events and were comparable to past years:

- In March, lead was the only parameter detected in the EB sample.
- In July, total ammonia, total and dissolved lead, total and dissolved magnesium, total strontium, dissolved aluminum, and dissolved barium were detected in the EB sample at concentrations slightly above the DL.
- In August, total ammonia and total lead were detected in the EB sample at concentrations slightly above the DL.
- In September, total chromium, total iron, total and dissolved lead, total and dissolved manganese, and total and dissolved zinc were detected in the EB sample at concentrations slightly above the DL.

The implications of possible cross-contamination on the interpretation of the water quality data from the same event was considered inconsequential for all sampling events. Of the analytes that were detected in EBs in 2023, all concentrations were less than 10 times the DL; therefore, no additional scrutiny is warranted.

Field Duplicates

Field duplicate analysis combined results for the Meadowbank, Baker Lake, and Whale Tail study areas. One field duplicate is collected for approximately every 10 samples (i.e., 10% of the total number of samples). In 2023, there was a combined total of 16 duplicates collected between the Meadowbank Lakes, Baker Lake, and the Whale Tail Lakes, corresponding to approximately 13% of the total number of water samples (n=122). Across all CREMP study areas, one to four field duplicates were collected in each sampling event. The field duplicate assessment is provided in **Table A-6**.

As mentioned in **Section A.1.1**, the DQOs for field duplicates were 1.5 times the laboratory RPD for each analyte unless no RPD was available in which case a default 40% was used. The laboratory RPDs for water chemistry for most analytes is 20% therefore the DQOs for field duplicate were less than $\pm 30\%$. In

2023, there were only 2 RPDs that did not meet DQOs out of the 1808 RPDs calculated¹, equal to less than 1% of the field duplicate comparisons. Of the two parameters that exceeded the DQOs, one of them was detected at a concentration greater than 10 times the DL (**Table A-6**):

- September DUP-3 (NEM-84): chlorophyll-a

Overall, less than 1% of field duplicate RPDs did not meet DQOs, suggesting that sample collection and sample handling in 2023 have maintained a high standard.

Laboratory QC Samples

ALS provided a thorough account of their QA assessment in each certificate of analysis (COA) report that was issued². These results are provided in **Table A-3**. The various components of the QA assessment are provided to help make informed decisions when interpreting the data. The QA program was comprised of four main elements:

- **Laboratory Duplicates** – the laboratory DQO for most parameters was an RPD of less than 20%. All laboratory duplicates met the DQOs for water chemistry in 2023.
- **Method blanks (MB)** – the MB was a blank matrix sample that was taken through the entire analytical procedure to test variability in the analytical method and report any bias in the analysis. MB results were equal to the limit of reporting (LOR or DL³ as termed here). MB qualifiers were either:
 - “B” – MB exceeded ALS DQO. Associated sample results which were less than DL or greater than 5X blank levels were considered reliable.
 - “MB-LOR” – MB exceeded ALS DQO. DLs were adjusted for samples with positive hits below 5x blank levels.
- For most sample analyses there were no flags or very few flags (e.g., one or two analytes in one sample may have been flagged for B) in the method blank results. However, the limited number

¹ Reporting an analyte does not necessarily calculate an RPD. See **Section A.1.2** for a description on how RPD values are not calculated when either the parent sample or the duplicate are below detection limits.

² The COA may include data qualifiers that relate to the sample “batch”. The sample batch may include samples that are from other projects and the qualifiers included in the COA may relate to those and not the CREMP samples. In general, this does not impact the assessment of laboratory QA; however, in some instances, particularly for sediment laboratory duplicates, data qualifiers in the COA related to sample heterogeneity may not relate to CREMP samples. The Microsoft Excel® report that accompanies the COA includes tabs with detailed assessments of laboratory QA that are project specific and can be reviewed in conjunction with the COAs.

³ The DL is sometimes referred to as the MDL (method detection limit) in this appendix and the main report.

of cases with DQO flags for MB samples were nonetheless reviewed; the results did not affect the interpretation of the water quality data.

- **Matrix Spike (MS)** – MS recovery is periodically flagged in the QC assessment due to high concentrations of the analyte in the sample. These instances are generally rare, and typically associated with parameters such as major cations (e.g., magnesium) or certain metals with detected results above the DL (e.g., strontium in 2020).
- **Laboratory Control Samples (LCS) / Certified Reference Material (CRM) / Internal Reference Material (IRM)** – there was one exceedance of DQOs for the laboratory control samples in 2023.

Part of the QA assessment involved comparing the paired sampling events collected at each station within a given event to confirm the data were representative of current conditions and to determine whether the data required additional review. First, the dissolved and total concentrations for a given parameter were compared for each location. Samples where the dissolved concentrations were greater than the total with an RPD of more than 30% were reviewed further. The second analysis compared the concentrations of parameters from the paired samples located within each water body (lake or basin). Parameters for which the difference between the paired intra-lake samples was greater than a factor of 5 (or factor of 10 in cases where at least one of the samples was within a factor of 10 of the DL) were flagged for further review. The sample review resulted in a few results being flagged and removed from formal analysis. For transparency, the sample results that were removed from formal analysis are retained in the water chemistry tables provided in [Appendix B](#).

A.2.4 Water Chemistry QA/QC Summary

The field and laboratory QA/QC results for the 2023 water chemistry were acceptable and comparable to the 2022 results:

Sample Integrity – there were no samples lost from breakage or mislabeling in 2023. Sample temperatures received at the laboratory were variable depending on the season and reflected the challenges with shipping from a remote mine site. Likewise, hold time exceedances for parameters and analytes with short hold times were unavoidable but were not considered likely to impact data analysis and interpretation. The detection limit for chromium was adjusted by the laboratory from 0.0001 to 0.0005 mg/L in May 2021 and for beryllium in 2018 from 0.00002 to 0.00001 mg/L due to method re-validation (Pers. Comm. Brent Mack, ALS November 28, 2022). For both parameters, the revised DLs still meet the lowest available Canadian quality guidelines (0.1 µg/L for beryllium, 0.5 µg/L for chromium; Pers. Comm. Brent Mack, ALS November 28, 2022). Beryllium has consistently remained below DL since baseline and is not a parameter of concern for the Site. Furthermore, the revised DL is below the trigger and threshold values for the Meadowbank, Whale Tail, and Baker Lake study areas. As such, the revised DL is sufficient to detect changes in concentrations of beryllium at the Site. There is no lower DL analysis

available for beryllium. For chromium, concentrations above DL have been detected during operations and the revised DL is higher than those detected concentrations. Starting in 2023, low-level chromium (DL = 0.1 µg/L) was analyzed in order to ensure any potential changes in chromium concentrations due to mining activities are detected. The 2023 results for beryllium were less than the revised DL. There were a few samples above the revised DL for chromium at NF areas and reference areas (INUG and PDL).

Blanks – blank results in 2023 indicated reliable sample handling and that cross-contamination related to sampling equipment was unlikely. Very few analytes were detected in blank samples from each event.

The implication of possible cross-contamination on interpretation of the 2023 water quality data was evaluated by comparing the sample concentrations with the equipment blank results from the same event. Sample results in the complete datasets were given a cautionary flag using underlining (e.g., 0.001) to indicate that the measured concentration was less than 5-times the concentration detected in the equipment blank sample. Several analytes were occasionally given cautionary flags, including aluminum, iron, lead, molybdenum, manganese, and zinc. None of the water quality results with cautionary flags exceeded the trigger except for lead in one sample at WAL in March. Sample results, including results with cautionary flags, are reported in [Appendix B1](#) (Meadowbank), [Appendix B2](#) (Whale Tail), and [Appendix B3](#) (Baker Lake).

Overall, approximately 10% of parameters were assigned cautionary flags for one or more samples. Despite the assigned cautionary flags, potential cross-contamination is considered unlikely to bias interpretation of the 2023 water quality analysis.

Field Duplicates – overall, the field duplicate results were very good with only 1% of all the calculated RPDs not meeting their DQOs in 2023.

Laboratory QC Assessment – the laboratory QC assessment completed by ALS indicated the 2023 water quality data were typically within the established DQOs. In the few instances where a DQO was exceeded, the laboratory concluded the results were reliable and fit for use in the water quality assessment.

A.3 SEDIMENT

Field duplicates, and filter swipe samples were analyzed as part of the QA/QC program in the August sediment sampling event. Results of the QA/QC analysis are discussed below, along with a discussion on the implications of the QA/QC assessment on the sample results.

A.3.1 Field Methods

Field QA consisted of taking care between sampling areas by rinsing and cleaning the sampling gear for sediment grabs (Petite Ponar grab, stainless steel bowls, and spoons) and sediment cores (coring kit) using site water and phosphate-free cleaning detergent, to avoid the possibility of cross-contamination. Field QC measures included collecting and analyzing field duplicates and filter swipes.

A filter swipe sample consisted of an ashless filter (QA/QC Filter) that was wiped over the pre-cleaned stainless-steel bowl and spoon and Petite Ponar to assess the cleaning procedures in the field. The significance of any metal detected on this filter was evaluated by comparing the detected amount on the filter to the minimum amount measured in the sediment samples. Where comparisons were required, the concentration of metals originating from any sampling equipment was estimated by dividing the amount detected on the filter (weight) by the surface area of two Petite Ponar grab samplers (assuming a thickness of 3 cm was collected from each) multiplied by the density of sediment (assumed to be 2 g/cm³)⁴.

A.3.2 Laboratory Methods

Laboratory duplicates were analyzed for sediment chemistry parameters similar to water chemistry parameters. The full list of laboratory DQOs for each parameter are presented in the SOP appended to the *CREMP 2022 Plan Update* (Azimuth, 2022).

A.3.3 Sediment Chemistry

Filter Swipes

Filter swipes were collected for various pieces of the sampling gear to quantify potential metals cross-contamination for grab samples. Ashless filters were wiped on the various sampling gear including the stainless-steel spoons and bowls, and the Petite Ponar, and analyzed for metals (µg/filter). The ashless filters themselves can sometimes pose a problem if they contain any trace metals. For example, in 2017 Whatman™ glass microfiber filters (47 mm) were used as swipe material. These filters were made entirely of borosilicate glass and were touted as “the industry standard for high purity filtration”; however, detectable amounts of copper, iron, magnesium, sodium, and zinc were found on the blank filters as well as the equipment swipes of the sampling equipment. A new filter swipe product was used in 2018, i.e., GhostWipes, which was an improvement from the prior year, and has been used in each

⁴ Certain metals have been detected on blank filter swipes and should be used with caution when doing field QC for metals (Pers. Comm. Brent Mack from ALS Laboratory, 2023). Starting in 2024, the laboratory will provide metals-free swabs for analyzing the standard list of metals.

CREMP sampling event since 2018. Certain metals have been detected on the GhostWipes and should be used with caution when doing field QC for metals (Pers. Comm. Brent Mack from ALS Laboratory, 2023). Starting in 2024, the laboratory will provide metals-free swabs for analyzing the standard list of metals.

Several analytes were detected on the core equipment filter swipes including: aluminum, barium, chromium, manganese, nickel, and titanium. All detectable analytes were at concentrations less than 10 times the DL (**Table A-7**). When comparing the amount of each metal on the filters to the concentration in the sediment core samples, the potential percent contribution from the swipe was less than 0.02% of the concentration present in the sediment cores for all detected parameters. The QA results show the potential for cross-contamination to affect the sediment chemistry results is negligible.

Field Duplicates

Nine grab sample field duplicates were collected for moisture content, TOC, and particle size. For cores, 15 field duplicates were collected for metals, moisture content, and pH. Additionally, two composite field duplicates were collected for moisture content, hydrocarbon and PAH chemistry. The field duplicates for core samples are provided in **Table A-8** (moisture content, pH, and metals). The field duplicates for grab samples are provided in **Table A-9** (moisture content, particle size, and TOC), and **Table A-10** (hydrocarbons and PAHs). The DQOs for sediment samples are outlined in **Section A.1.1**. Generally, the RPD limits were 1.5 times the laboratory RPDs unless no RPD was provided in which case a default $\pm 40\%$ was applied. For grab samples, RPDs are also calculated on particle size and moisture content where default DQOs of 40% and 30% were applied.

In 2023, only 28 parameters did not meet DQOs for sediment cores, equal to 3% of the field duplicate comparisons. For sediment grabs, six parameters did not meet DQOs, equal to 6% of the field duplicate comparisons. For composite grab samples all parameters met the DQOs. The field duplicate results indicate high precision for most parameters and the effect of the exceedances on interpreting data in the CREMP is negligible.

Parameters that exceeded the DQOs for the sediment core field duplicates in 2023

Sample ID	Duplicate	Parameters that exceeded DQOs	DQO based on ^[a]
Cores			
TPE-SC-7	DUP-SC-1	Arsenic Iron	RPD RPD
TPN-SC-5	DUP-SC-2	Arsenic Molybdenum	RPD RPD
BAP-SC-1	DUP-SC-5	Molybdenum	DIFF
BES-SC-4	DUP-SC-7	Manganese	RPD

Sample ID	Duplicate	Parameters that exceeded DQOs	DQO based on ^[a]
Cores			
A76-SC-4	DUP-SC-9	pH Manganese Phosphorus	RPD RPD RPD
MAM-SC-3	DUP-SC-10	Antimony Calcium Manganese Strontium Zirconium	RPD RPD RPD RPD DIFF
NEM-SC-8	DUP-SC-11	Cadmium	RPD
A20-SC-7	DUP-SC-12	Cadmium Cobalt Manganese	RPD RPD RPD
DS1-SC-4	DUP-SC-13	pH Arsenic Iron Manganese Molybdenum Phosphorus Zirconium	RPD RPD RPD RPD RPD RPD RPD
INUG-SC-1	DUP-SC-15	Arsenic	RPD
PDL-SC-2	DUP-SC-16	Manganese	RPD
Grabs			
TPE-4	Grab-DUP-1	Sand	DIFF
INUG-2	Grab-DUP-3	Sand Clay	DIFF RPD
LK8-4	Grab-DUP-5	Sand Clay TOC	DIFF RPD RPD

Notes:

[a] RPD DQO is <30% difference between duplicate samples (applicable when concentrations are > 5-times DL). DIFF DQO is a difference between duplicate samples of < 2-times the DL.

Laboratory QC Samples

Laboratory QC for sediment samples included laboratory duplicates, method blanks, matrix spikes, and reference material. The summary for the laboratory QC is provided in [Table A-3](#).

The laboratory QC assessment completed by ALS indicated the 2023 sediment quality data were typically within the established DQOs. In the few instances where a DQO was exceeded, the laboratory concluded the results were reliable and fit for use in the sediment quality assessment.

A.4 PHYTOPLANKTON

The phytoplankton QA/QC assessment included the Meadowbank, Baker Lake, and Whale Tail study areas. Three to four field duplicate samples were collected during each sampling event. Samples from the under-ice events (i.e., March and November) were archived as per the *CREMP 2022 Plan Update* (Azimuth, 2022). For total density and total biomass, RPDs were calculated between the original sample and the duplicate for both field and laboratory duplicates. While RPDs were also calculated for major taxa groups, these results were not relied on for QC purposes because small differences in abundance/biomass between the original and the duplicate tend to cause large differences in the RPD. As such, for field and laboratory duplicates, we evaluated the data quality based on total density and total biomass.

Results of the RPD analysis for all these parameters are presented in [Table A-11](#) (field) and [Table A-12](#) (laboratory) and are discussed below.

A.4.1 Field Methods

Water samples for phytoplankton were collected during monthly sampling events. Sampling gear was thoroughly rinsed between sampling areas to ensure that there was no inadvertent introduction (i.e., cross-contamination) from one area to another. Water samples were stored in a cooler with ice packs until returning to the camp. Water samples were processed back at camp within 6 hours of sampling. Processing involved preserving 50 mL of water with Lugol's iodine solution for phytoplankton taxonomy. The samples were stored in dark containers at room temperature.

Sample Shipping and Handling

The phytoplankton samples for taxonomy arrived at Plankton R Us (Winnipeg) without any sample integrity concerns.

Field Duplicates

Quality control procedures implemented during field operations during the 2023 sampling events included collecting duplicate phytoplankton samples using the same methods and collected at the same time as respective field samples.

Three to four field duplicate phytoplankton samples were collected during each sampling event alongside water sample duplicate collection. Duplicate samples were submitted *blind* to the laboratory for analysis in order to assess sampling variability and sample homogeneity. RPDs were calculated by comparing the original sample and the duplicate result for total density and total biomass. RPD values were also calculated for the major taxa groups, but these results are not relied on for QC purposes

because of the tendency for small differences in abundance/biomass between the original and the duplicate to cause large differences in the RPD. Thus, we evaluate the quality of these data based on total density and total biomass. For field duplicates, an RPD of 50% for total density and biomass concentrations is considered acceptable.

A.4.2 Laboratory Methods

Samples collected for taxonomic analysis of phytoplankton were submitted to Plankton-R-Us Inc., a reputable taxonomic laboratory. Overall, the reliability of the analytical results is considered high.

The first step in the QC program involves documenting any issues with the sample submission. This step applies to all sampling components. Plankton-R-Us reports sample integrity concerns via email. In 2023, there were no sample integrity concerns.

As a measure of laboratory QA/QC on the enumeration method, replicate counts are to be performed on 10% of the samples. In 2023, a total of 12 laboratory replicates (12 % of the total number of samples) were analyzed. Replicate samples are randomly chosen and processed at different times from the original analysis to reduce bias. The laboratory replicate is a new aliquot (10 mL) from the sample jar and is counted in the same manner as the original aliquot (10 mL) taken from the jar. An RPD of 25% for total density and biomass concentrations is considered acceptable for laboratory replicates.

A.4.3 Results and Discussion

Field duplicates – there were two RPDs that did not meet the DQO for total biomass: BAP-88 in August and NEM-84 in September, 2023. Three RPDs did not meet the DQO for total density: A-76 in July and BAP-88 and MAM-82 in August, 2023. More RPDs exceeded the DQO in 2023 compared to 2022. All other RPDs in 2023 for total biomass and total density were below 50% indicating good replicability in sample collection. Variability is expected in field collected phytoplankton samples and is mitigated in the study design by collecting two discrete samples from each sampling area. Therefore, the RPD exceedances are not expected to impact the findings of this report. See [Table A-11](#) for the field duplicate results, including RPDs calculated for major taxa groups.

Laboratory duplicates – In 2023, all laboratory RPDs for total density and total biomass met the DQOs. See [Table A-12](#) for the laboratory duplicate results, including RPDs calculated for major taxa groups.

A.4.4 Phytoplankton QA/QC Summary

Phytoplankton laboratory QA/QC in 2023 was good and overall results of the QA/QC analysis were similar to 2022. This indicates very good replicability and sample handling in the field and in the laboratory.

A.5 BENTHIC INVERTEBRATES

Standard procedures were used to collect phytoplankton and benthic invertebrate samples (Azimuth, 2022). Sampling gear was thoroughly rinsed between sampling areas to ensure that there was no inadvertent introduction (i.e., cross-contamination) of biota from one area to another.

A.5.1 Field QA/QC

Field replicates (5 per area) were collected for benthic invertebrates to determine natural variability and heterogeneity. Replicates were collected at least 20 m apart from one another within the defined sampling areas.

A.5.2 Laboratory QC

ZEAS re-sorted and re-counted approximately 10% of the samples, targeting greater than 90% recovery between the original and re-sorted sample.

No field duplicate samples were collected for benthic invertebrates. Laboratory replicate counts were performed on approximately 10% of all samples. Replicate samples were chosen at random and processed at different times from the original analysis to reduce bias. Percent recovery was above 95% in all re-sorted samples, with an average percent recovery of 97.4% (**Table A-13**). These results suggest that the majority of individual organisms are recovered by the taxonomist during enumeration. As in previous years, the reference collection of benthic taxa for this project has been maintained.

There were no QA/QC concerns for benthic invertebrates in 2023.

A.6 REFERENCES

- Azimuth. 2022. Core Receiving Environment Monitoring Program (CREMP): 2022 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. April, 2022.
- Azimuth. 2015. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.
- Canadian Council of Ministers of the Environment (CCME). 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. PN 1557.

TABLES

Table A-1. Sample submission and integrity QA/QC summary for the water and phytoplankton for all CREMP study areas, 2023.

Event ¹	Lab ID(s)	Parameters Measured	Sample Integrity Observations	Temperature (°C)	Hold-time Exceedances
March	VA23A5518 VA23A5681 VA23A5826 VA23A6274 VA23A5397 VA23A7103	All parameters	None	1, 5, 9, 13	pH, Turbidity, TSS, TDS, Alkalinity, Nitrite, Nitrate, Total Phosphorus, and D. O-OP4. See lab reports.
July	VA23B5555 VA23B5686 VA23B6138	All parameters	Sample 1 (WTS-79): The arsenic speciation bottle related to this sample is listed on the submitted COC but not received. Testing will not be conducted. Sample 15 (July TB): The chl-a tube related to this sample is listed on the submitted COC but not received. Testing will not be conducted. The Nutrient bottles from sample 1 to 4 and the metal bottles sample 3 to 4 had no indication of total or dissolved. However, the black dot marked on the lids were assumed to be the dissolved ones as all bottles had this indication (even the ones with written indication). Chl-a containers not received. Analysis will not proceed. From the two samples received July DI and July EB, the COC mentions that the dissolved parameters were filtered, however there is no indication as to whether the Metals, Mercury, and Nutrients bottles are Total or dissolved (filtered or not) except for the mercury samples "-July EB". The bottles were marked at random.	19, 20.7, 21	pH, Turbidity, TSS, TDS, Alkalinity, Nitrite, Nitrate, and D. O-OP4, Total and Free Cyanide. See lab reports.
August	WP2320725 VA23B9333 VA23B9337 VA23B9996 VA23C0684 VA23C0547 VA23C0550	All parameters	Sample ID AUGUST-DUP-2 was not included on the COC. It has been added to the workorder as -008. Sample(s) INUG-152, PDL-117: Arsenic container not received at laboratory, but requested on COC; The requested analysis cannot be performed. For sample #4 AUG-EB, opaque HDPE (EDTA + Acetic acid) container not received but mentioned on COC. Analysis and container deleted.	14, 16, 17, 18	pH, Turbidity, Nitrite, Nitrate, Total Phosphorus, D. O-OP4, and TOC. See lab reports.
	VA23C0329 VA23C0344 WP2320790 WP2320803	Sediment - All parameters	Sample(s) 004-005, 007-011, 013-017, 025-028, 034, 037-041, 043-047, 049-053, 055-059, 061-065, 074-077, 080, 082, 085-091, 097-104: Limited sample was available for PSA (100g minimum is standard). Measurement uncertainty for PSA results may be higher than usual. For sample #121 and #122, the sample ID mentioned on received containers is SC-DUP-1 and SC-DUP-2 but on COC sample id for both samples mentioned as DUP-SC-1 and DUP-SC-2. Labeled as per COC. 1:2 ratio could not be met for samples VA23C0344-61, 63, 65, 68, 69, 72-74, 76-80 due to low dry weights and high moisture content. Samples were leached with a 1:4 ratio and #63 was leached with a 1:5 ratio.	11, 20	Hg, MeHg, PHCs, PAHs. See lab reports.
September	VA23C1680 VA23C1748	All parameters	Sample DUP 1: Labeling issue. D-metals bottle (with dot on lid consistent with the rest of dissolved bottles) marked as total metals on label, but also marked as filtered. The second metals bottle is unmarked. The filtered bottle will be treated as D-Metals, and the unmarked bottle will be treated as T-Metals. Sample Received with arsenic bottle, but arsenic speciation analyses not requested on COC. Container will be logged in on hold until tests are confirmed. Amendment (20/10/2023): This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes Chl-a for client sample ID BBD-89. Sample IDs have been updated for two samples as well, as requested. September TB Arsenic speciation bottle: Sample Received but not listed on submitted COC/analytical request form. Logged in on hold.	14, 15, 16	pH, Turbidity, TSS, TDS, Nitrite, Nitrate, and D. O-OP4. See lab reports.
November	VA23C7441	All parameters	Dissolved Arsenic speciation container: For Sample 001 and 004 requested Arsenic analysis but containers not received. For sample 002 and 003 arsenic analysis not requested, but containers received. Logged in as per container received. Please contact PM for analysis changes.	10	pH, Turbidity, Nitrite, Nitrate, and D. O-OP4. See lab reports.

