

Figure B2-75. Dissolved uranium (mg/L).

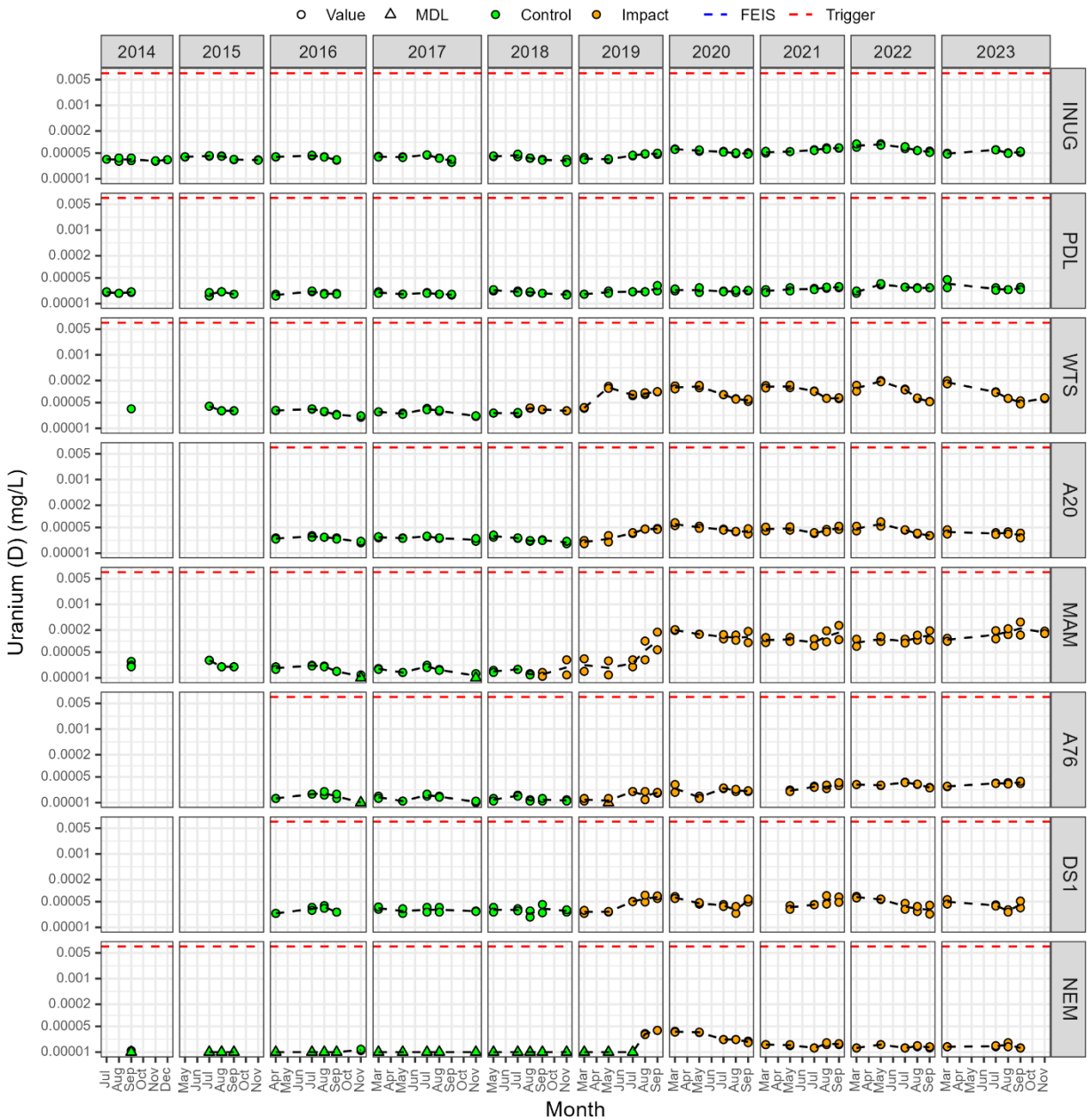


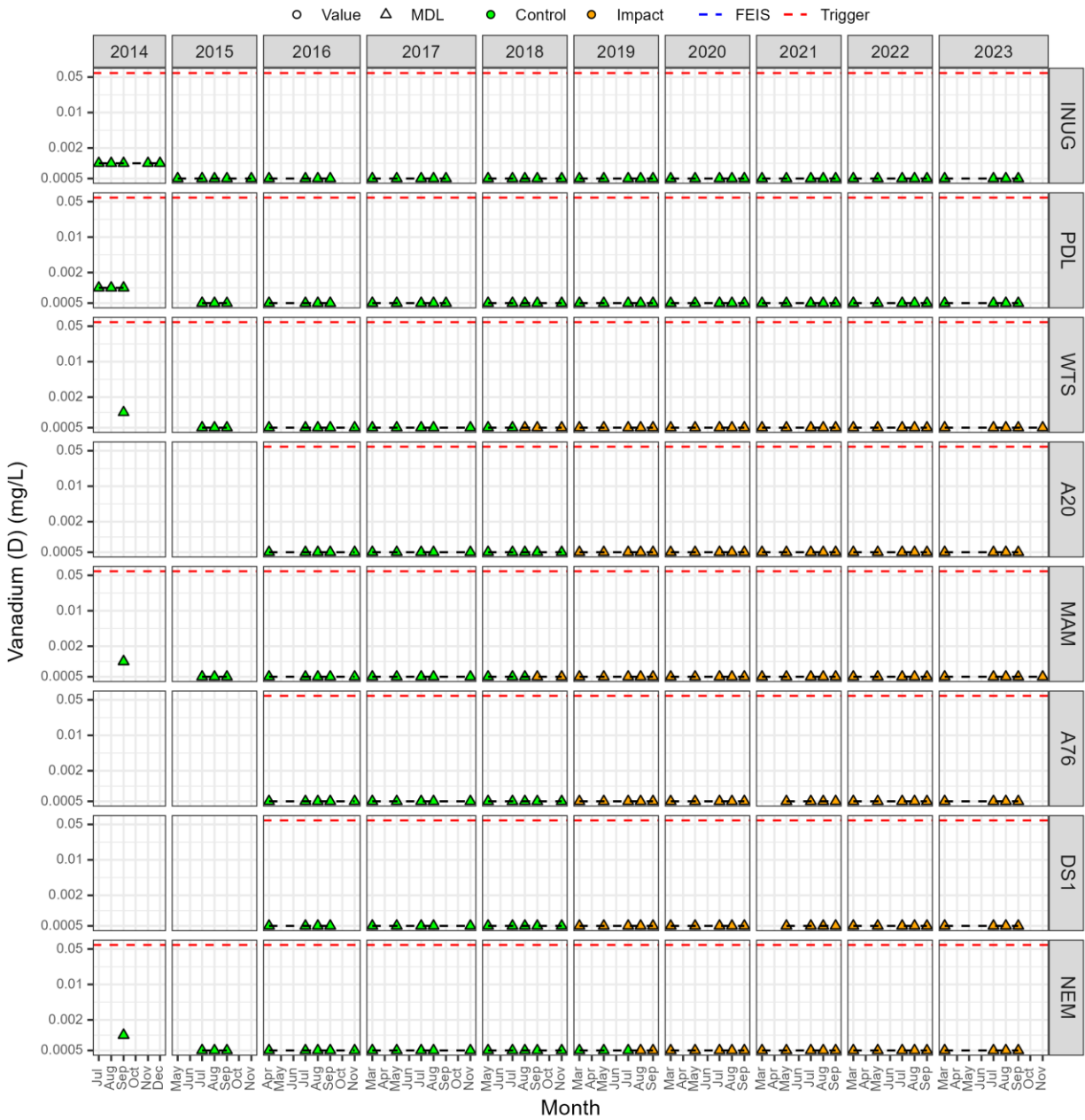
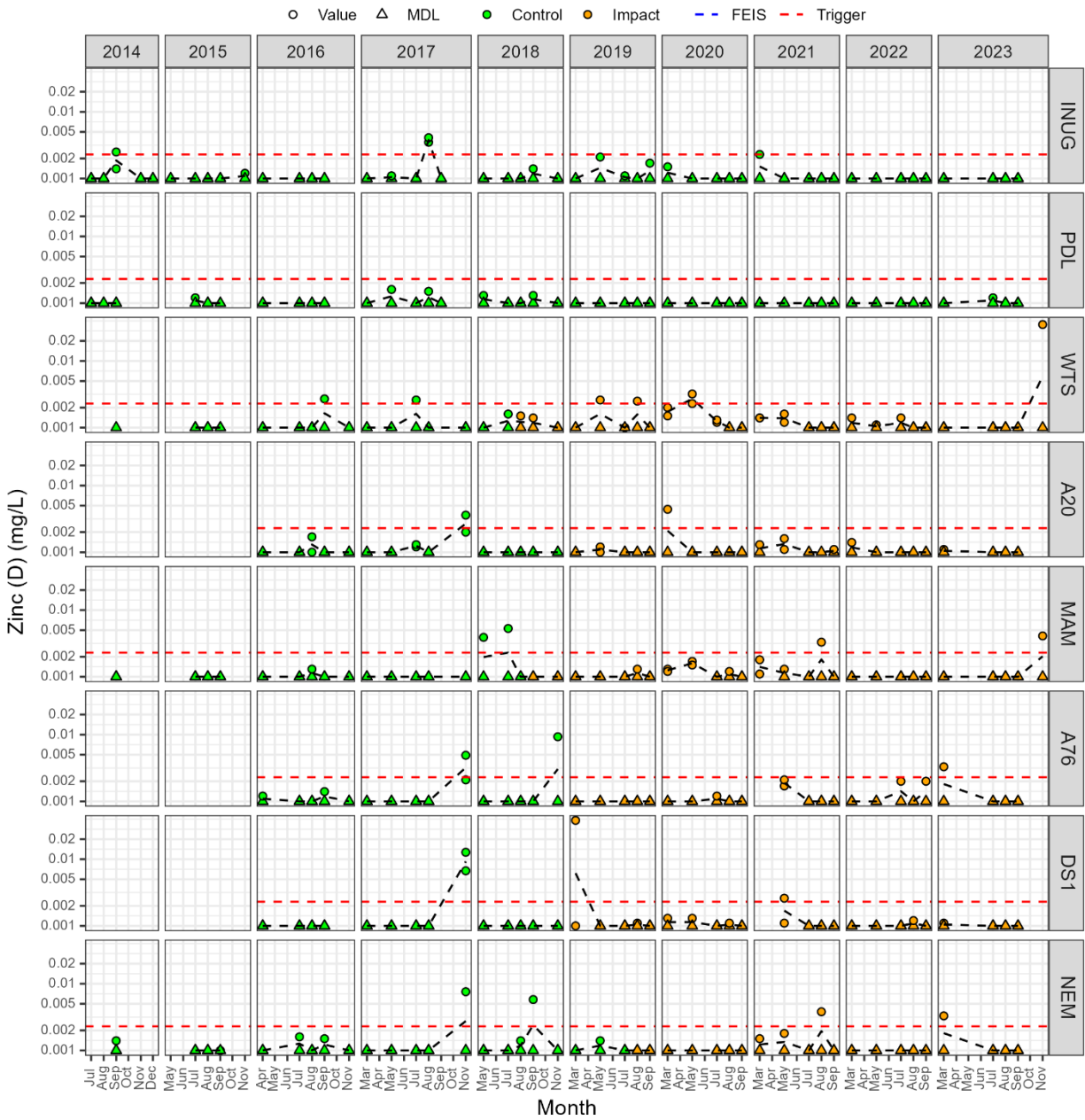
Figure B2-76. Dissolved vanadium (mg/L).

Figure B2-77. Dissolved zinc (mg/L).

Appendix B3

Water Chemistry – Baker Lake

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TABLES

Table B3–1. Water quality results from Baker Lake, 2023.

[illegible]

Notes

1. CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated up to 2018.

4. Chromium CCME guideline is for Cr VI.

123 Bold and shaded values exceed the threshold.

underline = results were given a cautionary flag in the QC assessment (refer to [Appendix A](#) for details).

~~strikethrough~~ = results flagged as unreliable in the QC assessment (refer to [Appendix A](#) for details).

FIGURES

Figure B3-1. Laboratory-measured conductivity ($\mu\text{S}/\text{cm}$).

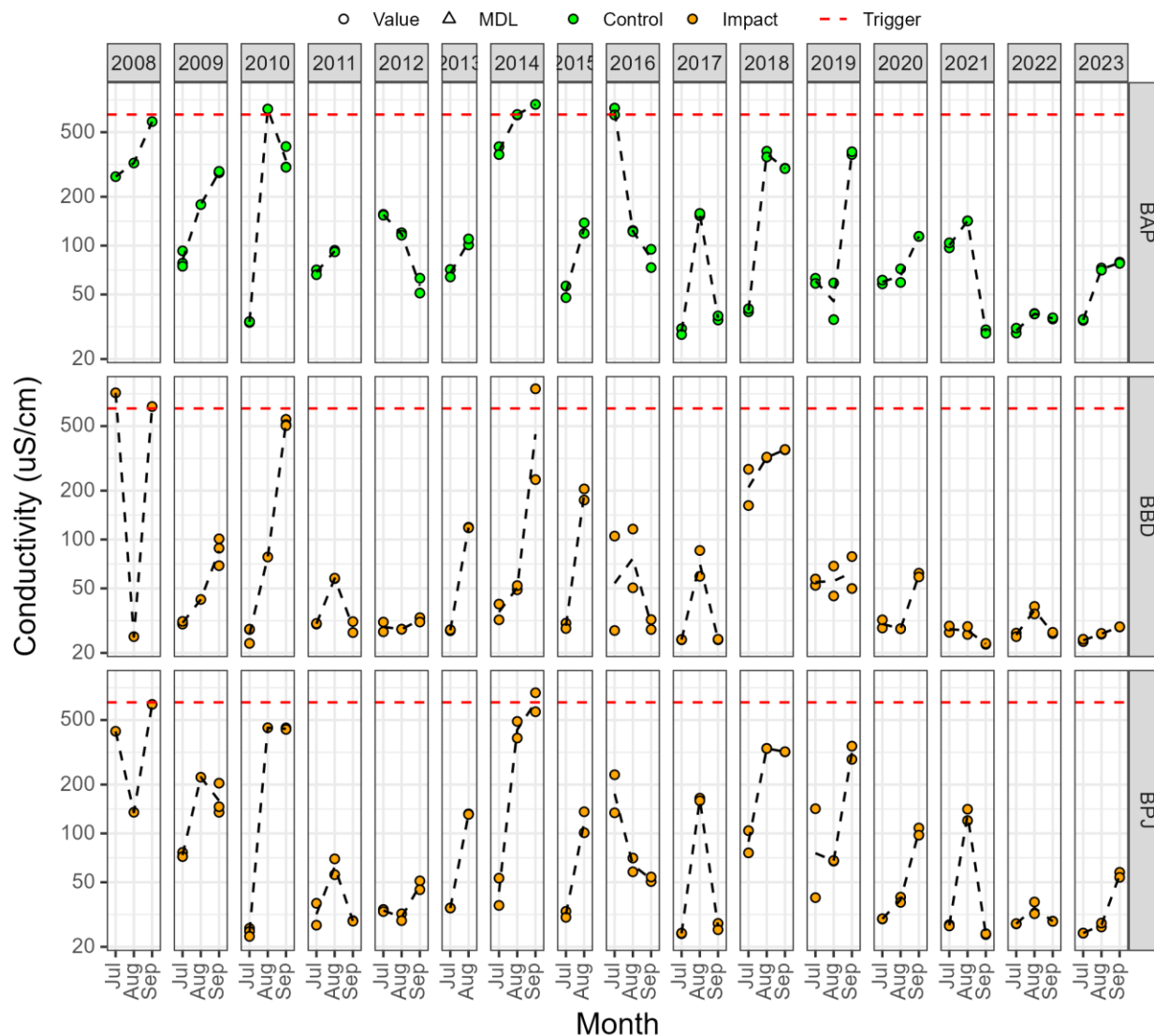


Figure B3-2. Laboratory-measured hardness (mg/L).

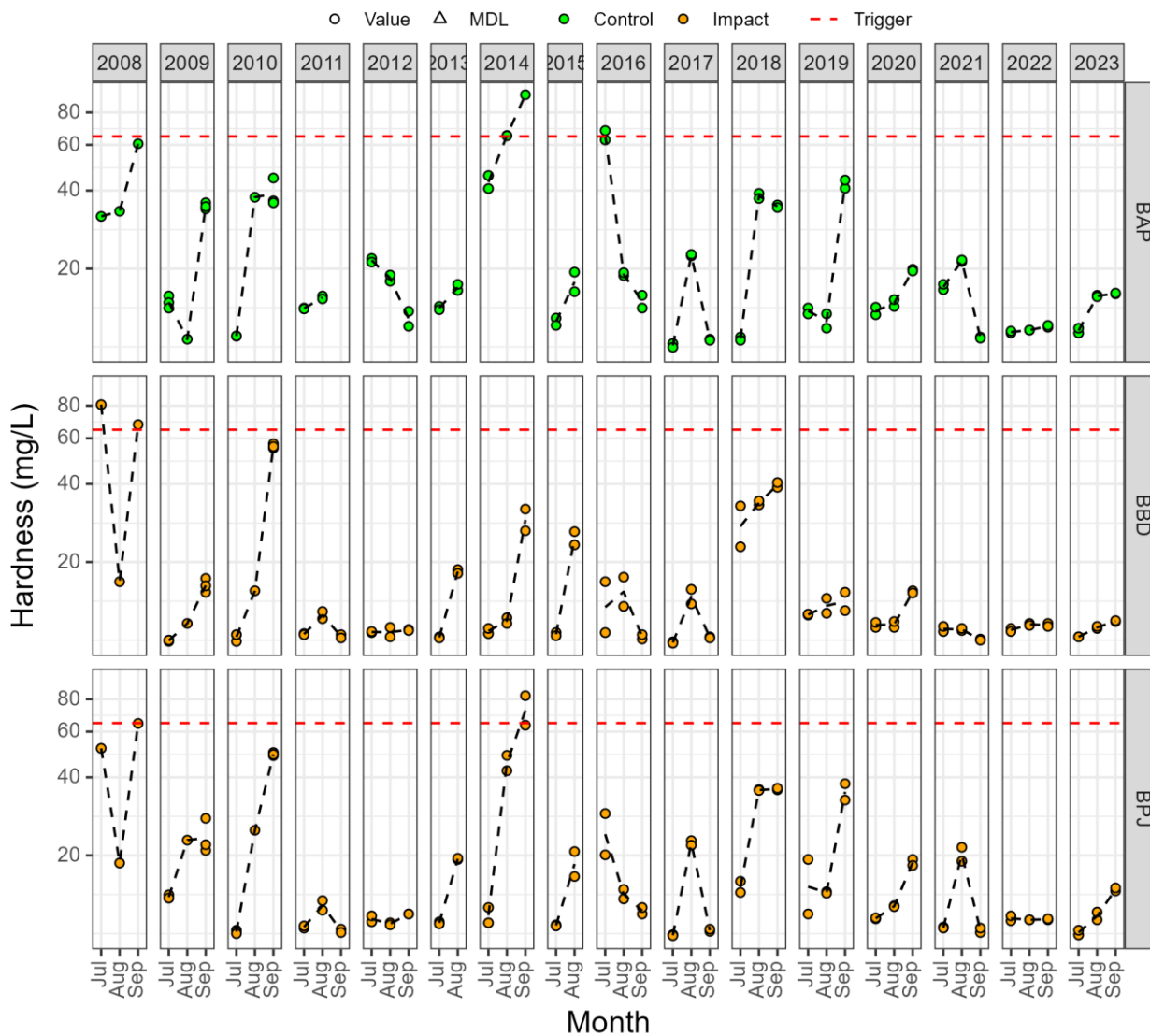


Figure B3-3. Field-measured pH.

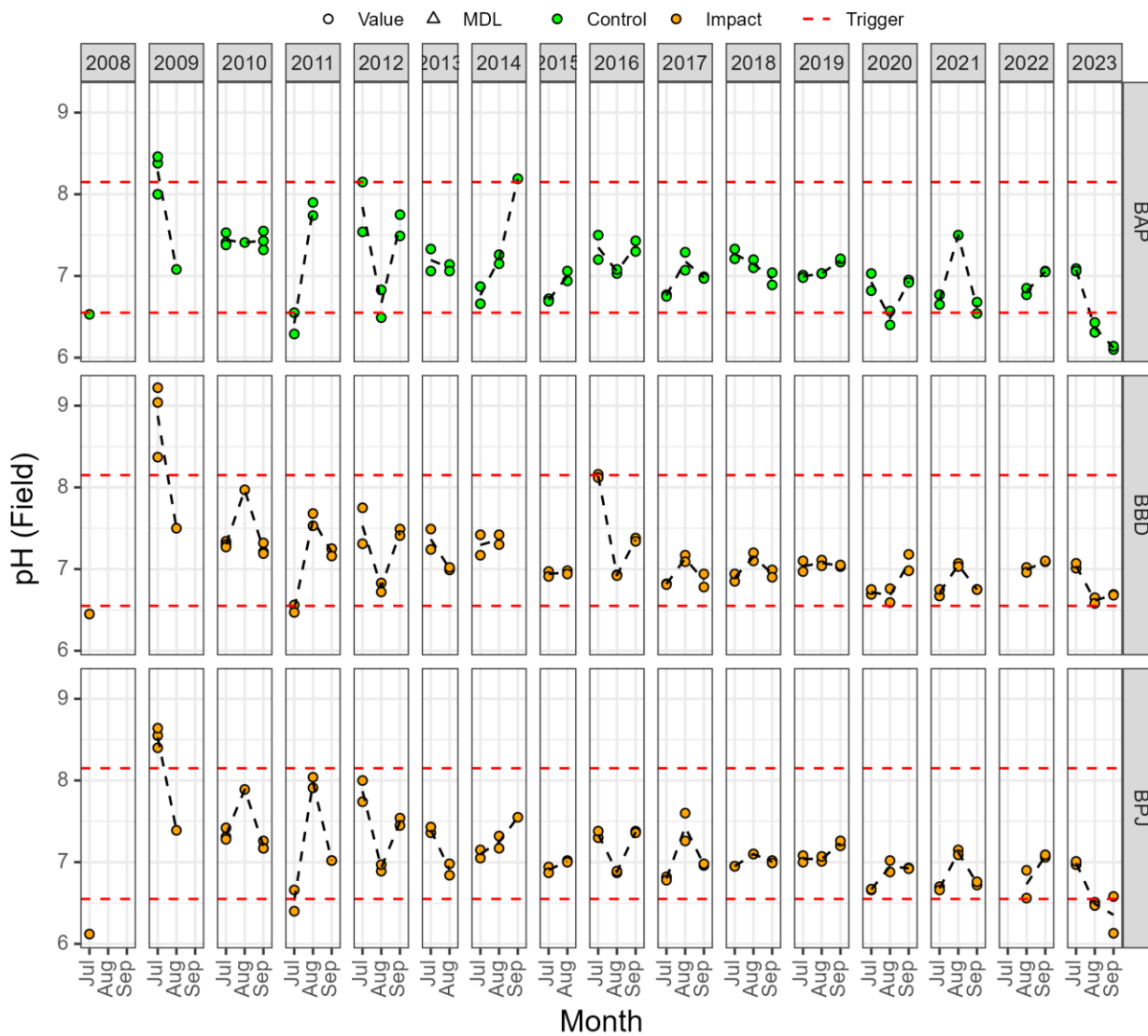


Figure B3-4. Laboratory-measured pH.

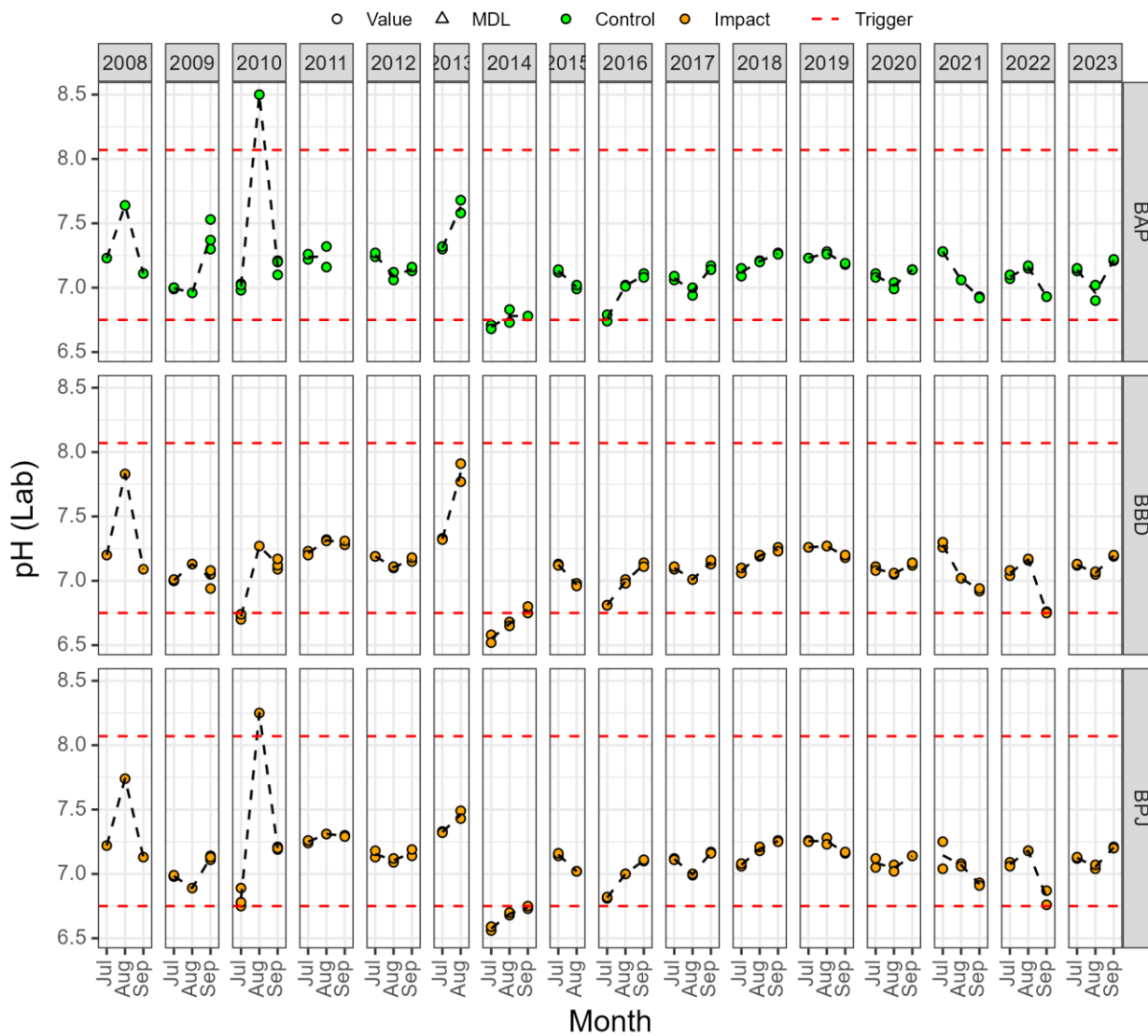


Figure B3-5. Total dissolved solids (TDS; mg/L).

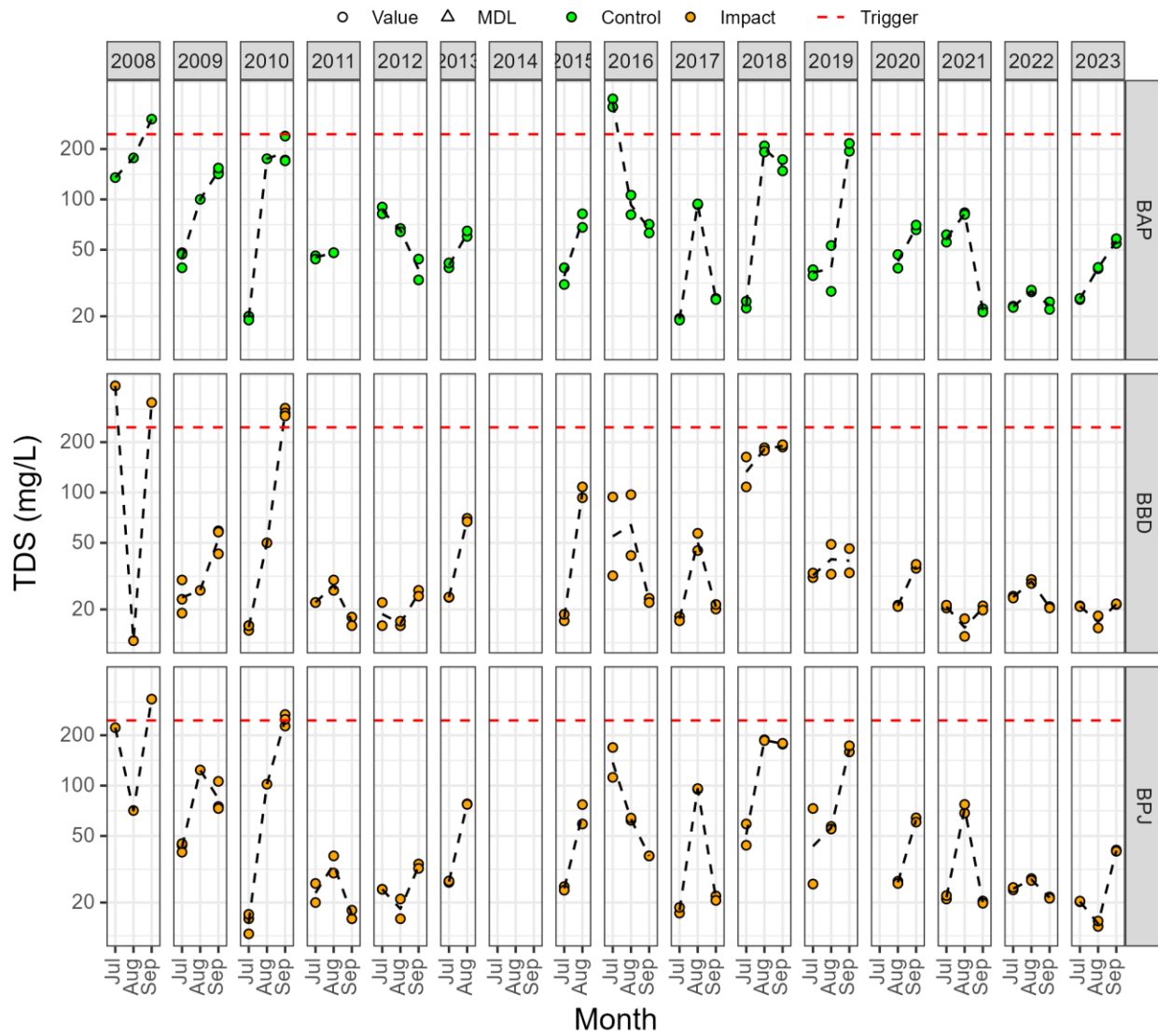


Figure B3-6. Total suspended solids (TSS; mg/L).

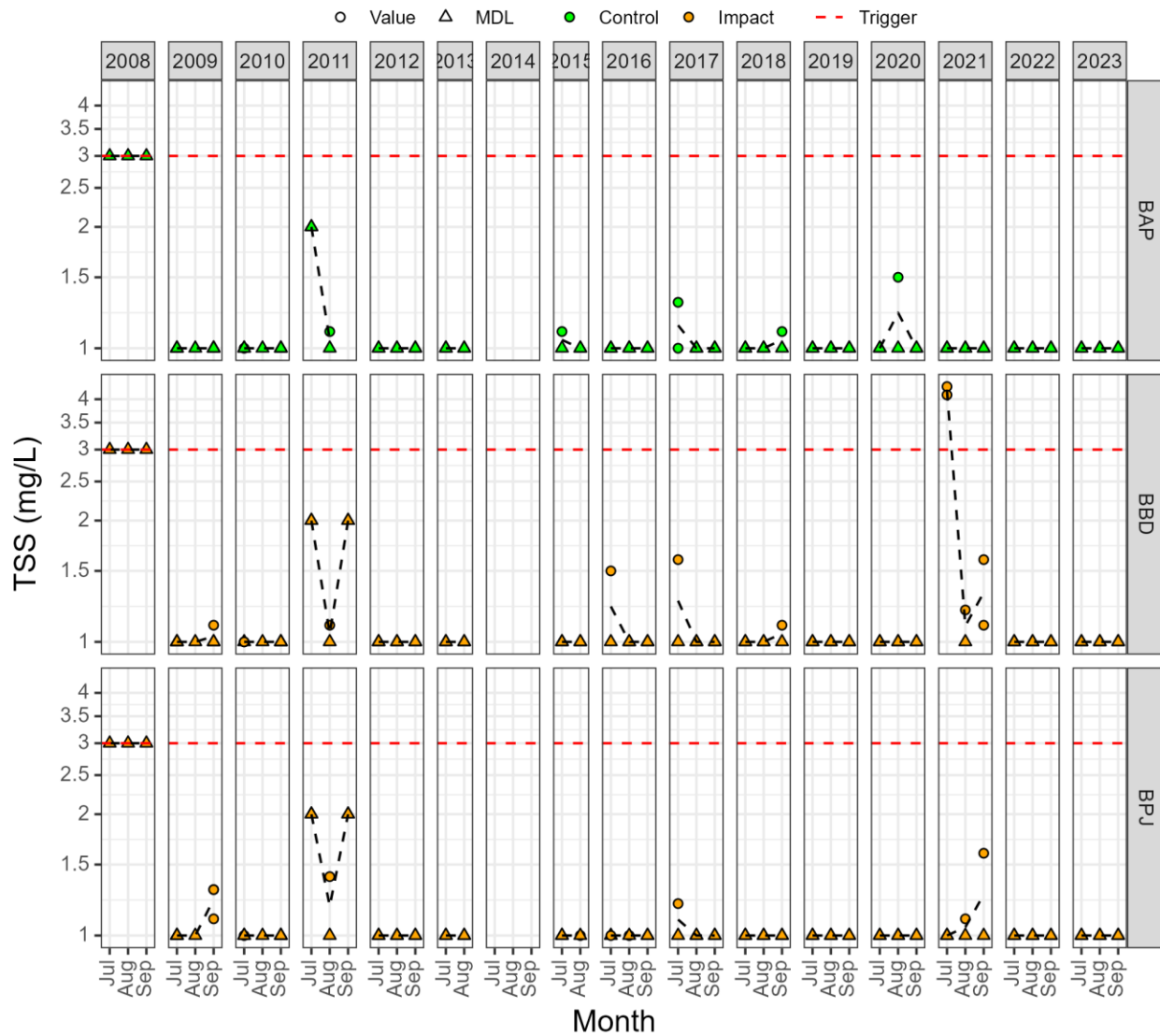


Figure B3-7. Carbonate alkalinity (mg/L).