Acronyms

COC = Chain of custody

CN = Cyanide

DI = De-ionized water blank

D. O-PO4 = Orthophosphate

EDTA = Ethylenediaminetetraacetic acid

EB = Equipment blank

HDPE = High Density Poly Ethylene

PSA = Particle size analysis

PTFE = Polytetrafluoroethylene

TB = Travel blank

TDS = Total dissolved solids

TKN = Total Kjeldahl nitrogen

T.Hg = Total mercury

TOC = Total organic carbon

TSS = Total suspended solids

Table A-2. Field QA/QC summary for the water and phytoplankton at CREMP study areas, 2023.

Event	Field QC summary ¹			
	Travel Blank	DI Blank	Equipment Blank	Duplicates
March	None	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
July	None	1 result failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
August	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	2 results failed to meet DQO; see lab reports.	None
September	None	2 results failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.	8 results failed to meet DQO; see lab reports.
November	N/A	N/A	N/A	2 results failed to meet DQO; see lab reports.

Notes
1 - For more details on parameters that failed to meet DQOs, see lab reports.
N/A = No field QC sample collected during this sampling event.
DQO = Data quality objective.

Table A-3. Laboratory QC summary for the water, phytoplankton, and sediment for all CREMP study areas, 2023.

Event	Laboratory QC Summary ¹				
	Detection Limits	Duplicates	Method Blanks	Matrix Spike	LCS / CRM
March	None	None	2 results failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	None
July	None	None	None	None	None
August	None	None	1 result failed to meet DQO; see lab reports.	None	None
August (Sediment)	DLHM for some PAHs	None	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.	1 result failed to meet DQO; see lab reports.
September	None	None	None	None	1 result failed to meet DQO; see lab reports.
November ²	None	None	None	None	None

Notes

¹ Data qualifiers referring to laboratory QC methods (e.g., Method Blanks, Matrix Spikes, and LCS/CRM) are flagged here.

² Abbreviated sampling event in November.

DLHM = Detection limit adjusted: Sample has high moisture content.

DQO = Data quality objectives.

LCS / CRM = laboratory control sample / certified reference material.

PAH = Polycyclic aromatic hydrocarbons.

Table A-4. Laboratory detection limits and blanks (travel, de-ionized, and equipment) for all CREMP study areas, 2023.

ALS Sample ID	March				July				August				September			
	Blank (Travel, DI, or EB)				Travel Blank				Travel Blank				Travel Blank			
	Date				DI Blank				DI Blank				DI Blank			
	Detection Limits	11-Mar-2023	09-Mar-2023	19-Mar-2023	Detection Limits	07-Jul-2023	04-Jul-2023	04-Jul-2023	Detection Limits	18-Aug-2023	22-Aug-2023	24-Aug-2023	Detection Limits	10-Sep-2023	10-Sep-2023	10-Sep-2023
Media		Water	Water	Water		Water	Water	Water		Water	Water	Water		Water	Water	Water
Physical Tests																
Conductivity (µS/cm)	2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0	<2.0
Alkalinity, Total	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0
Alkalinity, Bicarbonate	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0
Alkalinity, Carbonate	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0
Hardness (mg/L), Dissolved	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60
Hardness (as CaCO ₃), from total Ca/Mg pH (Laboratory)	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60	0.60	<0.60	<0.60	<0.60
Total Dissolved Solids (mg/L)	3.0	<3.0	<3.0	<3.0	3.0	<3.0	<3.0	<3.0	3.0	<3.0	<3.0	<3.0	3.0	<3.0	<3.0	<3.0
Total Suspended Solids (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
Turbidity (NTU)	0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10
Anions and Nutrients (mg/L)																
Total Kjeldahl Nitrogen	0.050	<0.050	<0.050	<0.0050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Ammonia, Total (as N)	0.0050	<0.0050	<0.0050	<0.050	0.0050	<0.0050	0.0107	0.0201	0.0050	<0.0050	0.0079	0.0115	0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.10	<0.10	<0.10	<0.020	0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	<0.10
Fluoride (F)	0.020	<0.020	<0.020	<0.050	0.020	<0.020	<0.020	<0.020	0.020	<0.020	<0.020	<0.020	0.020	<0.020	<0.020	<0.020
Nitrate (as N)	0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Orthophosphate-Dissolved (as P)	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)-Total Dissolved	0.0020	<0.0020	0.0045	0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	<0.0020	<0.0020
Reactive Silica (as SiO ₂)	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50
Sulfate (SO ₄)	0.30	<0.30	<0.30	<0.30	0.30	<0.30	<0.30	<0.30	0.30	<0.30	<0.30	<0.30	0.30	<0.30	<0.30	<0.30
Cyanides (mg/L)																
Free Cyanide	0.0010	<0.0010	-	-	0.0010	-	-	-	0.0010	-	-	<0.0010	0.0010	-	-	-
Total Cyanide	0.0010	<0.0010	-	-	0.0010	-	-	-	0.0010	-	-	<0.0010	0.0010	-	-	-
Organic / Inorganic Carbon (mg/L)																
Dissolved Organic Carbon	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50
Total Organic Carbon	0.50	<0.50	<0.50	<0.50	0.50	<0.50	<0.50	<0.50	0.50	0.94	<0.50	<0.50	0.50	<0.50	<0.50	<0.50
Total Metals (mg/L)																
Aluminum	0.0030	<0.0030	<0.0030	<0.0030	0.0030	<0.0030	<0.0030	<0.0030	0.0030	<0.0030	<0.0030	<0.0030	0.0030	<0.0030	<0.0030	<0.0030
Antimony	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Barium	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Beryllium	0.00010	<0.000100	<0.000100	<0.000100	0.00010	<0.000100	<0.000100	<0.000100	0.00010	<0.000020	<0.000100	<0.000100	0.00010	<0.000100	<0.000100	<0.000100
Bismuth	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050
Boron	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
Cadmium	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050
Calcium	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Cesium	0.000010	<0.000010	<0.000010	<0.000010	0.000010	<0.000010	<0.000010	<0.000010	0.000010	<0.000010	<0.000010	<0.000010	0.000010	<0.000010	<0.000010	<0.000010
Chromium	0.00010	<0.00010	<0.00010	<0.00010	0.00050	<0.00010	<0.00010	<0.00010	0.00050	<0.00010	<0.00010	<0.00010	0.00050	<0.00010	<0.00010	0.00017
Cobalt	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Copper	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050
Iron	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	0.02
Lead	0.000050	<0.000050	<0.000050	0.000078	0.000050	<0.000050	<0.000050	0.000159	0.000050	<0.000050	<0.000050	0.0000298	0.000050	<0.000050	<0.000050	0.00045
Lithium	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Magnesium	0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0084	0.0050	<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	<0.0050
Manganese	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	0.00032
Mercury	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050
Nickel	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050	<0.00050
Phosphorus	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Potassium	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050	0.050	<0.050	<0.050	<0.050
Rubidium	0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	<0.00020
Selenium	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	<0.000050	<0.000050
Silicon	0.10	<0.1														

Table A-5. Summary of parameters detected in blank samples for all CREMP study areas in 2023.

Event and Blank	Parameters Count	Count <DL	Count >DL	Parameters > 10*DL
March				
TB	112	112	0	0
DI	105	104	1	0
EB	105	104	1	0
July				
TB	110	110	0	0
DI	105	104	1	0
EB	105	97	8	0
August				
TB	105	104	1	0
DI	105	104	1	0
EB	107	105	2	0
September				
TB	110	110	0	0
DI	105	105	0	0
EB	105	97	8	0

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month Station Date Sampled	Units	Relative Percent Difference QDOs		March DIs	March DUP-1 (PDL-113)					March DUP-2 (INUG-148)					March DUP-3 (MAM-77)					March DUP-4 (A76-69)					Outcome
					PDL-113 09-Mar-2023		DUP 11-Mar-2023		Field Dup Method ¹⁾	Result ¹⁾ (RPD or DIFF)	Outcome	INUG-148 11-Mar-2023		DUP 11-Mar-2023		Field Dup Method ¹⁾	Result ¹⁾ (RPD or DIFF)	Outcome	MAM-77 07-Mar-2023		DUP 26-Mar-2023		Field Dup Method ¹⁾	Result ¹⁾ (RPD or DIFF)	
		Lab	Field		VA23AS626-001	VA23AS626-003	VA23AS681-001	VA23AS681-003				VA23AS681-001	VA23AS681-003	VA23AS397-003	VA23AS397-009				VA23AS397-003	VA23AS397-009	VA23A7103-003	VA23A7103-005			
		Parameter	ALS Sample ID		Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	
Physical Tests																									
Conductivity	µS/cm	10	15	2.0	31.3	31.1	RPD	0.60	Pass RPD	20	20.6	RPD	-3.00	Pass RPD	216	214	RPD	0.9	Pass RPD	120	120	RPD	0	Pass RPD	
Alkalinity, Bicarbonate	mg/L	20	30	1.0	10.4	10.6	RPD	-1.90	Pass RPD	6.4	6.2	RPD	3.2	Pass RPD	29.2	29.1	RPD	0.3	Pass RPD	16.8	16.4	RPD	2.4	Pass RPD	
Alkalinity, Carbonate	mg/L	20	30	1.0	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	
Alkalinity, Hydroxide	mg/L	20	30	1.0	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	
Alkalinity, Total (as CaCO ₃)	mg/L	20	30	1.0	10.4	10.6	RPD	-1.90	Pass RPD	6.4	6.2	RPD	3.2	Pass RPD	29.2	29.1	RPD	0.3	Pass RPD	16.8	16.4	RPD	2.4	Pass RPD	
Hardness (mg/L), Dissolved	-	40	40	0.60	12.4	11.7	RPD	5.8	Pass RPD	7.1	7.1	RPD	-0.700	Pass RPD	80.2	74.3	RPD	7.6	Pass RPD	46.6	47.8	RPD	-2.50	Pass RPD	
Hardness (as CaCO ₃), from total Ca/Mg	mg/L	40	40	0.60	12.4	12.4	RPD	1.6	Pass RPD	7.3	7.3	RPD	1.1	Pass RPD	79.2	79.2	RPD	1.5	Pass RPD	44.8	44.8	RPD	1.1	Pass RPD	
Total Dissolved Solids	mg/L	40	1.0	20.8	22.2	RPD	-6.50	Pass RPD	<1.0	<1.0	<DL	<DL	<DL	<DL	158	141	RPD	11.4	Pass RPD	79.8	71.2	RPD	11.4	Pass RPD	
Total Suspended Solids	mg/L	40	3.0	<1.0	<1.0	<DL	<DL	<DL	<DL	21.7	23	RPD	-5.80	Pass RPD	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	
Turbidity	NTU	15	23	0.10	<0.10	<0.10	<DL	<DL	<DL	<0.10	<0.10	<DL	<DL	<DL	0.12	0.12	DIFF	0	Pass DIFF	<0.10	<0.10	<DL	<DL	<DL	
pH (Laboratory)	pH	40	0.10	7.1	7.2	RPD	-0.300	Pass RPD	6.9	6.9	RPD	-0.300	Pass RPD	7.5	7.5	RPD	0	Pass RPD	7.1	7.2	RPD	-0.400	Pass RPD		
Anions and Nutrients																									
Ammonia, Total (as N)	mg/L	20	30	0.0050	0.0065	0.011	DIFF	-0.004700	Pass DIFF	0.019	0.023	DIFF	-0.0034	Pass DIFF	0.066	0.067	RPD	-1.80	Pass RPD	0.032	0.031	RPD	2.5	Pass RPD	
Bromide (Br)	mg/L	20	30	0.0050	<0.0010	<DL	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	0.30	0.30	RPD	-1.000	Pass RPD	0.15	0.16	DIFF	-0.008	Pass DIFF	
Chloride (Cl)	mg/L	20	30	0.10	1.0	0.99	RPD	3.0	Pass RPD	0.91	0.92	RPD	-0.0134	Pass RPD	26.8	26.7	RPD	0.4	Pass RPD	15.2	15.1	RPD	0.7	Pass RPD	
Fluoride (F)	mg/L	20	30	0.020	0.057	0.055	DIFF	0.0020	Pass DIFF	0.073	0.074	DIFF	-0.001	Pass DIFF	0.078	0.078	DIFF	0	Pass DIFF	0.049	0.044	DIFF	0.005	Pass DIFF	
Total Kjeldahl Nitrogen	mg/L	20	30	0.050	0.11	0.12	DIFF	-0.006000	Pass DIFF	0.13	0.14	DIFF	-0.011	Pass DIFF	0.28	0.32	RPD	-12.40	Pass RPD	0.20	0.20	DIFF	0	Pass DIFF	
Phosphorus (P)-Total	mg/L	25	30	0.0050	<0.0050	<DL	<DL	<DL	<DL	<0.0050	<0.0050	<DL	<DL	<DL	1.1	1.1	RPD	0	Pass RPD	0.12	0.12	RPD	0.9	Pass RPD	
Nitrite (as N)	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	0.0049	0.0063	DIFF	-0.0014	Pass DIFF	<0.0010	<0.0010	<DL	<DL	<DL	
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	0.0012	<0.0010	DIFF	<DL	0.0018	<0.0010	<DL	<DL	<DL		
Phosphorus (P)-Total	mg/L	20	30	0.0020	0.0026	0.0031	DIFF	-0.000500	Pass DIFF	0.0032	0.0030	DIFF	0.0002	Pass DIFF	0.0048	0.0052	DIFF	-0.0004	Pass DIFF	0.0035	0.0030	DIFF	0.0005	Pass DIFF	
Phosphorus (P)-Total Dissolved	mg/L	25	30	0.0020	0.0025	<DL	<DL	<DL	<DL	<0.0020	<0.0020	<DL	<DL	<DL	0.0024	0.0025	DIFF	-0.0001	Pass DIFF	<0.00010	<0.00010	<DL	<DL	<DL	
Silica, Reactive (as SiO ₂)	mg/L	20	30	0.50	<0.50	<DL	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	1.5	1.5	DIFF	0.01	Pass DIFF	0.97	0.99	DIFF	-0.02	Pass DIFF	
Sulfate (SO ₄)	mg/L	20	30	0.30	2.5	2.5	RPD	0	Pass RPD	1.1	1.1	DIFF	-0.01	Pass DIFF	31.3	31.1	RPD	0.6	Pass RPD	13.2	13.2	RPD	-0.02	Pass RPD	
Cyanides																									
Cyanide, Free	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL			DIFF	0	Pass DIFF			DIFF	0	Pass DIFF	
Cyanide, Total	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL			DIFF	0	Pass DIFF			DIFF	0	Pass DIFF	
Organic / Inorganic Carbon																									
Dissolved Organic Carbon	mg/L	20	30	0.50	2.8	3.3	RPD	-19	Pass RPD	2.4	2.9	DIFF	-0.540	Pass DIFF	2.9	2.8	RPD	2.8	Pass RPD	2.7	2.6	RPD	1.5	Pass RPD	
Total Organic Carbon	mg/L	20	30	0.50	2.1	2.0	DIFF	0.11	Pass DIFF	2.1	2.3	DIFF	-0.200	Pass DIFF	2.9	3.0	RPD	-1.70	Pass RPD	2.5	2.3	DIFF	0.2	Pass DIFF	
Total Metals																									
Aluminum (Al)-Total	mg/L	20	30	0.0030	<0.0030	<0.0030	<DL	<DL	<DL	0.0055	0.0056	DIFF	-0.0001	Pass DIFF	0.0039	<0.0030	<DL	<DL	<DL	<0.0030	<0.0030	<DL	<DL	<DL	
Antimony (Sb)-Total	mg/L	20	30	0.00010	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	0.0016	0.0017	RPD	-4.90	Pass RPD	0.00032	0.00030	DIFF	2E-05	Pass DIFF	
Arsenic (As)-Total	mg/L	20	30	0.00010	0.00034	0.00020	DIFF	0.000040	Pass DIFF	0.00013	0.00012	DIFF	1E-05	Pass DIFF	0.0012	0.0011	RPD	0.9	Pass RPD	0.00032	0.00029	DIFF	0.00003	Pass DIFF	
Barium (Ba)-Total	mg/L	20	30	0.00010	0.0026	0.0024	RPD	5.6	Pass RPD	0.0020	0.0020	RPD	1.5	Pass RPD	0.035	0.034	RPD	2.3	Pass RPD	0.020	0.020	RPD	-1.000	Pass RPD	
Beryllium (Be)-Total	mg/L	20	30	0.00010	<0.000100	<0.000100	<DL	<DL	<DL	<0.000100	<0.000100	<DL	<DL	<DL	<0.000100	<0.000100	<DL	<DL	<DL	<0.000100	<0.000100	<DL	<DL	<DL	
Bismuth (Bi)-Total	mg/L	20	30	0.000050	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	
Boron (B)-Total	mg/L	20	30	0.010	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	
Cadmium (Cd)-Total	mg/L	20	30	0.0000050	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL	
Calcium (Ca)-Total	mg/L	20	30	0.050	3.2	3.2	RPD	1.3	Pass RPD	1.5	1.5	RPD	0.7	Pass RPD	22.6	22	RPD	2.7	Pass RPD	12.6	12.5	RPD	0.8	Pass RPD	
Cesium (Cs)-Total	mg/L	20	30	0.000010	<0.000010	<0.000010	<DL	<DL	<DL	<0.000010	<0.000010	<DL	<DL	<DL	0.000024	0.000024	DIFF	0	Pass DIFF	<0.000010	<0.000010	<DL	<DL	<DL	
Chromium (Cr)-Total	mg/L	20	30	0.00010	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	0.00014	<0.00010	<DL	<DL	<DL	0.00019	<0.00010	<DL	<DL	<DL	
Cobalt (Co)-Total	mg/L	20	30	0.00010	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	
Copper (Cu)-Total	mg/L	20	30	0.00050	<0.00050	<0.00050	<DL	<DL	<DL	<0.00050	<0.00050	<DL	<DL	<DL	0.00066	0.00066	DIFF	0	Pass DIFF	0.00051	0.00052	DIFF	-1E-05	Pass DIFF	
Iron (Fe)-Total	mg/L	20	30	0.010	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	
Lead (Pb)-Total	mg/L	20	30	0.000050	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	
Lithium (Li)-Total	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	0.0032	0.0032	DIFF								

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month Station Date Sampled	Units	Relative Percent Difference DOQs		July DUP-1 (WAL-131)										July DUP-2 (TPE-162)										July DUP-3 (NEM-80)										July DUP-4 (A76-71)									
				WAL-131 06-Jul-2023		DUP-1 06-Jul-2023		Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome	TPE-162 03-Jul-2023		DUP-2 03-Jul-2023		Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome	NEM-80 30-Jun-2023		DUP-3 30-Jun-2023		Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome	A76-71 01-Jul-2023		DUP-4 01-Jul-2023		Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome												
				VA2386138-003		VA2386138-019					VA2386138-007		VA2386138-020					VA2385555-012		VA2385555-013					VA2385555-005		VA2385555-014																
				Parameter	ALS Sample ID	Lab	Field				July MDIs		July MDIs					July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs		July MDIs					
Physical Tests																																											
Conductivity	µS/cm	10	15	2.0	36.1	35	RPD	3.1	Pass RPD	30	28.4	RPD	5.5	Pass RPD	86.1	86	RPD	0.1	Pass RPD	89.1	88.6	RPD	0.6	Pass RPD	12.4	12.4	RPD	-1.60	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD									
Alkalinity, Bicarbonate	mg/L	20	30	1.0	11.3	11.7	RPD	-3.50	Pass RPD	30	7.7	RPD	4	Pass RPD	12.2	12.3	RPD	-0.8	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD									
Alkalinity, Carbonate	mg/L	20	30	1.0	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL									
Alkalinity, Hydroxide	mg/L	20	30	1.0	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL									
Alkalinity, Total (as CaCO ₃)	mg/L	20	30	1.0	11.3	11.7	RPD	-3.50	Pass RPD	30	7.7	RPD	4	Pass RPD	12.2	12.3	RPD	-0.8	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD	12.4	12.6	RPD	-1.60	Pass RPD									
Hardness (mg/L), Dissolved	-	40	40	0.60	16.2	15.9	RPD	1.9	Pass RPD	10.8	10.6	RPD	1.9	Pass RPD	32.5	32.8	RPD	-0.9	Pass RPD	31.9	32	RPD	-0.300	Pass RPD	31.9	32	RPD	-0.300	Pass RPD	31.9	32	RPD	-0.300	Pass RPD									
Hardness (as CaCO ₃), From Total Ca/Mg	mg/L	40	40	0.60	16.1	16.1	RPD	-3.30	Pass RPD	10.1	10.4	RPD	-2.90	Pass RPD	31.9	32.4	RPD	-1.6	Pass RPD	31.9	32.5	RPD	-2.80	Pass RPD	31.9	32.5	RPD	-2.80	Pass RPD	31.9	32.5	RPD	-2.80	Pass RPD									
Total Dissolved Solids	mg/L	40	30	2.6	22.8	22.8	RPD	15.4	Pass RPD	21.5	19.4	RPD	10.3	Pass RPD	62.5	59.8	RPD	4.4	Pass RPD	57.2	58.5	RPD	-2.20	Pass RPD	57.2	58.5	RPD	-2.20	Pass RPD	57.2	58.5	RPD	-2.20	Pass RPD									
Total Suspended Solids	mg/L	40	40	1.0	1.3	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL									
Turbidity	NTU	15	23	0.10	0.25	0.28	DIFF	-0.03	Pass DIFF	0.19	0.22	DIFF	-0.03	Pass DIFF	0.38	0.35	DIFF	0.03	Pass DIFF	0.26	0.25	DIFF	0.01	Pass DIFF	0.26	0.25	DIFF	0.01	Pass DIFF	0.26	0.25	DIFF	0.01	Pass DIFF									
pH (Laboratory)	pH	40	40	0.10	7.2	7.3	RPD	-1.10	Pass RPD	7.2	7.1	RPD	0.8	Pass RPD	7.3	7.3	RPD	0	Pass RPD	7.3	7.3	RPD	-0.1	Pass RPD	7.3	7.3	RPD	-0.1	Pass RPD	7.3	7.3	RPD	-0.1	Pass RPD									
Anions and Nutrients																																											
Ammonia, Total (as N)	mg/L	20	30	0.0050	0.014	0.0093	DIFF	0.0049	Pass DIFF	<0.0050	<0.0050	<DL	<DL	<DL	<0.0050	0.0021	<DL	<DL	<DL	<DL	<0.0050	0.015	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Bromide (Br)	mg/L	20	30	0.0050	<0.020	<0.020	<DL	<DL	<DL	<DL	<0.0050	<0.0050	<DL	<DL	<DL	0.0082	0.081	DIFF	0.001	Pass DIFF	0.094	0.093	DIFF	0.001	Pass DIFF	0.094	0.093	DIFF	0.001	Pass DIFF	0.094	0.093	DIFF	0.001	Pass DIFF								
Chloride (Cl)	mg/L	20	30	0.10	0.51	0.48	DIFF	0.03	Pass DIFF	0.73	0.70	RPD	4.2	Pass RPD	13.9	13.8	RPD	0.7	Pass RPD	10.6	10.6	RPD	0	Pass RPD	10.6	10.6	RPD	0	Pass RPD	10.6	10.6	RPD	0	Pass RPD									
Fluoride (F)	mg/L	20	30	0.020	0.049	0.042	DIFF	0.007	Pass DIFF	0.068	0.066	DIFF	0.002	Pass DIFF	0.030	0.032	DIFF	-0.002	Pass DIFF	0.042	0.038	DIFF	0.004	Pass DIFF	0.042	0.038	DIFF	0.004	Pass DIFF	0.042	0.038	DIFF	0.004	Pass DIFF									
Total Kjeldahl Nitrogen	mg/L	20	30	0.050	0.10	0.13	DIFF	-0.024	Pass DIFF	0.071	0.061	DIFF	0.01	Pass DIFF	0.13	0.14	DIFF	-0.014	Pass DIFF	0.13	0.15	DIFF	-0.014	Pass DIFF	0.13	0.15	DIFF	-0.014	Pass DIFF	0.13	0.15	DIFF	-0.014	Pass DIFF									
Nitrate (as N)	mg/L	20	30	0.0050	<0.0050	<0.0050	<DL	<DL	<DL	<DL	0.0091	0.0093	DIFF	<0.0091	<0.0091	<DL	<DL	<DL	<DL	<DL	0.064	0.063	RPD	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Nitrite (as N)	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.0010	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Phosphorus (P)-Total	mg/L	20	30	0.0020	0.0026	0.0033	DIFF	-0.0005	Pass DIFF	<0.0020	0.0043	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.0021	0.0068	DIFF	<0.0021	0.0037	DIFF	<0.0021	0.0037	DIFF	<0.0021	0.0037	DIFF	<0.0021	0.0037	DIFF	<0.0021	0.0037						
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.0020	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.0027	0.0026	DIFF	0.0001	Pass DIFF	0.0036	0.0034	DIFF	-0.0004	Pass DIFF	0.0036	0.0034	DIFF	-0.0004	Pass DIFF								
Silica, Reactive (as SiO ₂)	mg/L	20	30	0.50	1.1	0.1	DIFF	0.01	Pass DIFF	<0.50	<0.50	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	0.65	0.65	DIFF	0	Pass DIFF	10.0	10.0	RPD	0	Pass DIFF	10.0	10.0	RPD	0	Pass DIFF									
Sulfate (SO ₄)	mg/L	20	30	0.30	4.0	3.6	RPD	10.1	Pass RPD	4.0	3.9	RPD	1	Pass RPD	4.5	4.5	RPD	-0.2	Pass RPD	10.0	10.0	RPD	0	Pass RPD	10.0	10.0	RPD	0	Pass RPD	10.0	10.0	RPD	0	Pass RPD									
Cyanides																																											
Cyanide, Free	mg/L	20	30	0.0010	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-								
Cyanide, Total	mg/L	20	30	0.0010	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<0.0020	<0.0020	<DL	<DL	<DL	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-	<DL	<DL	-	-								
Organic / Inorganic Carbon																																											
Dissolved Organic Carbon	mg/L	20	30	0.50	2.4	2.4	DIFF	-0.05	Pass DIFF	1.4	1.5	DIFF	-0.110	Pass DIFF	1.6	1.6	DIFF	-0.03	Pass DIFF	1.8	1.7	DIFF	0.15	Pass DIFF	1.8	1.7	DIFF	0.15	Pass DIFF	1.8	1.7	DIFF	0.15	Pass DIFF									
Total Organic Carbon	mg/L	20	30	0.50	2.2	2.1	DIFF	0.05	Pass DIFF	1.1	1.2	DIFF	-0.110	Pass DIFF	1.8	2.0	DIFF	-0.17	Pass DIFF	1.6	2.0	DIFF	-0.420	Pass DIFF	1.6	2.0	DIFF	-0.420	Pass DIFF	1.6	2.0	DIFF	-0.420	Pass DIFF									
Total Metals																																											
Aluminum (Al)-Total	mg/L	20	30	0.0030	0.0085	0.0078	DIFF	0.0007	Pass DIFF	0.0062	0.0068	DIFF	-0.0006	Pass DIFF	0.012	0.011	DIFF	0.0009	Pass DIFF	0.0057	0.0064	DIFF	-0.0007	Pass DIFF	0.0057	0.0064	DIFF	-0.0007	Pass DIFF	0.0057	0.0064	DIFF	-0.0007	Pass DIFF									
Antimony (Sb)-Total	mg/L	20	30	0.00010	<0.00010	<0.00010	<DL	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.00024	0.00025	DIFF	-0.00001	Pass DIFF	0.00024	0.00025	DIFF	-0.00001	Pass DIFF	0.00024	0.00025	DIFF	-0.00001	Pass DIFF								
Arsenic (As)-Total	mg/L	20	30	0.00010	0.00031	0.00032	DIFF	-0.00001	Pass DIFF	0.00039	0.00057	RPD	3.4	Pass RPD	0.00057	0.00084	RPD	3.2	Pass RPD	0.00057	0.00084	RPD	3.2	Pass RPD	0.00057	0.00084	RPD	3.2	Pass RPD	0.00057	0.00084	RPD	3.2	Pass RPD									
Barium (Ba)-Total	mg/L	20	30	0.00010	0.0021	0.0022	RPD	-2.80	Pass RPD	0.0028	0.0029	RPD	-2.10	Pass RPD	0.016	0.017	RPD	-2.4	Pass RPD	0.015	0.015	RPD	0.7	Pass RPD	0.015	0.015	RPD	0.7	Pass RPD	0.015	0.015	RPD	0.7	Pass RPD									
Beryllium (Be)-Total	mg/L	20	30	0.00010	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Bismuth (Bi)-Total	mg/L	20	30	0.00050	<0.00050	<0.00050	<DL	<DL	<DL	<DL	<0.00050	<0.00050	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.00050	<0.00050	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Boron (B)-Total	mg/L	20	30	0.010	<0.010	<0.010	<DL	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL								
Cadmium (Cd)-Total	mg/L	20	30	0.000050	<0.000050	<0.000050	<DL	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<																	

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month Station Date Sampled	Units	Relative Percent Difference DQDs		August DUP-1 (SP-165)										August DUP-2 (BAP-88)										August DUP-3 (MAM-82)										August DUP-4 (A20-75)									
				SP-165 13-Aug-2023		DUP 13-Aug-2023		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		BAP-88 17-Aug-2023		DUP 17-Aug-2023		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		MAM-82 15-Aug-2023		DUP 15-Aug-2023		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		A20-75 18-Aug-2023		DUP 18-Aug-2023		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome	
				VA23B9333-002	VA23B9333-004									WP2320725-002	WP2320725-008																												
		ALS Sample ID	Lab	Field	Water		Water		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		Water		Water		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		Water		Water		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome		Water		Water		Field Dup Method ⁽¹⁾		Result ⁽¹⁾ (RPD or Diff)		Outcome
Parameter																																											
Physical Tests																																											
Conductivity	µS/cm	10	15	2.00	35.7	36.7	RPD	-3	Pass RPD	70.5	71.3	RPD	-1.10	Pass RPD	162	162	RPD	0	Pass RPD	69.2	68.4	RPD	1.2	Pass RPD																			
Alkalinity, Bicarbonate	mg/L	20	30	1.00	10.6	10.5	RPD	0.900	Pass RPD	9.40	9.10	RPD	3.2	Pass RPD	19.2	19.6	RPD	-2.10	Pass RPD	12.9	12.8	RPD	0.8	Pass RPD																			
Alkalinity, Carbonate	mg/L	20	30	1.00	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL																			
Alkalinity, Hydroxide	mg/L	20	30	1.00	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL																			
Alkalinity, Total (as CaCO ₃)	mg/L	20	30	1.00	10.6	10.5	RPD	0.900	Pass RPD	9.40	9.10	RPD	3.2	Pass RPD	19.2	19.6	RPD	-2.10	Pass RPD	12.9	12.8	RPD	0.8	Pass RPD																			
Hardness (mg/L), Dissolved	-	40	0.600	13.9	13.8	RPD	0.700	Pass RPD	14.4	14.7	RPD	-2.10	Pass RPD	57.6	57.7	RPD	-0.200	Pass RPD	25.1	25.4	RPD	-1.20	Pass RPD																				
Hardness (as CaCO ₃), From total Ca/Mg	mg/L	40	0.600	14.0	14.0	RPD	3.50	Pass RPD	15.2	15.2	RPD	-3.80	Pass RPD	56.2	56.2	RPD	-0.500	Pass RPD	25.0	25.0	RPD	-1.60	Pass RPD																				
Total Dissolved Solids	mg/L	40	3.00	21.9	21.1	RPD	3.70	Pass RPD	39.2	36.2	RPD	8	Pass RPD	144	154	RPD	-6.70	Pass RPD	65.0	64.3	RPD	1.1	Pass RPD																				
Total Suspended Solids	mg/L	40	1.00	<1.0	<1.0	<DL	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL																			
Turbidity	NTU	15	23	0.100	0.300	0.230	DIFF	0.0700	Pass Diff	0.210	0.170	DIFF	0.04	Pass Diff	0.260	0.280	DIFF	-0.02	Pass Diff	0.470	0.520	DIFF	-0.05	Pass Diff																			
pH (Laboratory)	pH	40	0.100	7.09	7.13	RPD	-1	Pass RPD	7.02	7.08	RPD	-0.900	Pass RPD	7.49	7.50	RPD	-0.1	Pass RPD	7.30	7.28	RPD	0.3	Pass RPD																				
Anions and Nutrients																																											
Ammonia, Total (as N)	mg/L	20	30	0.00500	<0.0050	<0.0050	<DL	<DL	<DL	0.00920	0.00820	DIFF	0.001	Pass Diff	0.0188	0.0189	DIFF	-0.0001	Pass Diff	<0.0050	0.00580	<DL	<DL	<DL																			
Antimony (Sb)-Total	mg/L	20	30	0.000100	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	0.000106	0.00107	DIFF	-0.024	Pass Diff	0.0740	0.0690	DIFF	0.005	Pass Diff																			
Chloride (Cl)	mg/L	20	30	0.100	0.880	0.880	RPD	0	Pass RPD	12.8	12.9	RPD	-0.800	Pass RPD	20.0	20.0	RPD	0	Pass RPD	7.33	7.34	RPD	-0.1	Pass RPD																			
Fluoride (F)	mg/L	20	30	0.0200	0.0740	0.0810	DIFF	0	Pass Diff	0.0690	0.0690	DIFF	0	Pass Diff	0.0590	0.0590	DIFF	0	Pass Diff	0.0510	0.0510	DIFF	0	Pass Diff																			
Total Kjeldahl Nitrogen	mg/L	20	30	0.0500	0.115	0.118	DIFF	0	Pass Diff	0.185	0.192	DIFF	-0.007	Pass Diff	0.286	0.280	RPD	2.1	Pass RPD	0.206	0.206	DIFF	0	Pass Diff																			
Nitrate (as N)	mg/L	20	30	0.00500	<0.0050	<0.0050	<DL	<DL	<DL	0.0249	0.0249	DIFF	-0.0003	Pass Diff	0.530	0.530	RPD	0	Pass RPD	<0.0050	<0.0050	<DL	<DL	<DL																			
Nitrite (as N)	mg/L	20	30	0.00100	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	0.00410	0.00440	DIFF	-0.0003	Pass Diff	<0.0010	<0.0010	<DL	<DL	<DL																			
Orthophosphate-Dissolved (as P)	mg/L	20	30	0.00100	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL																			
Phosphorus (P)-Total	mg/L	20	30	0.000100	0.00230	0.00200	DIFF	0.000300	Pass Diff	0.00400	0.00410	DIFF	-0.0001	Pass Diff	0.00400	0.00400	DIFF	-0.0001	Pass Diff	0.00360	0.00350	DIFF	1E-04	Pass Diff																			
Phosphorus (P)-Total Dissolved	mg/L	25	38	0.00200	<0.0020	<0.0020	<DL	<DL	<DL	<0.0020	<0.0020	<DL	<DL	<DL	0.00240	0.00230	DIFF	0.0001	Pass Diff	<0.0020	<0.0020	<DL	<DL	<DL																			
Silica, Reactive (as SiO ₂)	mg/L	20	30	0.500	0.620	0.620	DIFF	0	Pass Diff	<0.50	<0.50	<DL	<DL	<DL	0.690	0.690	DIFF	0	Pass Diff	<0.50	<0.50	<DL	<DL	<DL																			
Sulfate (SO ₄)	mg/L	20	30	0.300	4.82	4.83	RPD	0	Pass RPD	2.35	2.38	RPD	-1.30	Pass RPD	18.5	18.4	RPD	0.5	Pass RPD	5.49	5.49	RPD	0	Pass RPD																			
Cyanides																																											
Cyanide, Free	mg/L	20	30	0.00100	<0.0010	<0.0010	<DL	<DL	<DL	-	-	<DL	<DL	<DL	<0.0010	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL																			
Cyanide, Total	mg/L	20	30	0.00100	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	<0.0010	<DL	<DL	<DL	<0.0010	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL																			
Organic / Inorganic Carbon																																											
Dissolved Organic Carbon	mg/L	20	30	0.500	2.65	3.05	RPD	-14	Pass RPD	4.54	4.61	RPD	-1.50	Pass RPD	2.25	2.24	DIFF	0.01	Pass Diff	2.66	2.73	RPD	-2.60	Pass RPD																			
Total Organic Carbon	mg/L	20	30	0.500	2.54	2.32	DIFF	0.220	Pass Diff	4.74	3.89	RPD	19.7	Pass RPD	2.55	2.43	DIFF	0.12	Pass Diff	2.96	2.99	RPD	-1.000	Pass RPD																			
Total Metals																																											
Aluminum (Al)-Total	mg/L	20	30	0.00300	0.00520	0.00460	DIFF	0.000600	Pass Diff	0.00900	0.00920	DIFF	-0.0002	Pass Diff	0.00620	0.00610	DIFF	0.0001	Pass Diff	0.00500	0.00500	DIFF	0	Pass Diff																			
Antimony (Sb)-Total	mg/L	20	30	0.000100	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	0.000106	0.00107	RPD	-0.900	Pass RPD	0.000140	0.000160	DIFF	-0.00002	Pass Diff																			
Arsenic (As)-Total	mg/L	20	30	0.000100	0.000410	0.000390	DIFF	0.000030	Pass Diff	0.000160	0.000170	DIFF	0.00001	Pass Diff	0.001176	0.00178	RPD	-1.10	Pass RPD	0.000310	0.000350	DIFF	0.00002	Pass Diff																			
Barium (Ba)-Total	mg/L	20	30	0.000100	0.00244	0.00225	RPD	8.10	Pass RPD	0.0181	0.0182	RPD	-0.600	Pass RPD	0.0219	0.0217	RPD	0.9	Pass RPD	0.00918	0.00919	RPD	-0.1	Pass RPD																			
Beryllium (Be)-Total	mg/L	20	30	0.000020	<0.0000100	<0.000100	<DL	<DL	<DL	<0.000020	<0.000020	<DL	<DL	<DL	<0.000100	<0.000100	<DL	<DL	<DL	<0.000100	<0.000100	<DL	<DL	<DL																			
Bismuth (Bi)-Total	mg/L	20	30	0.000050	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL	<0.000050	<0.000050	<DL	<DL	<DL																			
Boron (B)-Total	mg/L	20	30	0.0100	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL	<0.010	<0.010	<DL	<DL	<DL																			
Cadmium (Cd)-Total	mg/L	20	30	0.0000050	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL	<0.0000050	<0.0000050	<DL	<DL	<DL																			
Calcium (Ca)-Total	mg/L	20	30	0.0500	3.78	3.72	RPD	1.60	Pass RPD	2.94	3.16	RPD	-7.20	Pass RPD	16.6	16.6	RPD	0	Pass RPD	6.81	6.91	RPD	-1.50	Pass RPD																			
Cesium (Cs)-Total	mg/L	20	30	0.000010	<0.000010	<0.000010	<DL	<DL	<DL	<0.000010	<0.000010	<DL	<DL	<DL	0.0000026	0.000025	DIFF	0.0000001	Pass Diff	<0.000010	<0.000010	<DL	<DL	<DL																			
Chromium (Cr)-Total	mg/L	20	30	0.000100	<0.00010	<0.00010	<DL	<DL	<DL	0.000110	<0.000110	<DL	<DL	<DL	0.000150	<0.000150	<DL	<DL	<DL	0.000050	<0.00010	<DL	<DL	<DL																			
Cobalt (Co)-Total	mg/L	20	30	0.000100	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL																			
Cobalt (Co)-Total	mg/L	20	30	0.000100	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL	<0.00010	<0.00010	<DL	<DL	<DL																			
Copper (Cu)-Total	mg/L	20	30	0.000500	0.000800	0.000750	DIFF	0.000050	Pass Diff	<0.00050	<0.00050	<DL	<DL	<DL	0.000570	0.000560	DIFF	0.000001	Pass Diff	<0.00050	<0.00050	<DL	<DL	<DL																			
Iron (Fe)-Total	mg/L	20	30	0.0100	0.0290	0																																					

Table A-6. Water quality field duplicate results for all CREMP study areas in 2023.

Month Station Date Sampled ALS Sample ID	Units	Relative Percent Difference PQDs		September DUP-1 (PDL-119)										September DUP-2 (BAP-89)										Outcome	September DUP-3 (NEM-84)										Outcome	November DUP-1 (MAM-86)										Outcome																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
				08-Sep-2023					Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome	08-Sep-2023					Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	08-Sep-2023						Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	07-Nov-2023					Field Dup Method ⁽¹⁾	Result ⁽¹⁾ (RPD or Diff)	Outcome																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
				September DIs								BAP-89							NEM-84								MAM-86																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
				VA23C1680-017	VA23C1680-019	VA23C1680-011	VA23C1680-020	VA23C1748-012				VA23C1748-019	VA23C17441-002	VA23C17441-005	VA23C17441-006	VA23C17441-007			VA23C17441-008	VA23C17441-009	VA23C17441-010	VA23C17441-011	VA23C17441-012				VA23C17441-013	VA23C17441-014	VA23C17441-015	VA23C17441-016	VA23C17441-017			VA23C17441-018		VA23C17441-019	VA23C17441-020	VA23C17441-021	VA23C17441-022	VA23C17441-023	VA23C17441-024	VA23C17441-025	VA23C17441-026	VA23C17441-027	VA23C17441-028		VA23C17441-029	VA23C17441-030	VA23C17441-031	VA23C17441-032	VA23C17441-033	VA23C17441-034	VA23C17441-035	VA23C17441-036	VA23C17441-037	VA23C17441-038	VA23C17441-039	VA23C17441-040	VA23C17441-041	VA23C17441-042	VA23C17441-043	VA23C17441-044	VA23C17441-045	VA23C17441-046	VA23C17441-047	VA23C17441-048	VA23C17441-049	VA23C17441-050	VA23C17441-051	VA23C17441-052	VA23C17441-053	VA23C17441-054	VA23C17441-055	VA23C17441-056	VA23C17441-057	VA23C17441-058	VA23C17441-059	VA23C17441-060	VA23C17441-061	VA23C17441-062	VA23C17441-063	VA23C17441-064	VA23C17441-065	VA23C17441-066	VA23C17441-067	VA23C17441-068	VA23C17441-069	VA23C17441-070	VA23C17441-071	VA23C17441-072	VA23C17441-073	VA23C17441-074	VA23C17441-075	VA23C17441-076	VA23C17441-077	VA23C17441-078	VA23C17441-079	VA23C17441-080	VA23C17441-081	VA23C17441-082	VA23C17441-083	VA23C17441-084	VA23C17441-085	VA23C17441-086	VA23C17441-087	VA23C17441-088	VA23C17441-089	VA23C17441-090	VA23C17441-091	VA23C17441-092	VA23C17441-093	VA23C17441-094	VA23C17441-095	VA23C17441-096	VA23C17441-097	VA23C17441-098	VA23C17441-099	VA23C17441-100	VA23C17441-101	VA23C17441-102	VA23C17441-103	VA23C17441-104	VA23C17441-105	VA23C17441-106	VA23C17441-107	VA23C17441-108	VA23C17441-109	VA23C17441-110	VA23C17441-111	VA23C17441-112	VA23C17441-113	VA23C17441-114	VA23C17441-115	VA23C17441-116	VA23C17441-117	VA23C17441-118	VA23C17441-119	VA23C17441-120	VA23C17441-121	VA23C17441-122	VA23C17441-123	VA23C17441-124	VA23C17441-125	VA23C17441-126	VA23C17441-127	VA23C17441-128	VA23C17441-129	VA23C17441-130	VA23C17441-131	VA23C17441-132	VA23C17441-133	VA23C17441-134	VA23C17441-135	VA23C17441-136	VA23C17441-137	VA23C17441-138	VA23C17441-139	VA23C17441-140	VA23C17441-141	VA23C17441-142	VA23C17441-143	VA23C17441-144	VA23C17441-145	VA23C17441-146	VA23C17441-147	VA23C17441-148	VA23C17441-149	VA23C17441-150	VA23C17441-151	VA23C17441-152	VA23C17441-153	VA23C17441-154	VA23C17441-155	VA23C17441-156	VA23C17441-157	VA23C17441-158	VA23C17441-159	VA23C17441-160	VA23C17441-161	VA23C17441-162	VA23C17441-163	VA23C17441-164	VA23C17441-165	VA23C17441-166	VA23C17441-167	VA23C17441-168	VA23C17441-169	VA23C17441-170	VA23C17441-171	VA23C17441-172	VA23C17441-173	VA23C17441-174	VA23C17441-175	VA23C17441-176	VA23C17441-177	VA23C17441-178	VA23C17441-179	VA23C17441-180	VA23C17441-181	VA23C17441-182	VA23C17441-183	VA23C17441-184	VA23C17441-185	VA23C17441-186	VA23C17441-187	VA23C17441-188	VA23C17441-189	VA23C17441-190	VA23C17441-191	VA23C17441-192	VA23C17441-193	VA23C17441-194	VA23C17441-195	VA23C17441-196	VA23C17441-197	VA23C17441-198	VA23C17441-199	VA23C17441-200	VA23C17441-201	VA23C17441-202	VA23C17441-203	VA23C17441-204	VA23C17441-205	VA23C17441-206	VA23C17441-207	VA23C17441-208	VA23C17441-209	VA23C17441-210	VA23C17441-211	VA23C17441-212	VA23C17441-213	VA23C17441-214	VA23C17441-215	VA23C17441-216	VA23C17441-217	VA23C17441-218	VA23C17441-219	VA23C17441-220	VA23C17441-221	VA23C17441-222	VA23C17441-223	VA23C17441-224	VA23C17441-225	VA23C17441-226	VA23C17441-227	VA23C17441-228	VA23C17441-229	VA23C17441-230	VA23C17441-231	VA23C17441-232	VA23C17441-233	VA23C17441-234	VA23C17441-235	VA23C17441-236	VA23C17441-237	VA23C17441-238	VA23C17441-239	VA23C17441-240	VA23C17441-241	VA23C17441-242	VA23C17441-243	VA23C17441-244	VA23C17441-245	VA23C17441-246	VA23C17441-247	VA23C17441-248	VA23C17441-249	VA23C17441-250	VA23C17441-251	VA23C17441-252	VA23C17441-253	VA23C17441-254	VA23C17441-255	VA23C17441-256	VA23C17441-257	VA23C17441-258	VA23C17441-259	VA23C17441-260	VA23C17441-261	VA23C17441-262	VA23C17441-263	VA23C17441-264	VA23C17441-265	VA23C17441-266	VA23C17441-267	VA23C17441-268	VA23C17441-269	VA23C17441-270	VA23C17441-271	VA23C17441-272	VA23C17441-273	VA23C17441-274	VA23C17441-275	VA23C17441-276	VA23C17441-277	VA23C17441-278	VA23C17441-279	VA23C17441-280	VA23C17441-281	VA23C17441-282	VA23C17441-283	VA23C17441-284	VA23C17441-285	VA23C17441-286	VA23C17441-287	VA23C17441-288	VA23C17441-289	VA23C17441-290	VA23C17441-291	VA23C17441-292	VA23C17441-293	VA23C17441-294	VA23C17441-295	VA23C17441-296	VA23C17441-297	VA23C17441-298	VA23C17441-299	VA23C17441-300	VA23C17441-301	VA23C17441-302	VA23C17441-303	VA23C17441-304	VA23C17441-305	VA23C17441-306	VA23C17441-307	VA23C17441-308	VA23C17441-309	VA23C17441-310	VA23C17441-311	VA23C17441-312	VA23C17441-313	VA23C17441-314	VA23C17441-315	VA23C17441-316	VA23C17441-317	VA23C17441-318	VA23C17441-319	VA23C17441-320	VA23C17441-321	VA23C17441-322	VA23C17441-323	VA23C17441-324	VA23C17441-325	VA23C17441-326	VA23C17441-327	VA23C17441-328	VA23C17441-329	VA23C17441-330	VA23C17441-331	VA23C17441-332	VA23C17441-333	VA23C17441-334	VA23C17441-335	VA23C17441-336	VA23C17441-337	VA23C17441-338	VA23C17441-339	VA23C17441-340	VA23C17441-341	VA23C17441-342	VA23C17441-343	VA23C17441-344	VA23C17441-345	VA23C17441-346	VA23C17441-347	VA23C17441-348	VA23C17441-349	VA23C17441-350	VA23C17441-351	VA23C17441-352	VA23C17441-353	VA23C17441-354	VA23C17441-355	VA23C17441-356	VA23C17441-357	VA23C17441-358	VA23C17441-359	VA23C17441-360	VA23C17441-361	VA23C17441-362	VA23C17441-363	VA23C17441-364	VA23C17441-365	VA23C17441-366	VA23C17441-367	VA23C17441-368	VA23C17441-369	VA23C17441-370	VA23C17441-371	VA23C17441-372	VA23C17441-373	VA23C17441-374	VA23C17441-375	VA23C17441-376	VA23C17441-377	VA23C17441-378	VA23C17441-379	VA23C17441-380	VA23C17441-381	VA23C17441-382	VA23C17441-383	VA23C17441-384	VA23C17441-385	VA23C17441-386	VA23C17441-387	VA23C17441-388	VA23C17441-389	VA23C17441-390	VA23C17441-391	VA23C17441-392	VA23C17441-393	VA23C17441-394	VA23C17441-395	VA23C17441-396	VA23C17441-397	VA23C17441-398	VA23C17441-399	VA23C17441-400	VA23C17441-401	VA23C17441-402	VA23C17441-403	VA23C17441-404	VA23C17441-405	VA23C17441-406	VA23C17441-407	VA23C17441-408	VA23C17441-409	VA23C17441-410	VA23C17441-411	VA23C17441-412	VA23C17441-413	VA23C17441-414	VA23C17441-415	VA23C17441-416	VA23C17441-417	VA23C17441-418	VA23C17441-419	VA23C17441-420	VA23C17441-421	VA23C17441-422	VA23C17441-423	VA23C17441-424	VA23C17441-425	VA23C17441-426	VA23C17441-427	VA23C17441-428	VA23C17441-429	VA23C17441-430	VA23C17441-431	VA23C17441-432	VA23C17441-433	VA23C17441-434	VA23C17441-435	VA23C17441-436	VA23C17441-437	VA23C17441-438	VA23C17441-439	VA23C17441-440	VA23C17441-441	VA23C17441-442	VA23C17441-443	VA23C17441-444	VA23C17441-445	VA23C17441-446	VA23C17441-447	VA23C17441-448	VA23C17441-449	VA23C17441-450	VA23C17441-451	VA23C17441-452	VA23C17441-453	VA23C17441-454	VA23C17441-455	VA23C17441-456	VA23C17441-457	VA23C17441-458	VA23C17441-459	VA23C17441-460	VA23C17441-461	VA23C17441-462	VA23C17441-463	VA23C17441-464	VA23C17441-465	VA23C17441-466	VA23C17441-467	VA23C17441-468	VA23C17441-469	VA23C17441-470	VA23C17441-471	VA23C17441-472	VA23C17441-473	VA23C17441-474	VA23C17441-475	VA23C17441-476	VA23C17441-477	VA23C17441-478	VA23C17441-479	VA23C17441-480	VA23C17441-481	VA23C17441-482	VA23C17441-483	VA23C17441-484	VA23C17441-485	VA23C17441-486	VA23C17441-487	VA23C17441-488	VA23C17441-489	VA23C17441-490	VA23C17441-491	VA23C17441-492	VA23C17441-493	VA23C17441-494	VA23C17441-495	VA23C17441-496	VA23C17441-497	VA23C17441-498	VA23C17441-499	VA23C17441-500	VA23C17441-501	VA23C17441-502	VA23C17441-503	VA23C17441-504	VA23C17441-505	VA23C17441-506	VA23C17441-507	VA23C17441-508	VA23C17441-509	VA23C17441-510	VA23C17441-511	VA23C17441-512	VA23C17441-513	VA23C17441-514	VA23C17441-515	VA23C17441-516	VA23C17441-517	VA23C17441-518	VA23C17441-519	VA23C17441-520	VA23C17441-521	VA23C17441-522	VA23C17441-523	VA23C17441-524	VA23C17441-525	VA23C17441-526	VA23C17441-527	VA23C17441-528	VA23C17441-529	VA23C17441-530	VA23C17441-531	VA23C17441-532	VA23C17441-533	VA23C17441-534	VA23C17441-535	VA23C17441-536	VA23C17441-537	VA23C17441-538	VA23C17441-539	VA23C17441-540	VA23C17441-541	VA23C17441-542	VA23C17441-543	VA23C17441-544	VA23C17441-545	VA23C17441-546	VA23C17441-547	VA23C17441-548	VA23C17441-549	VA23C17441-550	VA23C17441-551	VA23C17441-552	VA23C17441-553	VA23C17441-554	VA23C17441-555	VA23C17441-556	VA23C17441-557	VA23C17441-558	VA23C17441-559	VA23C17441-560	VA23C17441-561	VA23C17441-562	VA23C17441-563	VA23C17441-564	VA23C17441-565	VA23C17441-566	VA23C17441-567	VA23C17441-568	VA23C17441-569	VA23C17441-570	VA23C17441-571	VA23C17441-572