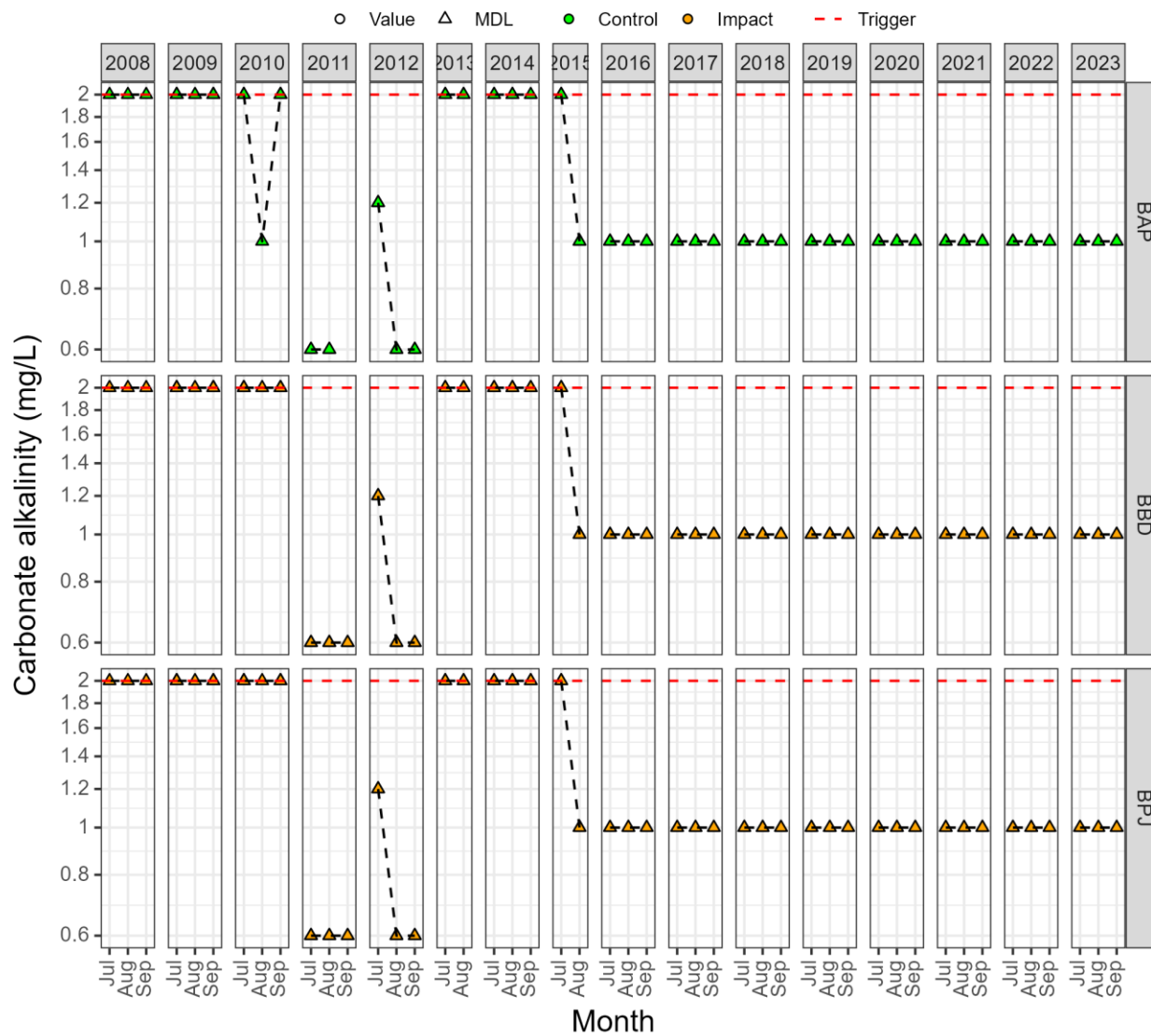


Figure B3-8. Bicarbonate alkalinity (mg/L).

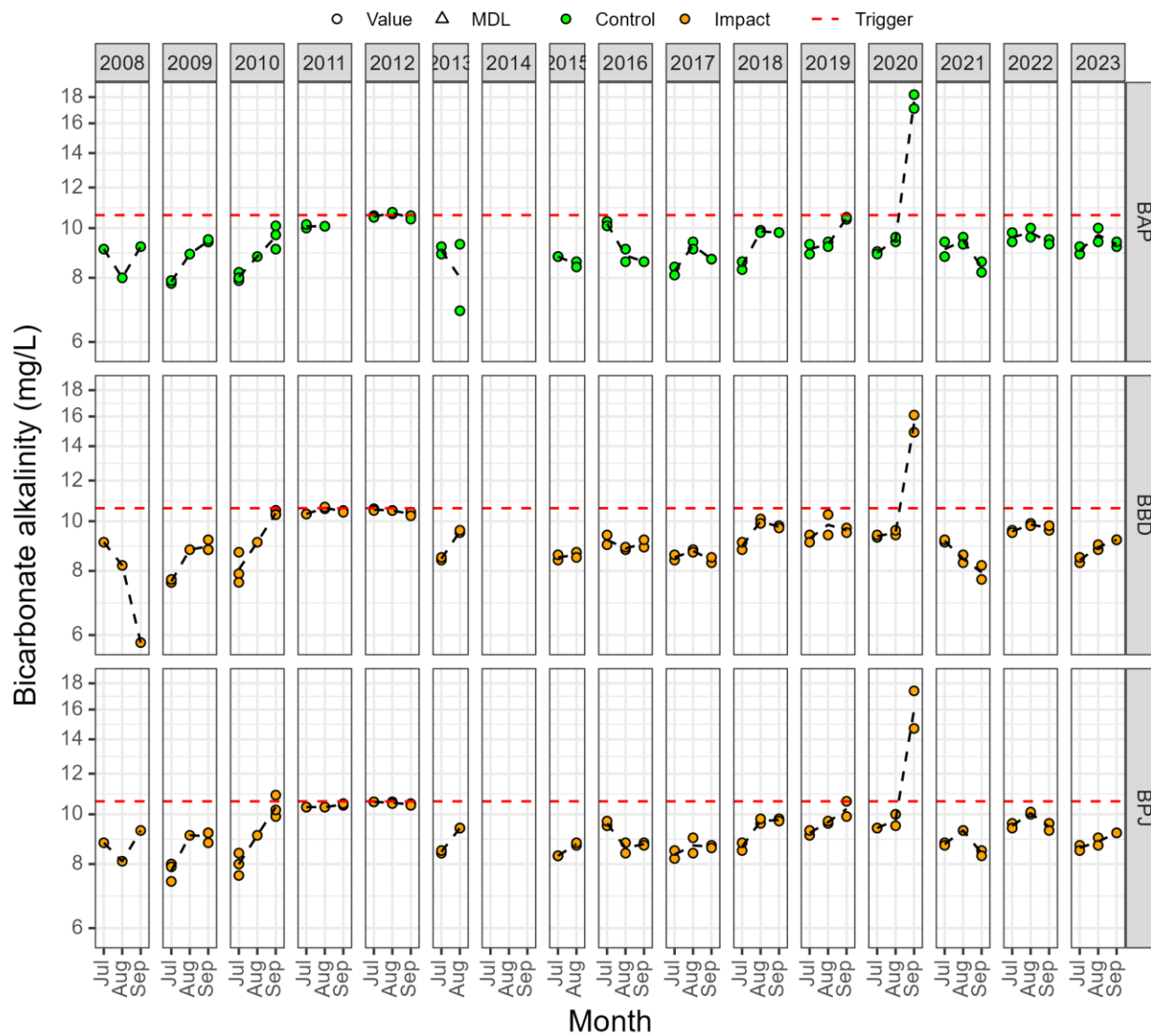


Figure B3-9. Total alkalinity (mg/L).

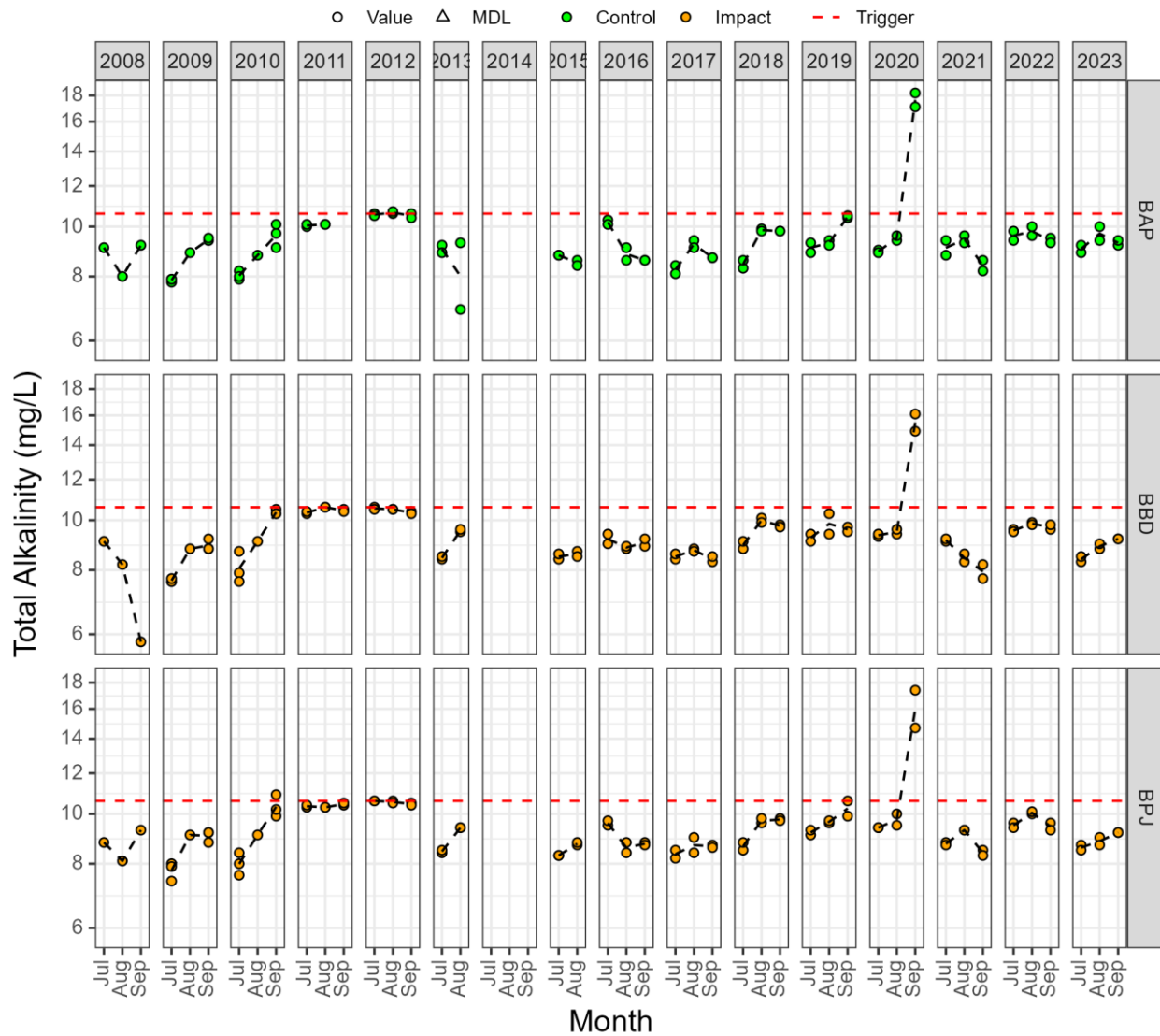


Figure B3-10. Ammonia-N (mg/L).

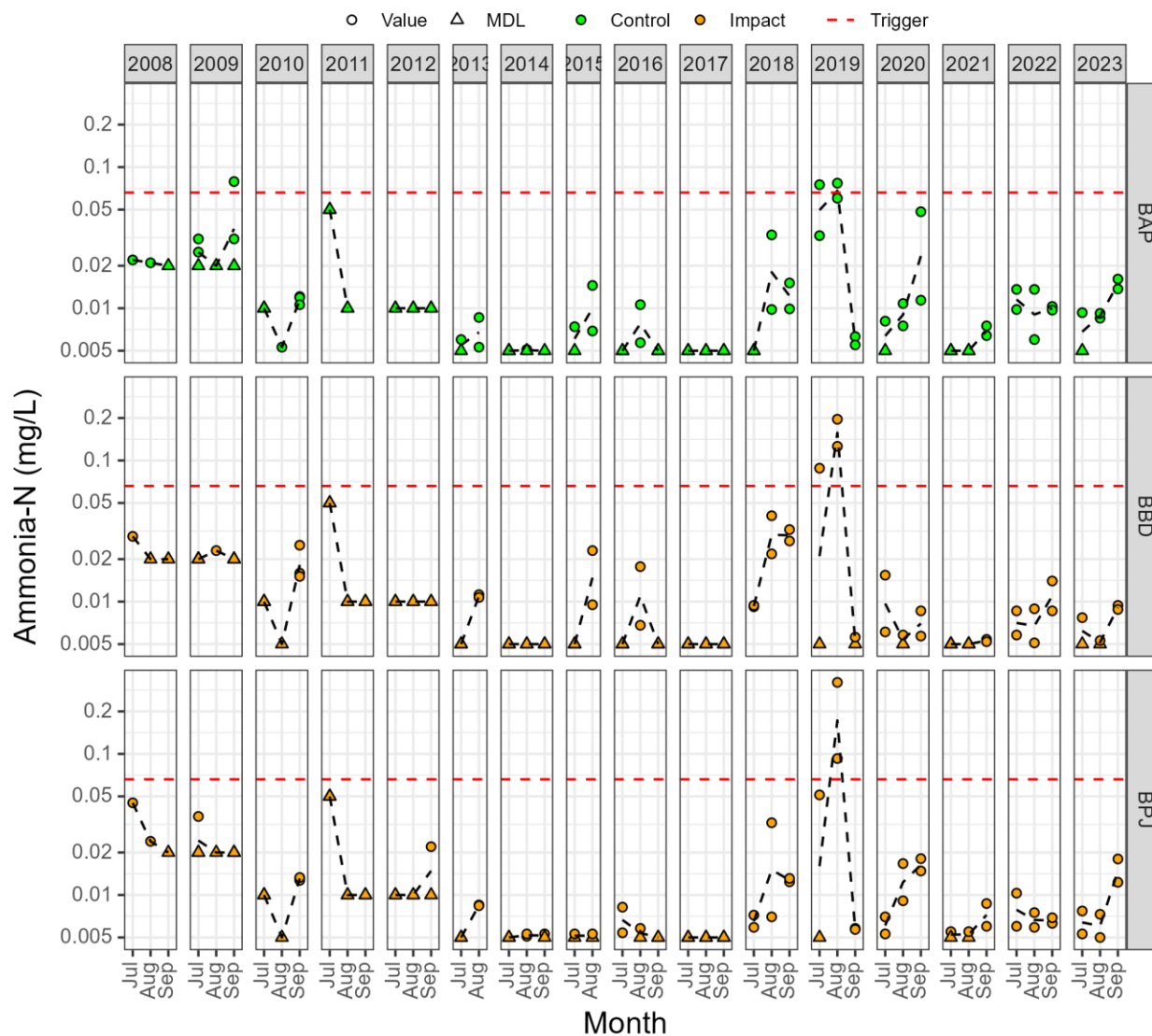


Figure B3-11. Chloride (mg/L).

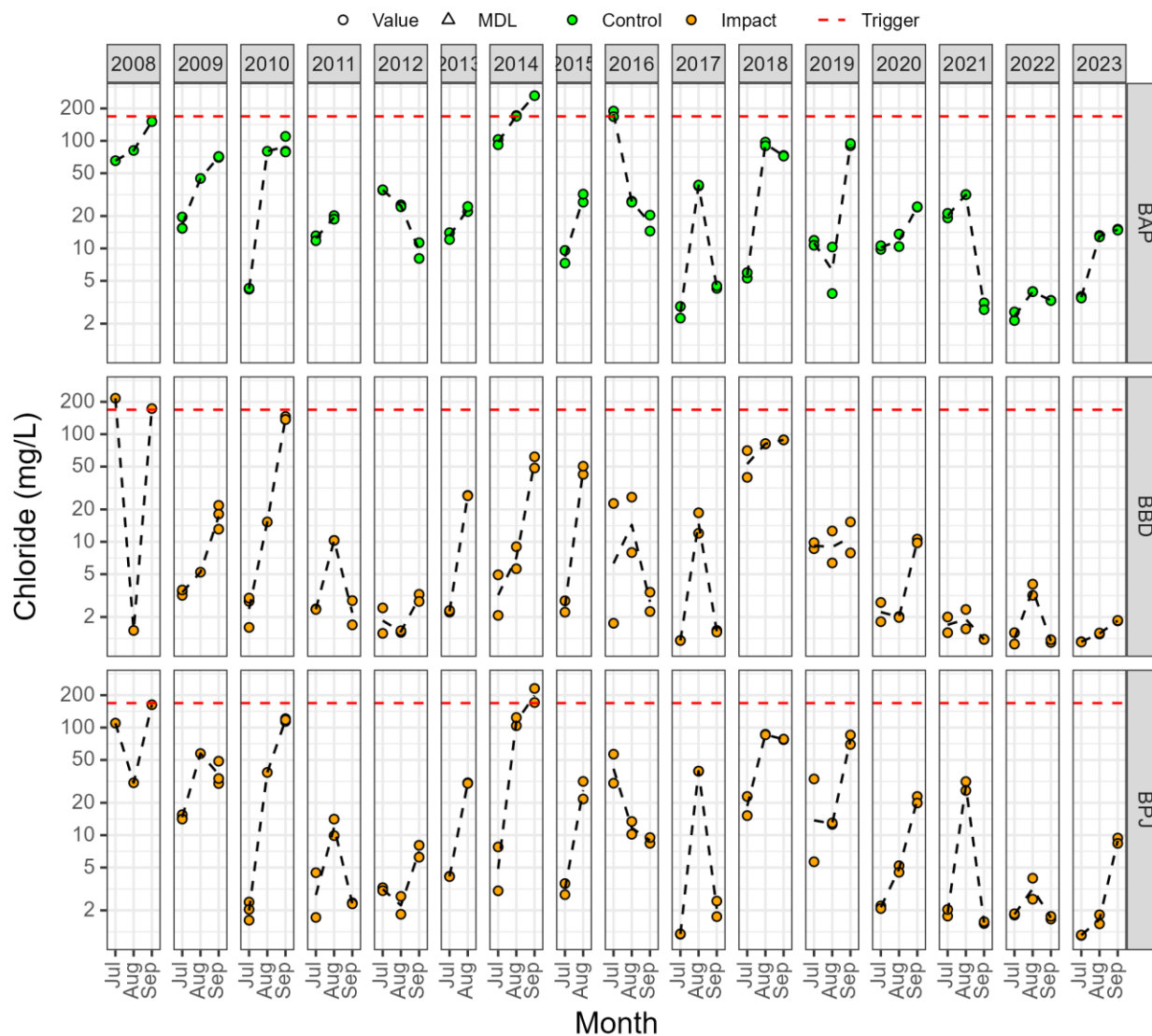


Figure B3-12. Fluoride (mg/L).

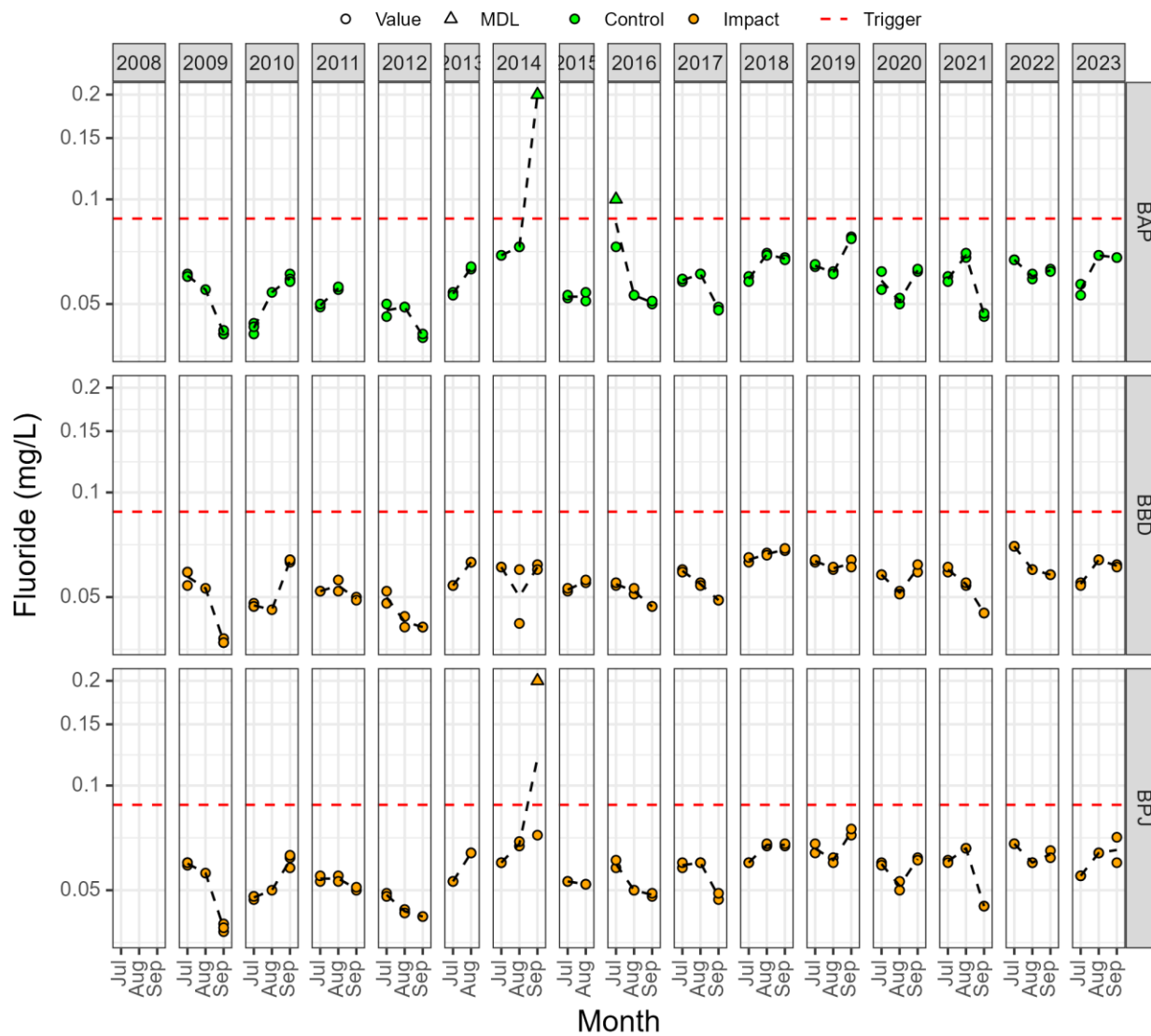


Figure B3-13. Nitrate-N (mg/L).

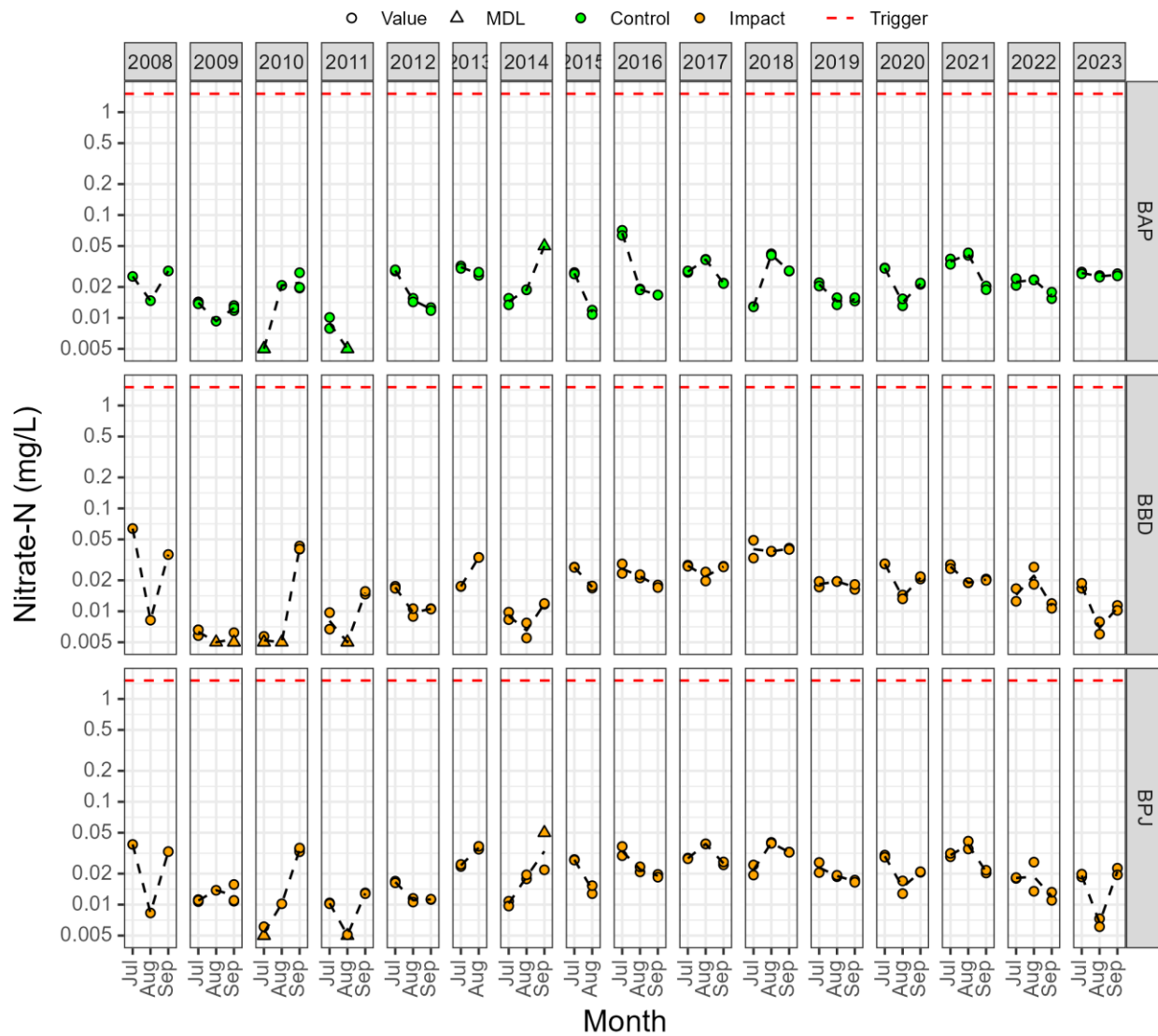


Figure B3-14. Nitrite-N (mg/L).

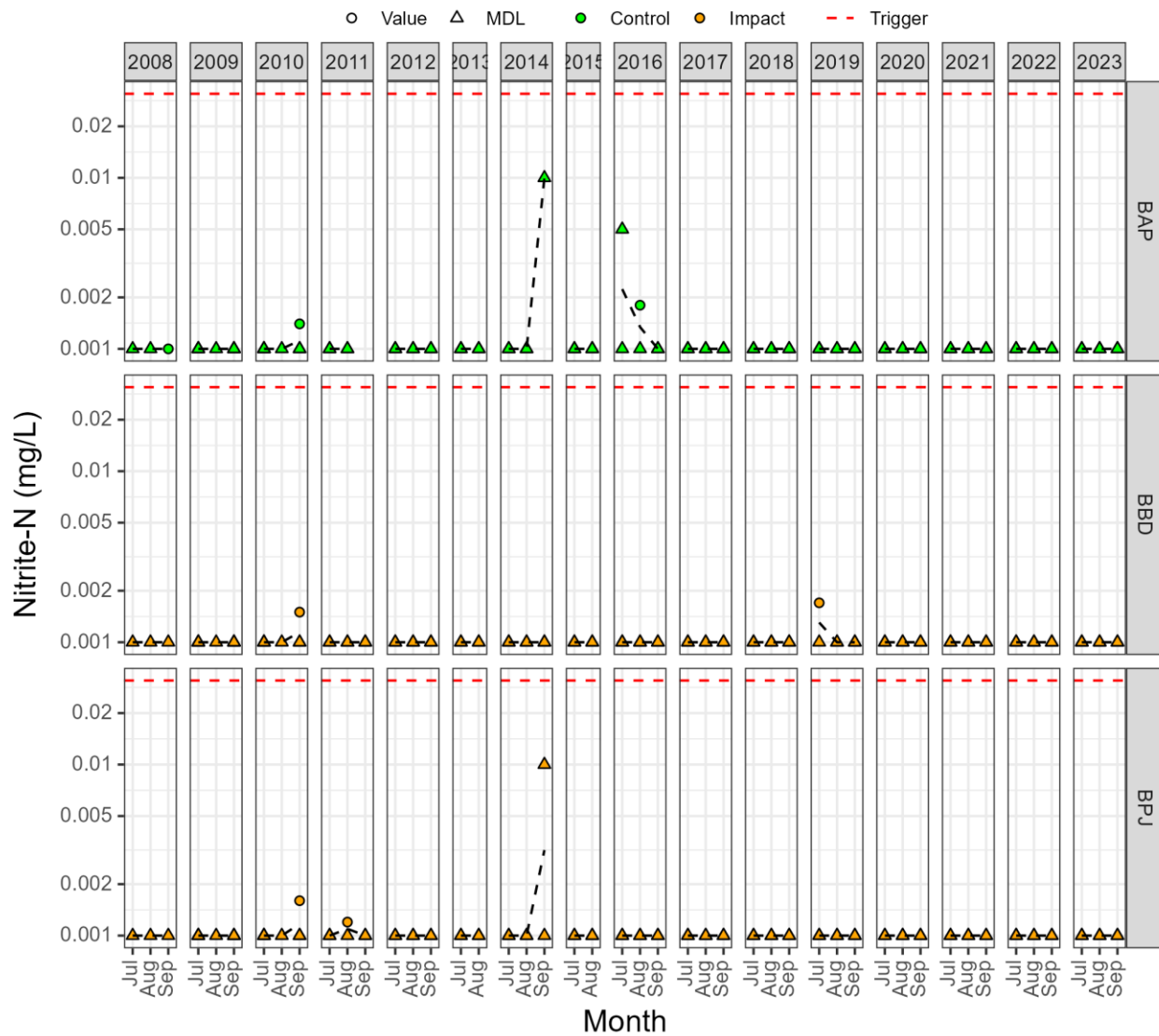


Figure B3-15. Total Kjeldahl Nitrogen (TKN; mg/L).

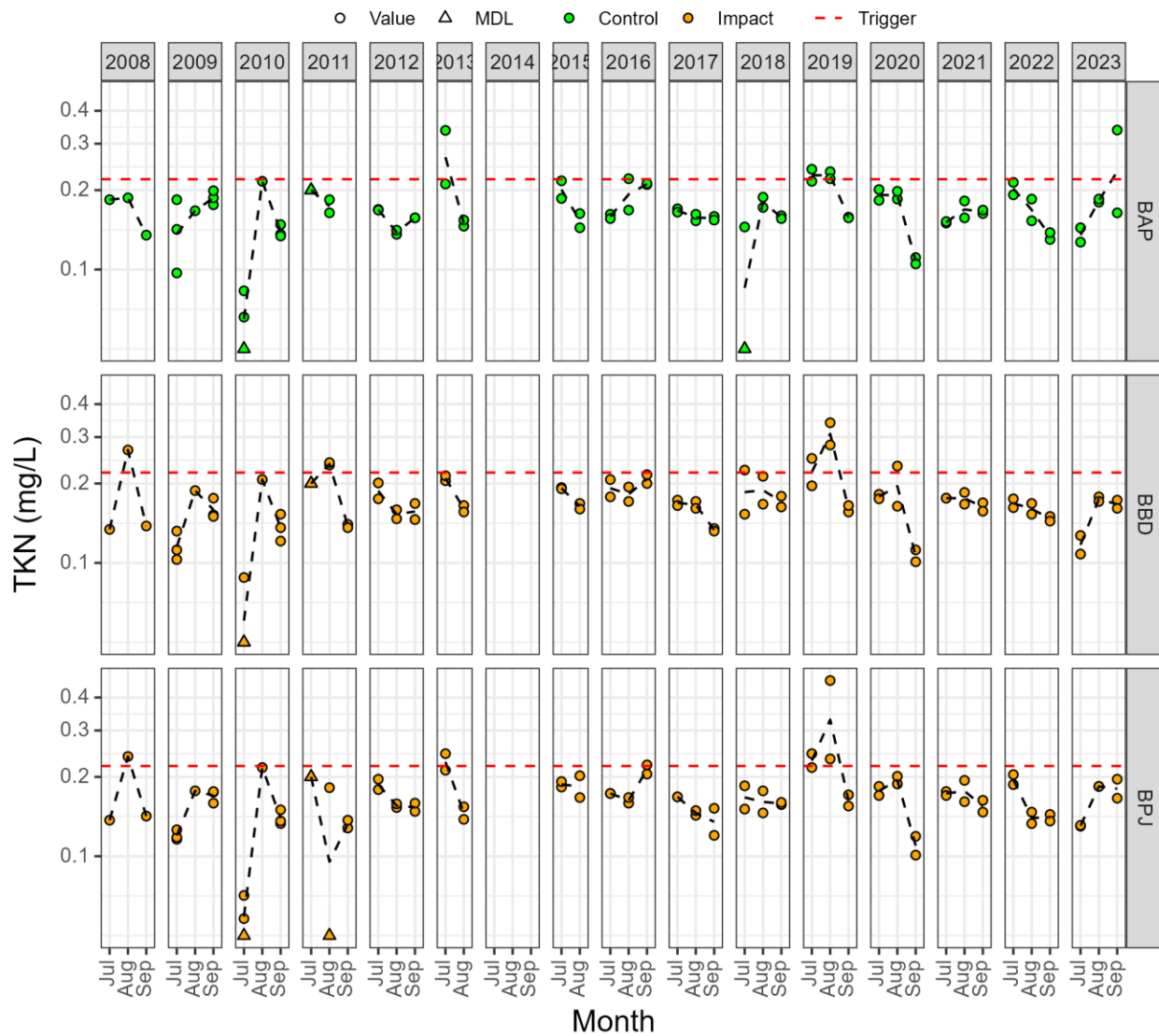


Figure B3-16. Ortho-phosphate (mg/L).