Table A-7. Swipe chemistry data for sediment grab analyses, 2023.

Analyte	ALS Sample ID	Equipment Swipes ¹	
		SWIPE-SC-1	SWIPE-SC-2
		FILTER	FILTER
		17-Aug-2023	18-Aug-2023
Swipe DLs (µg)		WP2320790-044	WP2320790-045
Total Metals (µg)			
Aluminum	20	<20	25
Antimony	20	<20	<20
Arsenic	20	<20	<20
Barium	1.0	<1.0	1.7
Beryllium	0.50	<0.50	<0.50
Bismuth	20	<20	<20
Cadmium	1.0	<1.0	<1.0
Calcium	200	<200	<200
Chromium	2.0	15	17
Cobalt	1.0	<1.0	<1.0
Copper	1.0	<1.0	<1.0
Lead	0.40	<0.40	<0.40
Lithium	1.0	<1.0	<1.0
Manganese	0.50	1.3	2.4
Mercury	0.010	<0.010	<0.010
Molybdenum	3.0	<3.0	<3.0
Nickel	5.0	6.3	8.5
Phosphorus	30	<30	<30
Potassium	200	<200	<200
Selenium	20	<20	<20
Silver	1.0	<1.0	<1.0
Sodium	400	<400	<400
Strontium	0.50	<0.50	<0.50
Thallium	20	<20	<20
Tin	3.0	<3.0	<3.0
Titanium	1.0	<1.0	1.7
Vanadium	3.0	<3.0	<3.0

Notes:

Bold Filter Swipes concentration exceeds laboratory DLs, but < 10x DL.

Shaded Filter Swipes concentration is > 10x DL.

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month Station Date Sampled ALS Sample ID	Units	Relative Percent Difference DQOs (%)		August DLS	DUP-SC-1 (TPE-SC-7)					DUP-SC-2 (TPN-SC-5)					DUP-SC-3 (SP-SC-10)					DUP-SC-4 (BBD-SC-1)					
					TPE-SC-7	DUP-SC-1	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	TPN-SC-5	DUP-SC-2	Field Dup	Result ^[b]	Outcome	SP-SC-10	DUP-SC-3	Field Dup	Result ^[b]	Outcome	BBD-SC-1	DUP-SC-4	Field Dup	Result ^[b]	Outcome	
					11-Aug-2023 VA23C0344-077	11-Aug-2023 VA23C0344-121				12-Aug-2023 VA23C0344-085	12-Aug-2023 VA23C0344-122				14-Aug-2023 VA23C0344-070	16-Aug-2023 WP2320790-047				16-Aug-2023 WP2320790-031	16-Aug-2023 WP2320790-046				
Parameter		Lab	Field		Sediment	Sediment				Sediment	Sediment				Sediment	Sediment			Sediment	Sediment					
Physical Tests																									
Moisture (%)	%	20	30	0.25	82	80.8	RPD	1.5	Pass RPD	68.7	61.4	RPD	11.2	Pass RPD	86	85.9	RPD	0.1	Pass RPD	37.5	44.5	RPD	-17.1	Pass RPD	
pH (Laboratory)	pH units	5.0	7.5	0.10	5.7	6.1	RPD	-7.3	Pass RPD	5.8	6.0	RPD	-3.9	Pass RPD	6.1	6.2	RPD	-1.5	Pass RPD	5.8	5.8	RPD	-0.3	Pass RPD	
Total Metals																									
Aluminum (Al)-Total	mg/kg	40	60	50	28600	31400	RPD	-9.3	Pass RPD	14500	12000	RPD	18.9	Pass RPD	29600	24800	RPD	17.6	Pass RPD	6670	6220	RPD	7	Pass RPD	
Antimony (Sb)-Total	mg/kg	30	45	0.10	0.19	0.23	DIFF	-0.040000	Pass Diff	0.12	<0.10	<DL	<DL	<DL	0.24	0.30	DIFF	-0.06	Pass Diff	0.10	0.11	DIFF	-0.01	Pass Diff	
Arsenic (As)-Total	mg/kg	30	45	0.10	41.2	20.3	RPD	68	Fail	13.2	6.8	RPD	63.7	Fail	33.5	30.8	RPD	8.4	Pass RPD	8.8	8.3	RPD	6.2	Pass RPD	
Barium (Ba)-Total	mg/kg	40	60	0.50	131	145	RPD	-10	Pass RPD	55.7	46.1	RPD	18.9	Pass RPD	133	111	RPD	18	Pass RPD	99.1	105	RPD	-5.8	Pass RPD	
Beryllium (Be)-Total	mg/kg	30	45	0.10	2.2	2.1	RPD	6.1	Pass RPD	0.80	0.60	RPD	28.6	Pass RPD	2.3	2.1	RPD	10.4	Pass RPD	0.29	0.29	DIFF	0	Pass Diff	
Bismuth (Bi)-Total	mg/kg	30	45	0.20	2.5	2.7	RPD	-6.9	Pass RPD	0.84	0.63	DIFF	0.21	Pass Diff	2.5	2.3	RPD	10	Pass RPD	<0.20	<0.20	<DL	<DL	<DL	
Boron (B)-Total	mg/kg	30	45	5.0	9.1	9.6	DIFF	-0.500000	Pass Diff	5.1	<5.0	<DL	<DL	<DL	11.9	8.1	DIFF	3.8	Pass Diff	5.8	6.0	DIFF	-0.2	Pass Diff	
Cadmium (Cd)-Total	mg/kg	30	45	0.020	0.11	0.11	RPD	27.5	Pass RPD	0.070	0.063	DIFF	0.007	Pass Diff	0.23	0.20	RPD	15.2	Pass RPD	0.044	0.044	DIFF	-0.003	Pass Diff	
Calcium (Ca)-Total	mg/kg	30	45	50	1910	2180	RPD	-13	Pass RPD	1260	1240	RPD	1.6	Pass RPD	2580	2620	RPD	-1.5	Pass RPD	2380	2450	RPD	-2.9	Pass RPD	
Chromium (Cr)-Total	mg/kg	30	45	0.50	108	105	RPD	2.8	Pass RPD	88.8	79	RPD	11.7	Pass RPD	85	90	RPD	-5.7	Pass RPD	15.6	15.3	RPD	1.9	Pass RPD	
Cobalt (Co)-Total	mg/kg	30	45	0.10	18.3	17	RPD	7.4	Pass RPD	7.5	6.4	RPD	16.7	Pass RPD	17.5	16.2	RPD	7.7	Pass RPD	5.1	5.2	RPD	-1.7	Pass RPD	
Copper (Cu)-Total	mg/kg	30	45	0.50	59.6	61.2	RPD	-2.6	Pass RPD	31.6	25.5	RPD	21.4	Pass RPD	78.3	76.9	RPD	1.8	Pass RPD	7.4	7.7	RPD	-4	Pass RPD	
Iron (Fe)-Total	mg/kg	30	45	50	85500	52700	RPD	47.5	Fail	23400	17800	RPD	27.2	Pass RPD	58300	55200	RPD	5.5	Pass RPD	14700	15400	RPD	-4.7	Pass RPD	
Lead (Pb)-Total	mg/kg	40	60	0.50	20.3	24.4	RPD	-18	Pass RPD	11.3	8.9	RPD	23.3	Pass RPD	22.1	22.9	RPD	-3.6	Pass RPD	6.2	6.9	RPD	-10.8	Pass RPD	
Lithium (Li)-Total	mg/kg	30	45	2.0	51.8	55.4	RPD	-6.7	Pass RPD	22.6	20	RPD	12.2	Pass RPD	49.2	46	RPD	6.7	Pass RPD	9.0	8.8	DIFF	0.2	Pass Diff	
Magnesium (Mg)-Total	mg/kg	30	45	20	11200	11700	RPD	-4.4	Pass RPD	7200	6280	RPD	13.6	Pass RPD	10400	9340	RPD	10.7	Pass RPD	3780	3730	RPD	1.3	Pass RPD	
Manganese (Mn)-Total	mg/kg	30	45	1.0	2200	1660	RPD	28	Pass RPD	226	203	RPD	10.7	Pass RPD	2700	2390	RPD	12.2	Pass RPD	295	335	RPD	-12.7	Pass RPD	
Mercury (Hg)-Total	mg/kg	40	60	0.0050	0.012	0.012	DIFF	0	Pass Diff	0.010	0.0088	DIFF	0.0013	Pass Diff	0.029	0.035	RPD	-20.7	Pass RPD	0.0056	0.0075	DIFF	-0.0019	Pass Diff	
Molybdenum (Mo)-Total	mg/kg	40	60	0.10	8.0	4.5	RPD	56.2	Pass RPD	2.4	1.2	RPD	67.8	Fail	6.5	6.3	RPD	2.5	Pass RPD	0.64	0.69	RPD	-7.5	Pass RPD	
Nickel (Ni)-Total	mg/kg	30	45	0.50	64.3	66.7	RPD	-3.7	Pass RPD	42.6	40.5	RPD	5.1	Pass RPD	59.8	62.1	RPD	-3.8	Pass RPD	9.9	9.6	RPD	2.7	Pass RPD	
Phosphorus (P)-Total	mg/kg	30	45	50	475	359	RPD	27.8	Pass RPD	312	280	RPD	10.8	Pass RPD	553	596	RPD	-7.5	Pass RPD	901	881	RPD	2.2	Pass RPD	
Potassium (K)-Total	mg/kg	40	60	100	4640	5060	RPD	-8.7	Pass RPD	2020	1690	RPD	17.8	Pass RPD	4840	4220	RPD	13.7	Pass RPD	1100	1100	RPD	0	Pass RPD	
Selenium (Se)-Total	mg/kg	30	45	0.20	0.35	0.22	DIFF	0.13	Pass Diff	<0.20	<0.20	<DL	<DL	<DL	<DL	0.54	0.61	DIFF	-0.07	Pass Diff	<0.20	<0.20	<DL	<DL	<DL
Silver (Ag)-Total	mg/kg	40	60	0.10	<0.10	<0.10	<DL	<DL	<DL	<0.10	<0.10	<DL	<DL	<DL	<0.10	0.12	<DL	<DL	<DL	<0.10	<0.10	<DL	<DL	<DL	
Sodium (Na)-Total	mg/kg	40	60	50	147	166	DIFF	-19	Pass Diff	79	71	DIFF	8	Pass Diff	174	171	DIFF	3	Pass Diff	99	77	DIFF	22	Pass Diff	
Strontium (Sr)-Total	mg/kg	40	60	0.50	16.4	20.2	RPD	-21	Pass RPD	11.5	11.7	RPD	-1.7	Pass RPD	21.3	21.1	RPD	0.9	Pass RPD	34.6	34.7	RPD	-0.3	Pass RPD	
Sulfur (S)-Total	mg/kg	30	45	1000	<1000	1100	<DL	<DL	<DL	<1000	<1000	<DL	<DL	<DL	1300	1400	DIFF	-100	Pass Diff	<1000	<1000	<DL	<DL	<DL	
Thallium (Tl)-Total	mg/kg	30	45	0.050	0.40	0.41	RPD	-3.7	Pass RPD	0.15	0.12	DIFF	0.021	Pass Diff	0.40	0.36	RPD	11.7	Pass RPD	<0.050	0.056	<DL	<DL	<DL	
Tin (Sn)-Total	mg/kg	40	60	2.0	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	<2.0	2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	
Titanium (Ti)-Total	mg/kg	40	60	1.0	935	1070	RPD	-14	Pass RPD	446	410	RPD	8.4	Pass RPD	835	725	RPD	14.1	Pass RPD	337	337	RPD	0	Pass RPD	
Tungsten (W)-Total	mg/kg	30	45	0.50	<0.50	<0.50	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	<0.50	0.80	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	
Uranium (U)-Total	mg/kg	30	45	0.050	18.5	20.5	RPD	-10	Pass RPD	9.3	7.5	RPD	21.5	Pass RPD	21.4	20.8	RPD	2.8	Pass RPD	1.3	1.4	RPD	-8.8	Pass RPD	
Vanadium (V)-Total	mg/kg	30	45	0.20	44.6	50.8	RPD	-13	Pass RPD	24.8	21	RPD	16.6	Pass RPD	41.6	40.7	RPD	2.2	Pass RPD	17.7	18.2	RPD	-2.8	Pass RPD	
Zinc (Zn)-Total	mg/kg	30	45	2.0	119	124	RPD	-4.1	Pass RPD	58.9	50.7	RPD	15	Pass RPD	121	113	RPD	6.8	Pass RPD	29.1	27.4	RPD	6	Pass RPD	
Zirconium (Zr)-Total	mg/kg	30	45	1.0	3.6	4.7	DIFF	-1.1	Pass Diff	2.2	1.7	DIFF	0.5	Pass Diff	2.0	2.1	DIFF	-0.1	Pass Diff	3.6	3.1	DIFF	0.5	Pass Diff	
Speciated Metals (µg/kg)																									
Methylmercury (as MeHg)	mg/kg	30	45	1.0	-	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL	

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month Station Date Sampled ALS Sample ID	Units	Relative Percent Difference DQOs (%)		August DLs	DUP-SC-5 (BAP-SC-1)					DUP-SC-6 (BPJ-SC-3)					DUP-SC-7 (BES-SC-4)					
					BAP-SC-1 17-Aug-2023 WP2320790-001 Sediment	DUP-SC-5 17-Aug-2023 WP2320790-043 Sediment	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	BPJ-SC-3 19-Aug-2023 WP2320790-023 Sediment	DUP-SC-6 19-Aug-2023 WP2320790-042 Sediment	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	BES-SC-4 18-Aug-2023 WP2320790-014 Sediment	DUP-SC-7 18-Aug-2023 WP2320790-043 Sediment	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	
Parameter		Lab	Field																	
Physical Tests																				
Moisture (%)	%	20	30	0.25	30.1	27.1	RPD	10.5	Pass RPD	50.8	56	RPD	-9.7	Pass RPD	51.2	46.5	RPD	9.6	Pass RPD	
pH (Laboratory)	pH units	5.0	7.5	0.10	6.2	5.9	RPD	4.1	Pass RPD	6.6	6.6	RPD	0.6	Pass RPD	6.5	6.5	RPD	-1.1	Pass RPD	
Total Metals																				
Aluminum (Al)-Total	mg/kg	40	60	50	4480	5000	RPD	-11	Pass RPD	10100	9320	RPD	8	Pass RPD	8330	7440	RPD	11.3	Pass RPD	
Antimony (Sb)-Total	mg/kg	30	45	0.10	0.14	0.15	DIFF	-0.01	Pass Diff	0.15	0.15	DIFF	0	Pass Diff	0.16	0.16	DIFF	0	Pass Diff	
Arsenic (As)-Total	mg/kg	30	45	0.10	2.9	3.8	RPD	-26.4	Pass RPD	9.6	9.0	RPD	6.4	Pass RPD	5.2	5.0	RPD	4.3	Pass RPD	
Barium (Ba)-Total	mg/kg	40	60	0.50	325	330	RPD	-1.5	Pass RPD	164	145	RPD	12.3	Pass RPD	152	154	RPD	-1.3	Pass RPD	
Beryllium (Be)-Total	mg/kg	30	45	0.10	0.29	0.33	DIFF	-0.04	Pass Diff	0.45	0.43	DIFF	0.02	Pass Diff	0.44	0.42	DIFF	0.02	Pass Diff	
Bismuth (Bi)-Total	mg/kg	30	45	0.20	<0.20	<0.20	<DL	<DL	<DL	0.22	0.24	DIFF	-0.02	Pass Diff	<0.20	<0.20	<DL	<DL	<DL	
Boron (B)-Total	mg/kg	30	45	5.0	6.3	6.3	DIFF	0.1	Pass Diff	9.1	8.6	DIFF	0.5	Pass Diff	8.6	8.2	DIFF	0.4	Pass Diff	
Cadmium (Cd)-Total	mg/kg	30	45	0.020	0.027	0.030	DIFF	-0.003	Pass Diff	0.089	0.097	DIFF	-0.008	Pass Diff	0.054	0.063	DIFF	-0.009	Pass Diff	
Calcium (Ca)-Total	mg/kg	30	45	50	1950	2470	RPD	-23.5	Pass RPD	2760	2800	RPD	-1.4	Pass RPD	2490	2700	RPD	-8.1	Pass RPD	
Chromium (Cr)-Total	mg/kg	30	45	0.50	14.3	16.3	RPD	-13.1	Pass RPD	24.1	23.4	RPD	2.9	Pass RPD	22.1	21.5	RPD	2.8	Pass RPD	
Cobalt (Co)-Total	mg/kg	30	45	0.10	3.6	3.9	RPD	-9.9	Pass RPD	8.9	8.2	RPD	7.3	Pass RPD	6.5	6.0	RPD	6.9	Pass RPD	
Copper (Cu)-Total	mg/kg	30	45	0.50	5.7	5.4	RPD	4.7	Pass RPD	11.1	10.9	RPD	1.8	Pass RPD	7.4	7.1	RPD	4.6	Pass RPD	
Iron (Fe)-Total	mg/kg	30	45	50	12100	13100	RPD	-7.9	Pass RPD	21900	19700	RPD	10.6	Pass RPD	17300	15200	RPD	12.9	Pass RPD	
Lead (Pb)-Total	mg/kg	40	60	0.50	3.6	4.9	RPD	-31.5	Pass RPD	9.9	9.5	RPD	3.7	Pass RPD	6.9	6.8	RPD	2.6	Pass RPD	
Lithium (Li)-Total	mg/kg	30	45	2.0	6.9	8.1	DIFF	-1.2	Pass Diff	13.1	13.1	RPD	0	Pass RPD	11.5	11.6	RPD	-0.9	Pass RPD	
Magnesium (Mg)-Total	mg/kg	30	45	20	2800	3080	RPD	-9.5	Pass RPD	5540	5160	RPD	7.1	Pass RPD	4710	4410	RPD	6.6	Pass RPD	
Manganese (Mn)-Total	mg/kg	30	45	1.0	124	129	RPD	-4	Pass RPD	4730	3490	RPD	30.2	Pass RPD	562	1160	RPD	-69.5	Fail	
Mercury (Hg)-Total	mg/kg	40	60	0.0050	<0.0050	<0.0050	<DL	<DL	<DL	0.012	0.012	DIFF	0.0002	Pass Diff	0.0097	0.0089	DIFF	0.0008	Pass Diff	
Molybdenum (Mo)-Total	mg/kg	40	60	0.10	0.33	0.58	DIFF	-0.25	Fail	2.2	2.3	RPD	-5.4	Pass RPD	0.75	1.2	RPD	-47.7	Pass RPD	
Nickel (Ni)-Total	mg/kg	30	45	0.50	8.6	9.6	RPD	-11.7	Pass RPD	16	15.6	RPD	2.5	Pass RPD	13.5	13.2	RPD	2.2	Pass RPD	
Phosphorus (P)-Total	mg/kg	30	45	50	679	838	RPD	-21	Pass RPD	1000	947	RPD	5.4	Pass RPD	800	754	RPD	5.9	Pass RPD	
Potassium (K)-Total	mg/kg	40	60	100	1020	1210	RPD	-17	Pass RPD	1760	1760	RPD	0	Pass RPD	1670	1590	RPD	4.9	Pass RPD	
Selenium (Se)-Total	mg/kg	30	45	0.20	<0.20	<0.20	<DL	<DL	<DL	<0.20	<0.20	<DL	<DL	<DL	<0.20	<0.20	<DL	<DL	<DL	
Silver (Ag)-Total	mg/kg	40	60	0.10	<0.10	<0.10	<DL	<DL	<DL	<0.10	<0.10	<DL	<DL	<DL	<0.10	<0.10	<DL	<DL	<DL	
Sodium (Na)-Total	mg/kg	40	60	50	71	66	DIFF	5	Pass Diff	140	139	DIFF	1	Pass Diff	134	117	DIFF	17	Pass Diff	
Strontium (Sr)-Total	mg/kg	40	60	0.50	39.5	39.1	RPD	1	Pass RPD	46.6	47	RPD	-0.9	Pass RPD	46.9	44.5	RPD	5.3	Pass RPD	
Sulfur (S)-Total	mg/kg	30	45	1000	<1000	<1000	<DL	<DL	<DL	<1000	<1000	<DL	<DL	<DL	<1000	<1000	<DL	<DL	<DL	
Thallium (Tl)-Total	mg/kg	30	45	0.050	<0.050	0.060	<DL	<DL	<DL	0.085	0.081	DIFF	0.004	Pass Diff	0.079	0.078	DIFF	0.001	Pass Diff	
Tin (Sn)-Total	mg/kg	40	60	2.0	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	
Titanium (Ti)-Total	mg/kg	40	60	1.0	277	318	RPD	-13.8	Pass RPD	443	411	RPD	7.5	Pass RPD	374	366	RPD	2.2	Pass RPD	
Tungsten (W)-Total	mg/kg	30	45	0.50	<0.50	0.62	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	
Uranium (U)-Total	mg/kg	30	45	0.050	1.0	1.4	RPD	-29.5	Pass RPD	2.0	1.9	RPD	1.6	Pass RPD	1.7	1.6	RPD	3.1	Pass RPD	
Vanadium (V)-Total	mg/kg	30	45	0.20	16.8	21.4	RPD	-24.1	Pass RPD	26.1	26.1	RPD	0	Pass RPD	24	23.4	RPD	2.5	Pass RPD	
Zinc (Zn)-Total	mg/kg	30	45	2.0	19.7	21.3	RPD	-7.8	Pass RPD	49.2	44.2	RPD	10.7	Pass RPD	34.7	31.2	RPD	10.6	Pass RPD	
Zirconium (Zr)-Total	mg/kg	30	45	1.0	3.7	3.5	DIFF	0.2	Pass Diff	3.0	3.0	DIFF	0	Pass Diff	2.3	2.0	DIFF	0.3	Pass Diff	
Speciated Metals (µg/kg)																				
Methylmercury (as MeHg)	mg/kg	30	45	1.0	-	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL	-	-	<DL	<DL	<DL	

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month Station Date Sampled ALS Sample ID	Units	Relative Percent Difference DQOs (%)		DUP-SC-8 (WAL-SC-2)						DUP-SC-9 (A76-SC-4)					DUP-SC-10 (MAM-SC-3)					DUP-SC-11 (NEM-SC-8)				
				WAL-SC-2 21-Aug-2023 VA23C0344-092	DUP-SC-8 21-Aug-2023 VA23C0344-123 Sediment	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	August MDLs	A76-SC-4 13-Aug-2023 VA23C0344-044	DUP-SC-9 23-Aug-2023 VA23C0344-124 Sediment	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	MAM-SC-3 15-Aug-2023 VA23C0344-003	DUP-SC-10 23-Aug-2023 VA23C0344-125	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	NEM-SC-8 16-Aug-2023 VA23C0344-058	DUP-SC-11 16-Aug-2023 VA23C0344-126	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome
		Lab	Field																					
Parameter																								
Physical Tests																								
Moisture (%)	%	20	30	88.8	88.7	RPD	0.1	Pass RPD	0.25	88.9	87.9	RPD	1.1	Pass RPD	90.7	89.6	RPD	1.2	Pass RPD	87.1	87.4	RPD	-0.3	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	6.2	6.2	RPD	-0.3	Pass RPD	0.10	5.9	5.4	RPD	9.6	Fail	6.1	6.1	RPD	0.7	Pass RPD	6.3	6.1	RPD	3.4	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/kg	40	60	20200	25800	RPD	-24.3	Pass RPD	50	18100	26800	RPD	-38.8	Pass RPD	22000	21800	RPD	0.9	Pass RPD	11400	12700	RPD	-10.8	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.38	0.45	DIFF	-0.07	Pass Diff	0.10	0.39	0.45	DIFF	-0.06	Pass Diff	1.5	3.2	RPD	-72.3	Fail	0.28	0.42	DIFF	-0.14	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	32.1	21.6	RPD	39.1	Pass RPD	0.10	356	253	RPD	33.8	Pass RPD	163	204	RPD	-22.3	Pass RPD	33.3	36	RPD	-7.8	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	112	152	RPD	-30.3	Pass RPD	0.50	164	193	RPD	-16.2	Pass RPD	157	164	RPD	-4.4	Pass RPD	81.2	99.3	RPD	-20.1	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	1.6	1.6	RPD	-3.2	Pass RPD	0.10	1.1	1.6	RPD	-36.5	Pass RPD	1.5	1.3	RPD	16.1	Pass RPD	0.63	0.74	RPD	-16.1	Pass RPD
Bismuth (Bi)-Total	mg/kg	30	45	1.9	2.1	RPD	-11.2	Pass RPD	0.20	0.59	0.76	DIFF	-0.17	Pass Diff	0.52	0.44	DIFF	0.08	Pass Diff	0.21	0.25	DIFF	-0.04	Pass Diff
Boron (B)-Total	mg/kg	30	45	9.7	11.8	DIFF	-2.1	Pass Diff	5.0	5.8	9.0	DIFF	-3.2	Pass Diff	21.4	27.9	DIFF	-6.5	Pass Diff	10.6	11.6	DIFF	-1	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.37	0.53	RPD	-37.2	Pass RPD	0.020	0.32	0.25	RPD	25.4	Pass RPD	0.33	0.26	RPD	24.9	Pass RPD	0.17	0.29	RPD	-50	Fail
Calcium (Ca)-Total	mg/kg	30	45	4680	4820	RPD	-2.9	Pass RPD	50	3060	3530	RPD	-14.3	Pass RPD	4220	16300	RPD	-117.7	Fail	3560	3620	RPD	-1.7	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	54.7	59.4	RPD	-8.2	Pass RPD	0.50	98.2	129	RPD	-27.1	Pass RPD	196	232	RPD	-16.8	Pass RPD	130	132	RPD	-1.5	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	9.4	9.7	RPD	-3.3	Pass RPD	0.10	22.4	22.4	RPD	0	Pass RPD	14.3	15.7	RPD	-9.3	Pass RPD	7.9	8.6	RPD	-8.6	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	118	137	RPD	-14.9	Pass RPD	0.50	62	85	RPD	-31.3	Pass RPD	73.1	59.2	RPD	21	Pass RPD	31.5	42.3	RPD	-29.3	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	33000	29400	RPD	11.5	Pass RPD	50	100000	90900	RPD	9.5	Pass RPD	50800	50000	RPD	1.6	Pass RPD	21300	24800	RPD	-15.2	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	29.4	32	RPD	-8.5	Pass RPD	0.50	18.7	22.6	RPD	-18.9	Pass RPD	18.9	16.2	RPD	15.4	Pass RPD	7.8	9.6	RPD	-20	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	34.9	36.9	RPD	-5.6	Pass RPD	2.0	14.3	19.7	RPD	-31.8	Pass RPD	19.6	18.6	RPD	5.2	Pass RPD	11.6	12.5	RPD	-7.5	Pass RPD
Magnesium (Mg)-Total	mg/kg	30	45	8060	9160	RPD	-12.8	Pass RPD	20	7660	10300	RPD	-29.4	Pass RPD	10800	12000	RPD	-10.5	Pass RPD	7780	8110	RPD	-4.2	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	365	397	RPD	-8.4	Pass RPD	1.0	2850	1220	RPD	80.1	Fail	519	1090	RPD	-71	Fail	358	445	RPD	-21.7	Pass RPD
Mercury (Hg)-Total	mg/kg	40	60	0.055	0.041	RPD	30.4	Pass RPD	0.0050	0.045	0.047	RPD	-3.5	Pass RPD	0.082	0.088	RPD	-7.3	Pass RPD	0.022	0.026	DIFF	-0.0044	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	7.2	6.4	RPD	12.6	Pass RPD	0.10	5.4	6.1	RPD	-11.1	Pass RPD	6.1	7.1	RPD	-15.8	Pass RPD	2.3	2.8	RPD	-20.7	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	51.9	53.4	RPD	-2.8	Pass RPD	0.50	109	110	RPD	-0.9	Pass RPD	124	120	RPD	3.3	Pass RPD	79.3	92.1	RPD	-14.9	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	647	770	RPD	-17.4	Pass RPD	50	977	1600	RPD	-48.4	Fail	822	1090	RPD	-28	Pass RPD	486	568	RPD	-15.6	Pass RPD
Potassium (K)-Total	mg/kg	40	60	3010	4100	RPD	-30.7	Pass RPD	100	2670	4170	RPD	-43.9	Pass RPD	3090	3550	RPD	-13.9	Pass RPD	1280	1330	RPD	-3.8	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.62	0.76	DIFF	-0.14	Pass Diff	0.20	0.89	0.97	DIFF	-0.08	Pass Diff	0.82	0.94	DIFF	-0.12	Pass Diff	0.42	0.56	DIFF	-0.14	Pass Diff
Silver (Ag)-Total	mg/kg	40	60	0.52	0.64	RPD	-20.7	Pass RPD	0.10	0.28	0.32	DIFF	-0.04	Pass Diff	0.46	0.40	DIFF	0.06	Pass Diff	0.14	0.17	DIFF	-0.03	Pass Diff
Sodium (Na)-Total	mg/kg	40	60	165	198	DIFF	-33	Pass Diff	50	154	192	DIFF	-38	Pass Diff	192	287	DIFF	-95	Pass Diff	85	92	DIFF	-7	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	26	37.6	RPD	-36.5	Pass RPD	0.50	24.2	33.3	RPD	-31.7	Pass RPD	36.9	71.1	RPD	-63.3	Fail	28.6	33.2	RPD	-14.9	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1700	1700	DIFF	0	Pass Diff	1000	1900	2200	DIFF	-300	Pass Diff	2700	3100	DIFF	-400	Pass Diff	1600	2400	DIFF	-800	Pass Diff
Thallium (Tl)-Total	mg/kg	30	45	0.28	0.32	RPD	-12.3	Pass RPD	0.050	0.31	0.35	RPD	-13.1	Pass RPD	0.25	0.21	DIFF	0.031	Pass Diff	0.078	0.097	DIFF	-0.019	Pass Diff
Tin (Sn)-Total	mg/kg	40	60	<2.0	3.4	<DL	<DL	<DL	2.0	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL
Titanium (Ti)-Total	mg/kg	40	60	534	901	RPD	-51.1	Pass RPD	1.0	338	555	RPD	-48.6	Pass RPD	507	649	RPD	-24.6	Pass RPD	259	234	RPD	10.1	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	0.95	1.5	DIFF	-0.5	Pass Diff	0.50	<0.50	<0.50	<DL	<DL	<DL	1.2	1.5	DIFF	-0.27	Pass Diff	<0.50	<0.50	<DL	<DL	<DL
Uranium (U)-Total	mg/kg	30	45	13.9	17.7	RPD	-24.1	Pass RPD	0.050	10.4	13.4	RPD	-25.2	Pass RPD	14.2	11.6	RPD	20.2	Pass RPD	3.7	4.6	RPD	-21.8	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	29.1	37	RPD	-23.9	Pass RPD	0.20	31.7	43.7	RPD	-31.8	Pass RPD	43.3	41.4	RPD	4.5	Pass RPD	23.5	25.5	RPD	-8.2	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	116	116	RPD	0	Pass RPD	2.0	97.3	120	RPD	-20.9	Pass RPD	126	108	RPD	15.4	Pass RPD	51.4	62.9	RPD	-20.1	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	4.8	3.2	DIFF	1.6	Pass Diff	1.0	2.1	2.0	DIFF	0.1	Pass Diff	3.9	1.2	DIFF	2.7	Fail	<1.0	<1.0	<DL	<DL	<DL
Speciated Metals (µg/kg)																								
Methylmercury (as MeHg)	mg/kg	30	45	-	-	<DL	<DL	<DL	1.0	-	-	<DL	<DL	<DL	1.8	1.3	DIFF	0.52	Pass Diff	-	-	<DL	<DL	<DL

Table A-8. Field duplicate results for the sediment cores collected in 2023.

Month Station Date Sampled ALS Sample ID	Units	Relative Percent Difference DQOs (%)		DUP-SC-12 (A20-SC-7)					DUP-SC-13 (DS1-SC-4)					DUP-SC-15 (INUG-SC-1)					DUP-SC-16 (PDL-SC-2)					
				A20-SC-7 16-Aug-2023 VA23C0344-037	DUP-SC-12 16-Aug-2023 VA23C0344-127	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	August MDLs	DS1-SC-4 17-Aug-2023 VA23C0344-024	DUP-SC-13 17-Aug-2023 VA23C0344-128	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	INUG-SC-1 22-Aug-2023 VA23C0344-111	DUP-SC-15 22-Aug-2023 VA23C0344-129	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome	PDL-SC-2 22-Aug-2023 VA23C0344-102	DUP-SC-16 22-Aug-2023 VA23C0344-130	Field Dup Method ^(a)	Result ^(b) (RPD or Diff)	Outcome
		Lab	Field	Lab	Field					Lab	Field				Lab	Field				Lab	Field			
Parameter																								
Physical Tests																								
Moisture (%)	%	20	30	87	87	RPD	0.8	Pass RPD	0.25	69.1	76.6	RPD	-10.3	Pass RPD	84.5	85.5	RPD	-1.2	Pass RPD	82	79.8	RPD	2.7	Pass RPD
pH (Laboratory)	pH units	5.0	7.5	5.3	5.2	RPD	2.7	Pass RPD	0.10	5.3	5.7	RPD	-7.5	Fail	5.1	5.2	RPD	-2.3	Pass RPD	5.1	5.0	RPD	3.2	Pass RPD
Total Metals																								
Aluminum (Al)-Total	mg/kg	40	60	20900	17300	RPD	18.8	Pass RPD	50	19100	18900	RPD	1.1	Pass RPD	22800	25200	RPD	-10	Pass RPD	20200	24500	RPD	-19.2	Pass RPD
Antimony (Sb)-Total	mg/kg	30	45	0.20	0.22	DIFF	-0.02	Pass Diff	0.10	0.29	0.29	DIFF	0	Pass Diff	0.16	0.18	DIFF	-0.02	Pass Diff	0.29	0.28	DIFF	0.01	Pass Diff
Arsenic (As)-Total	mg/kg	30	45	127	163	RPD	-24.8	Pass RPD	0.10	27.1	177	RPD	-146.9	Fail	55	23.2	RPD	81.3	Fail	135	106	RPD	24.1	Pass RPD
Barium (Ba)-Total	mg/kg	40	60	172	200	RPD	-15.1	Pass RPD	0.50	163	212	RPD	-26.1	Pass RPD	133	152	RPD	-13.3	Pass RPD	107	113	RPD	-5.5	Pass RPD
Beryllium (Be)-Total	mg/kg	30	45	2.0	1.7	RPD	21.1	Pass RPD	0.10	1.1	1.2	RPD	-9.8	Pass RPD	1.3	1.3	RPD	-4.6	Pass RPD	0.95	1.1	RPD	-10.9	Pass RPD
Bismuth (Bi)-Total	mg/kg	30	45	0.93	0.74	DIFF	0.19	Pass Diff	0.20	0.76	0.76	DIFF	0	Pass Diff	1.2	1.2	RPD	-4.2	Pass RPD	0.92	0.99	DIFF	-0.07	Pass Diff
Boron (B)-Total	mg/kg	30	45	7.6	8.2	DIFF	-0.6	Pass Diff	5.0	16.3	20.4	DIFF	-4.1	Pass Diff	8.8	8.8	DIFF	0	Pass Diff	7.8	8.1	DIFF	-0.3	Pass Diff
Cadmium (Cd)-Total	mg/kg	30	45	0.16	0.28	RPD	-55	Fail	0.020	0.35	0.34	RPD	3.5	Pass RPD	0.24	0.28	RPD	-15.1	Pass RPD	0.28	0.22	RPD	22.7	Pass RPD
Calcium (Ca)-Total	mg/kg	30	45	2500	2620	RPD	-4.7	Pass RPD	50	2380	2370	RPD	0.4	Pass RPD	1810	1910	RPD	-5.4	Pass RPD	1910	2090	RPD	-9	Pass RPD
Chromium (Cr)-Total	mg/kg	30	45	54.4	42.1	RPD	25.5	Pass RPD	0.50	84.4	75.2	RPD	11.5	Pass RPD	103	107	RPD	-3.8	Pass RPD	127	139	RPD	-9	Pass RPD
Cobalt (Co)-Total	mg/kg	30	45	15.3	28.1	RPD	-59	Fail	0.10	17.6	16.6	RPD	5.8	Pass RPD	15.4	19.4	RPD	-23	Pass RPD	20.5	19	RPD	7.6	Pass RPD
Copper (Cu)-Total	mg/kg	30	45	41.1	32.3	RPD	24	Pass RPD	0.50	18.4	18.1	RPD	1.6	Pass RPD	45.3	45.6	RPD	-0.7	Pass RPD	50.6	52.4	RPD	-3.5	Pass RPD
Iron (Fe)-Total	mg/kg	30	45	131000	167000	RPD	-24.2	Pass RPD	50	40400	66600	RPD	-49	Fail	79000	63500	RPD	21.8	Pass RPD	66500	56500	RPD	16.3	Pass RPD
Lead (Pb)-Total	mg/kg	40	60	17.8	16.2	RPD	9.4	Pass RPD	0.50	18.9	18.9	RPD	0	Pass RPD	13.3	14.3	RPD	-7.2	Pass RPD	15.6	15.6	RPD	0	Pass RPD
Lithium (Li)-Total	mg/kg	30	45	16.4	13.8	RPD	17.2	Pass RPD	2.0	22.4	23.3	RPD	-3.9	Pass RPD	25.8	26.8	RPD	-3.8	Pass RPD	24.9	28.7	RPD	-14.2	Pass RPD
Magnesium (Mg)-Total	mg/kg	30	45	7010	5690	RPD	20.8	Pass RPD	2.0	12100	11500	RPD	5.1	Pass RPD	9580	10600	RPD	-10.1	Pass RPD	10500	12200	RPD	-15	Pass RPD
Manganese (Mn)-Total	mg/kg	30	45	1720	4900	RPD	-96.1	Fail	1.0	1580	7240	RPD	-128.3	Fail	1410	2100	RPD	-39.3	Pass RPD	1260	691	RPD	58.3	Fail
Mercury (Hg)-Total	mg/kg	40	60	0.046	0.040	RPD	14.7	Pass RPD	0.0050	0.065	0.070	RPD	-7.3	Pass RPD	0.029	0.031	RPD	-8.6	Pass RPD	0.023	0.018	DIFF	0.0044	Pass Diff
Molybdenum (Mo)-Total	mg/kg	40	60	8.3	8.3	RPD	-0.7	Pass RPD	0.10	2.3	10.7	RPD	-128.2	Fail	9.4	7.9	RPD	18.4	Pass RPD	4.7	4.2	RPD	11.1	Pass RPD
Nickel (Ni)-Total	mg/kg	30	45	35.3	42.5	RPD	-18.5	Pass RPD	0.50	60.4	53.8	RPD	11.6	Pass RPD	82.3	91	RPD	-10	Pass RPD	104	103	RPD	1	Pass RPD
Phosphorus (P)-Total	mg/kg	30	45	1490	1380	RPD	7.7	Pass RPD	50	703	1550	RPD	-75.2	Fail	734	649	RPD	12.3	Pass RPD	650	740	RPD	-12.9	Pass RPD
Potassium (K)-Total	mg/kg	40	60	3000	2560	RPD	15.8	Pass RPD	100	2580	2580	RPD	0	Pass RPD	3510	3800	RPD	-7.9	Pass RPD	2720	2950	RPD	-8.1	Pass RPD
Selenium (Se)-Total	mg/kg	30	45	0.75	0.76	DIFF	-0.01	Pass Diff	0.20	0.34	0.44	DIFF	-0.1	Pass Diff	0.71	0.59	DIFF	0.12	Pass Diff	0.58	0.60	DIFF	-0.02	Pass Diff
Silver (Ag)-Total	mg/kg	40	60	0.20	0.16	DIFF	0.04	Pass Diff	0.10	0.15	0.15	DIFF	0	Pass Diff	0.15	0.16	DIFF	-0.01	Pass Diff	0.20	0.20	DIFF	0	Pass Diff
Sodium (Na)-Total	mg/kg	40	60	193	193	DIFF	0	Pass Diff	50	125	130	DIFF	-5	Pass Diff	170	163	DIFF	7	Pass Diff	100	106	DIFF	-6	Pass Diff
Strontium (Sr)-Total	mg/kg	40	60	26.2	25.6	RPD	2.3	Pass RPD	0.50	29.9	31.7	RPD	-5.8	Pass RPD	24.4	26.4	RPD	-7.9	Pass RPD	21.4	24.2	RPD	-12.3	Pass RPD
Sulfur (S)-Total	mg/kg	30	45	1900	1700	DIFF	200	Pass Diff	1000	<1000	<1000	<DL	<DL	<DL	<1000	<1000	<DL	<DL	<DL	<1000	<1000	<DL	<DL	<DL
Thallium (Tl)-Total	mg/kg	30	45	0.25	0.32	RPD	-22.1	Pass RPD	0.050	0.23	0.22	DIFF	0.011	Pass Diff	0.23	0.26	DIFF	-0.024	Pass Diff	0.20	0.20	DIFF	0.002	Pass Diff
Tin (Sn)-Total	mg/kg	40	60	<2.0	<2.0	<DL	<DL	<DL	2.0	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL	<2.0	<2.0	<DL	<DL	<DL
Titanium (Ti)-Total	mg/kg	40	60	439	405	RPD	8.1	Pass RPD	1.0	606	465	RPD	26.3	Pass RPD	639	550	RPD	15	Pass RPD	512	542	RPD	-5.7	Pass RPD
Tungsten (W)-Total	mg/kg	30	45	<0.50	<0.50	<DL	<DL	<DL	0.50	<0.50	0.58	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL	<0.50	<0.50	<DL	<DL	<DL
Uranium (U)-Total	mg/kg	30	45	13.6	10.6	RPD	24.8	Pass RPD	0.050	4.7	4.9	RPD	-5.2	Pass RPD	14.9	15.1	RPD	-1.3	Pass RPD	8.5	8.7	RPD	-2.8	Pass RPD
Vanadium (V)-Total	mg/kg	30	45	29.6	24.5	RPD	18.9	Pass RPD	0.20	41.5	39.4	RPD	5.2	Pass RPD	35.8	35.2	RPD	1.7	Pass RPD	35.2	37.6	RPD	-6.6	Pass RPD
Zinc (Zn)-Total	mg/kg	30	45	97.6	84	RPD	15	Pass RPD	2.0	97.4	91.1	RPD	6.7	Pass RPD	85.9	89.3	RPD	-3.9	Pass RPD	85.3	84.2	RPD	1.3	Pass RPD
Zirconium (Zr)-Total	mg/kg	30	45	2.6	1.3	DIFF	1.3	Pass Diff	1.0	11	6.1	RPD	57.3	Fail	2.3	2.8	DIFF	-0.5	Pass Diff	1.3	2.4	DIFF	-1.1	Pass Diff
Speciated Metals (µg/kg)																								
Methylmercury (as MeHg)	mg/kg	30	45	0.88	0.32	DIFF	0.557	Pass Diff	1.0	-	-	<DL	<DL	<DL	0.20	0.15	DIFF	0.049	Pass Diff	-	-	<DL	<DL	<DL