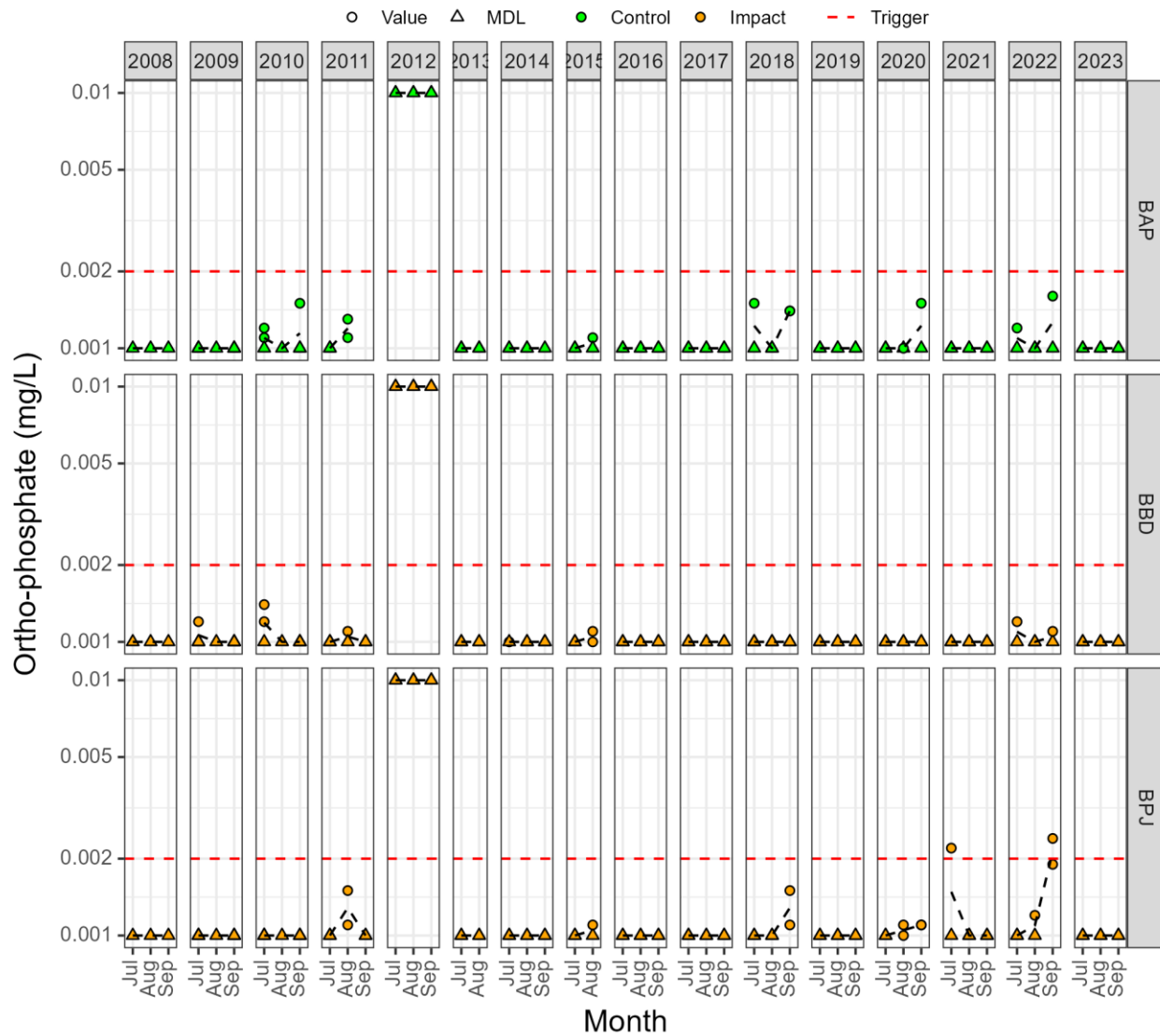


Figure B3-17. Total phosphorous (mg/L).

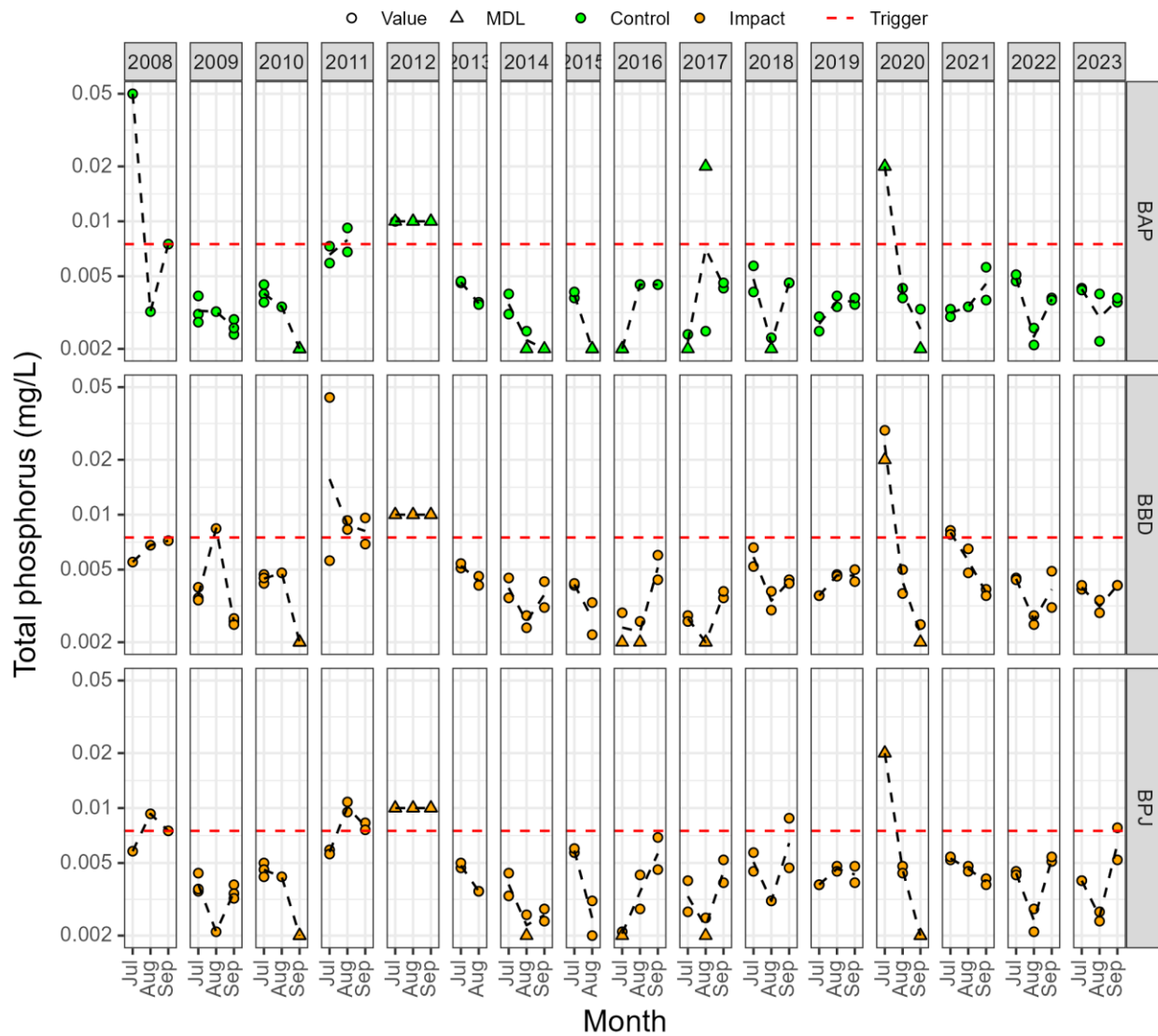


Figure B3-18. Reactive silica (mg/L).

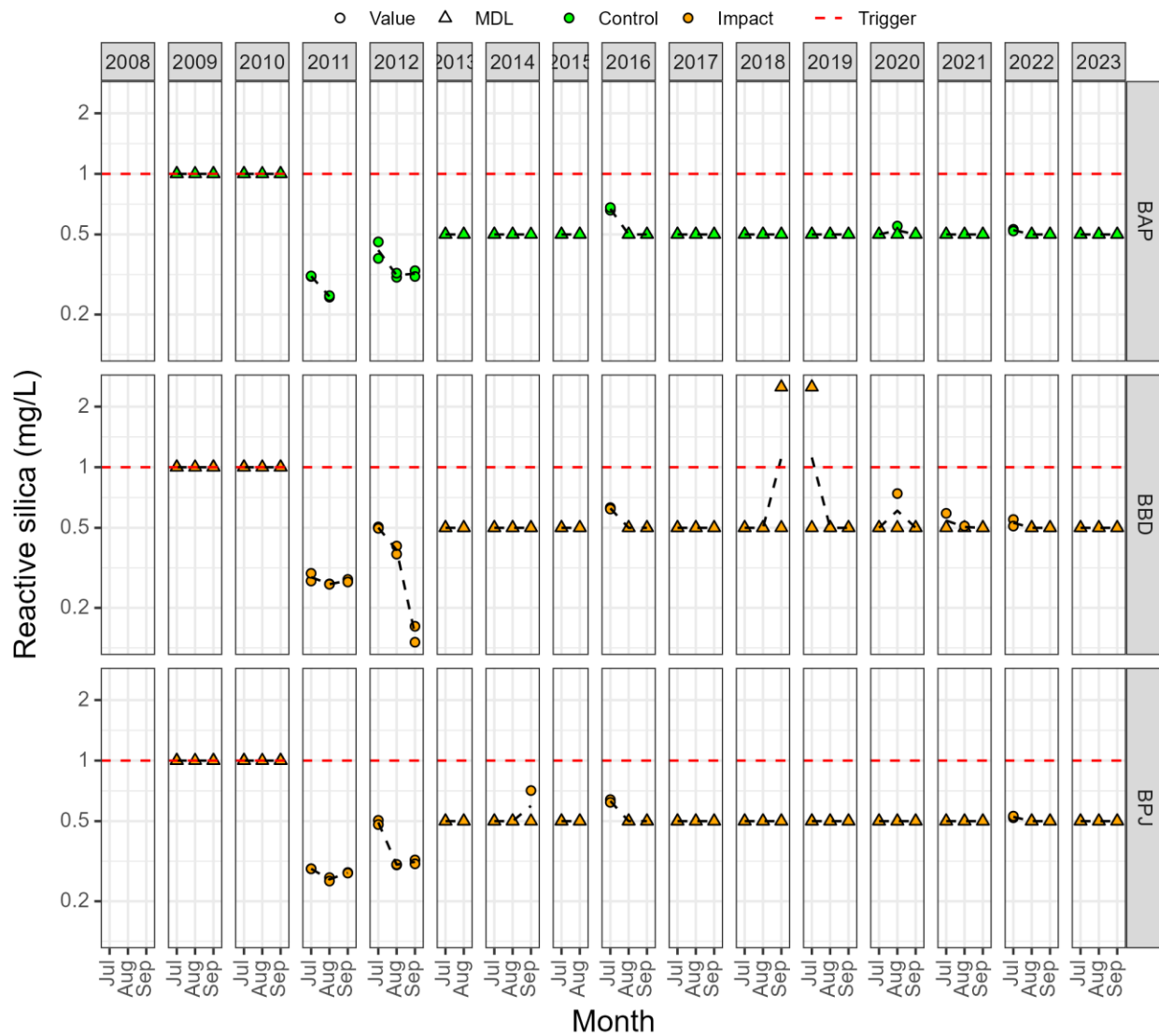


Figure B3-19. Sulphate (mg/L).

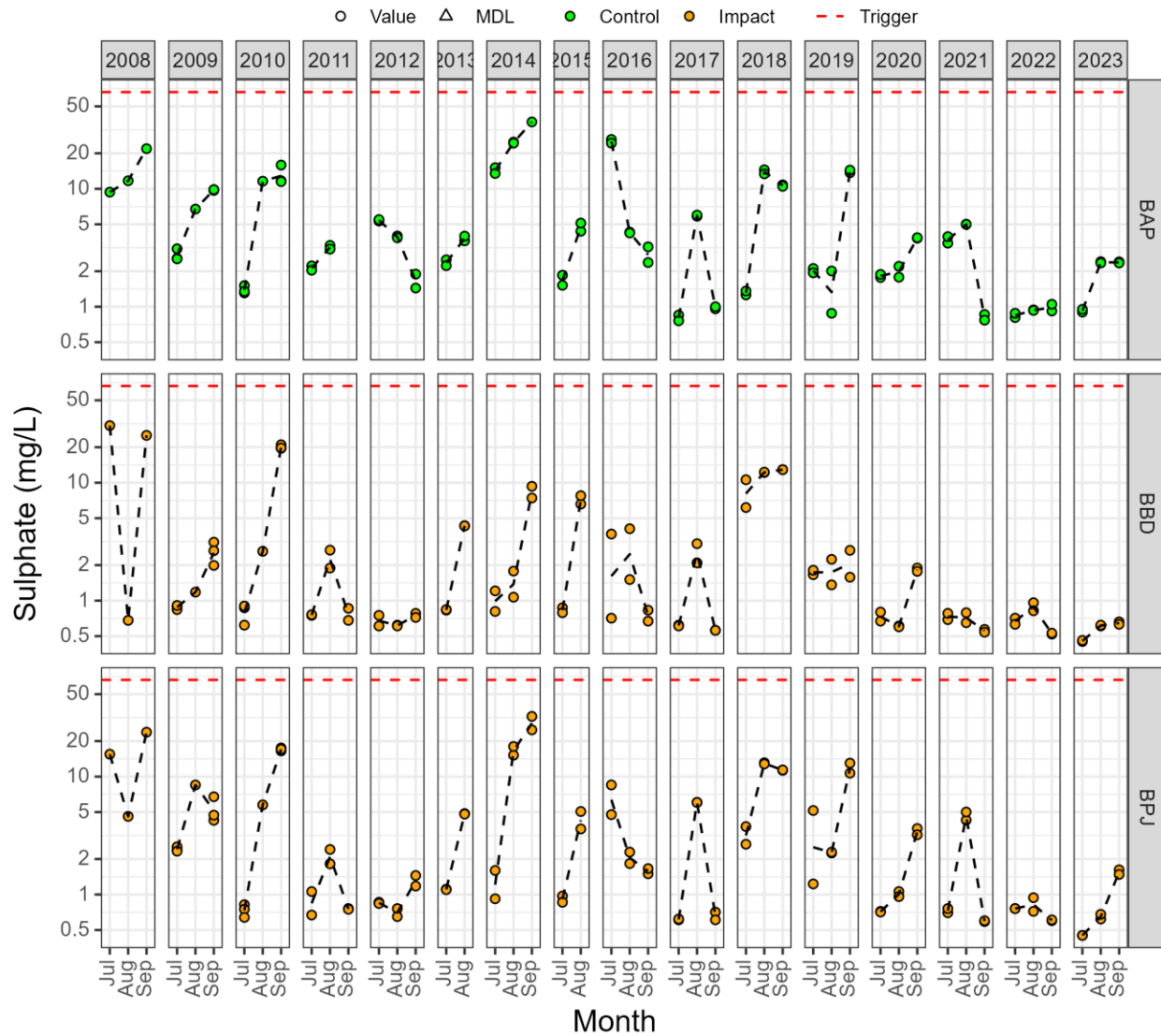


Figure B3-20. Dissolved organic carbon (DOC; mg/L).

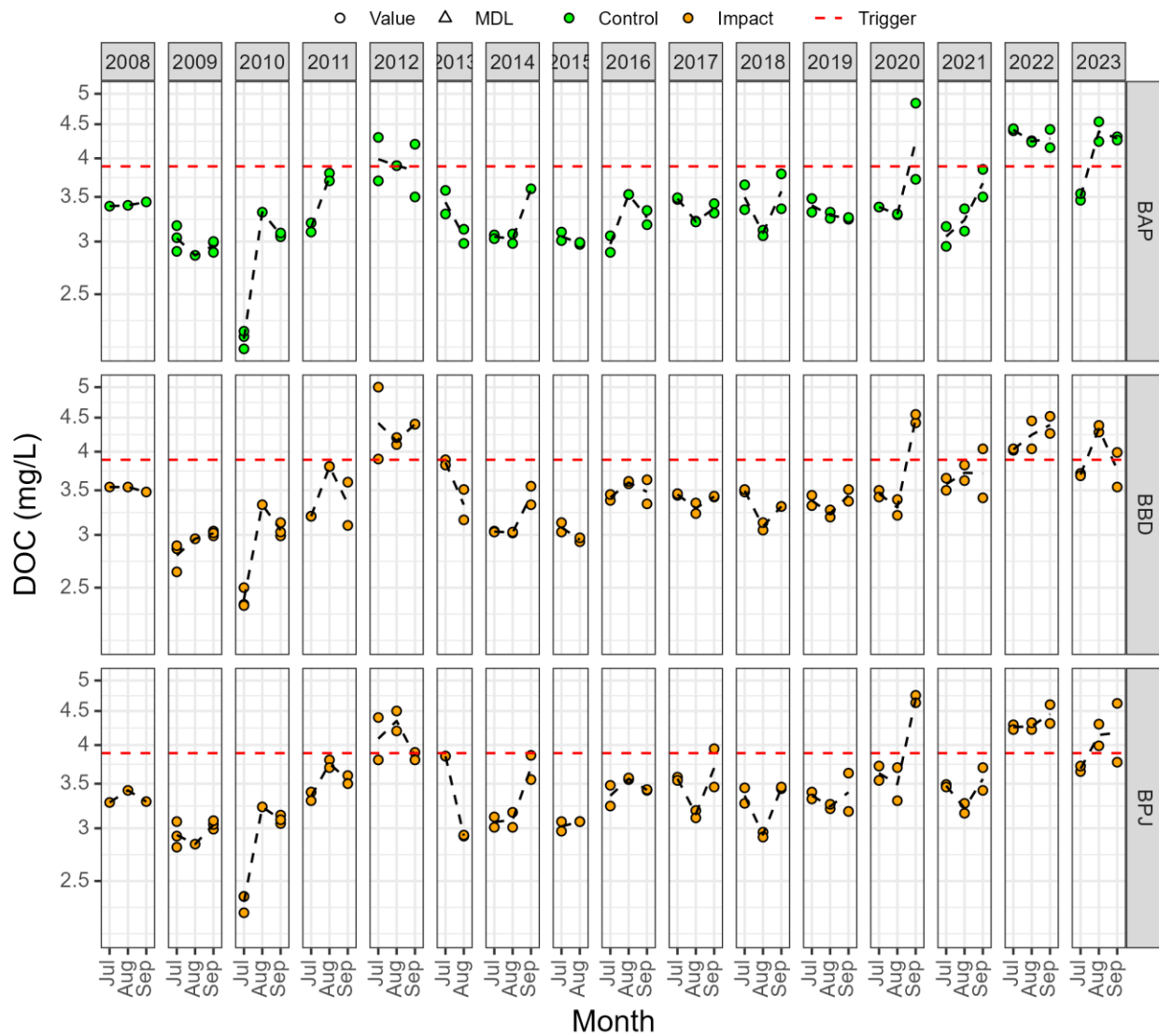


Figure B3-21. Total organic carbon (TOC; mg/L).

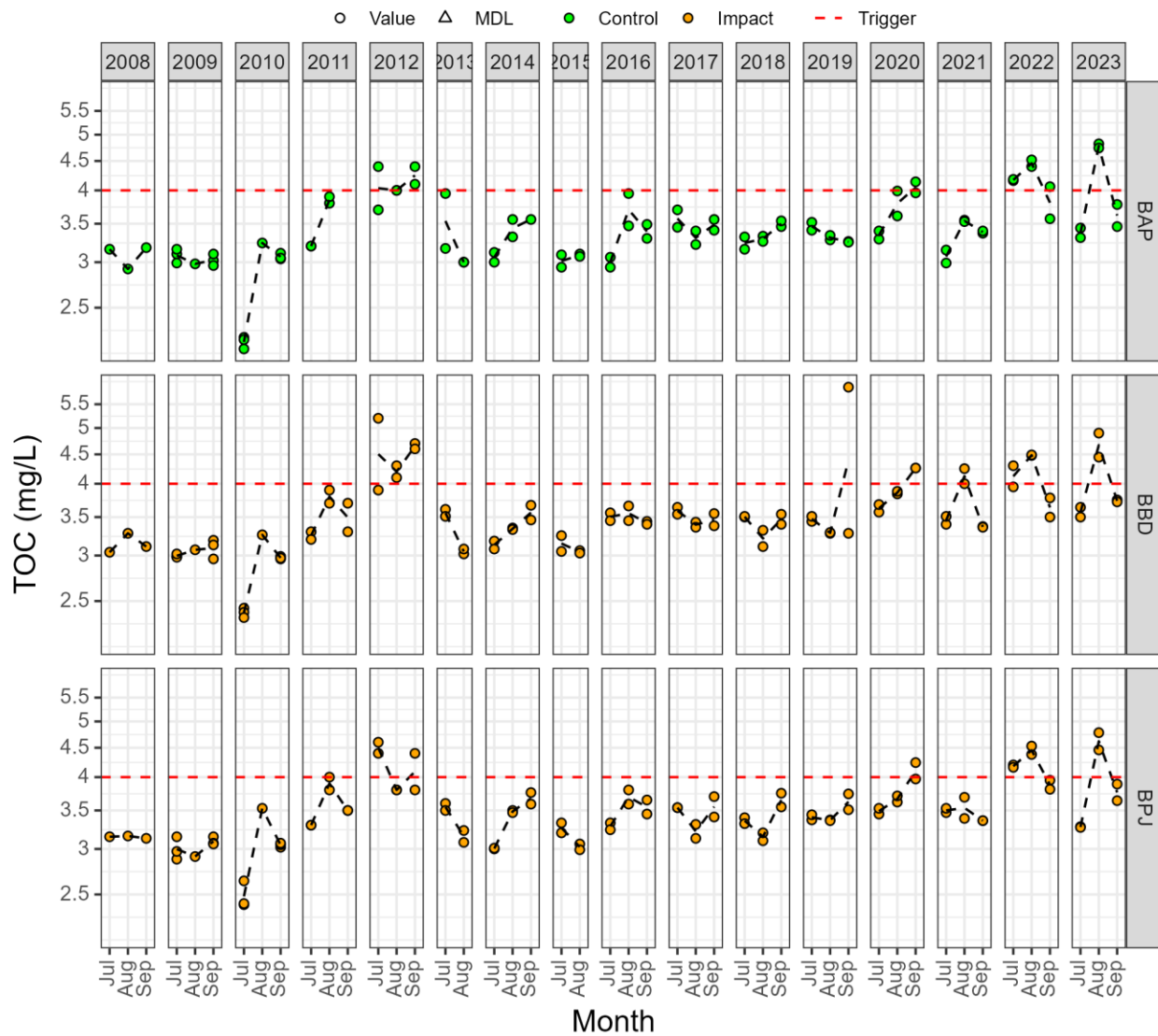


Figure B3-22. Total aluminum (mg/L).

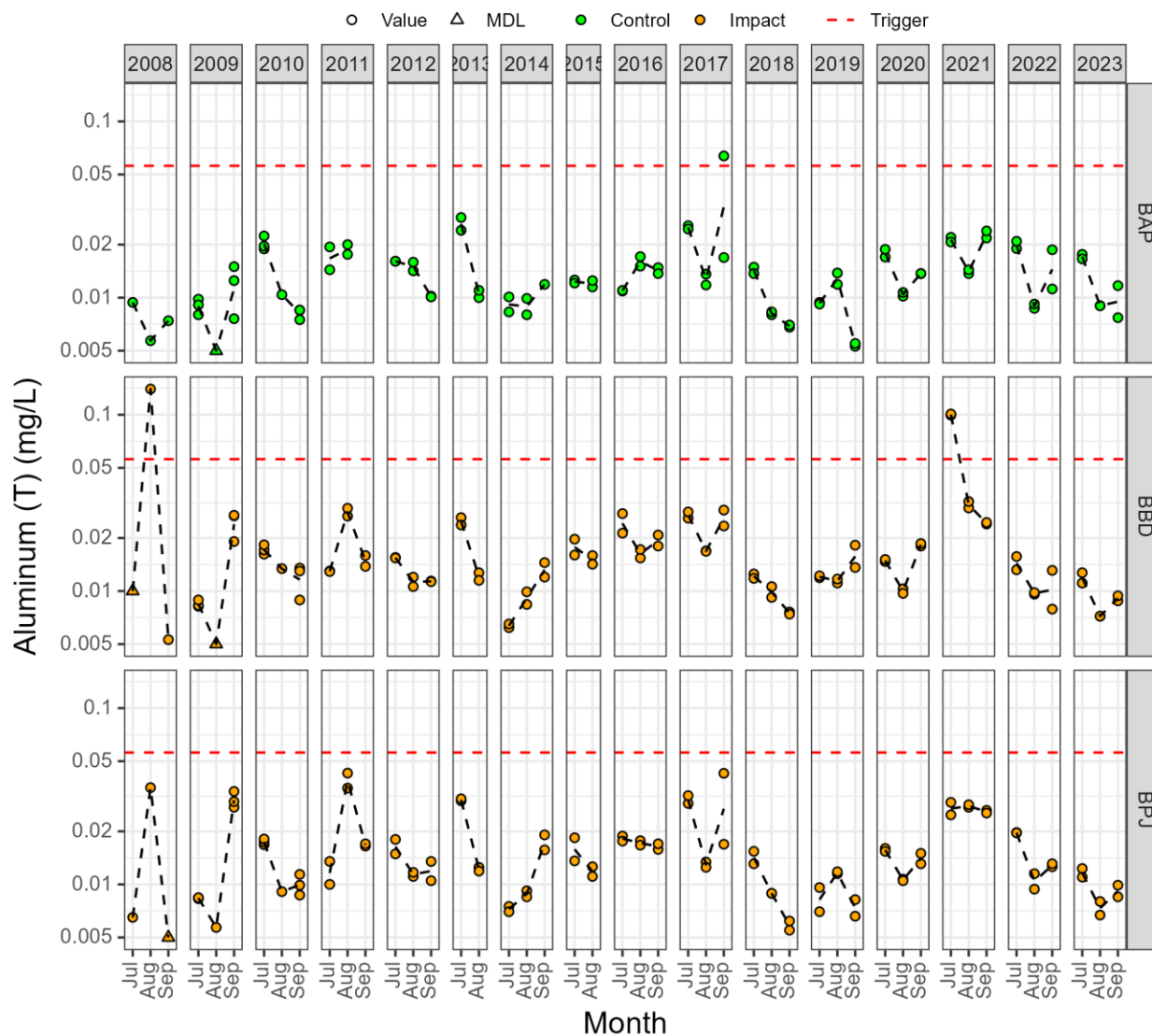


Figure B3-23. Total antimony (mg/L).

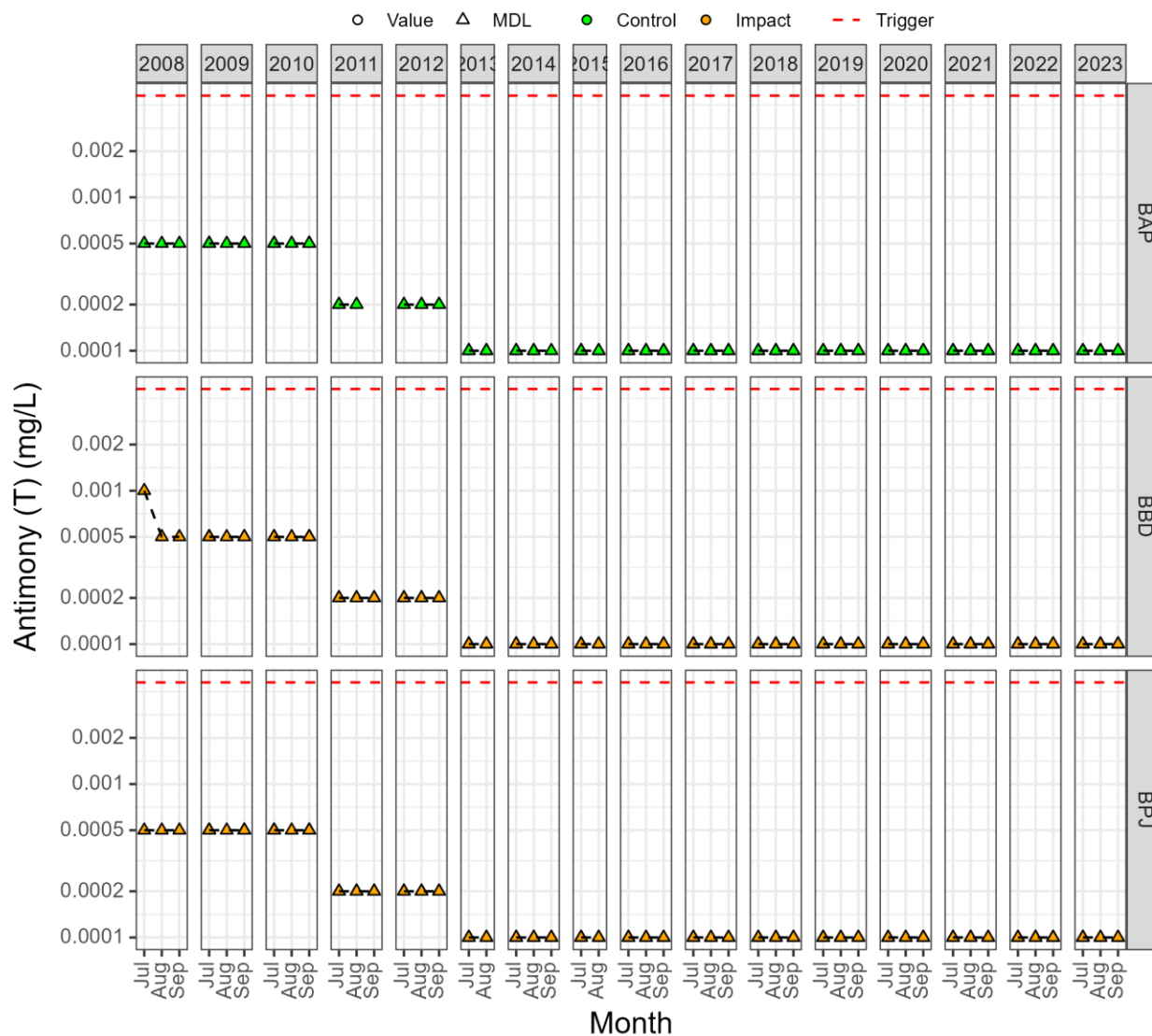


Figure B3-24. Total arsenic (mg/L).

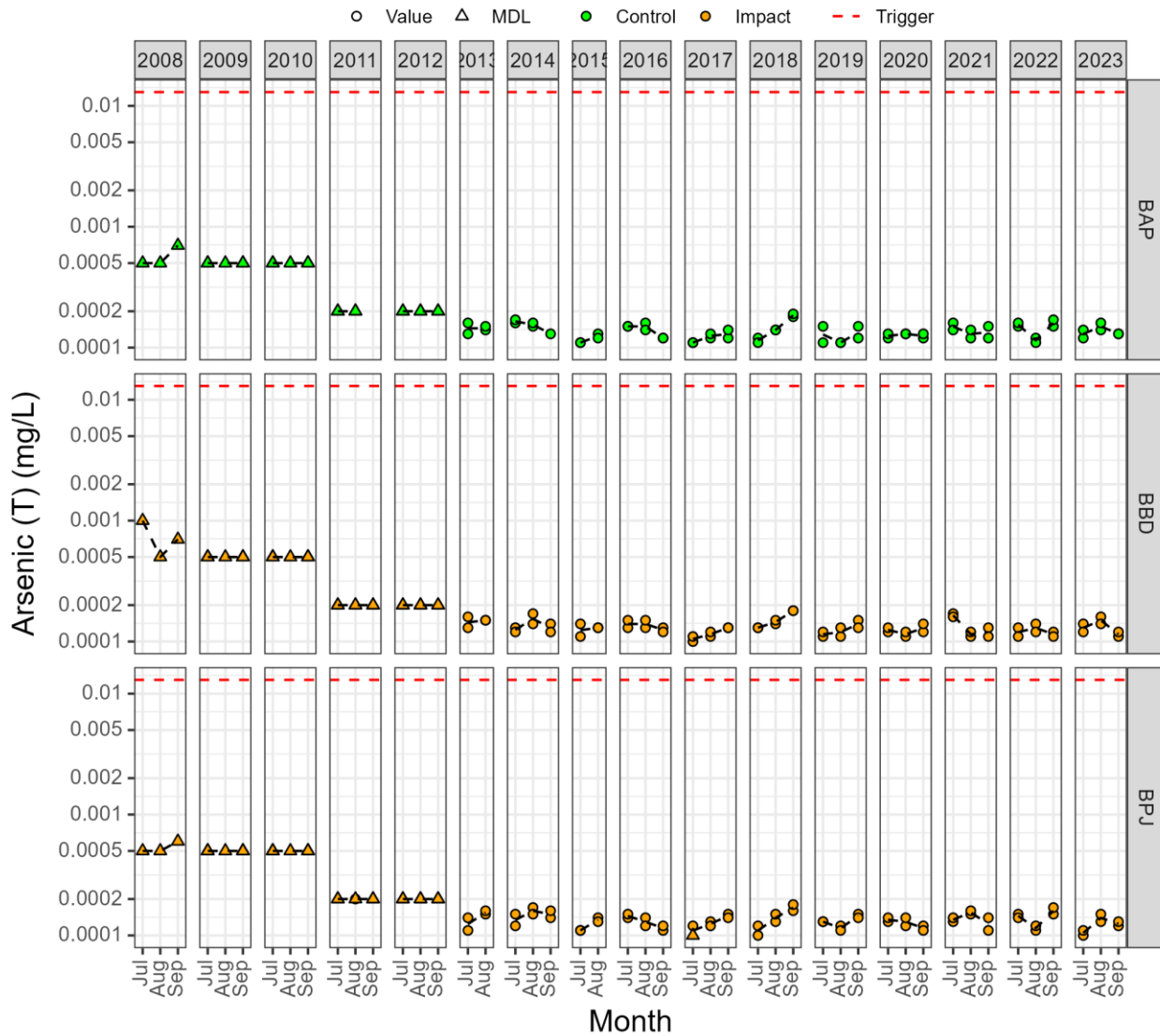


Figure B3-25. Total barium (mg/L).