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL
DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month Station	Units	Relative Percent Difference DQOs (%)		August DLs	DUP-1 (TPE-4)					DUP-2 (WAL-1)					DUP-3 (INUG-2)				
Date Sampled					TPE-4	Grab-DUP-1	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	Grab-DUP-2	WAL-1	Field Dup	Result ^[b]	Outcome	INUG-2	Grab-DUP-3	Field Dup	Result ^[b]	Outcome
ALS Sample ID		11-Aug-2023	11-Aug-2023		21-Aug-2023	21-Aug-2023				22-Aug-2023	22-Aug-2023								
Parameter		Lab	Field		VA23C0329-016	VA23C0329-097				VA23C0329-085	VA23C0329-007				VA23C0329-032	VA23C0329-086			
					Sediment	Sediment				Sediment	Sediment				Sediment	Sediment			
Physical Tests																			
Moisture (%)	%	20	30	0.25	80.8	84	RPD	-3.9	Pass RPD	87.3	86.7	RPD	0.7	Pass RPD	82.7	82.9	RPD	-0.2	Pass RPD
Particle Size																			
Gravel (>2mm)	%	-	40	1.0	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL
Sand (2.0mm - 0.063mm)	%	-	40	1.0	8.0	1.0	DIFF	7.0	Fail	3.7	4.1	DIFF	-0.4	Pass Diff	4.9	2.4	DIFF	2.5	Fail
Silt (0.063mm - 0.004mm)	%	-	40	1.0	67.4	71	RPD	-5.2	Pass RPD	81.8	84.3	RPD	-3	Pass RPD	72.3	83.5	RPD	-14.4	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	24.6	28	RPD	-13	Pass RPD	14.5	11.6	RPD	22.2	Pass RPD	22.8	14.1	RPD	47.2	Fail
Organic / Inorganic Carbon																			
Carbon, total organic [TOC]	%	20	30	0.050	3.1	3.5	RPD	-12	Pass RPD	6.7	6.8	RPD	-1.5	Pass RPD	3.7	3.7	RPD	-0.8	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month Station Date Sampled ALS Sample ID Parameter	Units	Relative Percent Difference DQOs (%)		August DLS	DUP-5 (LK8-4)					DUP-6 (A76-1)					DUP-7 (MAM-1)					DUP-8 (NEM-4)				
					LK8-4 20-Aug-2023 VA23C0329-082 Sediment	Grab-DUP-5 20-Aug-2023 VA23C0329-087 Sediment	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	A76-1 13-Aug-2023 VA23C0329-061 Sediment	Grab-DUP-6 23-Aug-2023 VA23C0329-088 Sediment	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	MAM-1 15-Aug-2023 VA23C0329-049 Sediment	Grab-DUP-7 15-Aug-2023 VA23C0329-090 Sediment	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	NEM-4 16-Aug-2023 VA23C0329-040 Sediment	Grab-DUP-8 16-Aug-2023 VA23C0329-090 Sediment	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome
		Lab	Field																					
Physical Tests																								
Moisture (%)	%	20	30	0.25	81.1	76.2	RPD	6.2	Pass RPD	89.4	86.5	RPD	3.3	Pass RPD	88.3	87.9	RPD	0.5	Pass RPD	86.4	87.3	RPD	-1	Pass RPD
Particle Size																								
Gravel (>2mm)	%	-	40	1.0	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL
Sand (2.0mm - 0.063mm)	%	-	40	1.0	4.6	9.0	DIFF	-4.4	Fail	1.0	<1.0	<DL	<DL	<DL	1.5	<1.0	<DL	<DL	<DL	24.9	23.2	RPD	7.1	Pass RPD
Silt (0.063mm - 0.004mm)	%	-	40	1.0	77.2	82.2	RPD	-6.3	Pass RPD	79.2	80.7	RPD	-1.9	Pass RPD	85.7	85.3	RPD	0.5	Pass RPD	66	70.3	RPD	-6.3	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	18.2	8.8	RPD	69.6	Fail	19.8	18.9	RPD	4.7	Pass RPD	12.8	14	RPD	-9	Pass RPD	9.1	6.5	RPD	33.3	Pass RPD
Organic / Inorganic Carbon																								
Carbon, total organic [TOC]	%	20	30	0.050	4.7	2.6	RPD	59.3	Fail	8.5	8.0	RPD	6.2	Pass RPD	10.6	10.1	RPD	4.8	Pass RPD	7.6	7.8	RPD	-2.9	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-9. Field duplicate results for the sediment grabs collected in 2023.

Month Station	Units	Relative Percent Difference DQOs (%)		DUP-9 (A20-3)						DUP-10 (DS1-5)				
Date Sampled				August MDLs	A20-3	Grab-DUP-9	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome	DS1-5	Grab-DUP-10	Field Dup Method ^[a]	Result ^[b] (RPD or Diff)	Outcome
ALS Sample ID		16-Aug-2023	16-Aug-2023		17-Aug-2023	17-Aug-2023								
Parameter		Sediment	Sediment		VA23C0329-071	VA23C0329-092								
		Lab	Field											
Physical Tests														
Moisture (%)	%	20	30	0.25	87.1	87.9	RPD	-0.9	Pass RPD	59.3	56.4	RPD	5	Pass RPD
Particle Size														
Gravel (>2mm)	%	-	40	1.0	<1.0	<1.0	<DL	<DL	<DL	<1.0	<1.0	<DL	<DL	<DL
Sand (2.0mm - 0.063mm)	%	-	40	1.0	1.1	<1.0	<DL	<DL	<DL	1.2	<1.0	<DL	<DL	<DL
Silt (0.063mm - 0.004mm)	%	-	40	1.0	74.3	75.7	RPD	-1.9	Pass RPD	80.8	80.9	RPD	-0.1	Pass RPD
Clay (<0.004mm)	%	-	40	1.0	24.6	24.2	RPD	1.6	Pass RPD	18	18.2	RPD	-1.1	Pass RPD
Organic / Inorganic Carbon														
Carbon, total organic [TOC]	%	20	30	0.050	5.2	5.5	RPD	-5.2	Pass RPD	1.2	1.3	RPD	-9.9	Pass RPD

Notes:

[a] Field Dup Methods are based on the concentrations:

RPD = relative percent difference is used to compare field duplicates when the measured concentration is > 5x the DL

DIFF = when concentrations < 5* DL

[b] Results refer to the RPD or absolute difference in concentration

DQO for RPDs is < Field RPD values

DQO for DIFF is < 2x the DL

Italicized numbers are below detection limits.

Table A-10. QA/QC results for sediment grab sample hydrocarbon and PAH analyses, 2023.

Analyte	Detection Limits	Lab DQO Values	Field DQO Values ¹	COMP-DUP-1			COMP-DUP-2		
				WAL-COMP	Dup ²	RPD (%)	MAM-COMP	Dup	RPD (%)
Date Sampled ALS Sample ID				21-Aug-2023 VA23C0329-012	21-Aug-2023 VA23C0329-093		15-Aug-2023 VA23C0329-054	15-Aug-2023 VA23C0329-094	
Physical Parameters									
Moisture (%)	0.25	20	30	89.4	89.3	0	90	90	0.0
Aggregate Organics (mg/kg)									
Mineral Oil and Grease	500	<1000	1500	<500	<500	-	<500	<500	-
Hydrocarbons (mg/kg)									
EPH10-19	200	<400	600	<580	<560	-	<520	<550	-
EPH19-32	200	<400	600	<580	<560	-	<520	<550	-
LEPH	200	<400	600	<580	<560	-	<520	<550	-
HEPH	200	<400	600	<580	<560	-	<520	<550	-
Hydrocarbons Surrogates (%)									
2-Bromobenzotrifluoride	5.8	60-140	17.4	125	117	6.6	112	110	1.8
Polycyclic Aromatic Hydrocarbons (mg/kg)									
acenaphthene	0.005	<0.01	0.015	<0.0291	<0.0280	-	<0.0262	<0.0274	-
acenaphthylene	0.005	<0.01	0.015	<0.0291	<0.0280	-	<0.0262	<0.0274	-
acridine	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
anthracene	0.004	<0.008	0.012	<0.0291	<0.0280	-	<0.0262	<0.0274	-
benz(a)anthracene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
benzo(a)pyrene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
benzo(b+j)fluoranthene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
benzo(b+j+k)fluoranthene	0.015	<0.03	0.045	<0.041	<0.040	-	<0.037	<0.038	-
benzo(g,h,i)perylene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
benzo(k)fluoranthene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
chrysene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
dibenz(a,h)anthracene	0.005	<0.01	0.015	<0.0700	<0.0280	-	<0.0262	<0.0274	-
fluoranthene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
fluorene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
indeno(1,2,3-c,d)pyrene	0.01	<0.02	0.03	<0.045	<0.028	-	<0.026	<0.027	-
methylnaphthalene, 1-	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
methylnaphthalene, 2-	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
naphthalene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
phenanthrene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
pyrene	0.01	<0.02	0.03	<0.029	<0.028	-	<0.026	<0.027	-
quinoline	0.01	<0.02	0.03	<0.029	0.04	-	<0.026	<0.027	-
PAH Surrogates (%)									
acridine-d9	0.1	35	52.5	124	123	0.8	117	123	-5.0
chrysene-d12	0.1	35	52.5	117	114	2.6	116	127	-9.1
naphthalene-d8	0.1	40	60	130	126	3.1	117	123	-5.0
phenanthrene-d10	0.1	35	52.5	129	128	0.8	123	130	-5.5

Notes:

¹ The DQO for field duplicates is an RPD 1.5x the laboratory DQO or 1.5x twice the DL when lab DQOs are "<" values.

² Field Dup grab samples are homogenized duplicates - the original and duplicate samples were split from the same homogenized bowl of sediment.

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

RPDs are only calculated when both samples are above detection.

Bold RPDs	RPD values exceeded but < 10 x MDL
Shaded RPDs	RPD values exceeded and > 10 x MDL

Italicized numbers are below detection limits.

Table A-11. Field QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m³)							Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
WAL - 131	6-Jul-23	0	2.5	181	31	13	35	262	33	0.79
DUP - 1	1-Jul-23	0.62	2.1	201	22	6.6	8.4	240	30	0.80
RPD (%)		NA	18	-10	34	63	122	8.5	9.5	-1.1
TPE - 162	3-Jul-23	0	0.073	80	39	2.8	21	142	21	0.63
DUP - 2	1-Jul-23	0	0.14	106	10	3.8	20	139	21	0.64
RPD (%)			-60	-28	116	-30	5.5	1.8	0	-1.0
NEM - 80	30-Jun-23	0	0.72	98	304	17	1.5	422	24	0.86
DUP - 3	1-Jul-23	0	4.1	113	359	19	3.6	499	19	0.87
RPD (%)			-140	-14	-17	-10	-82	-17	23	-0.94
A76 - 71	1-Jul-23	0	0.29	214	32	25	8.1	279	24	0.59
DUP - 4	1-Jul-23	0	0.79	155	30	35	9.6	230	24	0.84
RPD (%)			-92	32	8.1	-35	-17	19	0	-36
SP - 165	13-Aug-23	1.3	7.6	127	17	31	16	199	35	0.87
DUP - 1	13-Aug-23	1.3	12	64	25	17	20	138	33	0.83
RPD (%)		0	-44	66	-40	59	-20	36	5.9	4.1
BAP - 88	17-Aug-23	0.40	3.6	42	13	17	2.2	78	23	0.89
DUP - 2	17-Aug-23	0	1.7	20	9.3	2.1	0.84	34	23	0.71
RPD (%)		NA	71	72	37	156	90	80	0	23
MAM - 82	15-Aug-23	0.20	20	44	77	17	15	173	25	0.65
DUP - 3	15-Aug-23	0.037	22	30	24	24	11	112	25	0.86
RPD (%)		136	-9.2	36	106	-36	30	43	0	-28
A20 - 75	18-Aug-23	0.44	21	211	100	12	66	411	29	0.81
DUP - 4	1-Aug-23	0.52	16	218	99	15	68	416	30	0.80
RPD (%)		-17	25	-3.1	1.6	-22	-2.8	-1.3	-3.4	1.9
PDL - 119	6-Sep-23	5.9	4.4	63	24	3.5	13	114	28	0.89
DUP - 1	6-Sep-23	7.3	2.2	65	15	0.15	12	101	28	0.83
RPD (%)		-21	66	-3.2	46	184	10	12	0	6.3
BAP - 89	8-Sep-23	0	3.5	23	8.2	13	1.3	49	20	0.78
DUP - 2	8-Sep-23	0	2.9	29	15	16	0	62	21	0.81
RPD (%)			20	-22	-57	-21	NA	-24	-4.9	-3.7
NEM - 84	8-Sep-23	3.3	11	53	15	1.0	16	100	23	0.86
DUP - 3	1-Sep-23	2.9	8.0	22	16	5.0	1.1	55	20	0.83
RPD (%)		11	36	82	-1.6	-131	174	59	14	3.8

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 50%.

RPDs have not been calculated for cases where one or both of the samples is "0".



Table A-11. Field QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL
WAL - 131	6-Jul-23	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
DUP - 1	1-Jul-23	7,184	107,960	1,736,944	201,464	32,336	1,800	2,087,688
RPD (%)		NA	-21	21	38	101	-25	23
TPE - 162	3-Jul-23	0	200	1,047,680	187,400	8,384	3,400	1,247,064
DUP - 2	1-Jul-23	0	28,736	1,205,528	207,368	9,184	3,600	1,454,416
RPD (%)			-197	-14	-10	-9.1	-5.7	-15
NEM - 80	30-Jun-23	0	14,368	1,362,976	1,452,544	36,936	400	2,867,224
DUP - 3	1-Jul-23	0	79,024	1,720,576	1,477,448	39,336	400	3,316,784
RPD (%)			-138	-23	-1.7	-6.3	0	-15
A76 - 71	1-Jul-23	0	28,736	5,333,744	306,840	126,744	1,400	5,797,464
DUP - 4	1-Jul-23	0	57,472	1,704,224	302,424	215,552	1,800	2,281,472
RPD (%)			-67	103	1.4	-52	-25	87
SP - 165	13-Aug-23	7,184	977,624	1,660,104	314,112	157,864	2,400	3,119,288
DUP - 1	13-Aug-23	7,184	374,768	1,149,640	301,344	71,056	3,200	1,907,192
RPD (%)		0	89	36	4.1	76	-29	48
BAP - 88	17-Aug-23	7,184	337,648	705,432	160,496	116,144	400	1,327,304
DUP - 2	17-Aug-23	0	64,856	474,144	74,672	7,984	200	621,856
RPD (%)		NA	136	39	73	174	67	72
MAM - 82	15-Aug-23	1,200	934,720	912,568	2,932,472	62,672	9,584	4,853,216
DUP - 3	15-Aug-23	200	843,328	733,168	355,616	43,336	2,800	1,978,448
RPD (%)		143	10	22	157	36	110	84
A20 - 75	18-Aug-23	2,400	554,168	1,861,856	2,301,296	46,904	13,600	4,780,224
DUP - 4	1-Aug-23	3,200	453,392	1,862,456	2,399,672	28,552	14,400	4,761,672
RPD (%)		-29	20	-0.03222	-4.2	49	-5.7	0.39
PDL - 119	6-Sep-23	36,968	195,568	661,728	265,824	15,168	1,400	1,176,656
DUP - 1	6-Sep-23	59,520	187,384	841,728	285,376	200	1,400	1,375,608
RPD (%)		-47	4.3	-24	-7.1	195	0	-16
BAP - 89	8-Sep-23	0	165,232	567,536	59,888	66,256	200	859,112
DUP - 2	8-Sep-23	0	122,128	632,592	125,192	87,608	0	967,520
RPD (%)			30	-11	-71	-28	NA	-12
NEM - 84	8-Sep-23	16,000	222,704	806,808	403,904	600	1,000	1,451,016
DUP - 3	1-Sep-23	13,200	165,232	639,376	417,872	22,552	200	1,258,432
RPD (%)		19	30	23	-3.4	-190	133	14

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 50%.

RPDs have not been calculated for cases where one or both of the samples is "0".



Table A-12. Laboratory QA/QC data for phytoplankton for all CREMP study areas, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m ³)							Taxa Richness	Phytoplankton Density (cells/L)						
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL
A76 - 72	1-Jul-23	0	0.68	154	32	27	18	232	22	0	93,392	1,667,120	325,392	162,064	3,200	2,251,168
A76 - 72R	1-Jul-23	0	0.70	142	32	23	14	212	23	0	43,104	1,543,592	434,536	145,896	2,600	2,169,728
RPD (%)			-2.0	8.4	1.4	13	23	9.0	-4.4		74	7.7	-29	11	21	3.7
INUG - 151	29-Jun-23	0	3.1	172	49	18	47	290	30	0	43,904	2,223,672	363,248	70,056	3,000	2,703,880
INUG - 151R	29-Jun-23	0	3.3	176	62	21	19	282	29	0	100,776	2,168,000	402,768	105,176	2,800	2,779,520
RPD (%)			-5.9	-2.1	-23	-18	84	2.7	3.4		-79	2.5	-10	-40	6.9	-2.8
MAM - 80	3-Jul-23	0	2.7	79	403	65	0.79	550	26	0	244,256	1,488,288	1,018,344	151,528	200	2,902,616
MAM - 80R	3-Jul-23	0	2.2	88	435	73	1.1	599	26	0	265,808	1,430,216	981,824	188,248	200	2,866,296
RPD (%)			20	-11	-7.8	-11	-34	-8.6	0		8.5	4.0	3.7	-22	0	1.3
WAL - 131	6-Jul-23	0	2.5	181	31	13	35	262	33	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
WAL - 131R	6-Jul-23	0	1.3	185	25	9.2	6.1	227	30	0	58,072	2,180,552	311,424	41,120	1,200	2,592,368
RPD (%)			66	-2.5	19	33	140	14	9.5		40	-1.3	-4.7	82	15	1.6
BBD - 88	18-Aug-23	0	5.4	100	12	19	1.1	137	31	0	266,808	1,609,416	86,224	223,304	200	2,185,952
BBD - 88R	18-Aug-23	0	6.3	79	7.5	14	7.4	114	30	0	224,104	1,580,880	85,424	159,048	800	2,050,256
RPD (%)			-15	23	45	29	-148	18	3.3		17	1.8	0.93	34	-120	6.4
LK8 - 22	19-Aug-23	0.86	3.8	77	13	0.60	8.9	104	28	4,200	252,040	920,352	220,520	7,184	1,800	1,406,096
LK8 - 22R	19-Aug-23	1.3	2.3	97	12	0.74	6.1	119	29	7,200	301,928	1,200,928	219,720	400	1,200	1,731,376
RPD (%)		-44	49	-23	8.4	-20	37	-13	-3.5	-53	-18	-26	0.36	179	40	-21
PDL - 117	22-Aug-23	6.6	7.4	130	4.6	4.7	13	166	30	32,384	296,344	1,402,280	75,040	22,552	8,984	1,837,584
PDL - 117R	22-Aug-23	9.0	7.4	146	5.3	5.3	11	184	32	51,352	217,520	1,575,496	81,424	16,168	1,400	1,943,360
RPD (%)		-30	-0.56	-12	-14	-11	14	-10	-6.5	-45	31	-12	-8.2	33	146	-5.6
WAL - 133	21-Aug-23	0.064	16	101	17	22	24	180	39	400	806,008	1,100,152	265,624	52,104	10,984	2,235,272
WAL - 133R	21-Aug-23	0.15	16	92	23	25	23	180	36	800	769,488	921,552	336,464	48,120	16,968	2,093,392
RPD (%)		-78	-0.35	9.4	-30	-13	2.1	0.13	8.0	-67	4.6	18	-24	8.0	-43	6.6
A20 - 78	7-Sep-23	0	65	483	114	29	38	729	38	0	1,165,408	2,076,776	2,819,544	86,824	1,600	6,150,152
A20 - 78R	7-Sep-23	0.11	63	484	108	34	14	703	38	600	1,128,888	2,156,800	2,890,184	102,792	1,200	6,280,464
RPD (%)		NA	3.4	-0.21	5.3	-15	92	3.7	0	NA	3.2	-3.8	-2.5	-17	29	-2.1
BBD - 89	8-Sep-23	0	3.8	22	25	14	7.9	72	22	0	64,856	704,232	176,264	66,656	1,200	1,013,208
BBD - 89R	8-Sep-23	0	1.8	30	25	16	5.4	78	22	0	71,840	654,144	132,760	87,608	800	947,152
RPD (%)			70	-34	-0.41	-15	37	-8.7	0		-10	7.4	28	-27	40	6.7
MAM - 84	10-Sep-23	0	9.3	113	48	16	2.8	190	23	0	330,464	997,192	2,391,488	15,584	600	3,735,328
MAM - 84R	10-Sep-23	0.085	4.0	121	41	18	3.9	188	24	600	222,704	1,128,904	2,066,608	36,136	800	3,455,752
RPD (%)		NA	79	-6.7	16	-8.1	-34	1.1	-4.3	NA	39	-12	15	-79	-29	7.8
TPE - 166	7-Sep-23	0.88	4.1	75	35	15	5.6	135	25	9,384	503,480	474,944	1,550,560	34,936	1,200	2,574,504
TPE - 166R	7-Sep-23	2.0	4.1	70	38	15	9.6	138	25	25,352	546,184	517,848	1,477,320	41,920	2,000	2,610,624
RPD (%)		-79	-0.05248	7.1	-7.7	0.090	-53	-2.1	0	-92	-8.1	-8.6	4.8	-18	-50	-1.4

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Bolded RPD values exceed 25%.

RPDs have not been calculated for cases where one or both of the samples is "0".

Table A-13. Percent recovery of benthic invertebrate samples for all CREMP study areas, 2023.

Area-Replicate	Number of Organisms Recovered	Number of Organisms in Re-sort	Percent Recovery
BAP-3	36	40	90.0%
BBD-3	173	177	97.7%
BES-1	141	146	96.6%
INUG-1	160	160	100.0%
NEM-1	193	195	99.0%
PDL-4	64	65	98.5%
PDL-5	64	65	98.5%
TPE-4	85	86	98.8%
Average % Recovery			97.4%

Notes:

1. All samples were sorted in their entirety.
2. Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
3. Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.
4. The exceptions to this rule are immature Tubificidae with and without hairs. Immature oligochaetes are counted as taxa as the probability of the immature being a unique taxa is high.
5. Indeterminates are unique taxa that could not be identified further for various reasons (e.g., small, damaged).

APPENDIX B

WATER CHEMISTRY DATA AND SUPPLEMENTAL PLOTS

Appendix B1

Water Chemistry – Meadowbank Study Area Lakes

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Lake & Area Month Area-Replicate ID Date Time ALS Sample ID	Aquatic Life Guideline ¹	Meadowbank Screening Values ²			Inuggugayualik Lake (INUG)							
					March	March	July	July	August	August	September	September
		Triggers			INUG-148	INUG-149	INUG-150	INUG-151	INUG-152	INUG-153	INUG-154	INUG-155
		Meadowbank	Wally Lake	Thresholds	11-Mar-2023	11-Mar-2023	29-Jun-2023	29-Jun-2023	22-Aug-2023	22-Aug-2023	09-Sep-2023	09-Sep-2023
					12:10	12:35	16:15	17:00	10:00	10:46	13:50	14:30
					VA23A5681-001	VA23A5681-002	VA23B6138-002	VA23B6138-001	VA23C0684-001 VA23C0547-001	VA23C0547-002	VA23C1680-001	VA23C1680-002
Field Measurements (Surface 3m)												
Dissolved Oxygen (mg/L)					17	16	14	13	9.6	9.7	12	12
Specific Conductivity (µS/cm)					20	19	15	15	17	17	16	16
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.1	6.1	7.2	7.0	6.3	6.4	6.1	6.3
Temperature (°C)					0.77	0.76	5.8	6.2	14	14	7.6	7.4
Physical Tests (mg/L)												
Conductivity (µS/cm)		27	37		20	19	16	17	18	18	18	18
Alkalinity - Total (as CaCO ₃)		8.7	18		6.4	5.8	4.6	5.0	6.2	6.1	5.3	5.1
Alkalinity - Carbonate		8.7	18		6.4	5.8	4.6	5.0	6.2	6.1	5.3	5.1
Alkalinity - Bicarbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hardness (as CaCO3), dissolved		9.5	17		7.1	6.6	6.0	6.3	6.4	6.4	6.3	6.3
Hardness (as CaCO3), from total Ca/Mg					7.3	7.0	6.0	6.1	5.9	6.0	6.6	6.7
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	6.9	6.9	6.8	6.8	6.9	6.9	6.9	7.0
Total Dissolved Solids (TDS)		19	25		22	24	15	19	11	9.0	16	17
Total Suspended Solids (TSS)		3.0	3.0	5.0	<1.0	<1.0	1.2	<1.0	1.4	<1.0	1.4	<1.0
Turbidity (NTU)					<0.10	<0.10	0.33	0.37	0.21	0.23	0.45	0.53
Anions and Nutrients (mg/L)												
Total Kjeldahl Nitrogen		0.17	0.16		0.13	0.13	0.091	0.096	0.11	0.12	0.12	0.13
Ammonia (as N) ³	equation	0.065	0.067	0.13	0.019	0.016	0.0056	0.0053	0.0075	<0.0050	0.0089	0.018
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	120	60	60	120	0.91	0.87	0.72	0.72	0.78	0.78	0.79	0.77
Fluoride	0.12	0.088	0.080	0.12	0.073	0.069	0.065	0.065	0.068	0.068	0.072	0.066
Nitrate (as N)	3.0	1.5	1.5	3.0	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.06	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ortho Phosphate (as P)		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	0.0032	0.0033	0.0037	0.0039	0.0031	0.0029	0.0035	0.0035
Phosphorus (P) - Total Diss.					<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	0.0025	0.0021
Reactive Silica (as SiO ₂)		1.0	1.1		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate (SO ₄)		65	65	128	1.1	1.0	0.93	0.94	0.81	0.82	0.90	0.88
Cyanides (mg/L)												
Free Cyanide	0.005				<0.0010	-	<0.0020	-	-	<0.0020	<0.0020	-
Total Cyanide					<0.0010	-	<0.0020	-	-	<0.0020	<0.0020	-
Organic / Inorganic Carbon (mg/L)												
Dissolved Organic Carbon		2.5	3.2		2.4	2.7	2.4	2.4	2.2	2.6	2.1	2.6
Total Organic Carbon		2.6	4.1		2.1	2.2	1.9	2.0	2.3	2.4	2.1	2.2
Total Metals (mg/L)												
Aluminum ¹	equation	0.053	0.053	0.10	0.0055	0.0050	0.012	0.0099	0.0067	0.0068	0.016	0.018
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.0026	0.0026	0.0050	0.00013	0.00011	0.00011	0.00012	0.00012	0.00012	0.00012	0.00013
Barium		0.50	0.50	1.0	0.0020	0.0019	0.0021	0.0020	0.0018	0.0018	0.0021	0.0020
Beryllium		0.00012	0.00012	0.00013	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium ³	equation	0.00002	0.00002	0.00004	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium		2.4	4.9		1.5	1.4	1.2	1.2	1.2	1.2	1.3	1.3
Cesium					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium ⁴	0.001	0.0025	0.0026	0.0050	<0.00010	<0.00010	0.00013	0.00012	<0.00010	<0.00010	0.00017	0.00014
Cobalt	0.00077			0.00077	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper ³	equation	0.0012	0.0015	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00056	<0.00050
Iron	0.3	0.15	0.16	0.30	<0.010	<0.010	0.026	0.023	0.018	0.017	0.037	0.036
Lead ³	equation	0.00053	0.00053	0.0010	<0.000050	<0.000050	0.00006	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.93	1.4		0.90	0.85	0.73	0.75	0.74	0.75	0.82	0.82
Manganese ⁵	equation	0.32	0.33	See note 3	0.00041	0.00047	0.0061	0.0058	0.0032	0.0029	0.0029	0.0025
Mercury	0.000026	0.00002	0.00002	0.00003	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	0.073	0.037	0.037	0.073	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel ³	equation	0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium		0.58	0.59		0.46	0.44	0.38	0.38	0.39	0.40	0.41	0.41
Rubidium					0.00062	0.00062	0.00052	0.00050	0.00057	0.00061	0.00066	0.00068
Selenium	0.001	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.20	0.65		0.20	0.19	0.22	0.23	0.20	0.20	0.23	0.27
Silver	0.0001	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		1.2	0.72		0.70	0.66	0.58	0.59	0.59	0.58	0.64	0.63
Strontium		1.25	1.26	2.5	0.0080	0.0074	0.0066	0.0066	0.0071	0.0070	0.0073	0.0074
Sulfur					<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tellurium					<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0008	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Aquatic Life Guideline ¹	Meadowbank Screening Values ²			Third Portage Lake - North Basin (TPN)							
Month	March					March	July	July	August	August	September	September	
Area-Replicate ID	TPN-160		TPN-161	TPN-162	TPN-163	August TPN-164	TPN-165	TPN-166	TPN-167				
Date	04-Mar-2023		04-Mar-2023	03-Jul-2023	03-Jul-2023	24-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023				
Time	11:30		11:55	14:45	15:25	09:00	09:30	09:30	09:00				
ALS Sample ID	VA23A5518-003	VA23A5518-004	VA23B6138-005	VA23B6138-006	VA23C0550-001	VA23C0550-002	VA23C1680-005	VA23C1680-006					
Field Measurements (Surface 3m)													
Dissolved Oxygen (mg/L)					18	19	14	14	10	10	11	11	
Specific Conductivity (µS/cm)					34	33	25	25	26	26	27	28	
pH	6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.8	7.8	6.8	6.8	6.1	6.3	6.4	6.3	
Temperature (°C)					0.38	0.36	4.9	4.8	12	13	8.6	8.7	
Physical Tests (mg/L)													
Conductivity (µS/cm)		27	37		32	31	27	27	28	28	28	28	
Alkalinity - Total (as CaCO ₃)		8.7	18		8.3	8.0	6.1	6.0	7.1	7.0	6.3	6.3	
Alkalinity - Carbonate		8.7	18		8.3	8.0	6.1	6.0	7.1	7.0	6.3	6.3	
Alkalinity - Bicarbonate		2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Alkalinity - Hydroxide					<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Hardness (as CaCO ₃), dissolved		9.5	17		11	11	9.8	9.6	9.6	9.6	9.6	9.9	
Hardness (as CaCO ₃), from total Ca/Mg					11	11	9.2	9.4	10	10	10.0	10	
pH (Laboratory)	6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.1	7.0	7.0	6.9	7.0	7.0	7.1	7.1	
Total Dissolved Solids (TDS)		19	25		18	15	19	19	14	13	20	20	
Total Suspended Solids (TSS)		3.0	3.0	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Turbidity (NTU)					<0.10	<0.10	0.13	0.13	0.24	0.27	0.16	0.14	
Anions and Nutrients (mg/L)													
Total Kjeldahl Nitrogen		0.17	0.16		0.10	0.096	0.052	0.057	0.081	0.079	0.098	0.086	
Ammonia (as N) ³	equation	0.065	0.067	0.13	0.018	0.014	<0.0050	<0.0050	0.014	0.0059	0.012	0.011	
Bromide					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Chloride	120	60	60	120	1.0	1.0	0.77	0.77	0.80	0.79	0.78	0.80	
Fluoride	0.12	0.088	0.080	0.12	0.091	0.089	0.069	0.069	0.071	0.069	0.073	0.065	
Nitrate (as N)	3.0	1.5	1.5	3.0	0.0063	0.0054	0.011	0.011	<0.0050	<0.0050	<0.0050	<0.0050	
Nitrite (as N)	0.06	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Ortho Phosphate (as P)		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Phosphorus (P) - Total	0.01	0.0051	0.0067	0.010	<0.0020	0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0020	<0.0020	
Phosphorus (P) - Total Diss.					<0.0020	0.0027	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
Reactive Silica (as SiO ₂)		1.0	1.1		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Sulphate (SO ₄)		65	65	128	5.7	5.5	4.2	4.3	4.1	4.1	4.2	4.2	
Cyanides (mg/L)													
Free Cyanide	0.005					<0.0010	<0.0020	-	<0.0010	-	<0.0010	<0.0010	
Total Cyanide						<0.0010	<0.0020	-	<0.0010	-	<0.0010	<0.0010	
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon		2.5	3.2		1.6	1.6	1.5	1.6	1.8	2.4	1.5	2.2	
Total Organic Carbon		2.6	4.1		1.6	1.5	1.1	1.2	1.8	1.9	1.4	1.4	
Total Metals (mg/L)													
Aluminum ¹	equation	0.053	0.053	0.10	0.0041	0.0037	0.0039	0.0044	0.0054	0.010	0.0059	0.0044	
Antimony		0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Arsenic	0.005	0.0026	0.0026	0.0050	0.00024	0.00024	0.00019	0.00019	0.00024	0.00024	0.00021	0.00023	
Barium		0.50	0.50	1.0	0.0033	0.0032	0.0025	0.0026	0.0028	0.0027	0.0029	0.0029	
Beryllium		0.00012	0.00012	0.00013	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	
Bismuth					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Boron	1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Cadmium ³	equation	0.00002	0.00002	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Calcium		2.4	4.9		2.7	2.6	2.3	2.3	2.4	2.4	2.4	2.4	
Cesium					<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Chromium ⁴	0.001	0.0025	0.0026	0.0050	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	
Cobalt	0.00077			0.00077	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Copper ³	equation	0.0012	0.0015	0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Iron	0.3	0.15	0.16	0.30	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Lead ³	equation	0.00053	0.00053	0.0010	0.00017	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Lithium		0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Magnesium		0.93	1.4		1.1	1.1	0.85	0.89	1.00	1.00	0.96	0.98	
Manganese ⁵	equation	0.32	0.33	See note 3	0.00049	0.00051	0.0012	0.0013	0.0015	0.0014	0.0015	0.0015	
Mercury	0.000026	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	0.073	0.037	0.037	0.073	0.00014	0.00013	0.00010	0.00009	0.00012	0.00011	0.00010	0.00010	
Nickel ³	equation	0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	
Phosphorus		0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Potassium		0.58	0.59		0.60	0.60	0.45	0.49	0.49	0.49	0.51	0.51	
Rubidium					0.00087	0.00087	0.00074	0.00064	0.00074	0.00074	0.00077	0.00076	
Selenium	0.001	0.00053	0.00053	0.0010	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
Silicon		0.20	0.65		0.12	0.12	0.14	0.13	0.12	0.12	0.13	0.13	
Silver	0.0001	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Sodium		1.2	0.72		1.2	1.2	0.93	0.99	1.1	1.1	0.99	1.00	
Strontium		1.25	1.26	2.5	0.012	0.012	0.010	0.010	0.011	0.011	0.011	0.011	
Sulfur					1.9	1.6	1.4	1.1	1.5	1.6	1.5	1.6	
Tellurium					<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
Thallium	0.0008	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Thorium					<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		

Table B1-1. Water quality results from the 2023 CREMP, Meadowbank study area lakes.

Lake & Area		Aquatic Life Guideline ¹	Meadowbank Screening Values ²			Wally Lake (WAL)							
Month	Area-Replicate ID					March	March	July	July	August	August	September	September
Date			Triggers			04-Mar-2023	04-Mar-2023	06-Jul-2023	06-Jul-2023	21-Aug-2023	21-Aug-2023	09-Sep-2023	09-Sep-2023
Time			Meadowbank	Wally Lake	Thresholds	08:50	09:20	08:20	08:55	15:15	15:40	09:46	10:00
ALS Sample ID						VA23A5518-001	VA23A5518-002	VA23B6138-003	VA23B6138-004	VA23C0547-005	VA23C0547-006	VA23C1680-003	VA23C1680-004
Field Measurements (Surface 3m)													
Dissolved Oxygen (mg/L)						17	17	11	11	10.0	9.9	12	12
Specific Conductivity (µS/cm)						49	54	35	35	37	36	37	36
pH		6.5 - 9.0	6.4-8.15	6.54 - 8.34	6.5 - 9.0	6.7	6.6	7.2	7.2	6.9	7.1	6.1	6.1
Temperature (°C)						1.5	1.5	12	12	14	14	6.4	6.5
Physical Tests (mg/L)													
Conductivity (µS/cm)			27	37		50	53	36	36	40	39	40	39
Alkalinity - Total (as CaCO ₃)			8.7	18		17	19	11	11	13	13	13	12
Alkalinity - Bicarbonate			8.7	18		17	19	11	11	13	13	13	12
Alkalinity - Carbonate			2.0	2.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity - Hydroxide						<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hardness (as CaCO ₃), dissolved			9.5	17		10	23	16	16	17	16	17	16
Hardness (as CaCO ₃), from total Ca/Mg						16	24	16	16	16	15	18	17
pH (Laboratory)		6.47-7.95	6.47-7.95	6.92 - 8.17	6.5 - 9.0	7.3	7.4	7.2	7.2	7.2	7.2	7.4	7.3
Total Dissolved Solids (TDS)			19	25		33	43	27	27	19	19	29	29
Total Suspended Solids (TSS)			3.0	3.0	5.0	<1.0	<1.0	1.3	1.2	<1.0	<1.0	<1.0	<1.0
Turbidity (NTU)						<0.10	<0.10	0.25	0.27	0.21	0.22	0.25	0.39
Anions and Nutrients (mg/L)													
Total Kjeldahl Nitrogen			0.17	0.16		0.14	0.15	0.10	0.10	0.14	0.12	0.13	0.15
Ammonia (as N) ³		equation	0.065	0.067	0.13	0.018	0.015	0.014	0.0066	0.0090	<0.0050	0.014	0.025
Bromide						<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride		120	60	60	120	0.71	0.84	0.51	0.51	0.55	0.54	0.54	0.54
Fluoride		0.12	0.088	0.080	0.12	0.066	0.074	0.049	0.049	0.054	0.058	0.056	0.055
Nitrate (as N)		3.0	1.5	1.5	3.0	0.0064	0.0094	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)		0.06	0.031	0.031	0.060	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Ortho Phosphate (as P)			0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total		0.01	0.0051	0.0067	0.010	0.0033	0.0079	0.0028	0.0024	0.0028	0.0028	0.0026	0.0029
Phosphorus (P) - Total Diss.						0.0021	0.0022	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Reactive Silica (as SiO ₂)			1.0	1.1		1.8	2.0	1.1	1.0	1.3	1.3	1.4	1.4
Sulphate (SO ₄)			65	65	128	5.7	6.6	4.0	3.9	3.9	3.8	4.1	4.4
Cyanides (mg/L)													
Free Cyanide		0.005				<0.0010		<0.0020	-	<0.0010	-	<0.0020	-
Total Cyanide						<0.0010		<0.0020	-	<0.0010	-	<0.0020	-
Organic / Inorganic Carbon (mg/L)													
Dissolved Organic Carbon			2.5	3.2		2.5	2.8	2.4	2.8	2.5	2.7	2.4	2.4
Total Organic Carbon			2.6	4.1		2.5	2.9	2.2	2.3	2.8	2.6	2.3	2.4
Total Metals (mg/L)													
Aluminum ¹		equation	0.053	0.053	0.10	0.0032	0.0033	0.0085	0.0077	0.0047	0.0050	0.0090	0.0093
Antimony			0.0046	0.0046	0.0090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic		0.005	0.0026	0.0026	0.0050	0.00023	0.00033	0.00031	0.00029	0.00044	0.00040	0.00042	0.00037
Barium			0.50	0.50	1.0	0.0021	0.0032	0.0021	0.0022	0.0021	0.0020	0.0021	0.0021
Beryllium			0.00012	0.00012	0.00013	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth						<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		1.5	0.76	0.76	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium ³		equation	0.00002	0.00002	0.00004	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium			2.4	4.9		4.6	6.4	4.3	4.2	4.3	4.0	4.7	4.5
Cesium						<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium ⁴		0.001	0.0025	0.0026	0.0050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Cobalt		0.00077			0.00077	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper ³		equation	0.0012	0.0015	0.0020	0.00085	0.0013	0.0010	0.0011	0.0010	0.0010	0.0011	0.0011
Iron		0.3	0.15	0.16	0.30	<0.010	<0.010	0.020	0.020	0.022	0.024	0.036	0.036
Lead ³		equation	0.00053	0.00053	0.0010	0.00011	0.00051	<0.000050	<0.000050	<0.000050	<0.000050	0.00010	<0.000050
Lithium			0.0020	0.0020		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium			0.93	1.4		1.2	2.0	1.3	1.3	1.3	1.3	1.4	1.4
Manganese ⁵		equation	0.32	0.33	See note 3	0.00068	0.0017	0.0018	0.0017	0.0027	0.0028	0.0026	0.0028
Mercury		0.000026	0.00002	0.00002	0.00003	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum		0.073	0.037	0.037	0.073	0.00015	0.00019	0.00013	0.00013	0.00017	0.00016	0.00019	0.00017
Nickel ³		equation	0.013	0.013	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus			0.0051	0.0067	0.0040	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium			0.58	0.59		0.40	0.65	0.42	0.41	0.45	0.44	0.45	0.46
Rubidium						0.00052	0.00082	0.00061	0.00069	0.00070	0.00067	0.00071	0.00076
Selenium		0.001	0.00053	0.00053	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon			0.20	0.65		0.64	0.94	0.52	0.49	0.70	0.67	0.71	0.71
Silver		0.0001	0.00013	0.00013	0.00025	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium			1.2	0.72		0.50	0.86	0.57	0.57	0.58	0.57	0.61	0.62
Strontium			1.25	1.26	2.5	0.022	0.032	0.022	0.022	0.024	0.022	0.023	0.022
Sulfur						1.3	2.0	1.4	1.4	1.2	1.2	1.5	1.6
Tellurium						<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium		0.0008	0.00041	0.00041	0.00080	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium						<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<		

Table B1-2. Water quality results screened against FEIS predicted concentrations for Third Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L)				Third Portage Lake East Basin (TPE)								
		Third Portage Lake ²												
Area-Replicate ID	CCME (2012) Guideline ¹	Upper Mixing Estimate (169 Mm ³) Without Dike Leaching		Mid-range Mixing Estimate (92 Mm ³) Without Dike Leaching		TPE-160	TPE-161	TPE-163	TPE-162	TPE-164	TPE-165	TPE-166	TPE-167	
Depth (m)						3	3	3	3	3	3	3	3	
Date						12-Mar-2023	12-Mar-2023	03-Jul-2023	03-Jul-2023	13-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023	
Physical Tests (mg/L)														
Hardness			5.7	6.0		6.0	6.4							
Anions and Nutrients (mg/L)														
Alkalinity - Total			4.1	4.1		4.2	4.2							
Ammonia (as N) ³		equation	0.033	0.033		0.050	0.050							
120			0.80	0.80		1.0	1.1							
Fluoride			0.12	0.070	0.080		0.070	0.090						
Nitrate (as N)			3.0	0.035	0.036		0.057	0.059						
Ortho Phosphate (as P)			0.0022	0.0022		0.0024	0.0024							
Phosphorus (P) - Total		0.0040	0.0027	0.0029		0.0032	0.0035							
Sulphate (SO ₄)			1.7	1.7		2.0	2.0							
Cyanides (mg/L)														
Total Cyanide			0	0		0	0							
Total Metals (mg/L)														
Aluminum ³		equation	0.0070	0.0090		0.0070	0.010							
Antimony			0.00056	0.00057		0.00060	0.00062							
Arsenic			0.00062	0.00062		0.00072	0.00072							
Barium			0.020	0.022		0.020	0.023							
Beryllium			0.0010	0.0010		0.0010	0.0010							
Bismuth			0.10	0.10		0.10	0.10							
Boron		1.5	0.00001	0.00001		0.00001	0.00001							
Cadmium ³		equation	<0.000051	<0.000051		<0.000052	<0.000052							
Calcium			1.3	1.4		1.5	1.5							
Chromium ⁴		0.001	0.0010	0.0010		0.0010	0.0010							
Cobalt			0.0040	0.0013		0.00040	0.0017							
Copper ³		equation	0.0012	0.0012		0.0013	0.0013							
Iron		0.3	0.030	0.030		0.030	0.030							
Lead ³		equation	0.00060	0.00060		0.00060	0.00070							
Lithium			0.0050	0.0050		0.0050	0.0050							
Magnesium			0.60	0.60		0.60	0.70							
Manganese ³			0.0090	0.052		0.015	0.072							
Mercury		0.000026	0.00005	0.00005		0.00005	0.00005							
Molybdenum		0.073	0.0010	0.0010		0.0010	0.0010							
Nickel ³		equation	0.0016	0.0016		0.0020	0.0021							
Potassium			2.0	2.1		2.0	2.1							
Selenium		0.001	0.0010	0.0010		0.0010	0.0010							
Silicon			0.010	0.080		0.020	0.12							
Silver		0.0001	0.00002	0.00002		0.00002	0.00002							
Sodium			2.0	2.0		2.0	2.1							
Strontium			0.0020	0.0050		0.0040	0.0070							
Thallium		0.0008	0.00020	0.00020		0.00020	0.00020							
Uranium		0.015	0.00020	0.00020		0.00020	0.00030							
Vanadium			0.030	0.030		0.030	0.030							
Zinc ³		equation	0.011	0.011		0.015	0.015							

- Notes:**
1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
 2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).
 3. "equation" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
 4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Upper-range Mixing Estimate (169 Mm³):	
● Shaded cells = concentrations exceed the prediction "Without Dike Leaching."	
● Bordered cells = concentrations exceed the prediction "With Dike Leaching."	
Mid-range Mixing Estimate (92 Mm³):	
● Bold = concentrations exceed the prediction "Without Dike Leaching."	
● Bold italicized = concentrations exceed the prediction "With Dike Leaching."	