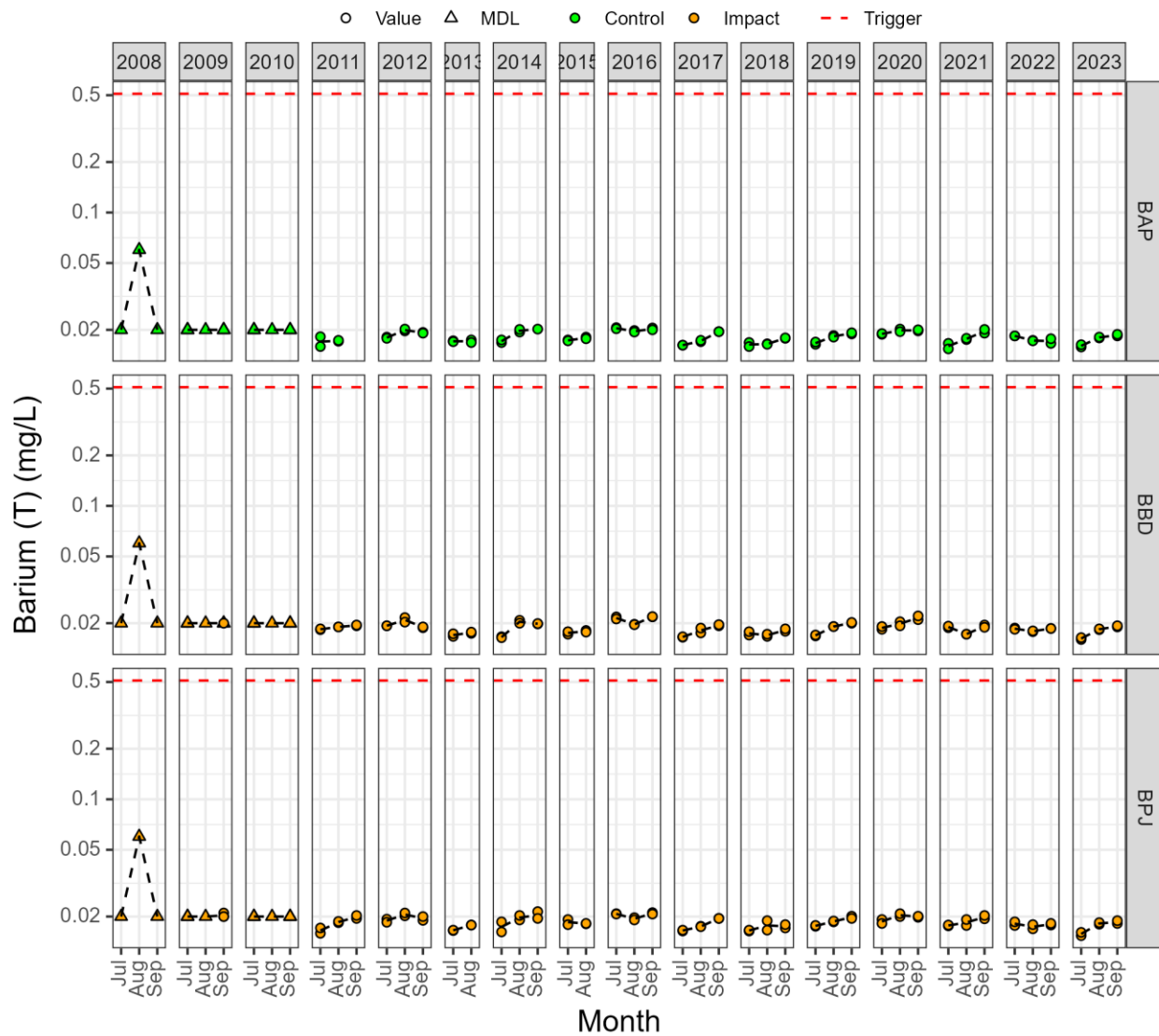


Figure B3-26. Total beryllium (mg/L).

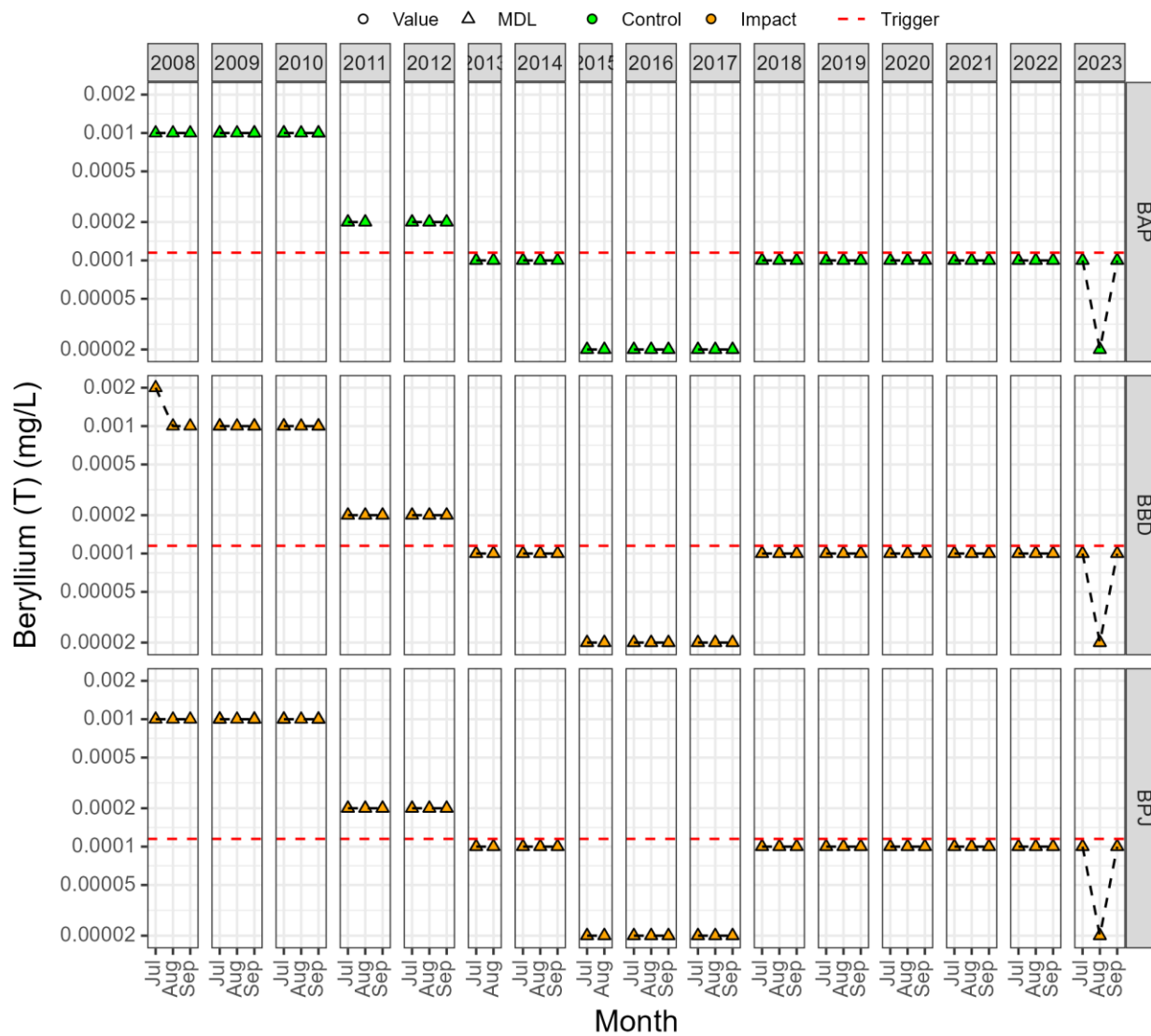


Figure B3-27. Total boron (mg/L).

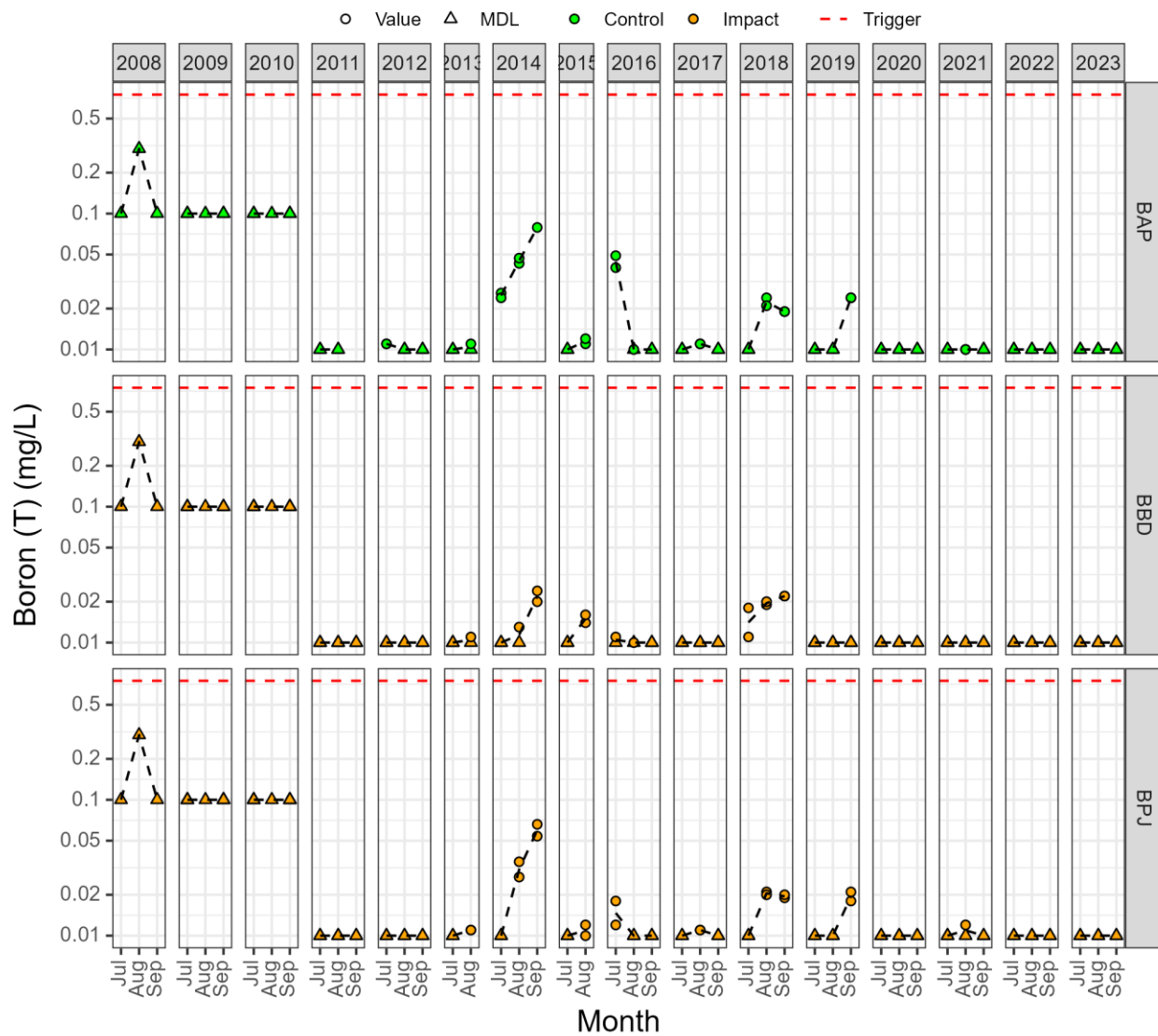


Figure B3-28. Total cadmium (mg/L).

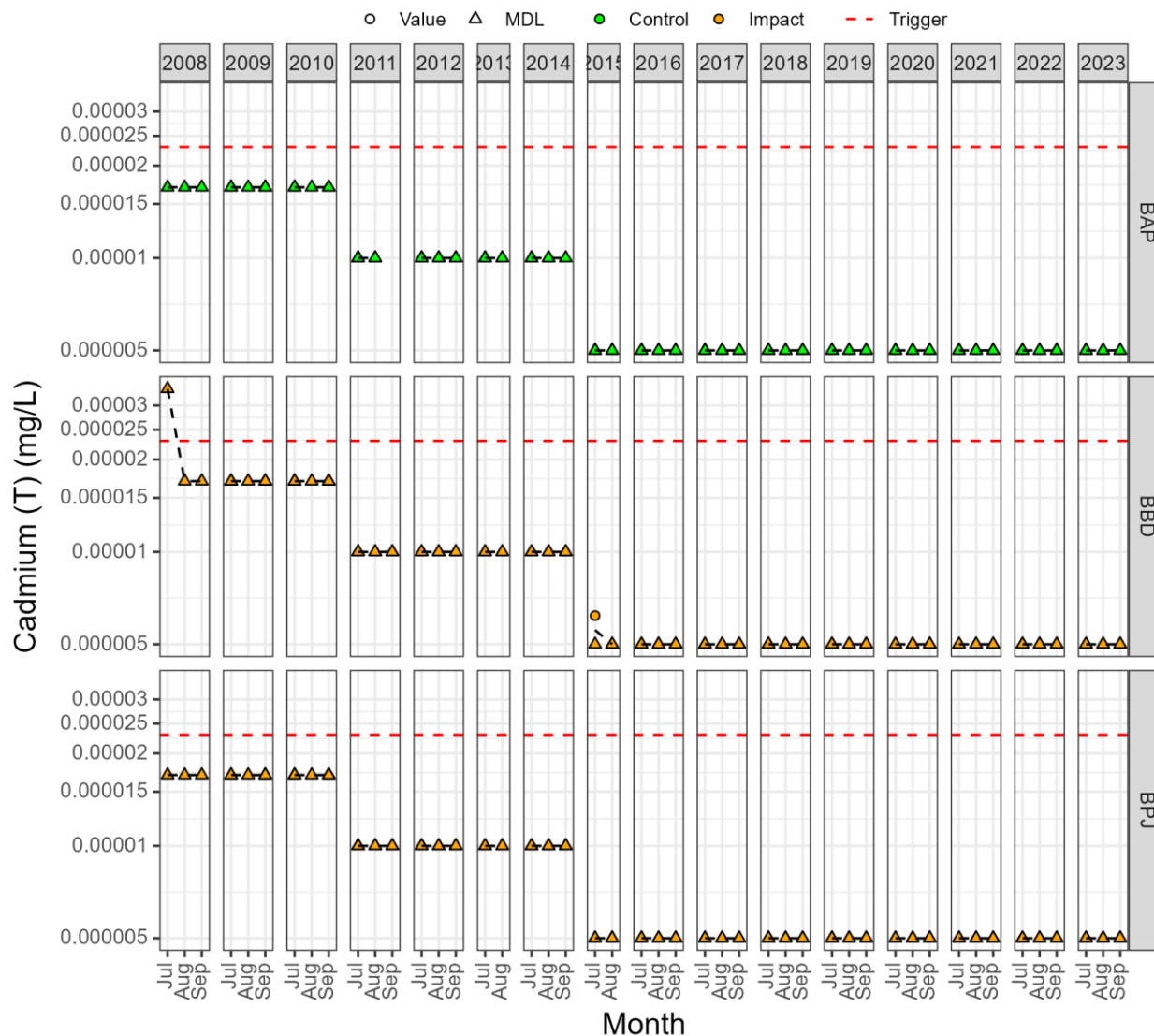


Figure B3-29. Total calcium (mg/L).

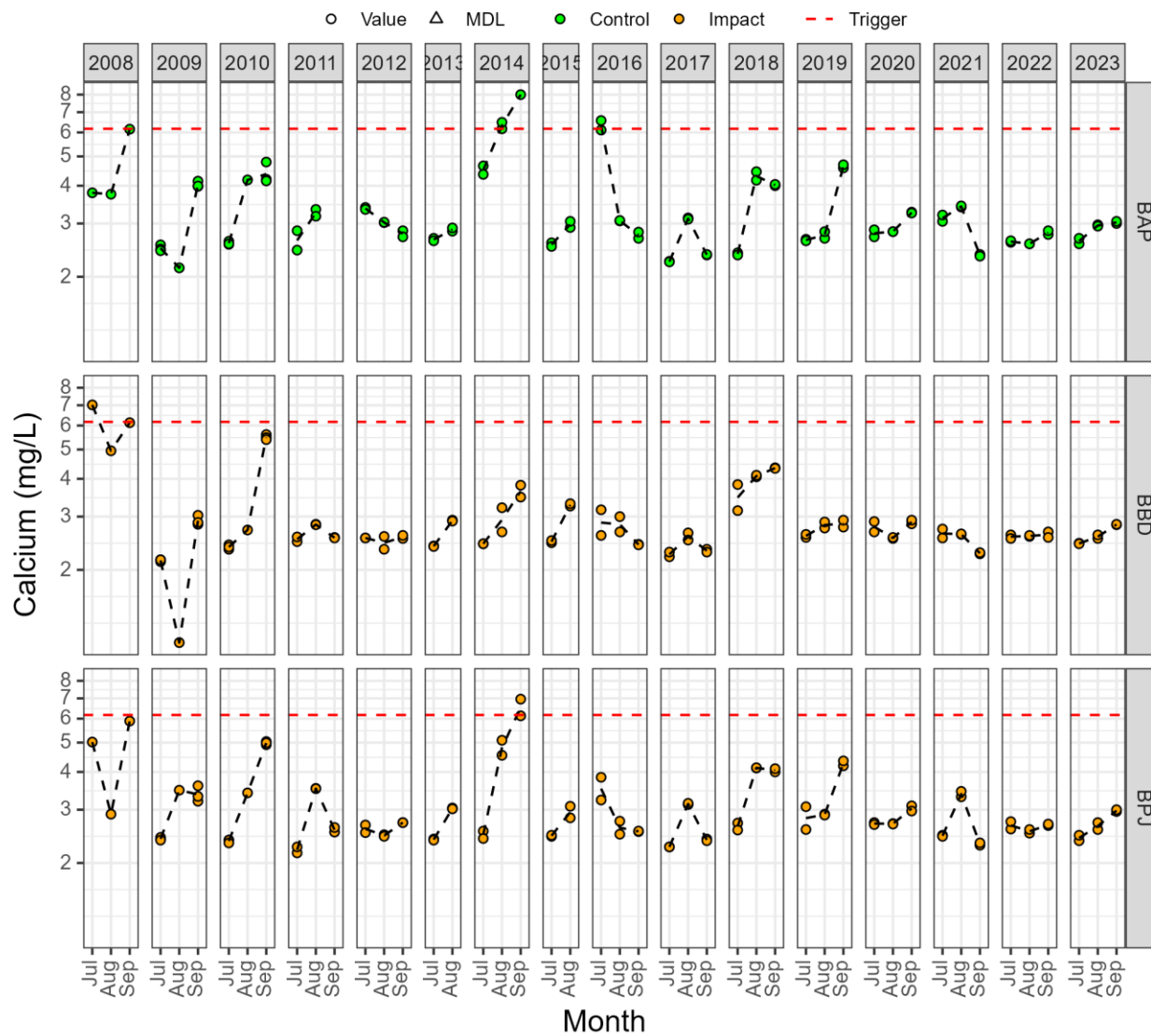


Figure B3-30. Total chromium (mg/L).

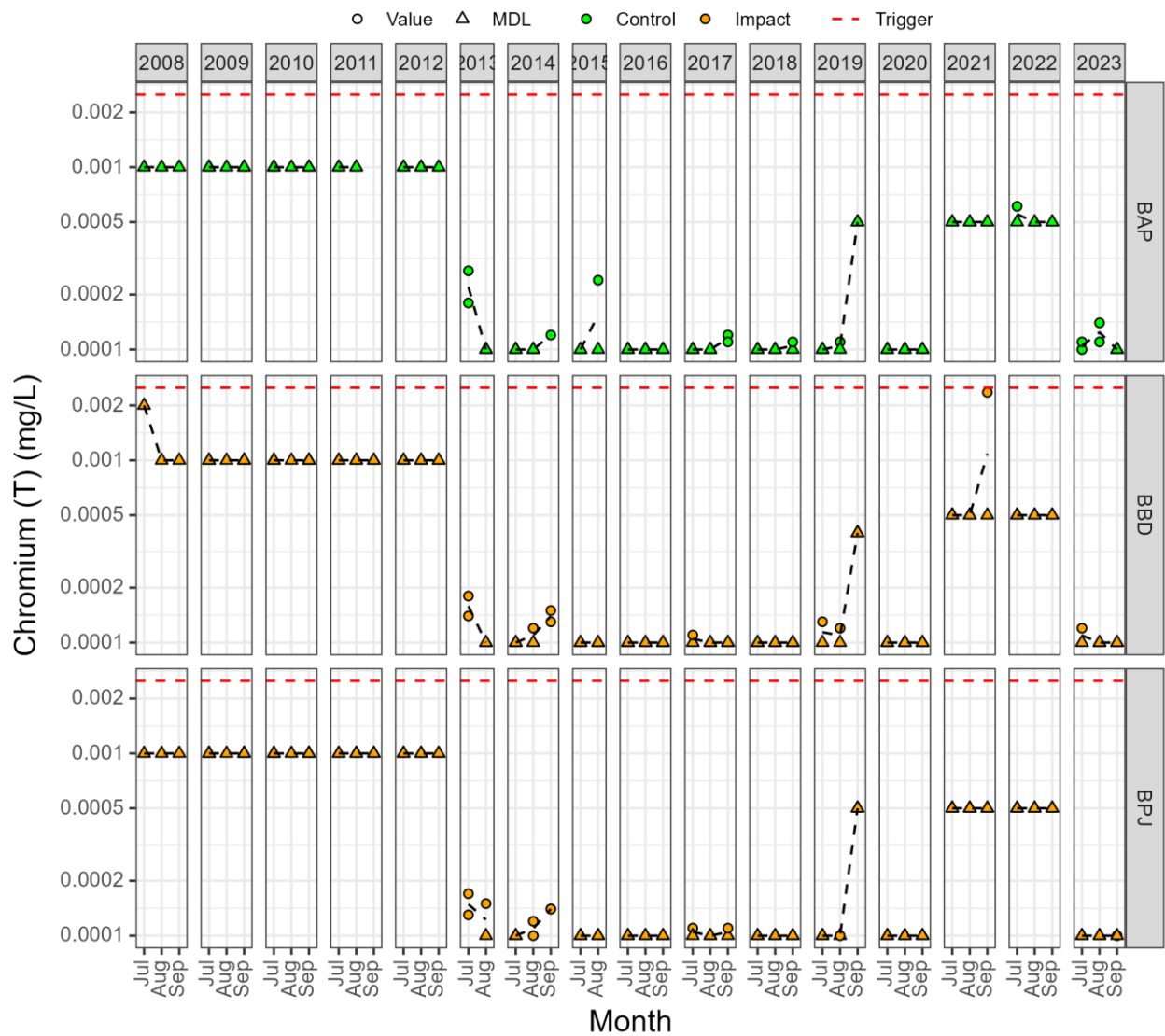


Figure B3-31. Total copper (mg/L).

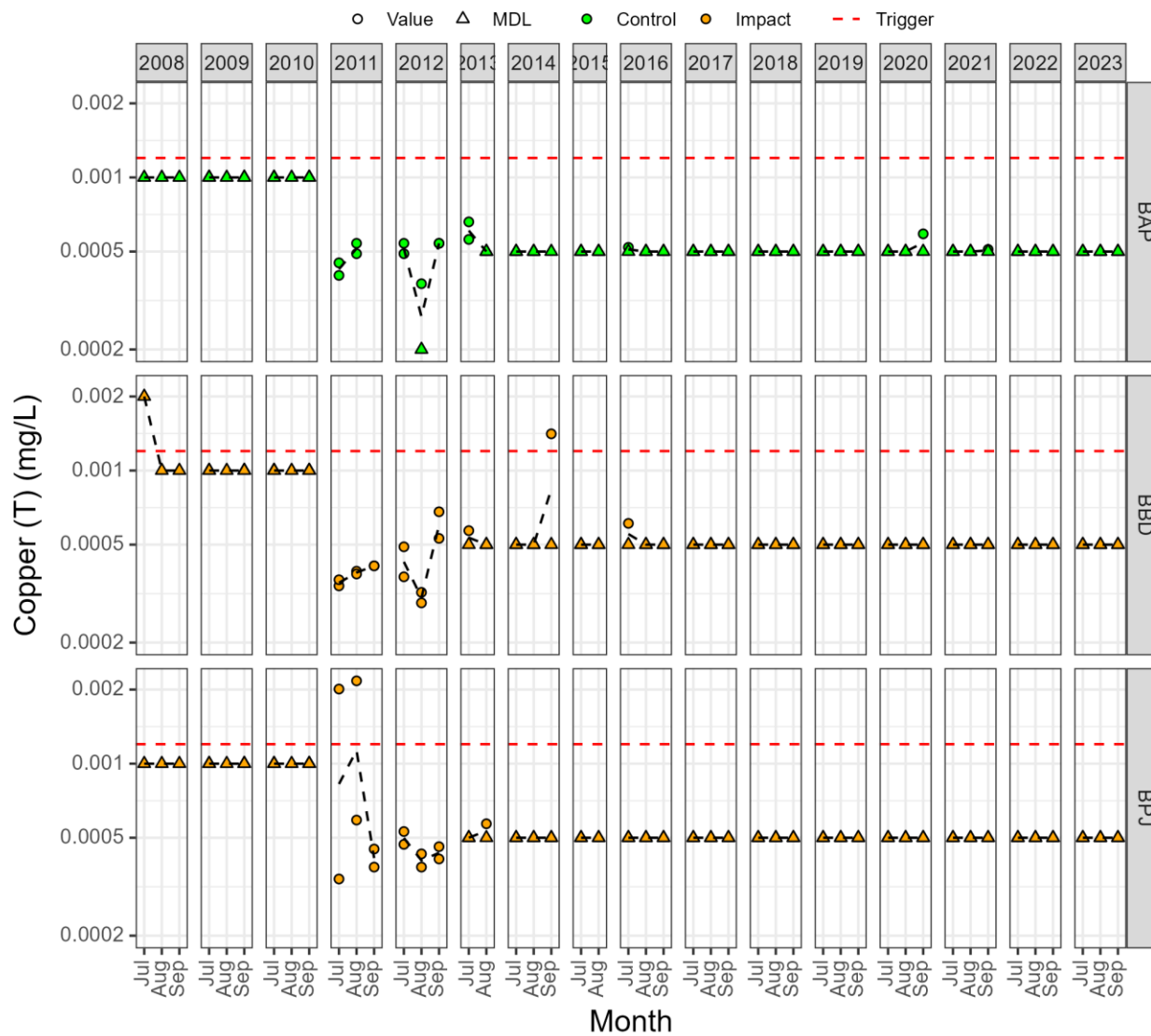


Figure B3-32. Total iron (mg/L).

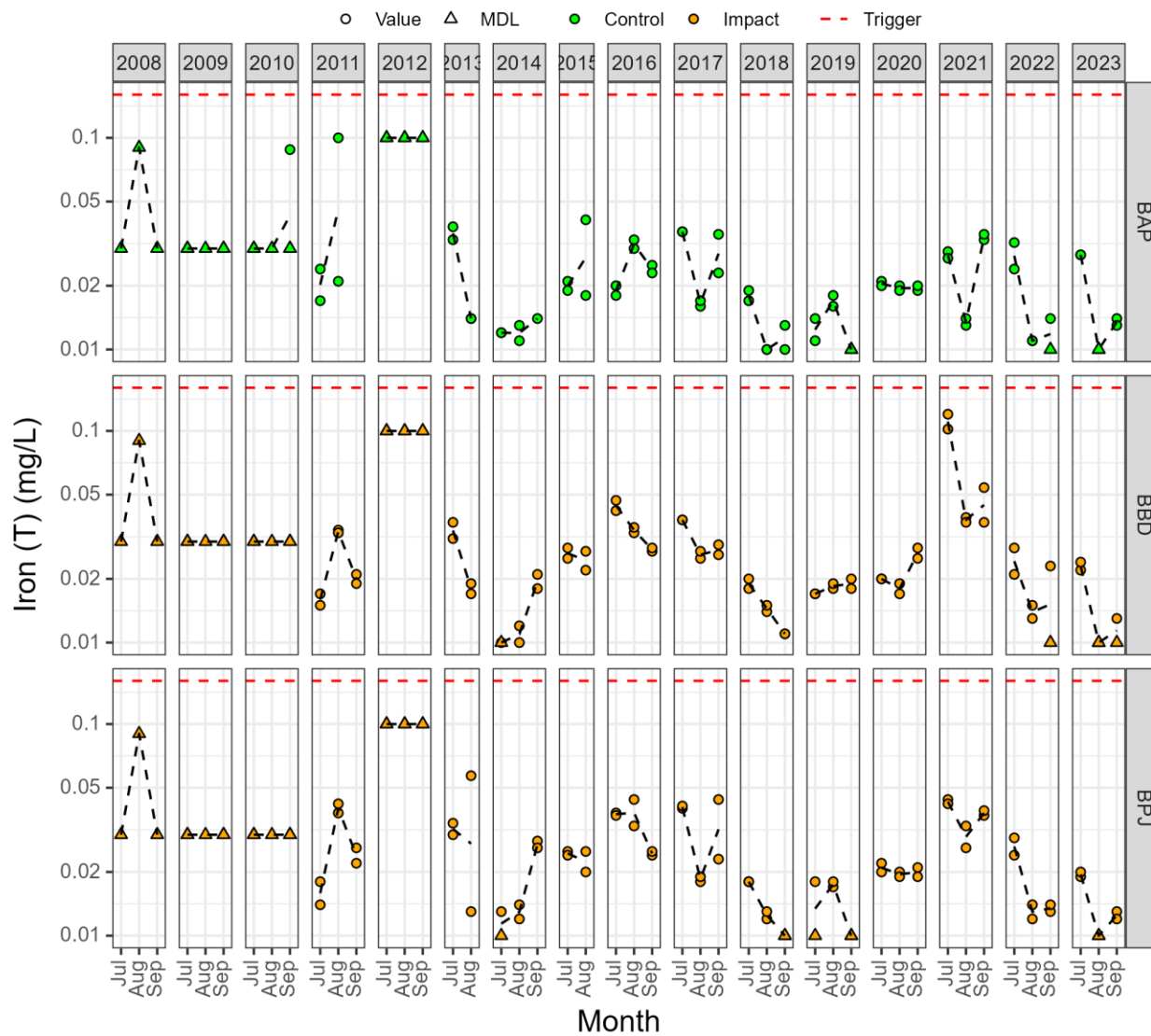


Figure B3-33. Total lead (mg/L).

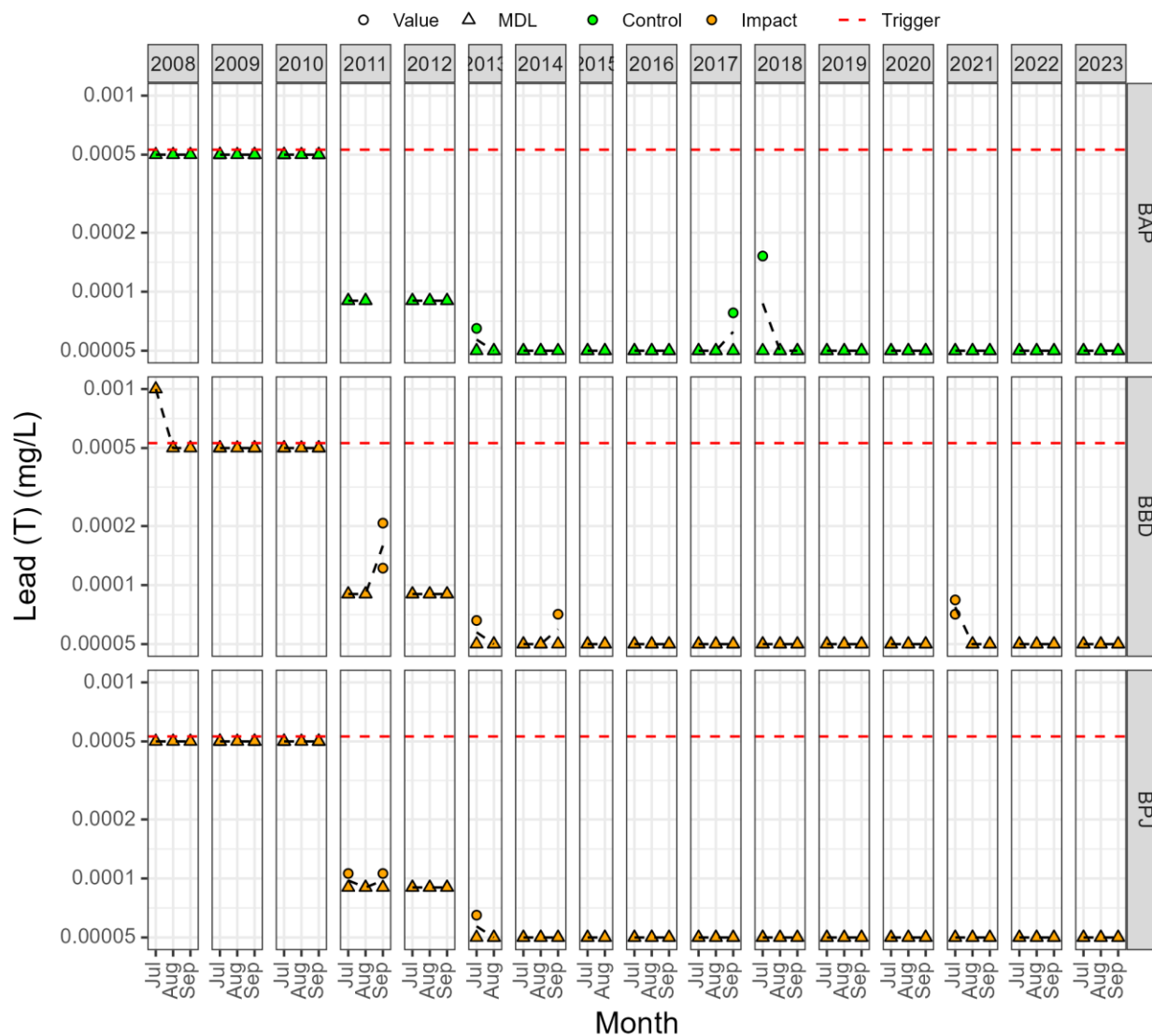


Figure B3-34. Total lithium (mg/L).