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

Table B1-2. Water quality results screened against FEIS predicted concentrations for Third Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L)				Third Portage Lake North Basin (TPN)							
		Third Portage Lake ²											
Area-Replicate ID	CCME (2012) Guideline ¹	Upper Mixing Estimate (169 Mm ³)		Mid-range Mixing Estimate (92 Mm ³)		TPN-160	TPN-161	TPN-162	TPN-163	TPN-164	TPN-165	TPN-166	TPN-167
		Without Dike	With Dike	Without Dike	With Dike	3	3	3	3	3	3	3	3
Depth (m)						04-Mar-2023	04-Mar-2023	03-Jul-2023	03-Jul-2023	24-Aug-2023	24-Aug-2023	07-Sep-2023	07-Sep-2023
Date													
Physical Tests (mg/L)													
Hardness		5.7	6.0	6.0	6.4								
Anions and Nutrients (mg/L)													
Alkalinity - Total		4.1	4.1	4.2	4.2								
Ammonia (as N) ³	<i>equation</i>	0.033	0.033	0.050	0.050								
Chloride	120	0.80	0.80	1.0	1.1								
Fluoride	0.12	0.070	0.080	0.070	0.090								
Nitrate (as N)	3.0	0.035	0.036	0.057	0.059								
Ortho Phosphate (as P)		0.0022	0.0022	0.0024	0.0024								
Phosphorus (P) - Total	0.0040	0.0027	0.0029	0.0032	0.0035								
Sulphate (SO ₄)		1.7	1.7	2.0	2.0								
Cyanides (mg/L)													
Total Cyanide		0	0	0	0								
Total Metals (mg/L)													
Aluminum ³	<i>equation</i>	0.0070	0.0090	0.0070	0.010								
Antimony		0.00056	0.00057	0.00060	0.00062								
Arsenic	0.0050	0.00062	0.00062	0.00072	0.00072								
Barium		0.020	0.022	0.020	0.023								
Beryllium		0.0010	0.0010	0.0010	0.0010								
Bismuth		0.10	0.10	0.10	0.10								
Boron	1.5	0.00001	0.00001	0.00001	0.00001								
Cadmium ³	<i>equation</i>	<0.000051	<0.000051	<0.000052	<0.000052								
Calcium		1.3	1.4	1.5	1.5								
Chromium ⁴	0.001	0.0010	0.0010	0.0010	0.0010								
Cobalt		0.0040	0.0013	0.00040	0.0017								
Copper ³	<i>equation</i>	0.0012	0.0012	0.0013	0.0013								
Iron	0.3	0.030	0.030	0.030	0.030								
Lead ³	<i>equation</i>	0.00060	0.00060	0.00060	0.00070								
Lithium		0.0050	0.0050	0.0050	0.0050								
Magnesium		0.60	0.60	0.60	0.70								
Manganese ³		0.0090	0.052	0.015	0.072								
Mercury	0.000026	0.00005	0.00005	0.00005	0.00005								
Molybdenum	0.073	0.0010	0.0010	0.0010	0.0010								
Nickel ³	<i>equation</i>	0.0016	0.0016	0.0020	0.0021								
Potassium		2.0	2.1	2.0	2.1								
Selenium	0.001	0.0010	0.0010	0.0010	0.0010								
Silicon		0.010	0.080	0.020	0.12								
Silver	0.0001	0.00002	0.00002	0.00002	0.00002								
Sodium		2.0	2.0	2.0	2.1								
Strontium		0.0020	0.0050	0.0040	0.0070								
Thallium	0.0008	0.00020	0.00020	0.00020	0.00020								
Uranium	0.015	0.00020	0.00020	0.00020	0.00030								
Vanadium		0.030	0.030	0.030	0.030								
Zinc ³	<i>equation</i>	0.011	0.011	0.015	0.015								

- Notes:**
1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
 2. Whole lake data are given for a range of mixing conditions, representing mid-range and upper mixing estimate for the north basin discharge location. The model includes treated water releases from the project (Years 1 to 4), and long-term substance loading due to leaching from the Bay-Goose dike (Cumberland, 2005).
 3. "equation" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
 4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Upper-range Mixing Estimate (169 Mm ³):
● Shaded cells = concentrations exceed the prediction "Without Dike Leaching."
● Bordered cells = concentrations exceed the prediction "With Dike Leaching."
Mid-range Mixing Estimate (92 Mm ³):
● Bold = concentrations exceed the prediction "Without Dike Leaching."
● Bold italicized = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

"-": not analyzed/not sampled.

Table B1-3. Water quality results screened against FEIS predicted concentrations for Second Portage Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L)											
		Second Portage Lake ²				Second Portage Lake (SP)							
Area-Replicate ID	CCME (2012) Guideline ¹	Upper Mixing Estimate (169 Mm ³)		Mid-range Mixing Estimate (92 Mm ³)		SP-160	SP-161	SP-163	SP-162	SP-164	SP-165	SP-166	SP-167
Depth (m)		Without Dike	With Dike	Without Dike	With Dike	3	3	3	3	3	3	3	3
Date		Leaching	Leaching	Leaching	Leaching	12-Mar-2023	12-Mar-2023	05-Jul-2023	05-Jul-2023	13-Aug-2023	13-Aug-2023	07-Sep-2023	07-Sep-2023
Physical Tests (mg/L)													
Hardness		8.9	8.9	8.9	8.9	17	16	16	15	14	14	14	15
Anions and Nutrients (mg/L)													
Alkalinity - Total		7.0	7.0	7.0	7.0	12	12	11	11	11	11	10	10
Ammonia (as N) ³		equation 0.025	0.025	0.031	0.031	0.022	0.021	0.0073	0.0061	0.0093	<0.0050	0.012	0.017
Chloride		120 0.70	0.70	0.80	0.80	1.1	1.0	0.83	0.82	0.87	0.88	0.84	0.86
Fluoride		0.12 0.070	0.071	0.070	0.071	0.091	0.089	0.060	0.058	0.069	0.074	0.067	0.076
Nitrate (as N)		3.0 0.017	0.017	0.025	0.025	0.013	0.0088	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Ortho Phosphate (as P)		0.0030	0.0030	0.0030	0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total		0.0040 0.0030	0.0030	0.0031	0.0031	0.0023	0.0023	0.0024	0.0025	0.0033	0.0023	0.0024	0.0027
Sulphate (SO ₄)		2.8	2.8	2.8	2.8	6.2	6.1	4.3	4.3	4.8	4.8	4.5	4.6
Cyanides (mg/L)													
Total Cyanide		0	0	0	0	<0.0010	-	<0.0020	-	-	<0.0010	<0.0010	-
Total Metals (mg/L)													
Aluminum ³		equation 0.0070	0.0070	0.0070	0.0070	<0.0030	0.0040	0.010	0.011	0.0054	0.0052	0.0089	0.0084
Antimony		0.00050	0.00050	0.00050	0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Arsenic		0.0050 0.00050	0.00050	0.00060	0.00060	0.00048	0.00043	0.00038	0.00035	0.00034	0.00042	0.00038	0.00035
Barium		0.020	0.020	0.020	0.020	0.0035	0.0033	0.0027	0.0025	0.0024	0.0024	0.0025	0.0026
Beryllium		0.0010	0.0010	0.0010	0.0010	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Bismuth		0.10	0.10	0.10	0.10	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron		1.5 0.00001	0.00001	0.00001	0.00001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium ³		equation <0.000050	<0.000050	<0.000051	<0.000051	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium		2.3	2.3	2.3	2.3	4.4	4.3	3.8	3.9	3.8	3.8	3.8	3.9
Chromium ⁴		0.0010 0.0010	0.0010	0.0010	0.0010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt		0.00030	0.00040	0.00030	0.00040	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper ³		equation 0.0011	0.0011	0.0011	0.0011	0.00064	0.00066	0.00085	0.00079	0.00072	0.00080	0.00070	0.00069
Iron		0.30 0.030	0.030	0.030	0.030	<0.010	<0.010	0.026	0.028	0.028	0.029	0.042	0.037
Lead ³		equation 0.00090	0.00090	0.00090	0.00090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium		0.0050	0.0050	0.0050	0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		0.80	0.80	0.80	0.80	1.5	1.5	1.3	1.2	1.2	1.2	1.3	1.3
Manganese ³		0.0044	0.0067	0.0066	0.0089	0.00034	0.00040	0.0022	0.0021	0.0027	0.0031	0.0027	0.0027
Mercury		0.00003 0.00005	0.00005	0.00005	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum		0.073 0.0010	0.0010	0.0010	0.0010	0.00016	0.00014	0.00011	0.00012	0.00013	0.00013	0.00014	0.00014
Nickel ³		equation 0.0010	0.0010	0.0010	0.0010	0.00054	0.00053	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Potassium		2.0	2.0	2.0	2.0	0.68	0.67	0.51	0.47	0.48	0.52	0.52	0.53
Selenium		0.0010 0.0010	0.0010	0.0010	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.010	0.010	0.010	0.010	0.29	0.30	0.36	0.37	0.34	0.34	0.34	0.37
Silver		0.00010 0.00001	0.00001	0.00001	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		2.0	2.0	2.0	2.0	1.2	1.1	0.76	0.72	0.72	0.80	0.80	0.80
Strontium		0.80	0.80	0.80	0.80	0.020	0.020	0.018	0.018	0.019	0.018	0.019	0.019
Thallium		0.00080 0.00020	0.00020	0.00020	0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium		0.015 0.00020	0.00020	0.00020	0.00020	0.00004	0.00004	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005
Vanadium		0.030	0.030	0.030	0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc ³		equation 0.0070	0.0070	0.0090	0.0090	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
2. The Second Portage Lake water quality model includes substance loading from the Third Portage and East dikes and inflow from Third Portage and Wally lakes. Changes in water quality in Second Portage Lake were modelled for two different mixing scenarios of water releases into Third Portage Lake (Cumberland, 2005).
3. "*equation*" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. The ammonia and aluminum guidelines vary with pH; the cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

Upper-range Mixing Estimate (169 Mm³):

- Shaded cells = concentrations exceed the prediction "Without Dike Leaching."
- Bordered cells = concentrations exceed the prediction "With Dike Leaching."

Mid-range Mixing Estimate (92 Mm³):

- **Bold** = concentrations exceed the prediction "Without Dike Leaching."
- **Bold italicized** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

Table B1-4. Water quality results screened against FEIS predicted concentrations for Wally Lake, 2023.

Lake and Area		Simulated Maximum Whole Lake Concentration (mg/L)									
		Wally Lake ²		Wally Lake (WAL)							
Area-Replicate ID	CCME (2012) Guideline ¹	Without Dike Leaching	With Dike Leaching	WAL-129	WAL-130	WAL-131	WAL-132	WAL-133	WAL-134	WAL-135	WAL-136
Depth (m)				3	3	3	3	3	3	3	3
Date				04-Mar-2023	04-Mar-2023	06-Jul-2023	06-Jul-2023	21-Aug-2023	21-Aug-2023	09-Sep-2023	09-Sep-2023
Physical Tests (mg/L)											
Hardness		17	17	10	23	16	16	17	16	17	16
Anions and Nutrients (mg/L)											
Alkalinity - Total		13	13	17	19	11	11	13	13	13	12
Ammonia (as N) ³	<i>equation</i>	0.089	0.089	0.018	0.015	0.014	0.0066	0.009	<0.0050	0.014	0.025
Chloride	120	0.70	0.70	0.71	0.84	0.51	0.51	0.55	0.54	0.54	0.54
Fluoride	0.12	0.050	0.050	0.066	0.074	0.049	0.049	0.054	0.058	0.056	0.055
Nitrate (as N)	3.0	0.10	0.10	0.0064	0.0094	<0.0050	0.0078	<0.0050	<0.0050	<0.0050	<0.0050
Ortho Phosphate (as P)		0.0030	0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P) - Total	0.0040	0.0039	0.0040	0.0033	0.0079	0.0028	0.0024	0.0028	0.0028	0.0026	0.0029
Sulphate (SO ₄)		5.3	5.3	5.7	6.6	4.0	3.9	3.9	3.8	4.1	4.4
Cyanides (mg/L)											
Total Cyanide		0	0	<0.0010	0	<0.0020	-	<0.0010	-	<0.0020	-
Total Metals (mg/L)											
Aluminum ³	<i>equation</i>	0.012	0.013	0.0032	0.0033	0.0085	0.0077	0.0047	0.0050	0.0090	0.0093
Antimony		0.00090	0.00090	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.0050	0.0050	0.0060	0.00023	0.00033	0.00031	0.00029	0.00044	0.00040	0.00042	0.00037
Barium		0.020	0.020	0.0021	0.0032	0.0021	0.0022	0.0021	0.0020	0.0021	0.0021
Beryllium		0.0010	0.0010	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth		0.10	0.10	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	1.5	0.00001	0.00001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium ³	<i>equation</i>	0.00018	0.00019	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium		4.7	4.7	4.6	6.4	4.3	4.2	4.3	4.0	4.7	4.5
Chromium ⁴	0.001	0.0010	0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Cobalt		0.00030	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper ³	<i>equation</i>	0.0020	0.0020	0.00085	0.0013	0.0010	0.0011	0.0010	0.0010	0.0011	0.0011
Iron	0.3	0.030	0.030	<0.010	<0.010	0.020	0.020	0.022	0.024	0.036	0.036
Lead ³	<i>equation</i>	0.00070	0.00070	0.0011	0.00051	<0.000050	<0.000050	<0.000050	<0.000050	0.00010	<0.000050
Lithium		0.0050	0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		1.3	1.3	1.2	2.0	1.3	1.3	1.3	1.3	1.4	1.4
Manganese ³		0.0020	0.0020	0.00068	0.0017	0.0018	0.0017	0.0027	0.0028	0.0026	0.0028
Mercury	0.000026	0.00010	0.00010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum	0.073	0.0020	0.0020	0.00015	0.00019	0.00013	0.00013	0.00017	0.00016	0.00019	0.00017
Nickel ³	<i>equation</i>	0.0010	0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Potassium		2.0	2.0	0.40	0.65	0.42	0.41	0.45	0.44	0.45	0.46
Selenium	0.001	0.0010	0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon		0.040	0.040	0.64	0.94	0.52	0.49	0.70	0.67	0.71	0.71
Silver	0.0001	0.00002	0.00002	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium		2.0	2.0	0.50	0.86	0.57	0.57	0.58	0.57	0.61	0.62
Thallium	0.0008	0.00020	0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	0.015	0.00070	0.00070	0.00003	0.00006	0.00006	0.00006	0.00006	0.00005	0.00006	0.00006
Vanadium		0.030	0.030	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc ³	<i>equation</i>	0.013	0.013	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2016.
2. Preliminary modelling of whole lake water quality in the receiving environment water bodies incorporates long-term loadings from the Vault dike and effluent releases from the Vault Attenuation pond (Cumberland, 2005).
3. "equation" means that CCME guidelines (or thresholds) are calculated based on an equation which is either pH or hardness dependent. Ammonia and aluminum guidelines vary with pH; cadmium, copper, lead, manganese, nickel and zinc guidelines vary with hardness.
4. Chromium CCME guideline is for Cr VI.

Formatting for indicating the parameters that exceed the model predictions in the FEIS:

- **Bold** = concentrations exceed the prediction "Without Dike Leaching."
- **Bold Italicized** = concentrations exceed the prediction "With Dike Leaching."

Italicized numbers are below detection limits.

"-" not analyzed/not sampled.

FIGURES

Figure B1-1. Laboratory-measured conductivity ($\mu\text{S}/\text{cm}$).

Note: Conductivity data from 2014 should be interpreted with caution. See Azimuth (2015) for more details.

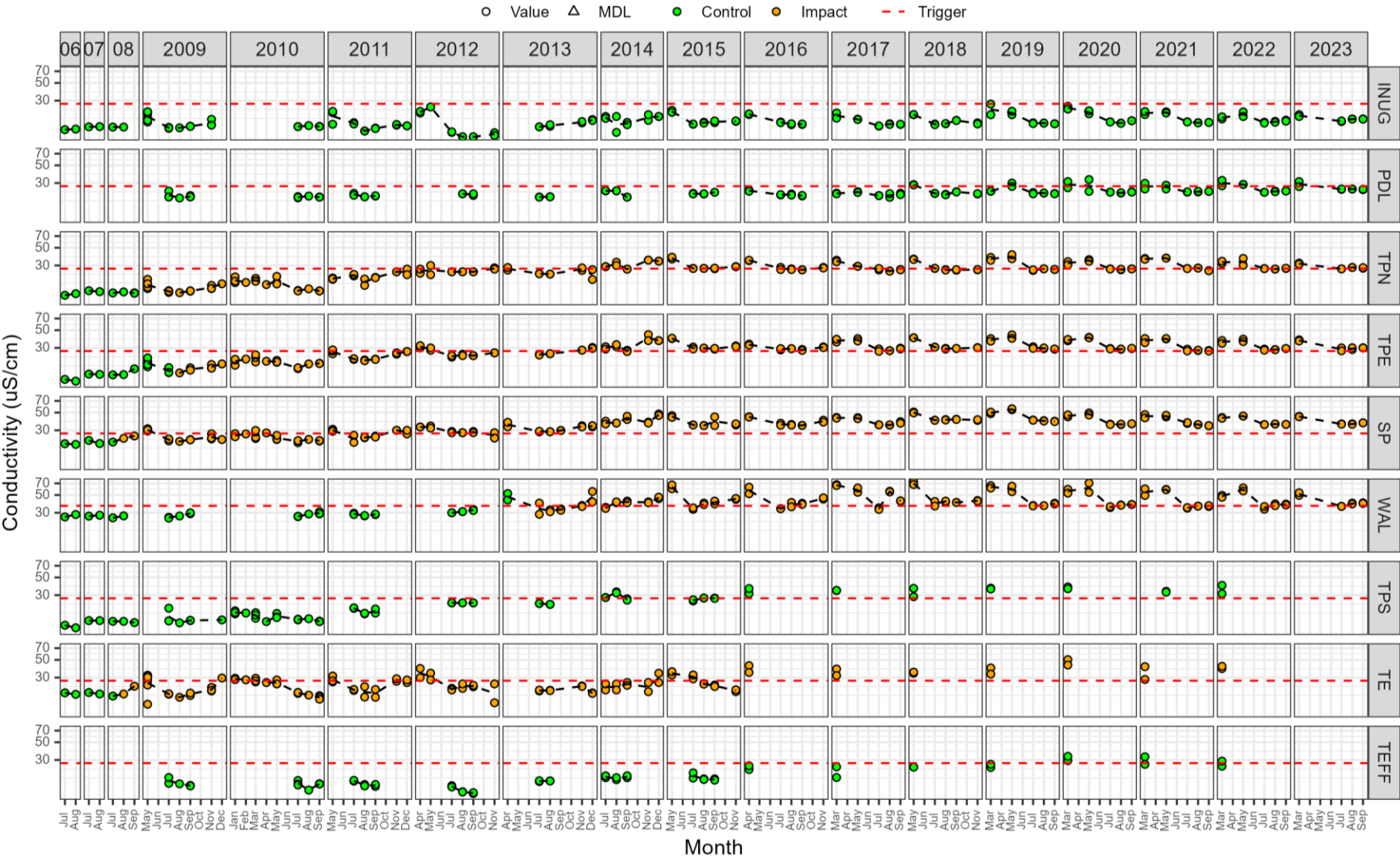


Figure B1-2. Laboratory-measured hardness (mg/L).

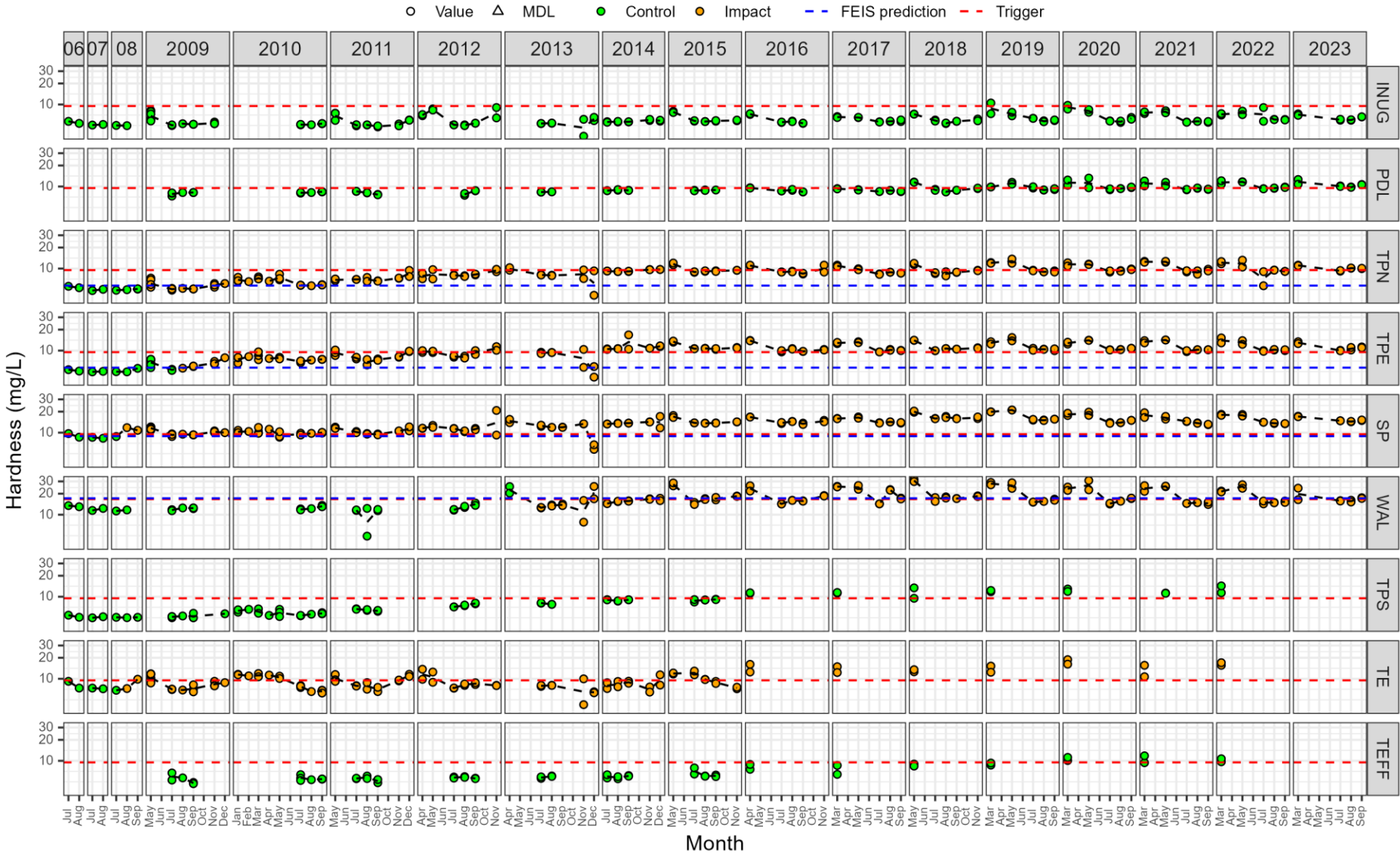


Figure B1-3. Field-measured pH.