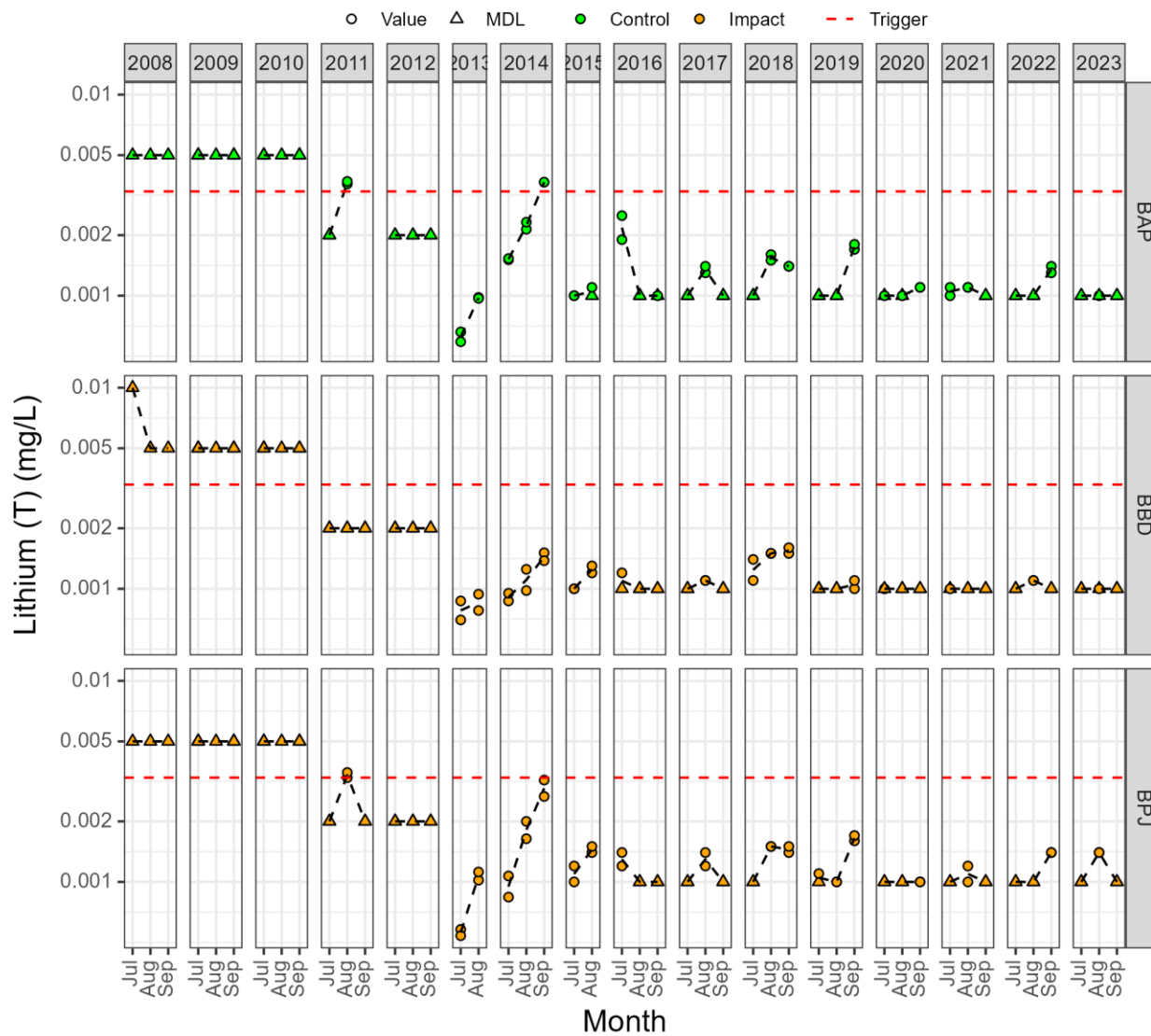


Figure B3-35. Total magnesium (mg/L).

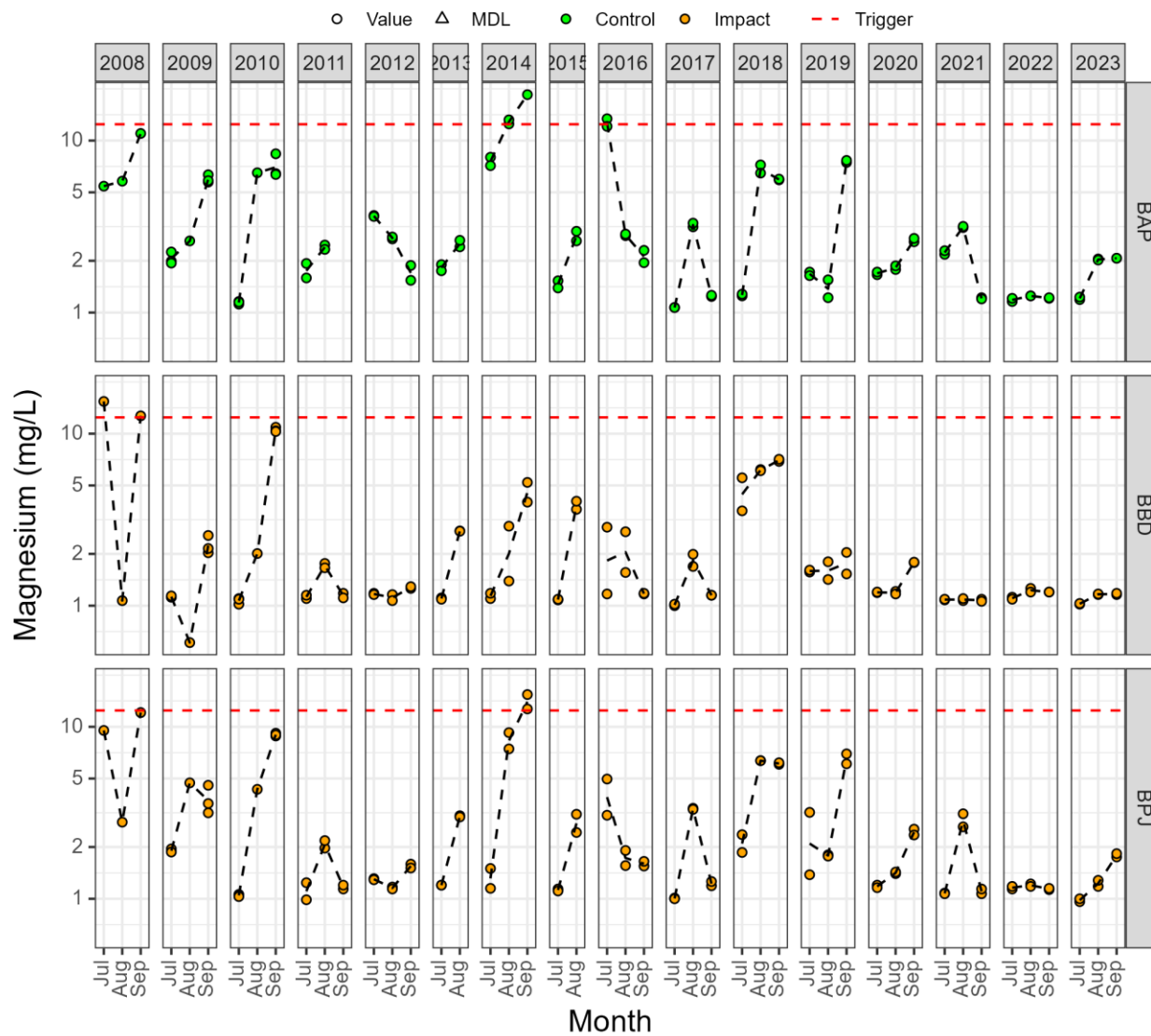


Figure B3-36. Total manganese (mg/L).

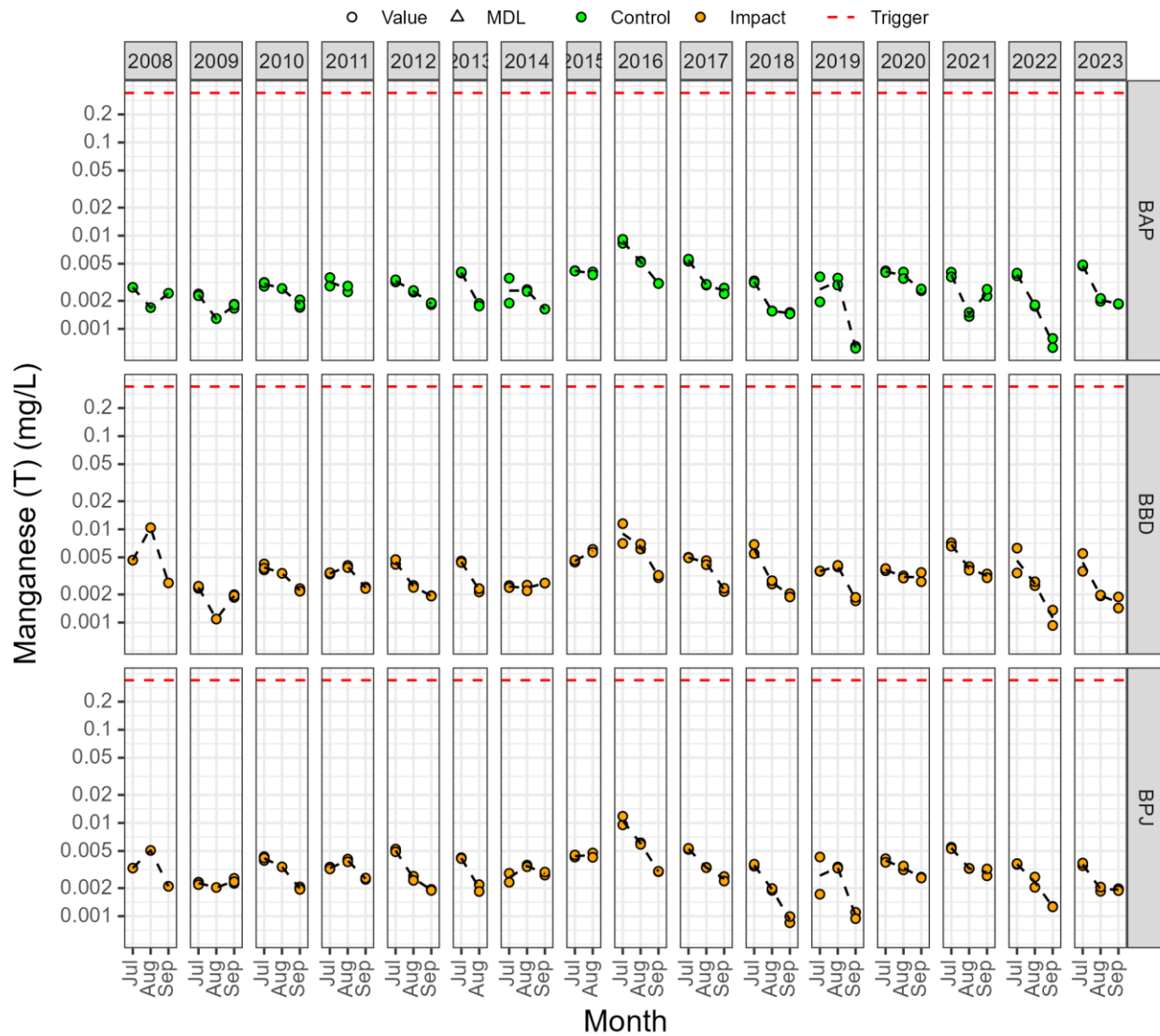


Figure B3-37. Total mercury (mg/L).

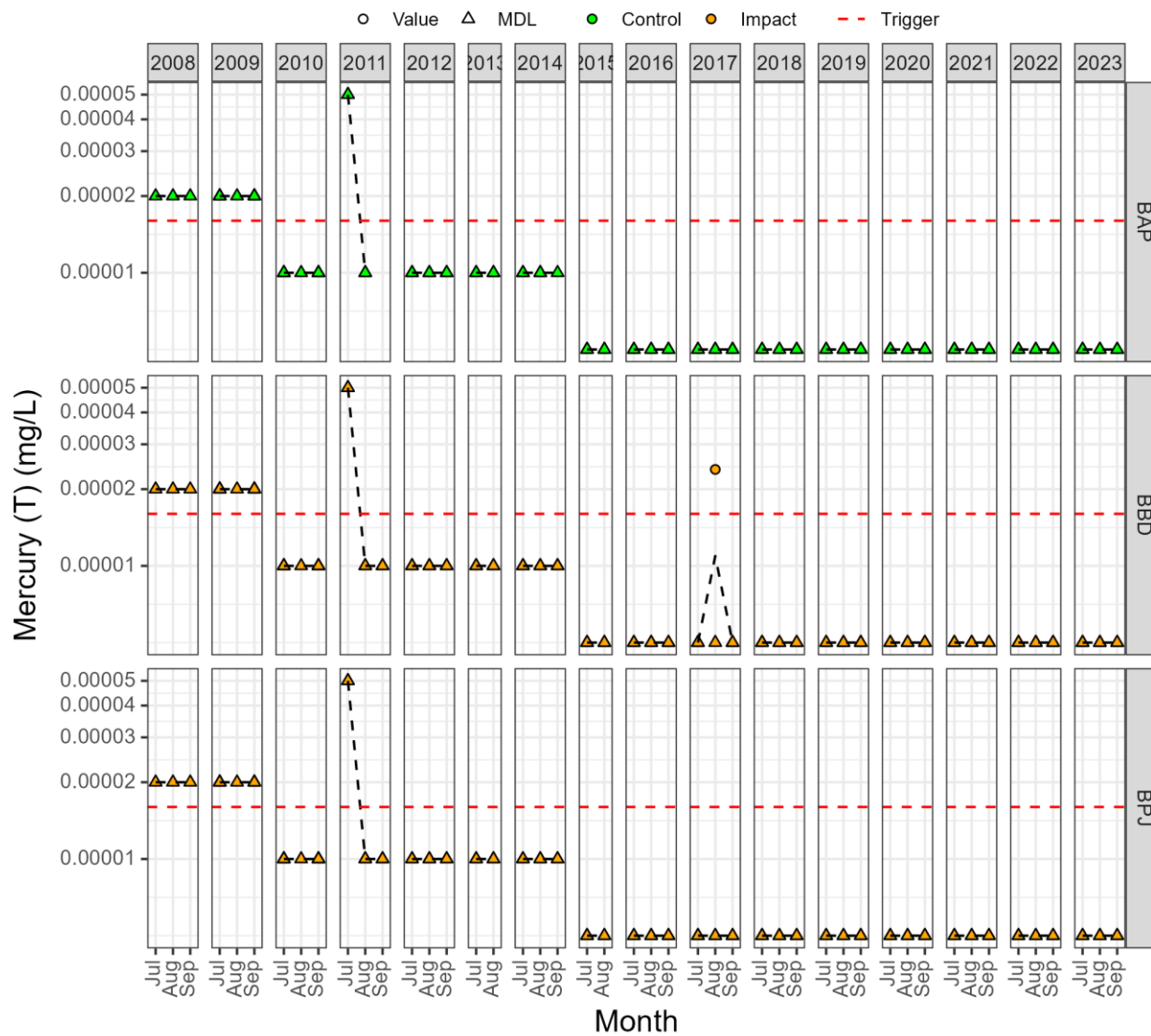


Figure B3-38. Total molybdenum (mg/L).

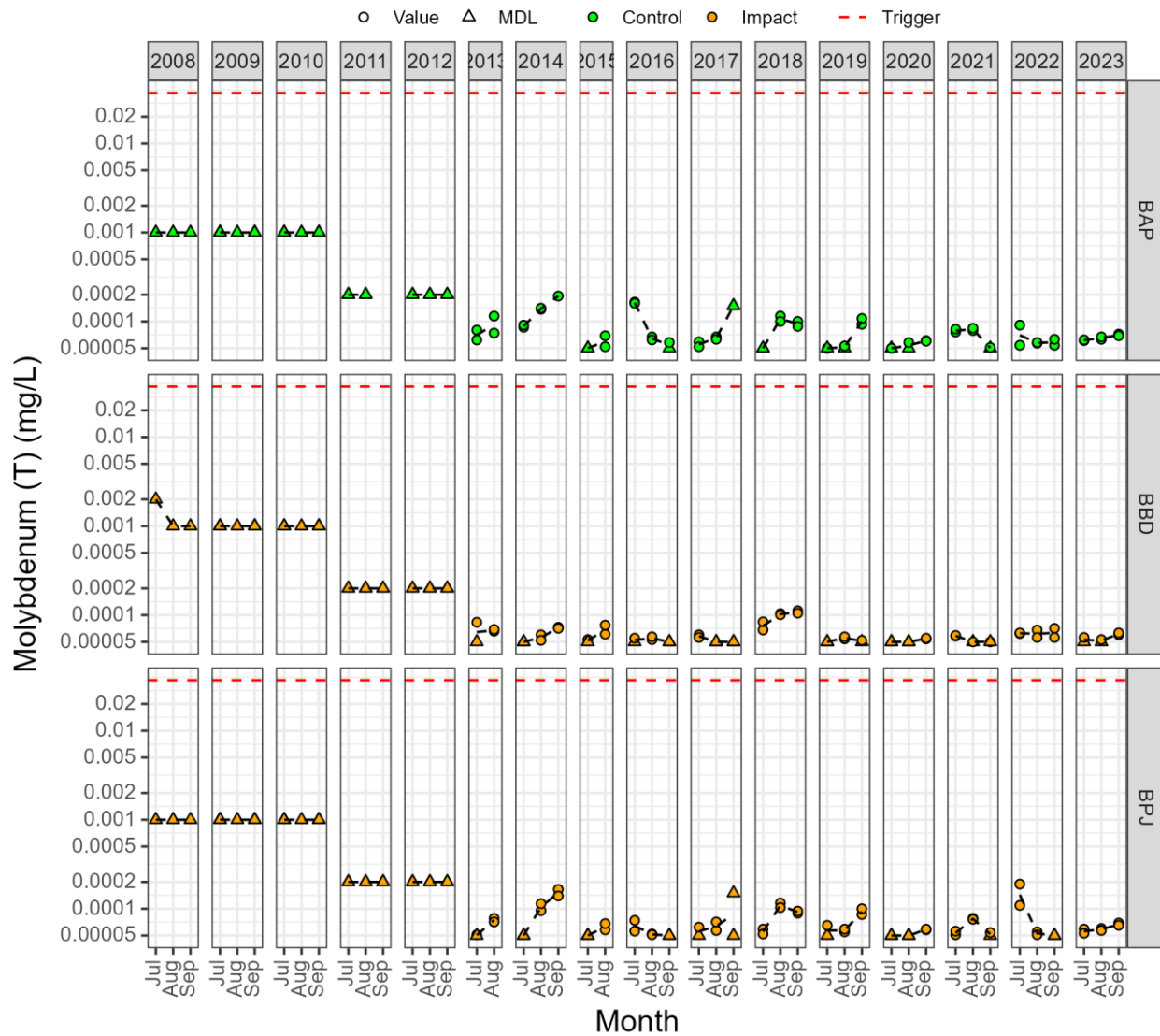


Figure B3-39. Total nickel (mg/L).

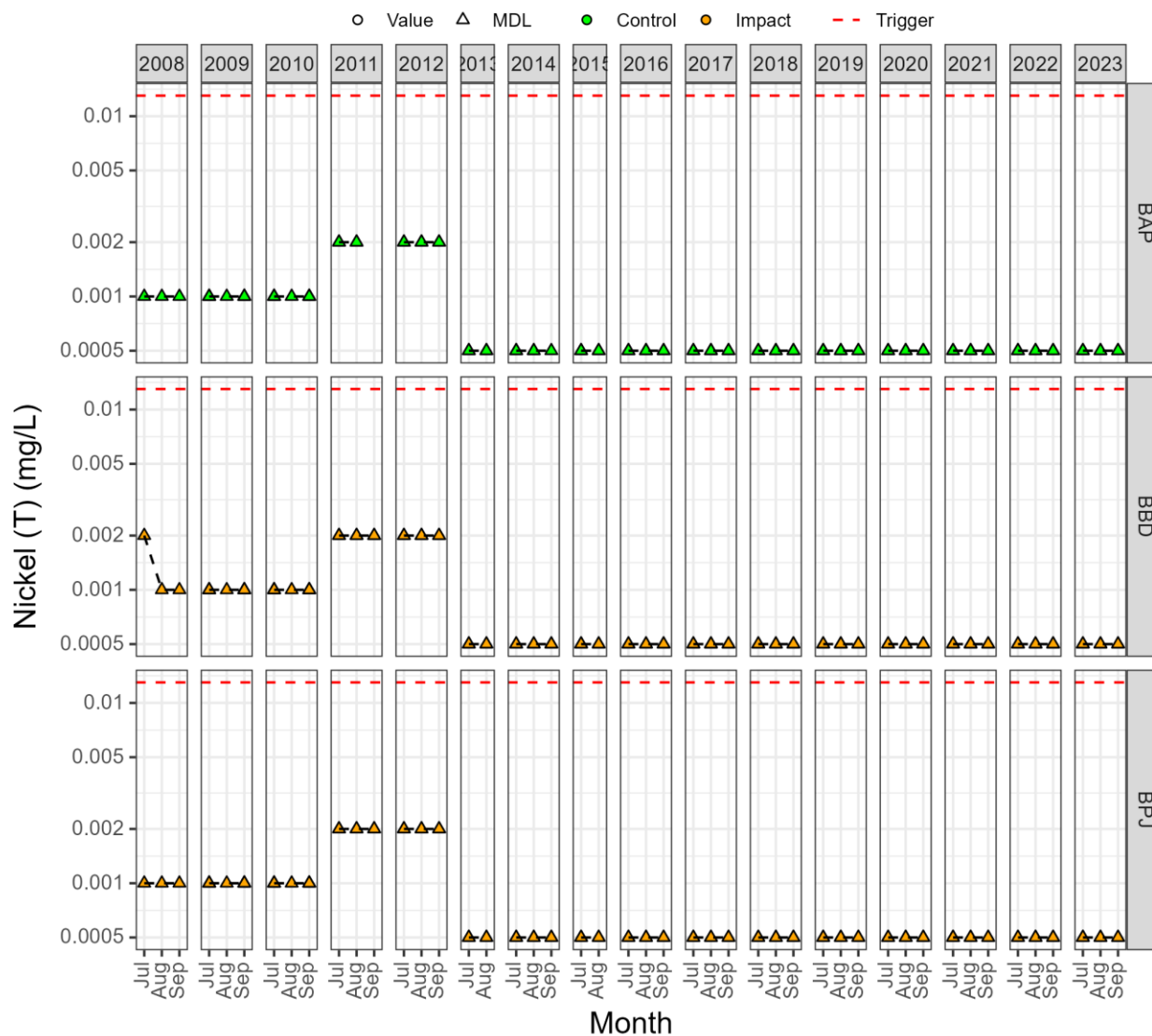


Figure B3-40. Total potassium (mg/L).

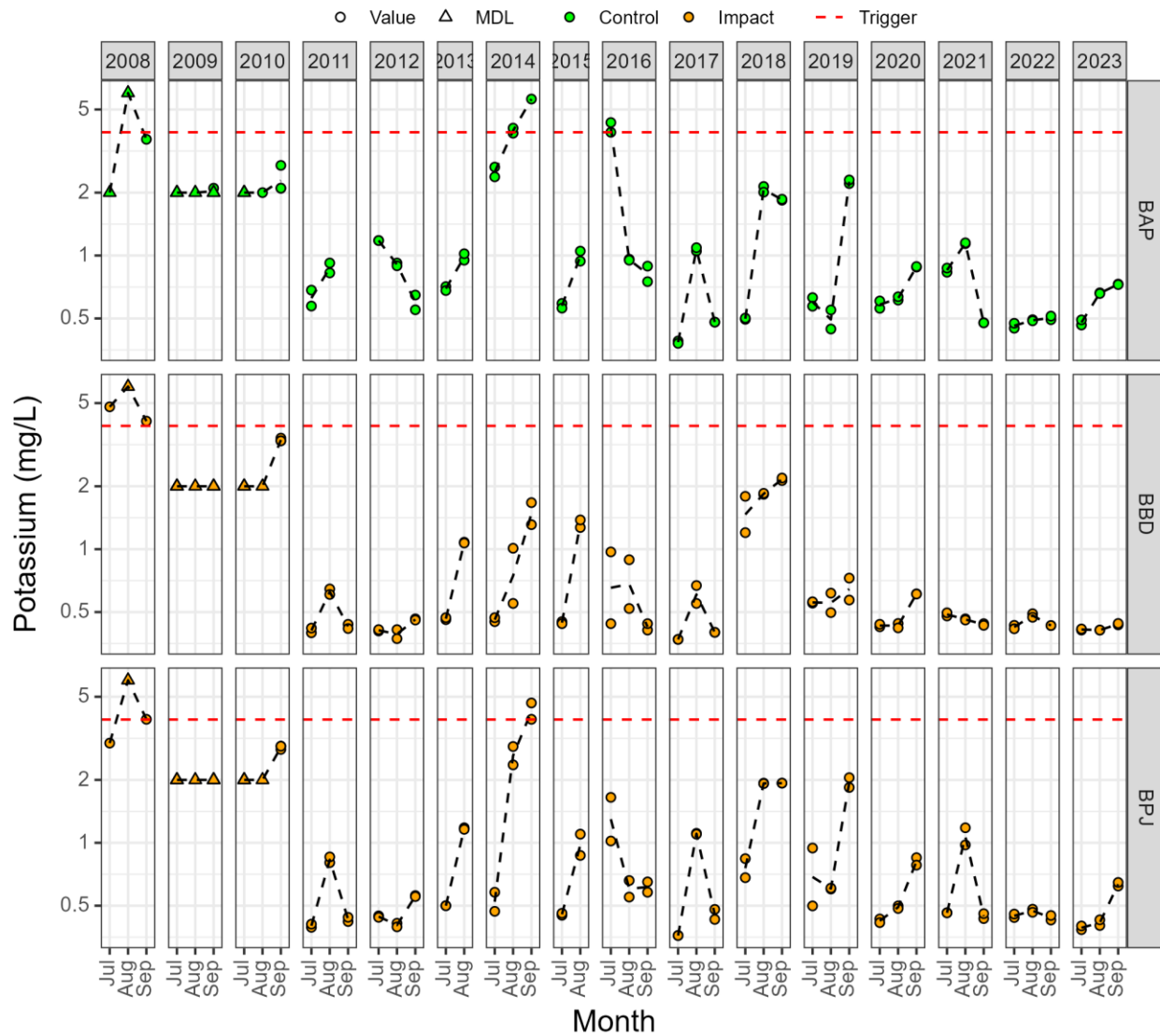


Figure B3-42. Total silicon (mg/L).

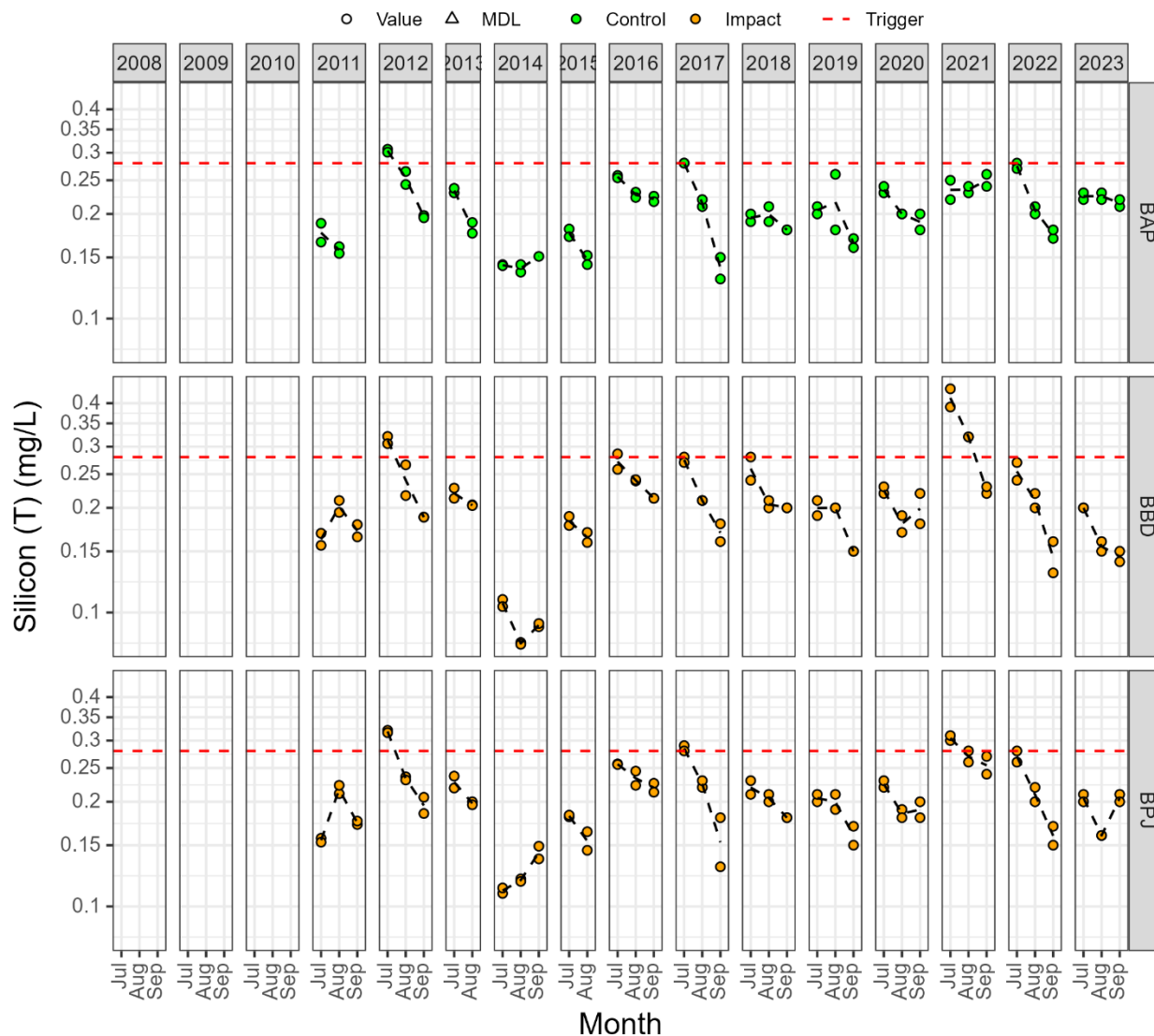


Figure B3-43. Total silver (mg/L).

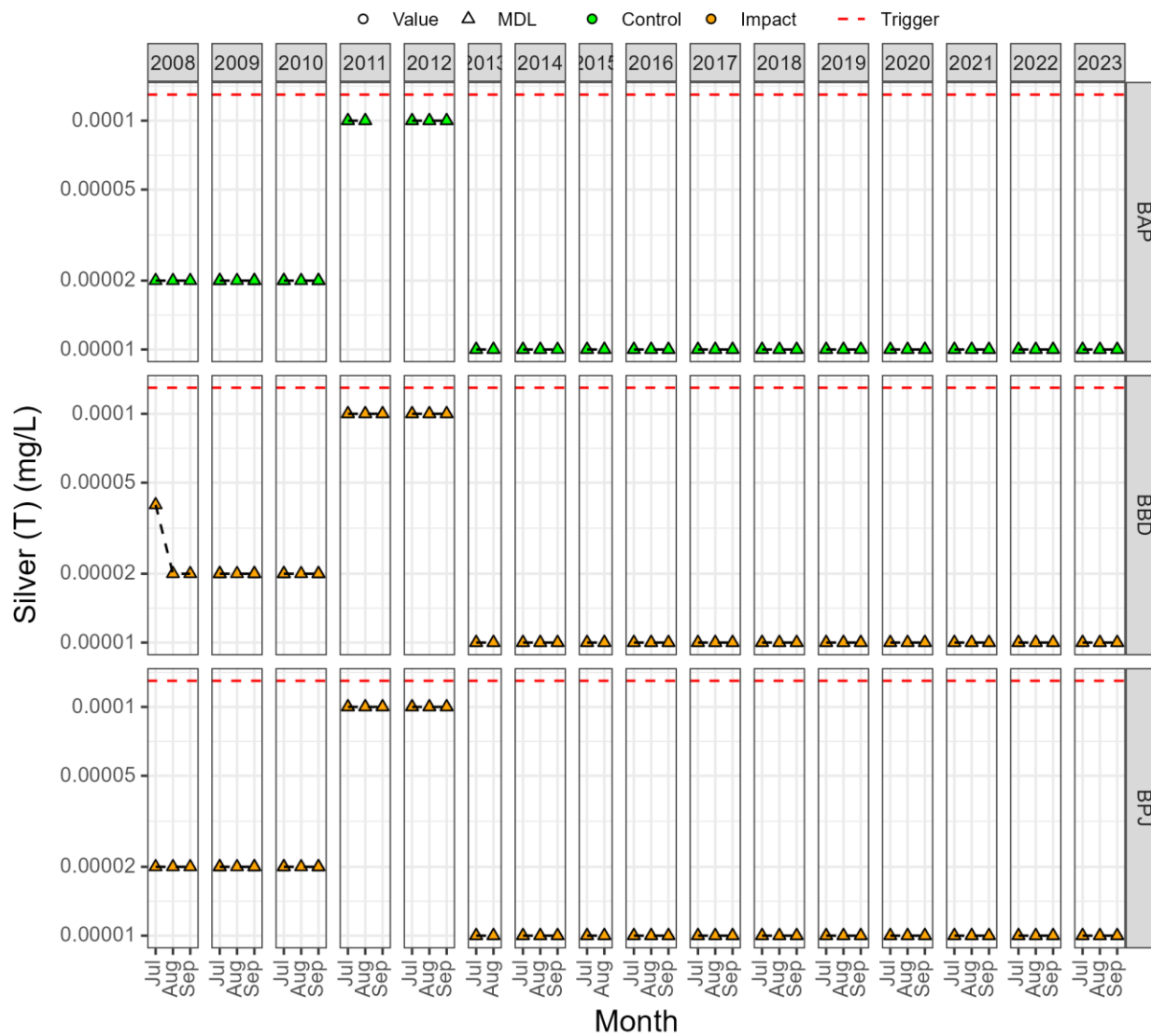


Figure B3-44. Total sodium (mg/L).

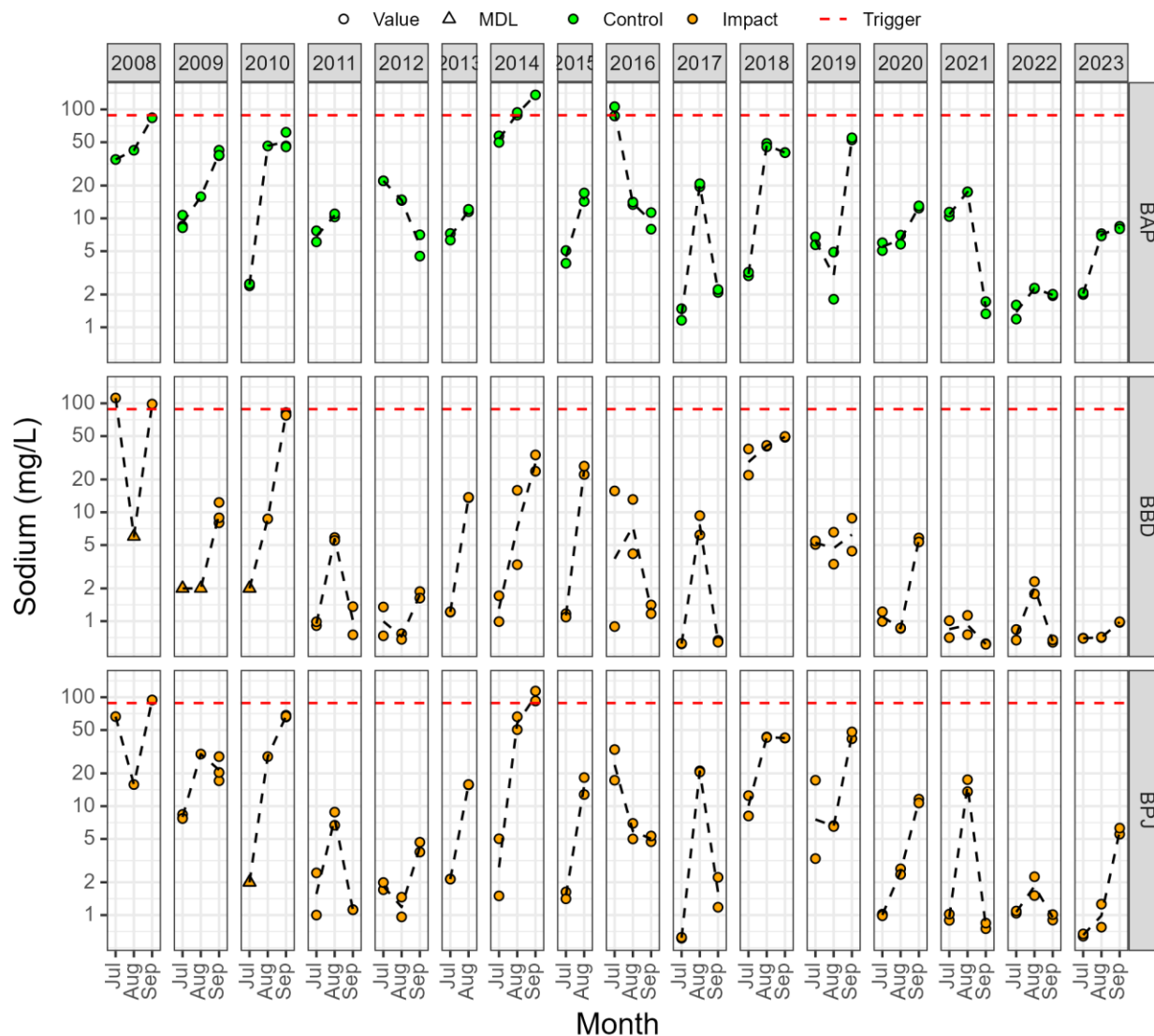


Figure B3-45. Total strontium (mg/L).

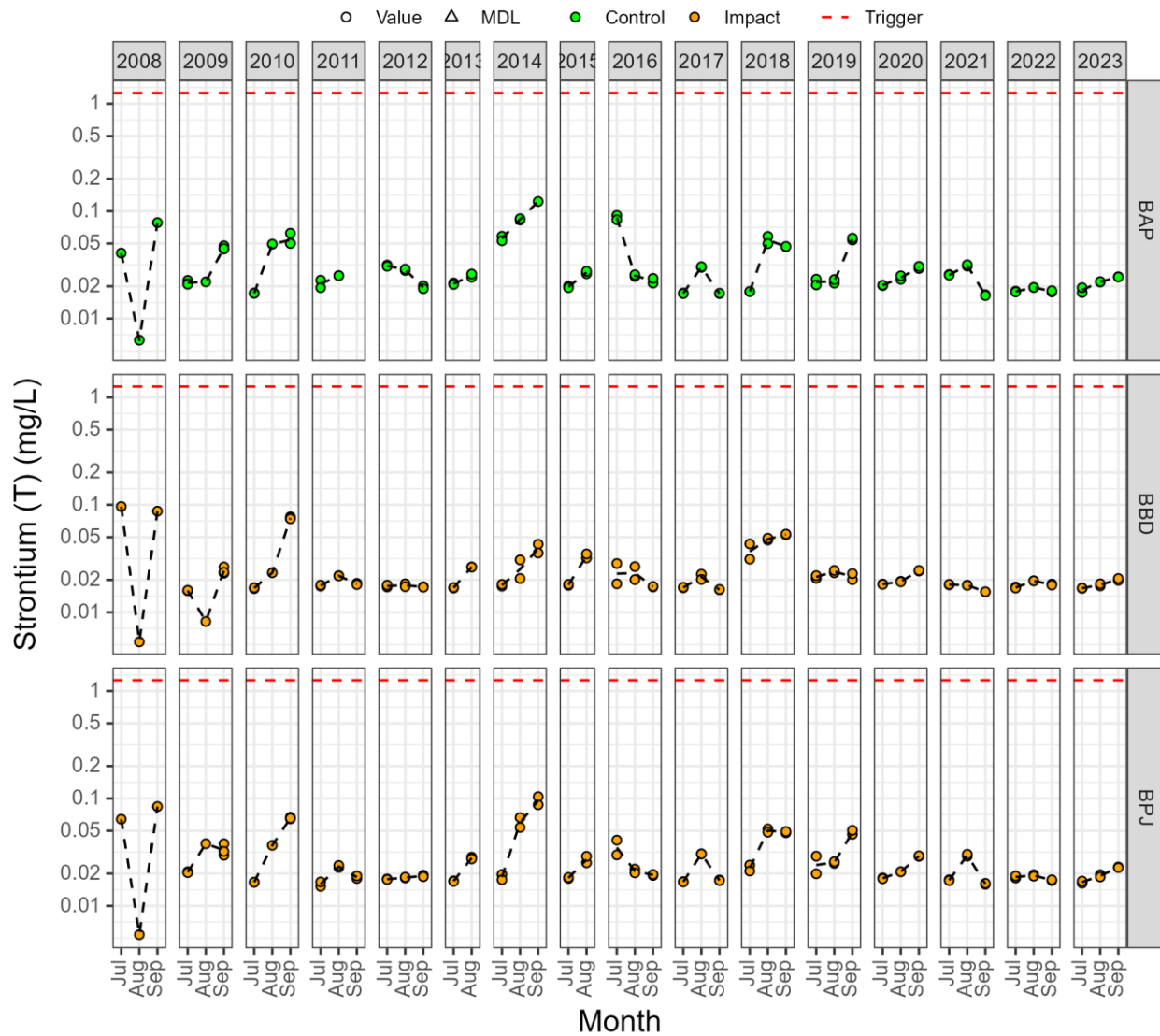


Figure B3-46. Total thallium (mg/L).

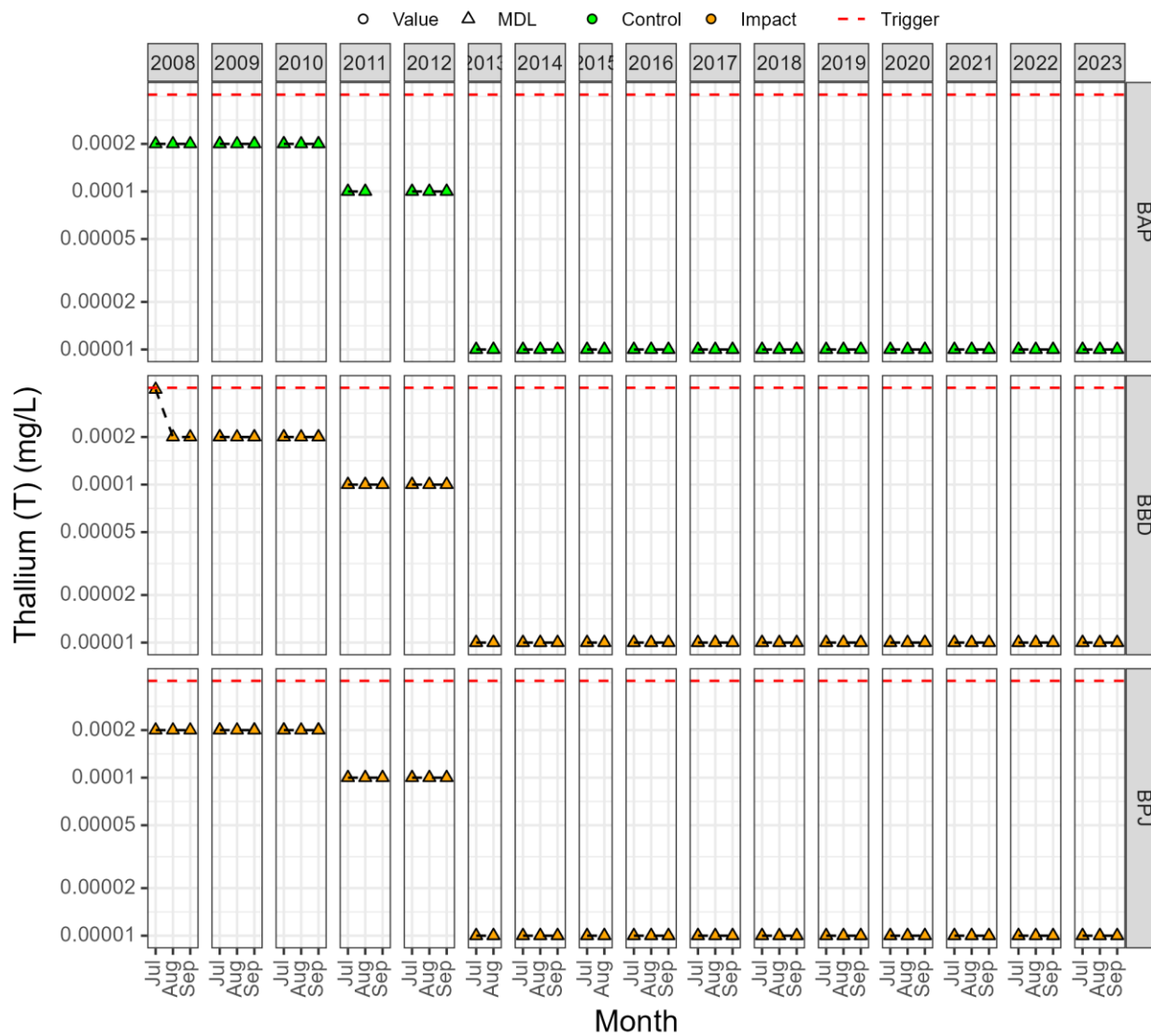


Figure B3-47. Total tin (mg/L).

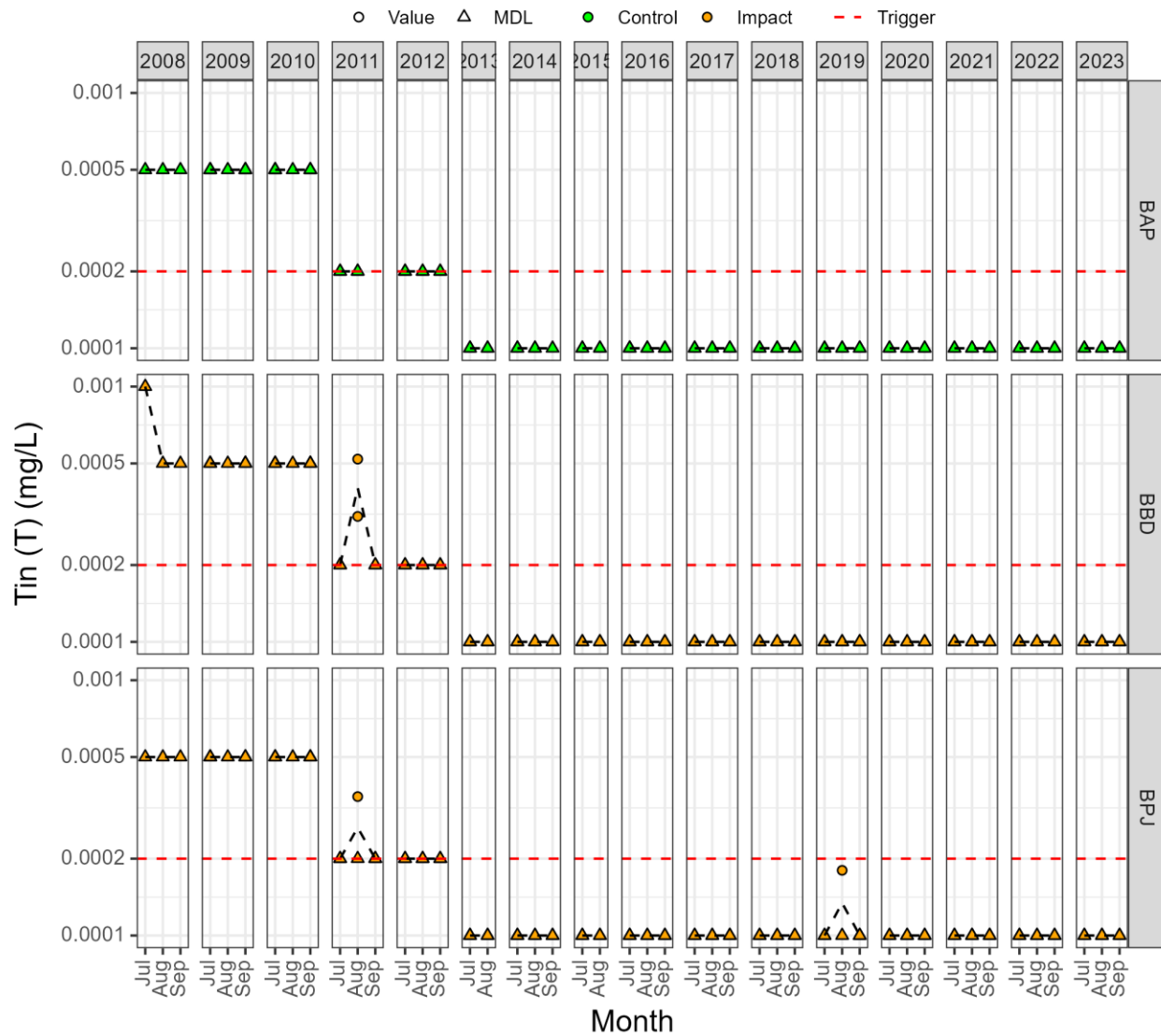


Figure B3-48. Total titanium (mg/L).

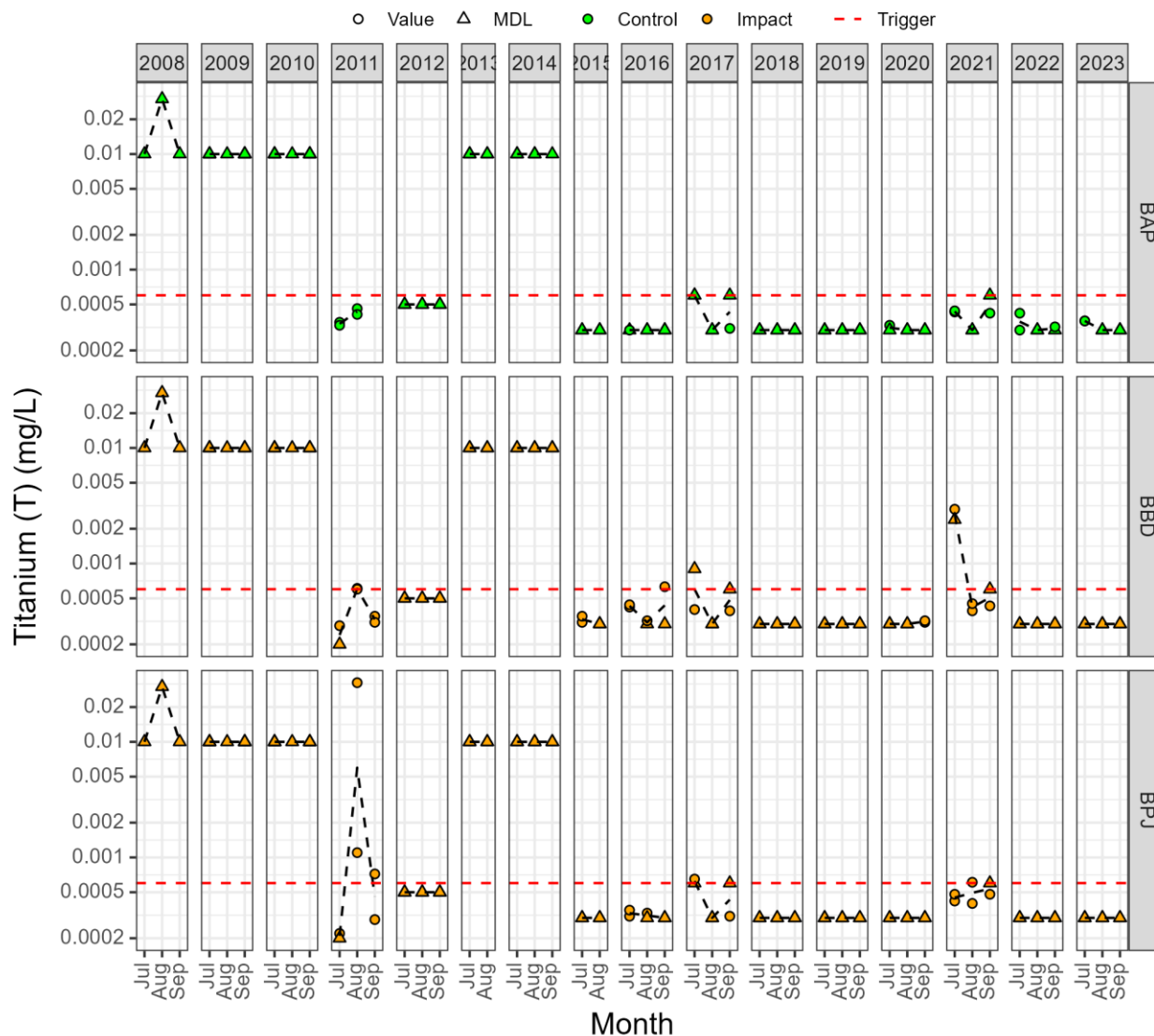


Figure B3-49. Total uranium (mg/L).

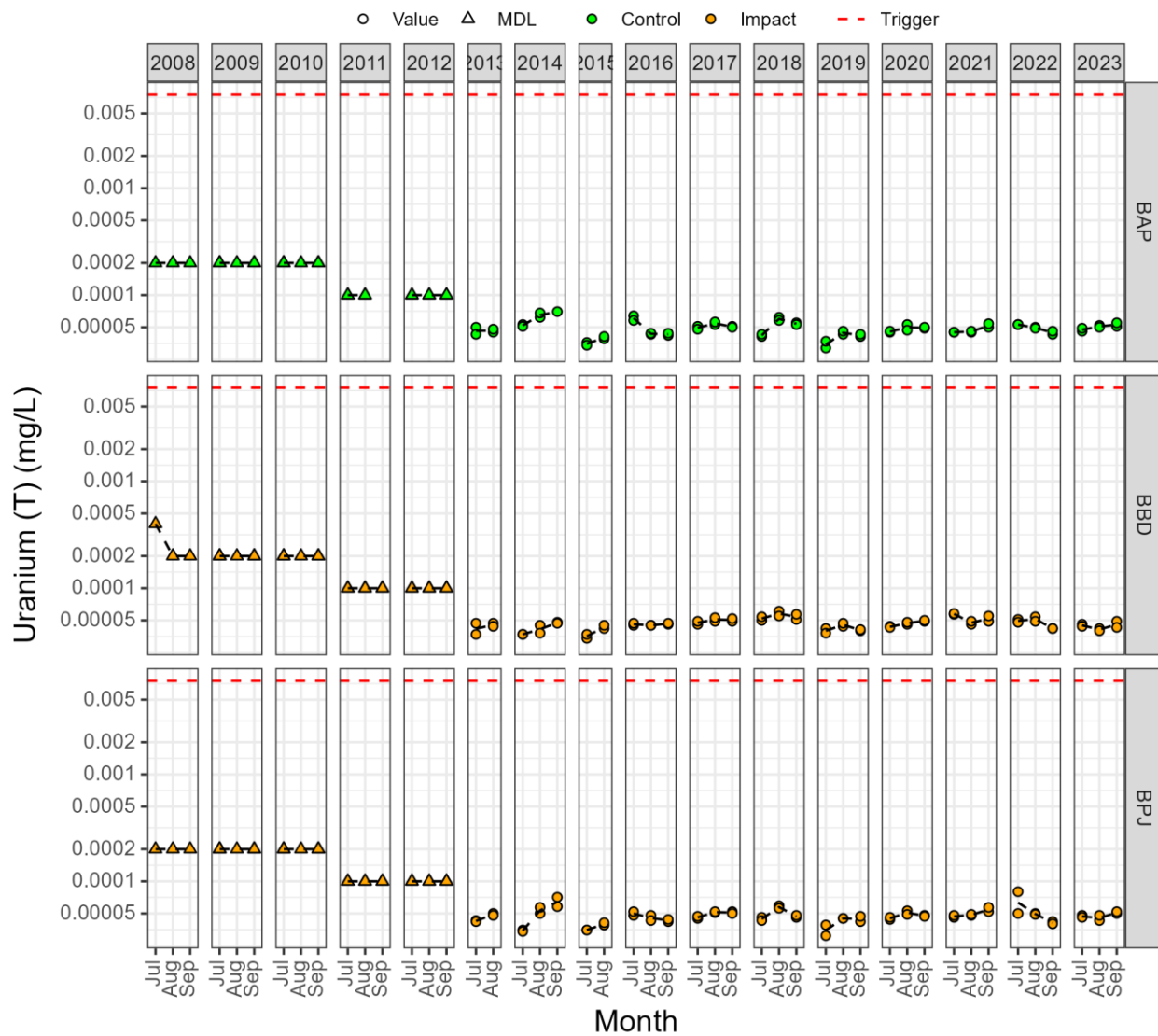


Figure 1 displays a 3x15 grid of plots showing Vanadium (T) (mg/L) over time (Month) for three locations: BAP, BBD, and BPJ. The columns represent years from 2008 to 2023. The rows represent the three locations. Each plot shows monthly data points (green circles for Control, orange circles for Impact) and a red dashed line indicating the Trigger level. The y-axis is logarithmic, ranging from 0.0002 to 0.05 mg/L. The x-axis shows months (Jul, Aug, Sep). The legend indicates: Value (circle), MDL (triangle), Control (green circle), Impact (orange circle), and Trigger (red dashed line).

Figure B3-51. Total zinc (mg/L).

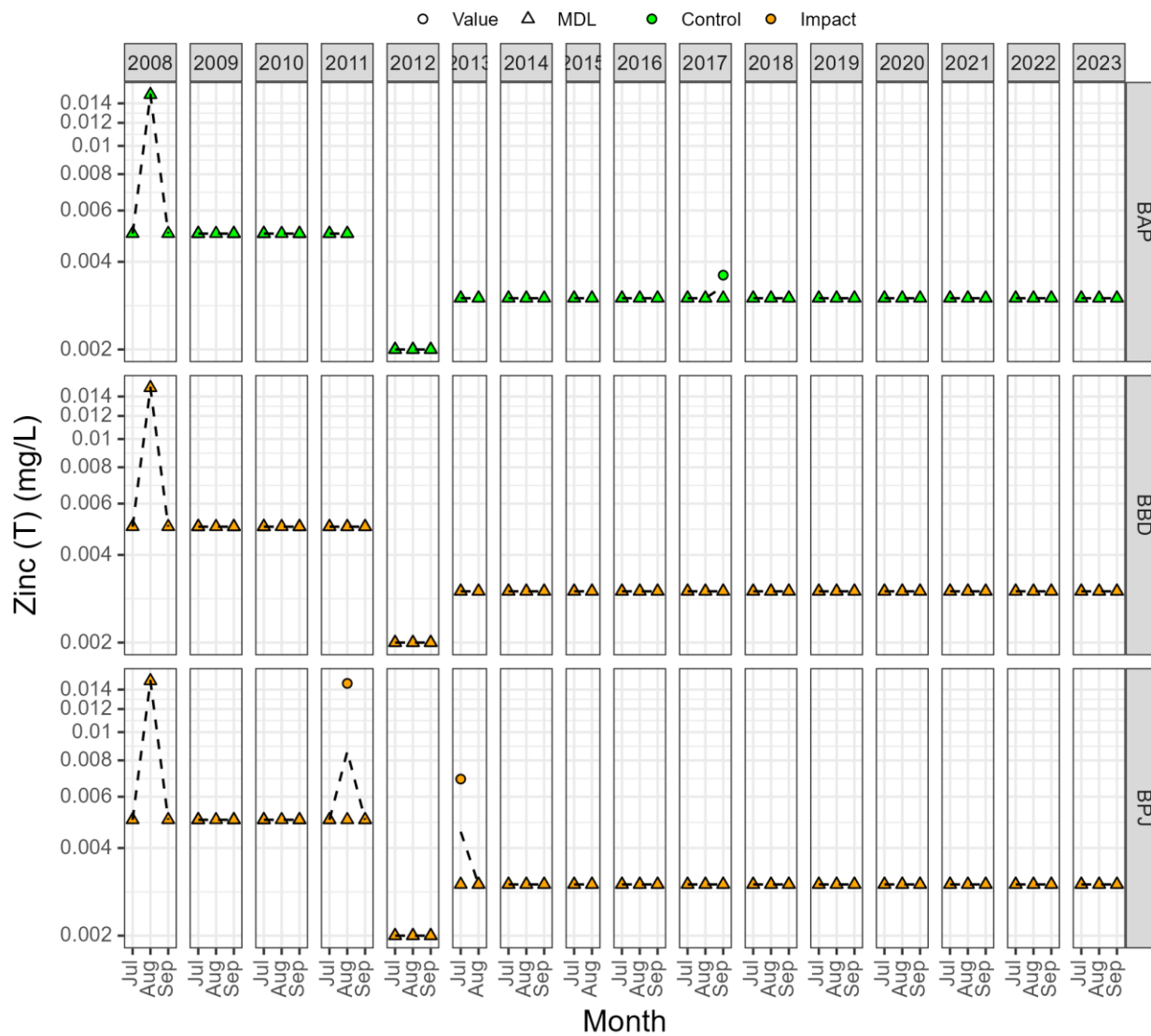


Figure B3-52. Dissolved aluminum (mg/L).

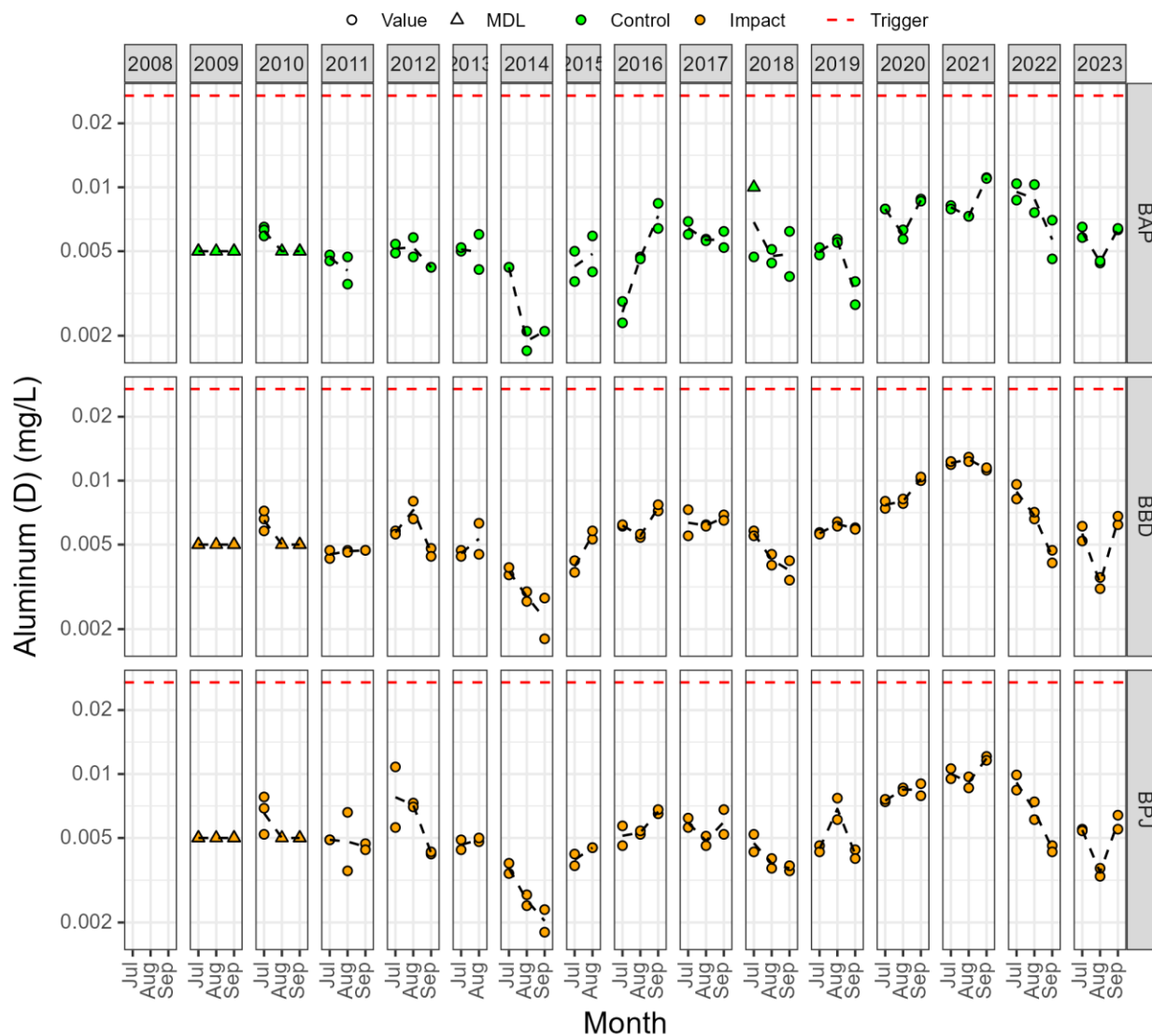


Figure B3-53. Dissolved antimony (mg/L).

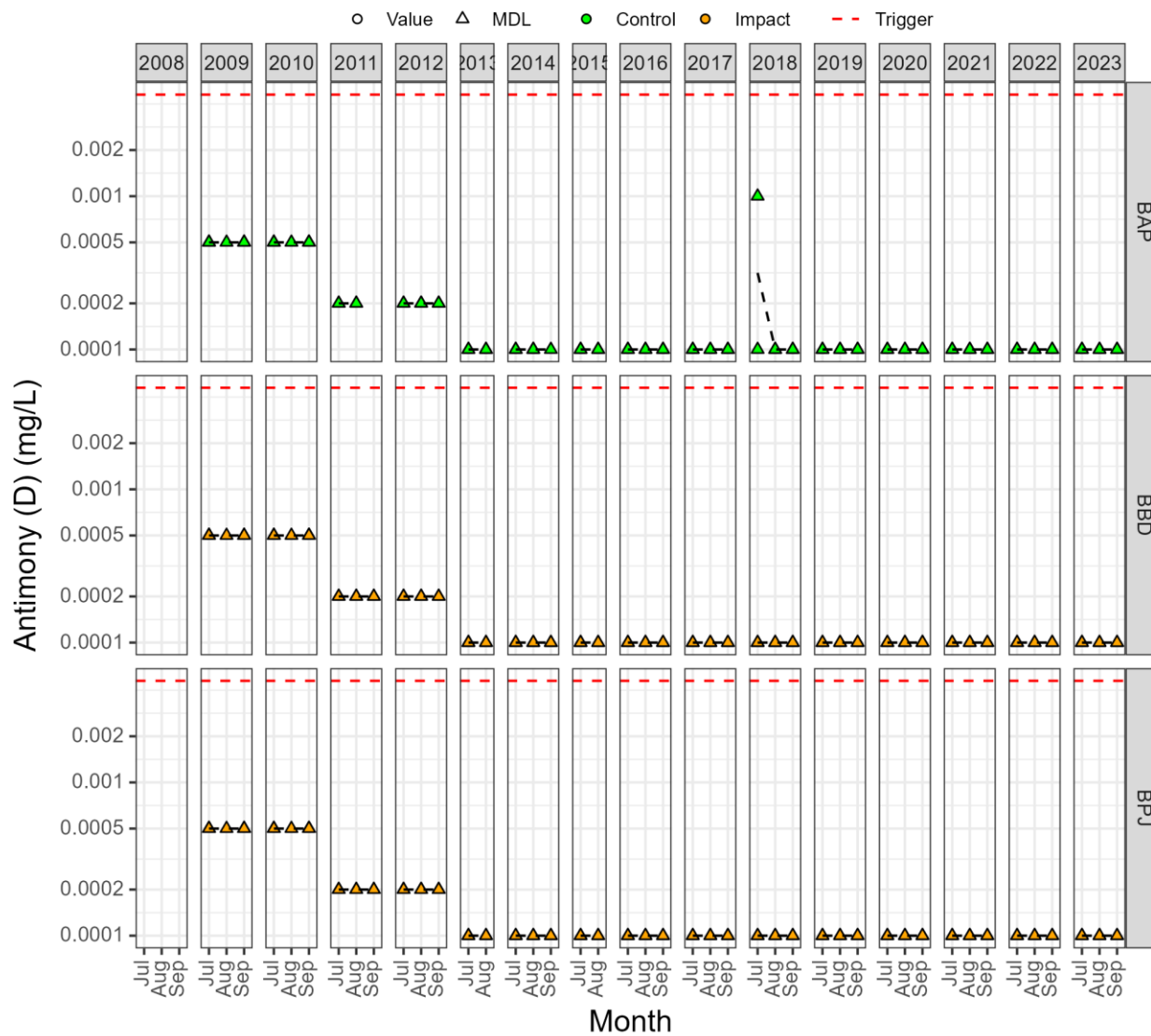


Figure B3-54. Dissolved arsenic (mg/L).

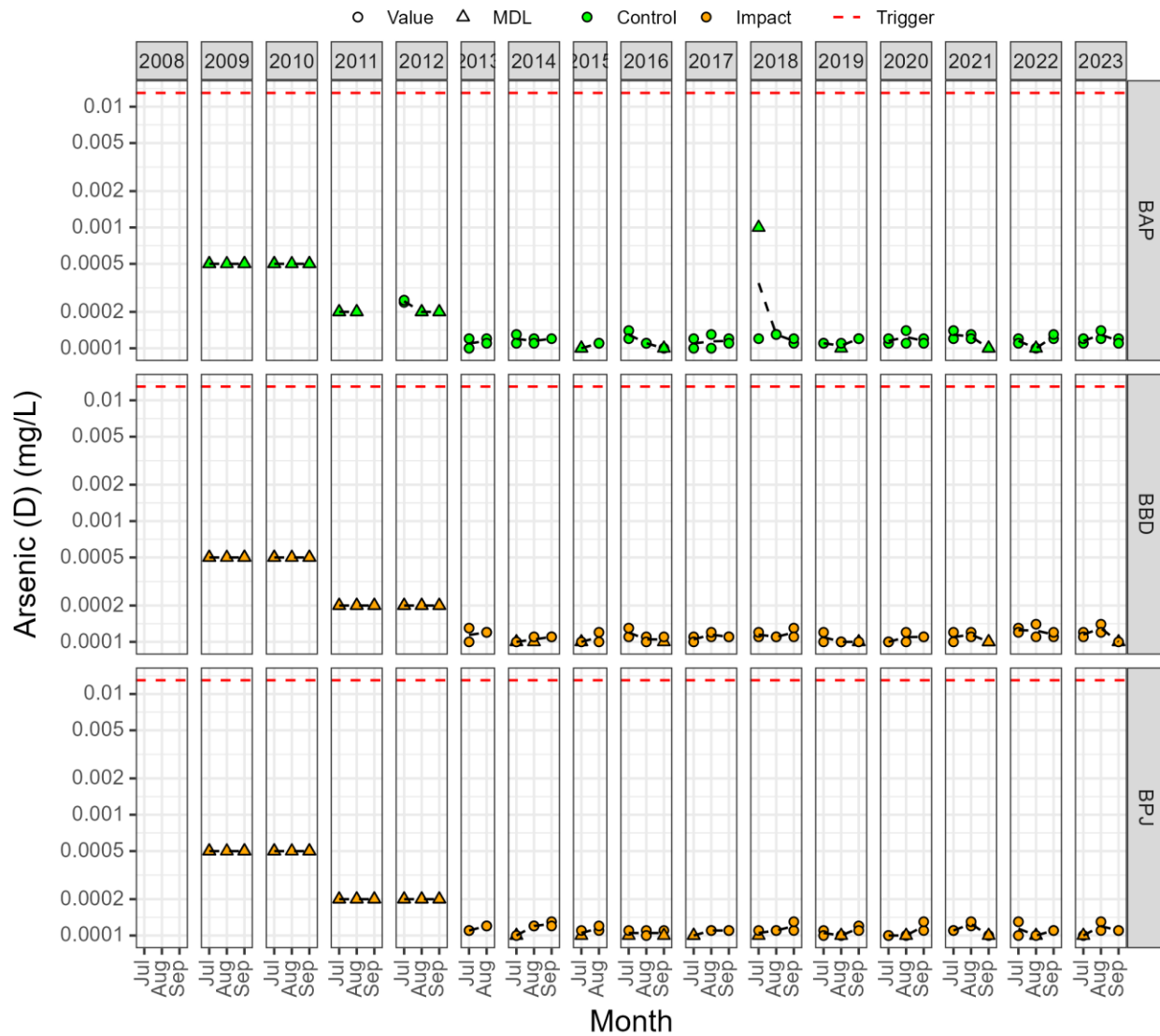


Figure B3-55. Dissolved barium (mg/L).

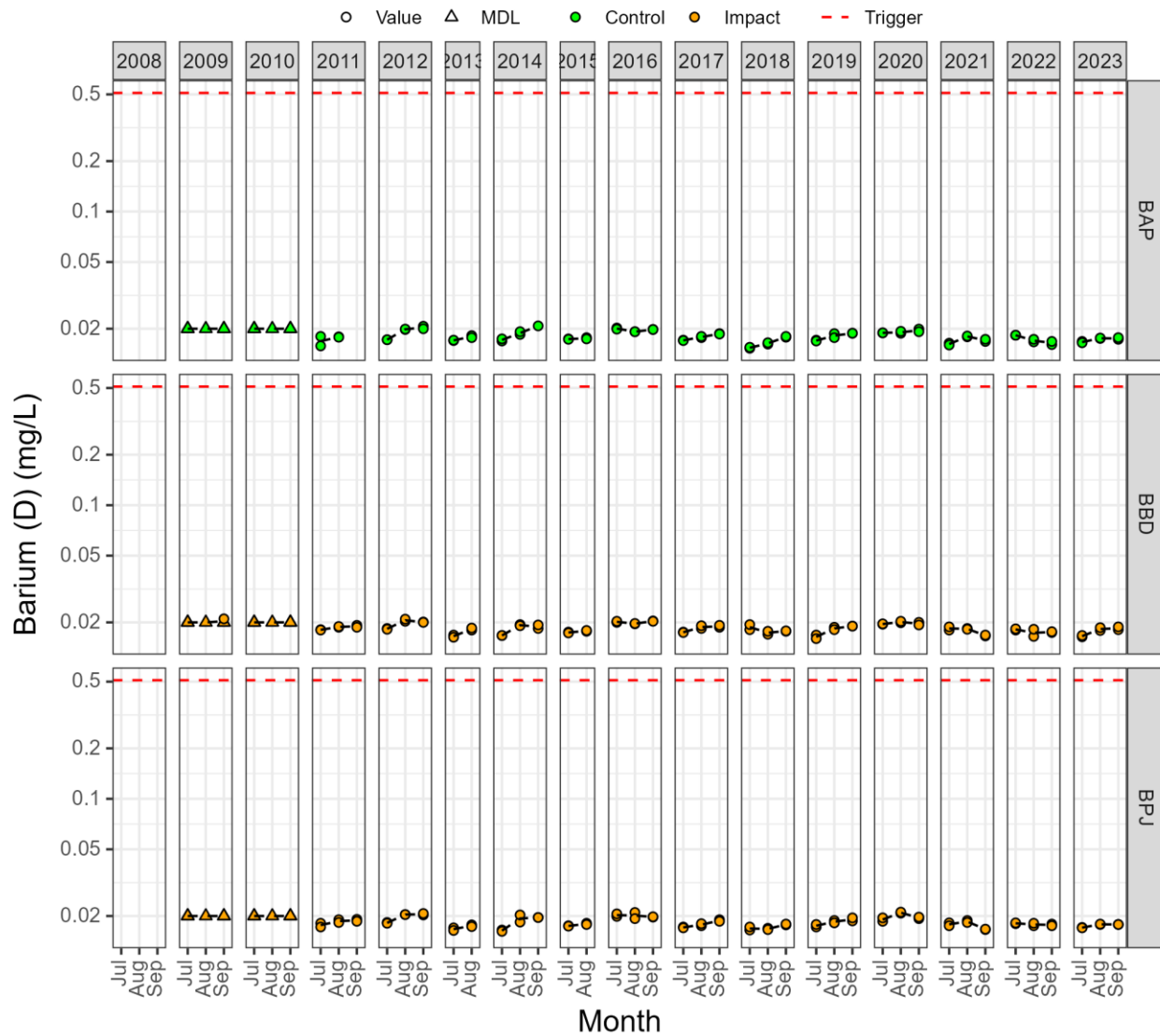


Figure B3-56. Dissolved beryllium (mg/L).

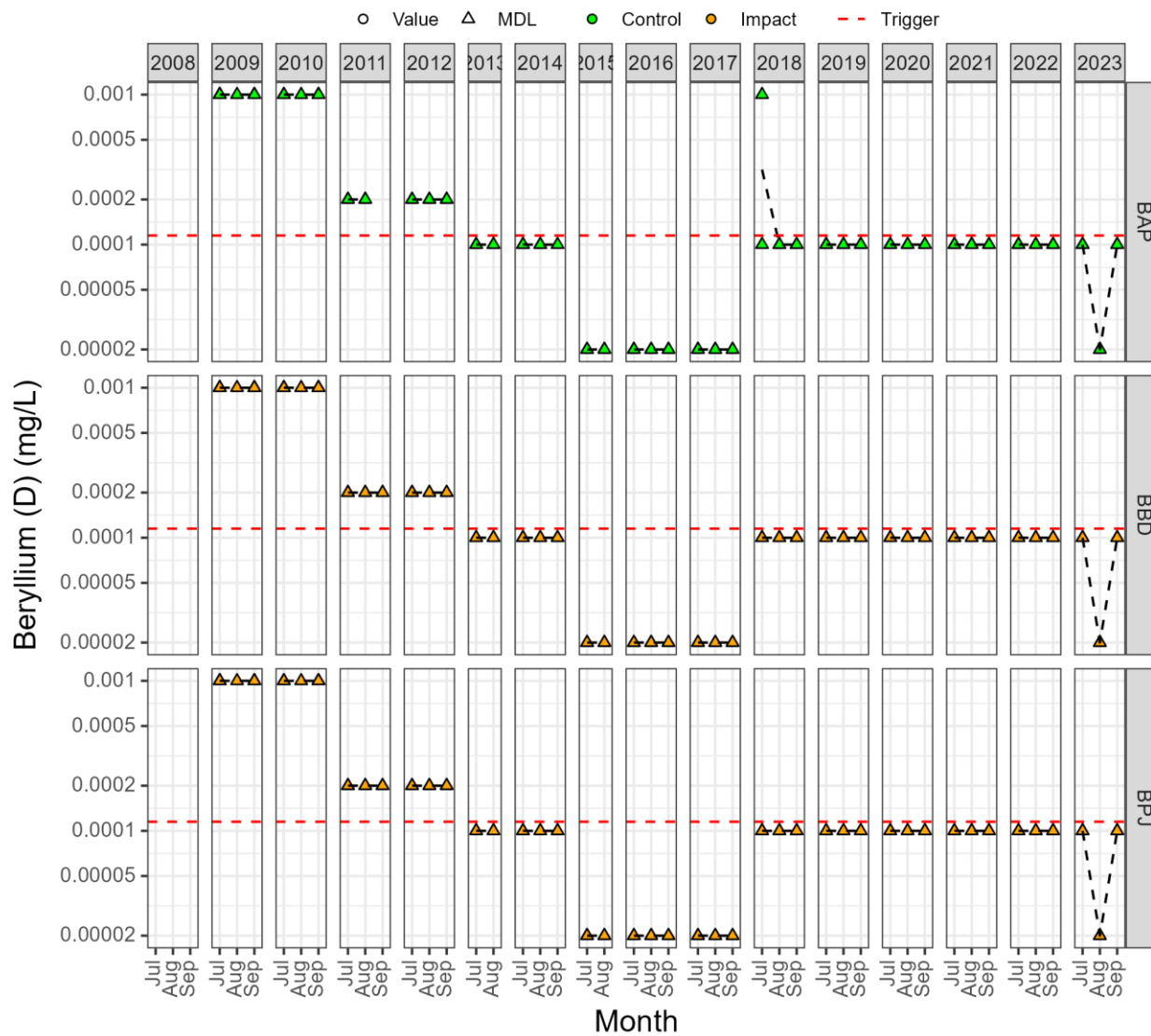


Figure B3-57. Dissolved boron (mg/L).

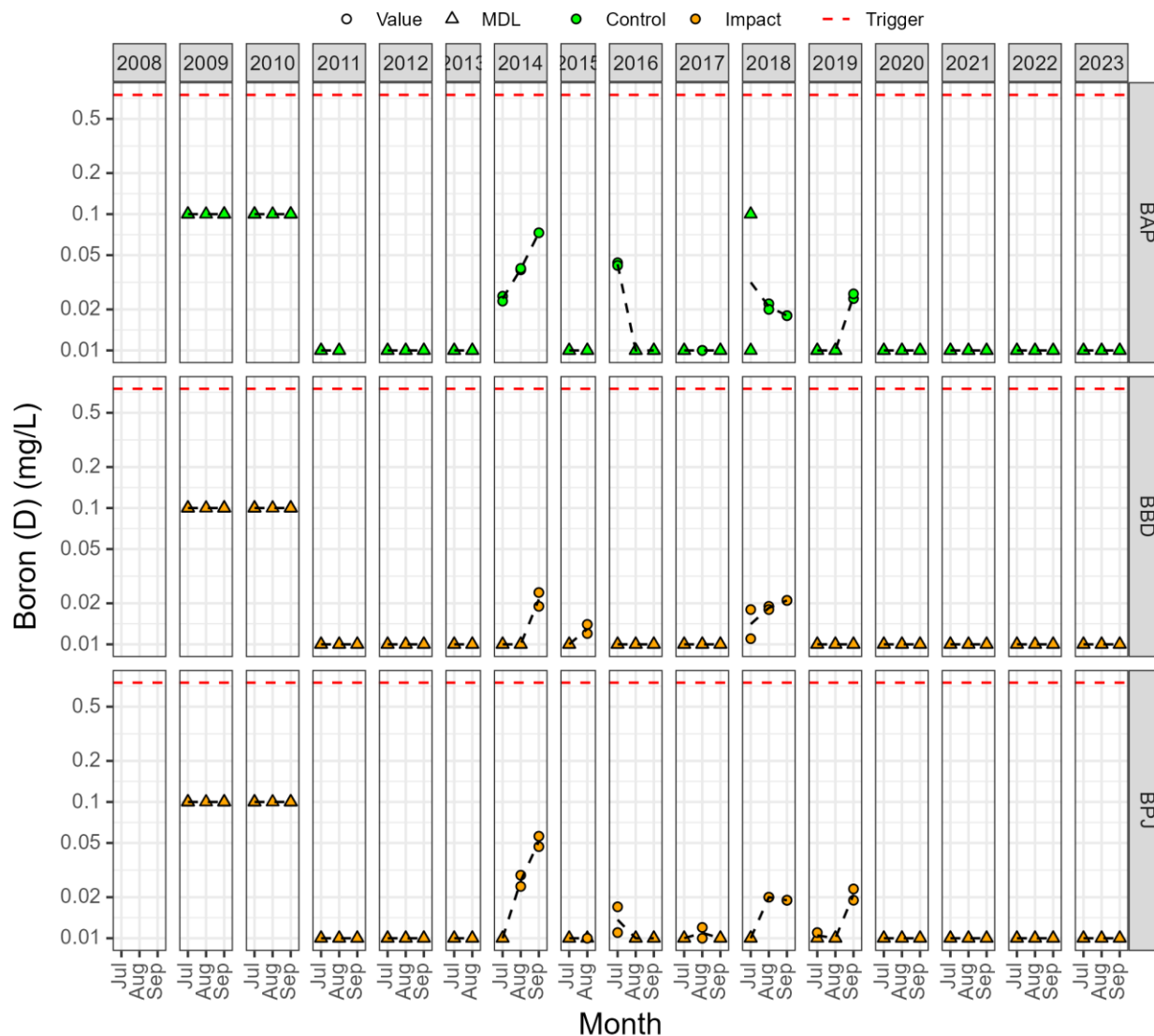


Figure B3-59. Dissolved chromium (mg/L).

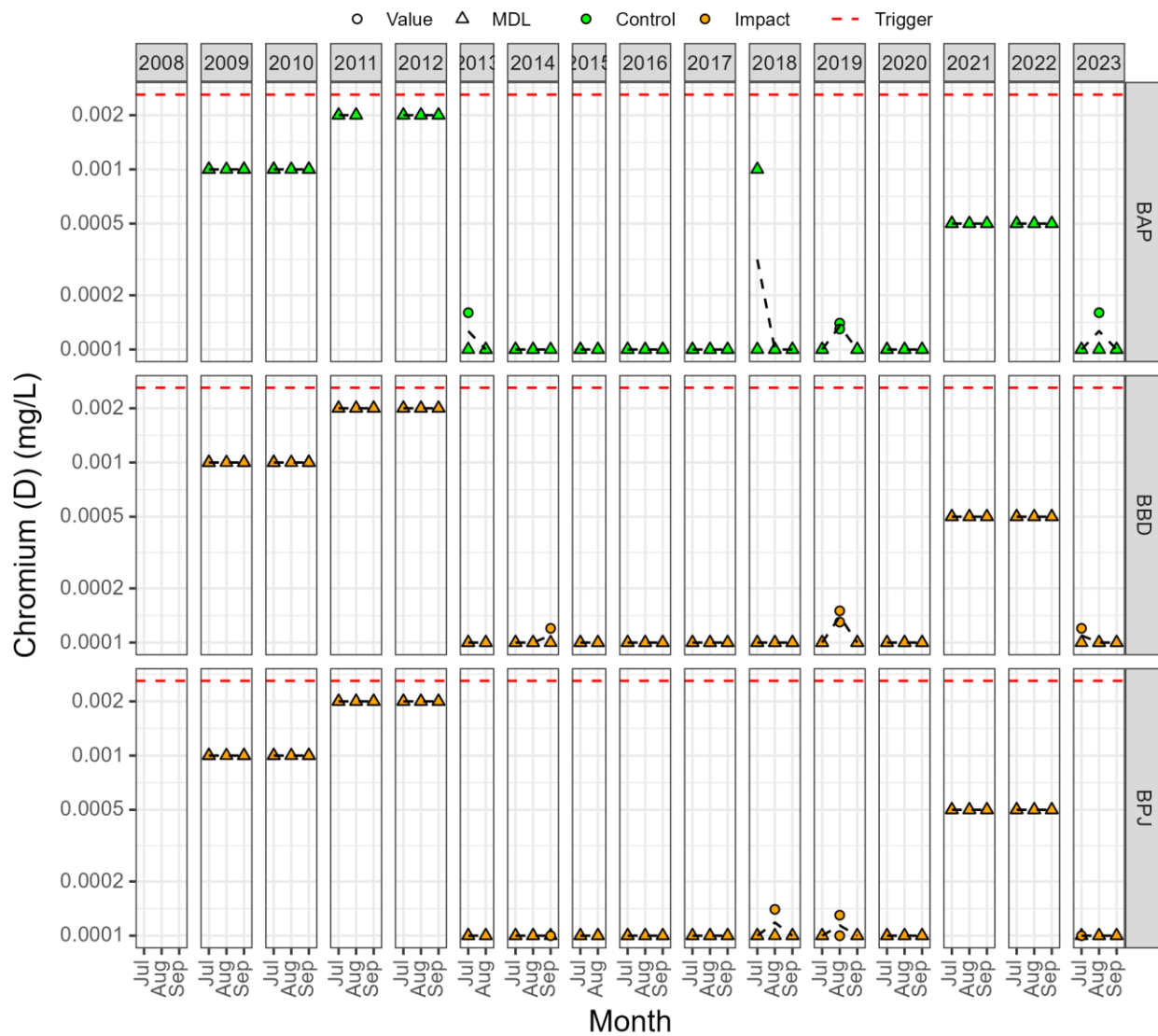


Figure B3-60. Dissolved copper (mg/L).

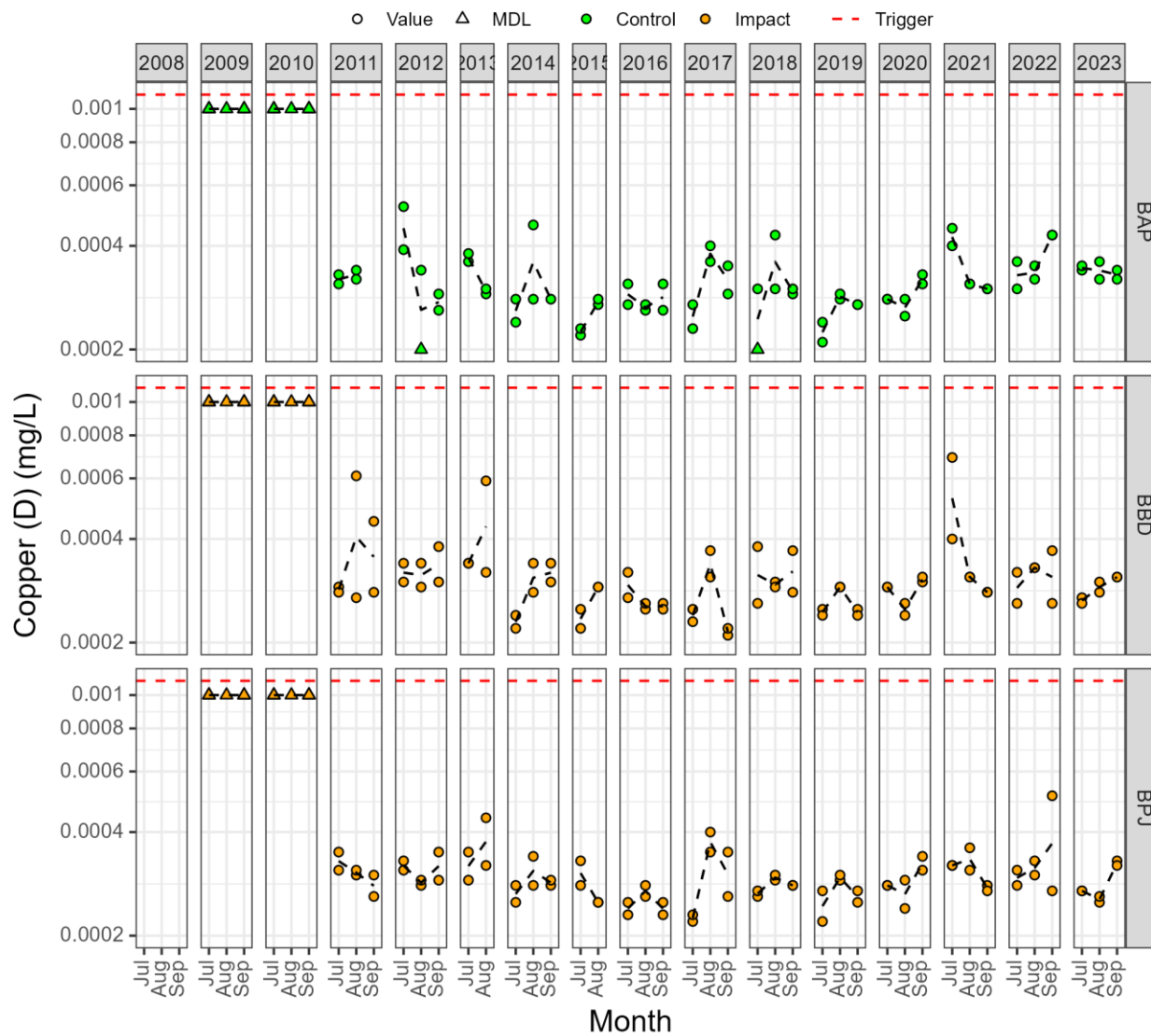


Figure B3-61. Dissolved iron (mg/L).

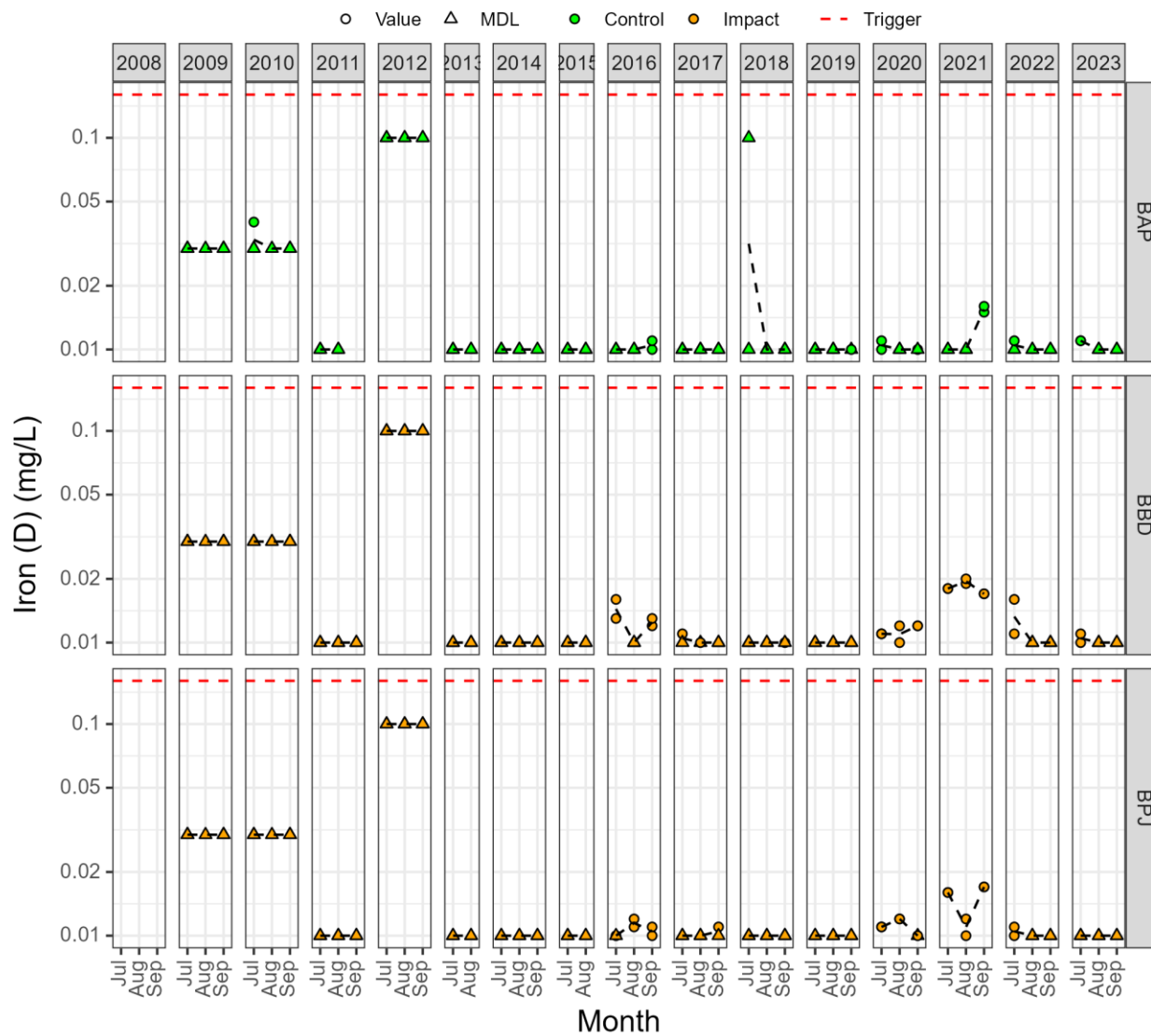


Figure B3-62. Dissolved lead (mg/L).

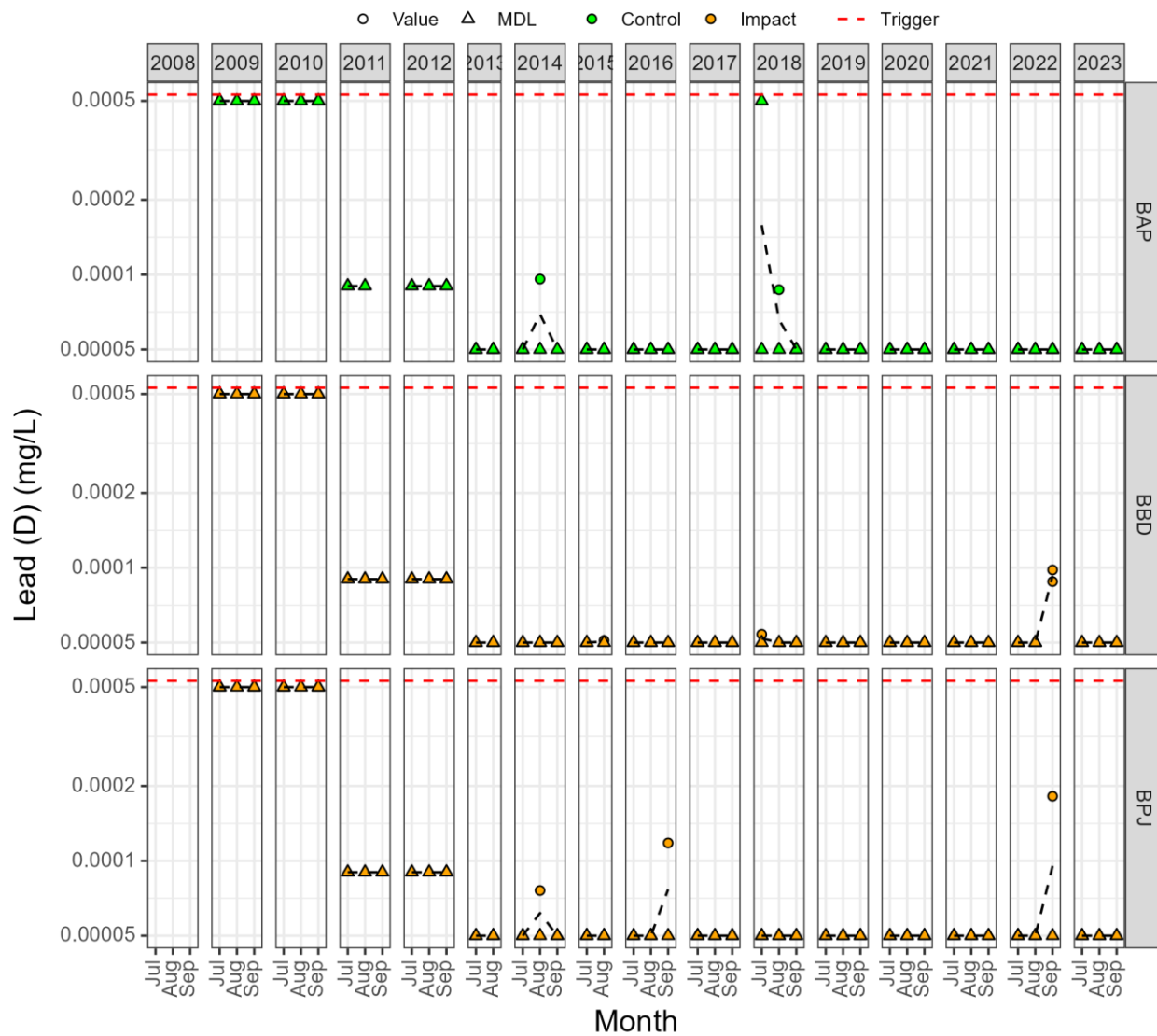


Figure B3-63. Dissolved lithium (mg/L).

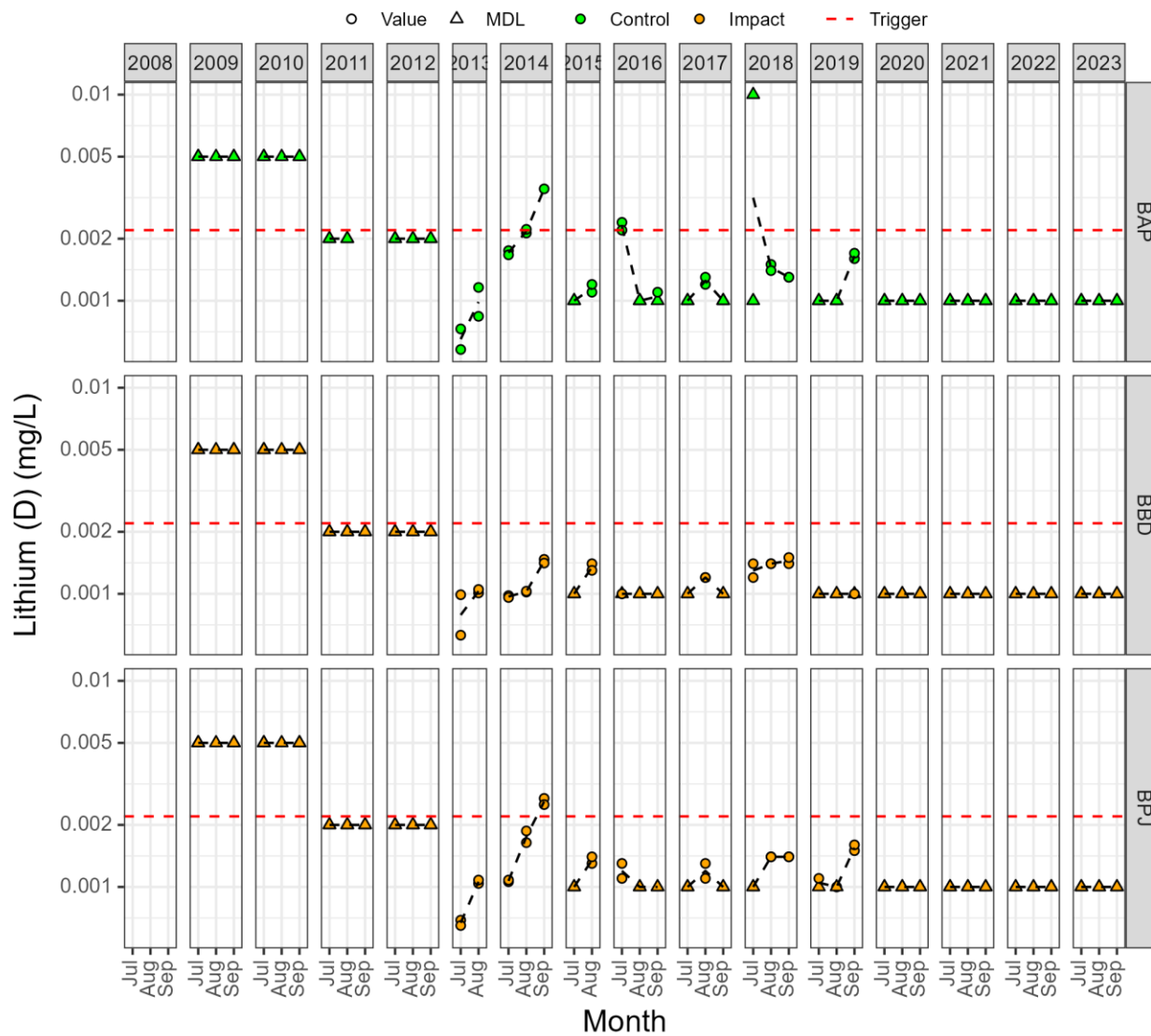


Figure B3-64. Dissolved manganese (mg/L).

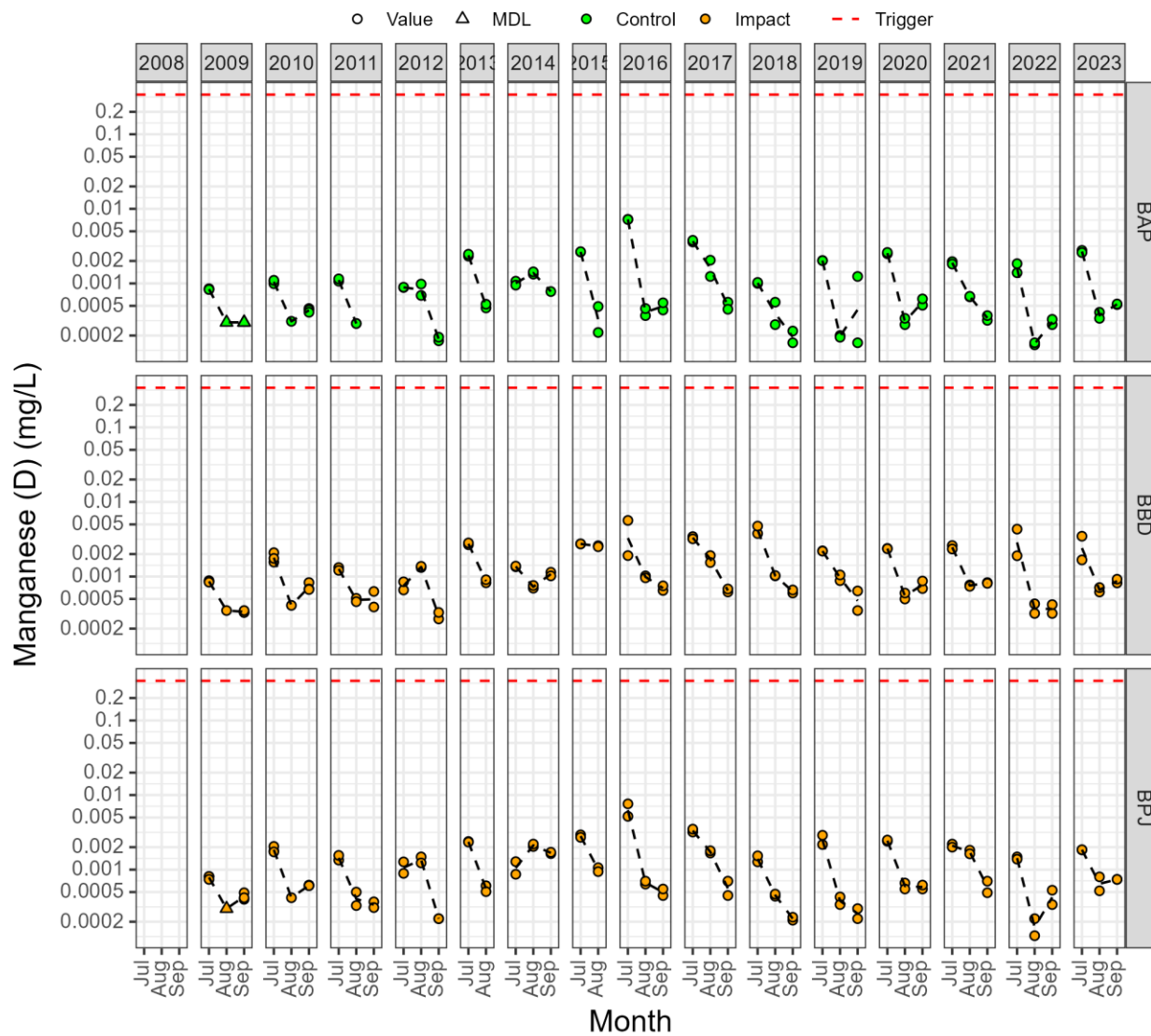


Figure 1 displays a 3x12 grid of plots showing mercury (D) (mg/L) from 2008 to 2023 for three locations: BAP, BBD, and BPJ. The y-axis represents Mercury (D) (mg/L) ranging from 0.000006 to 0.00002. The x-axis represents the Month (Jul, Aug, Sep) for each year. The legend indicates: Value (circle), MDL (triangle), Control (green circle), Impact (orange circle), and Trigger (red dashed line).

The plots show that mercury levels are generally low and stable across all locations and years, with values mostly below the trigger line. The BAP location shows slightly higher values than BBD and BPJ, particularly in 2009 and 2012. The BBD and BPJ locations show very low values, mostly below 0.00001 mg/L.

Figure B3-66. Dissolved molybdenum (mg/L).

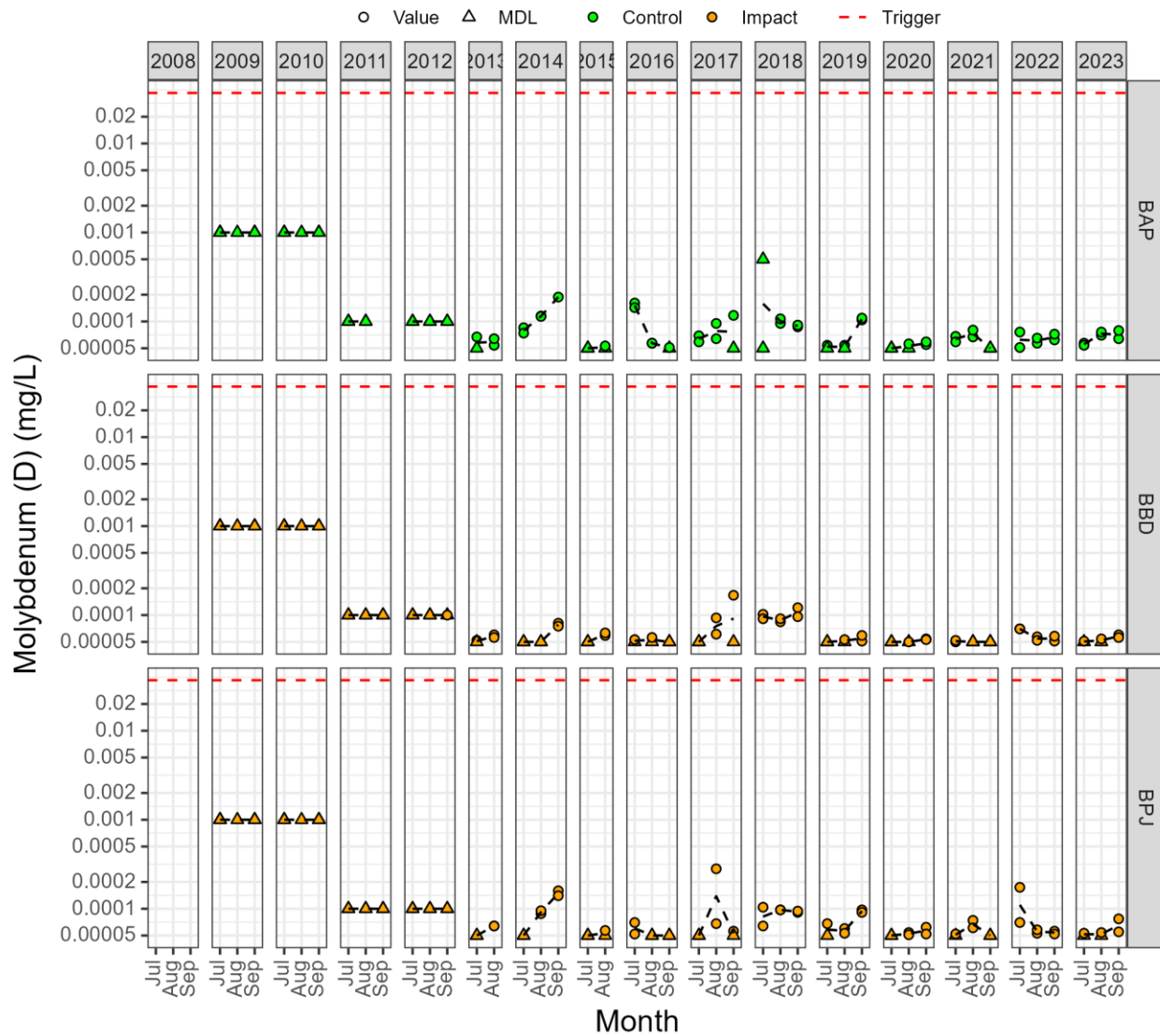


Figure B3-67. Dissolved nickel (mg/L).

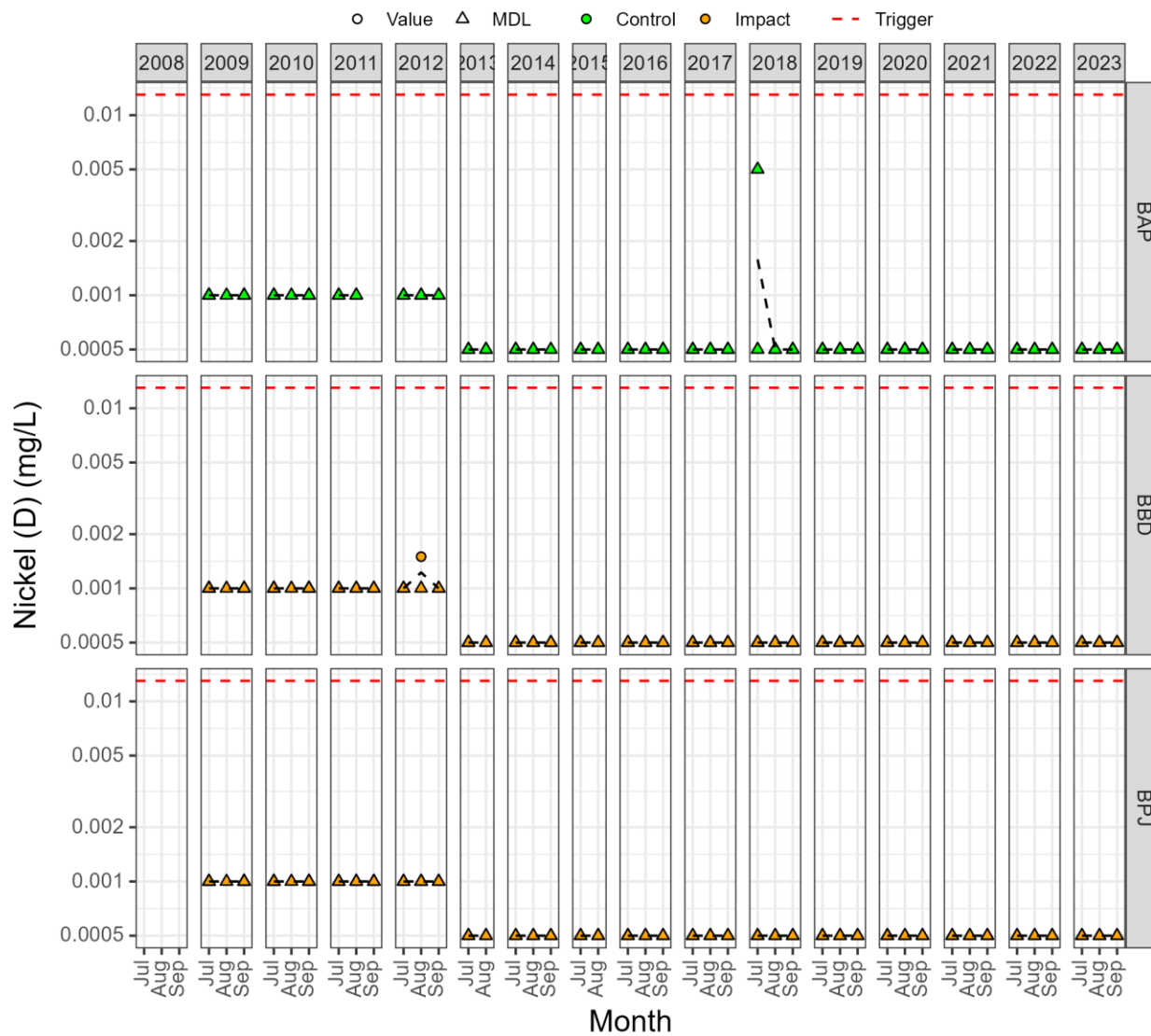


Figure B3-68. Dissolved selenium (mg/L).

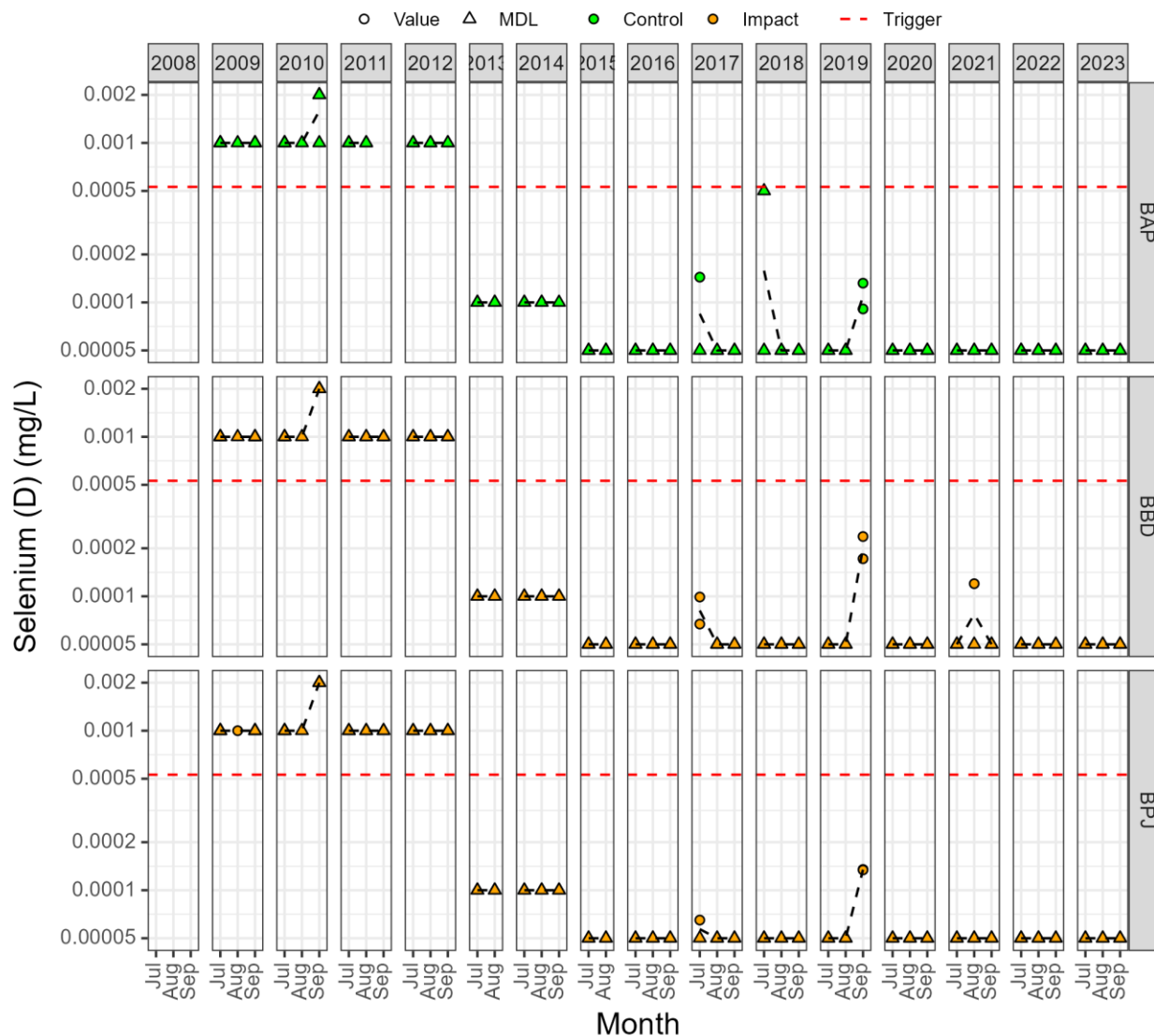


Figure B3-69. Dissolved silicon (mg/L).

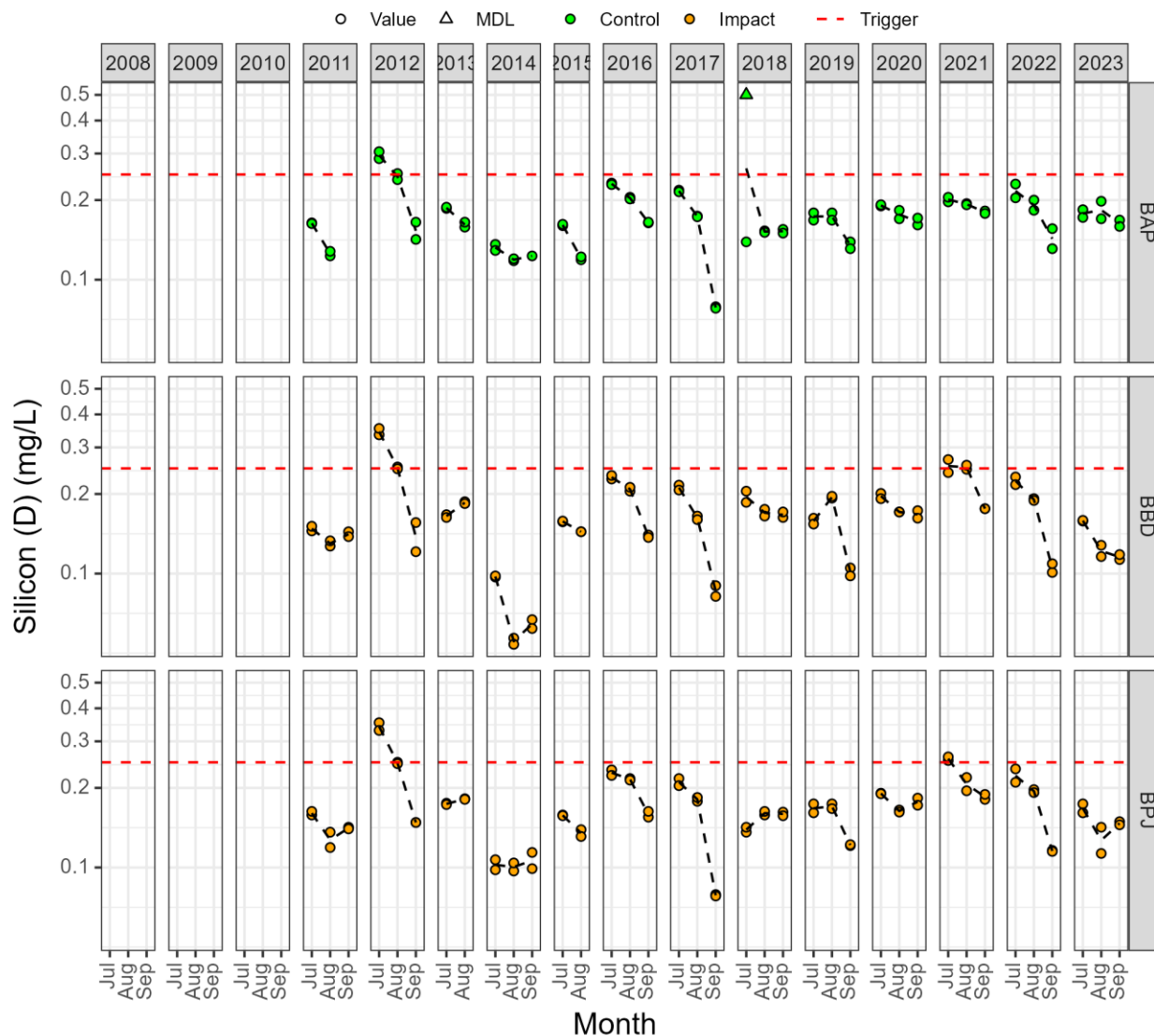


Figure B3-70. Dissolved silver (mg/L).

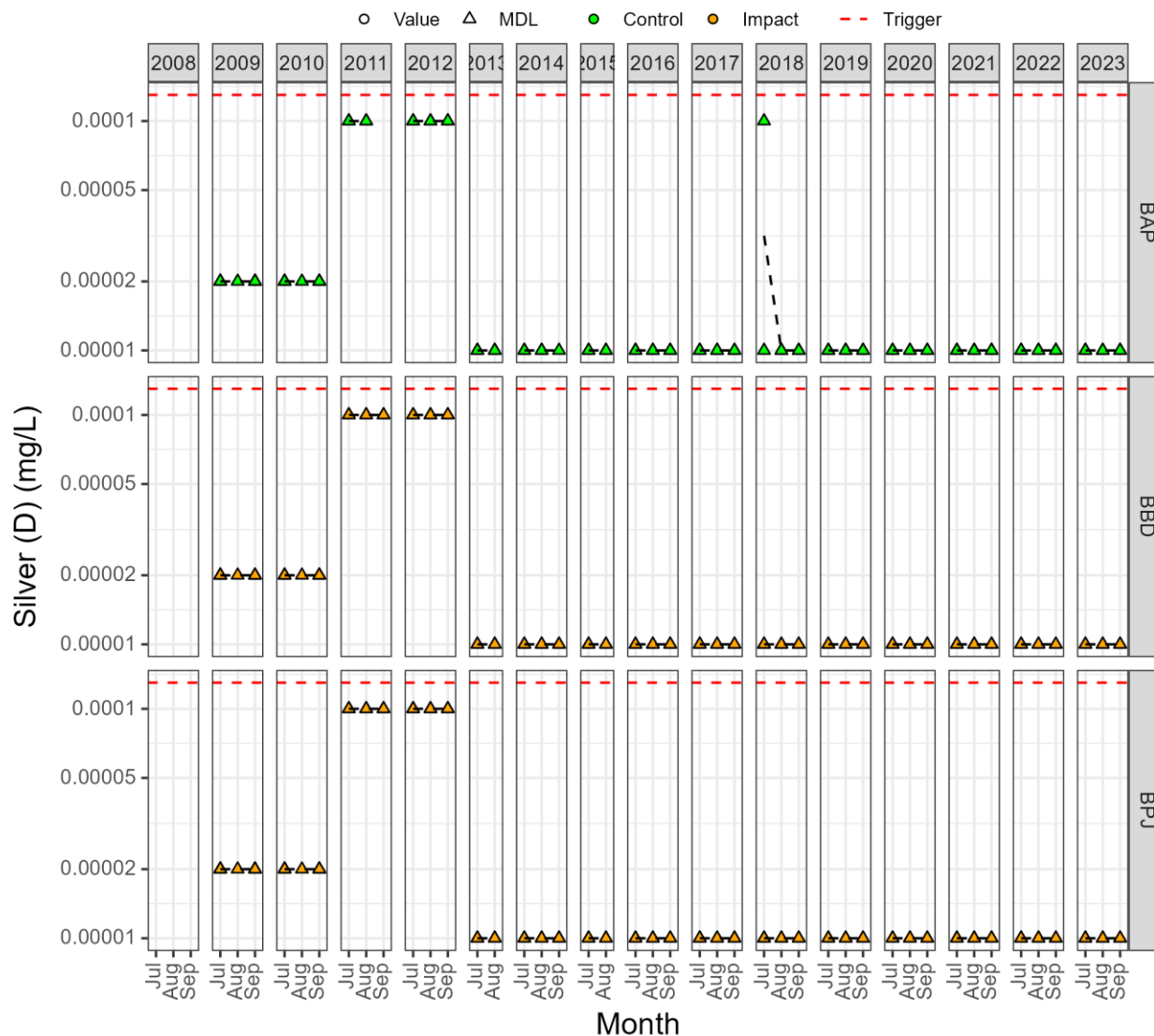


Figure B3-71. Dissolved strontium (mg/L).

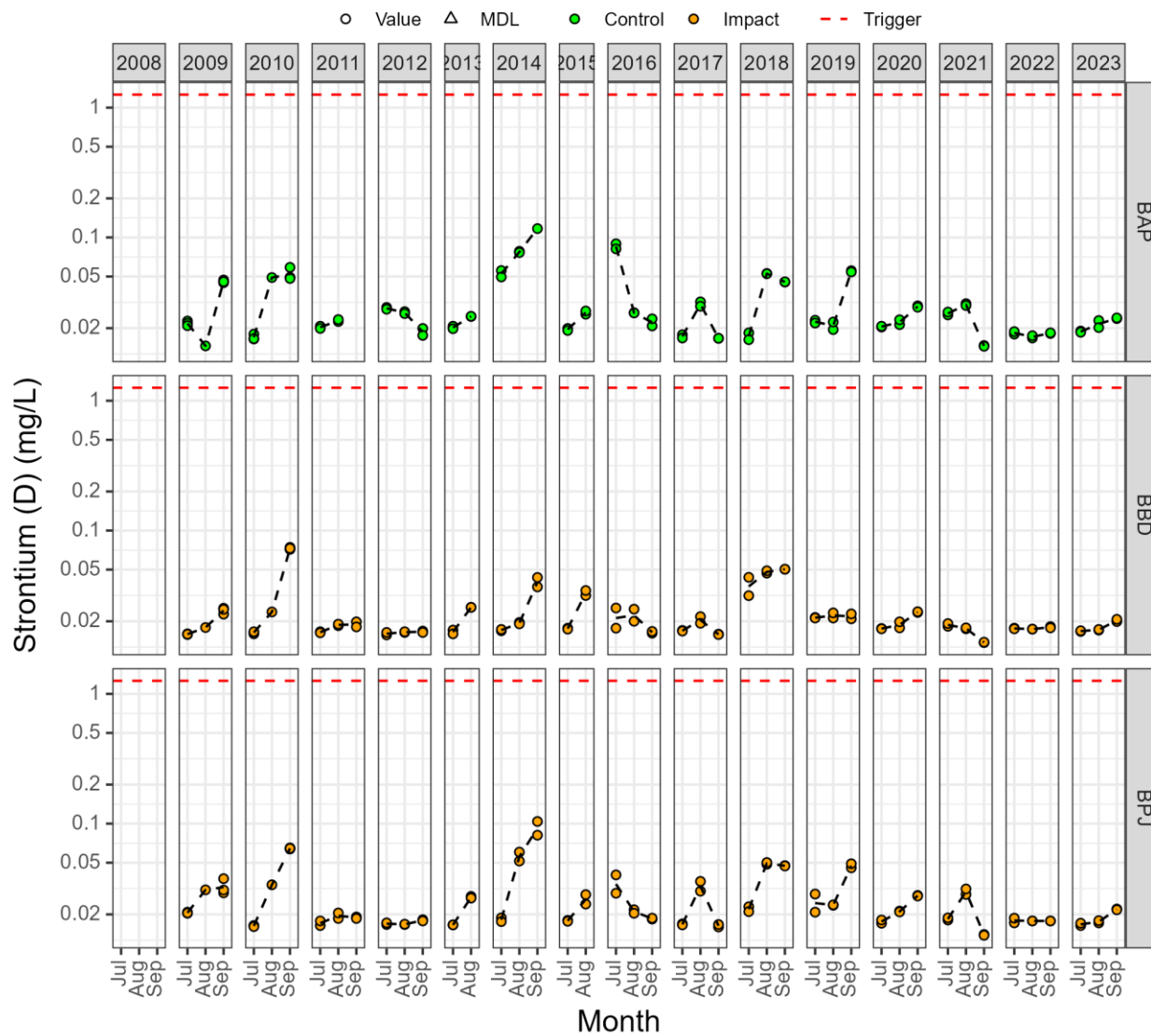


Figure B3-72. Dissolved thallium (mg/L).

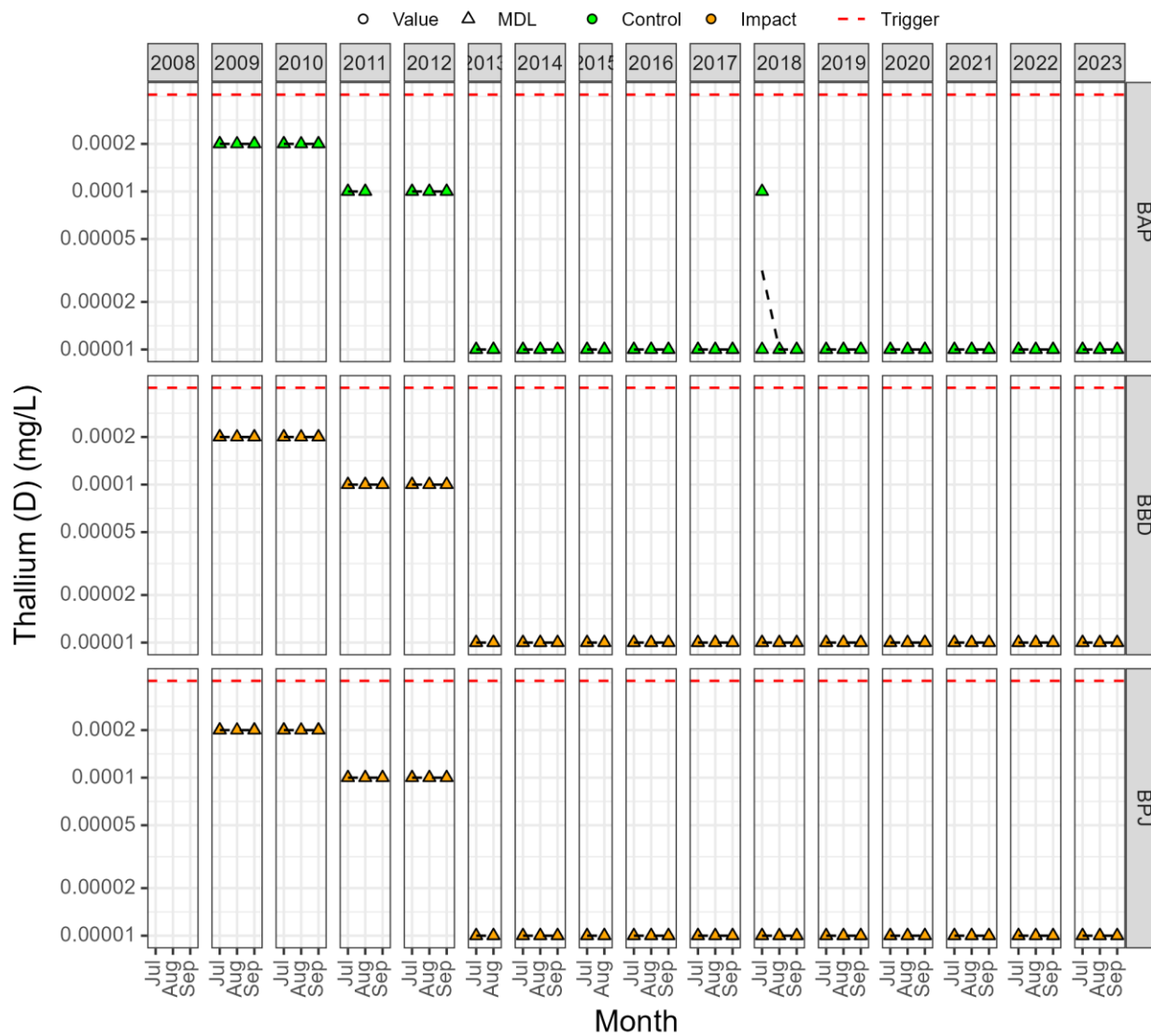


Figure B3-73. Dissolved tin (mg/L).



Figure B3-74. Dissolved titanium (mg/L).

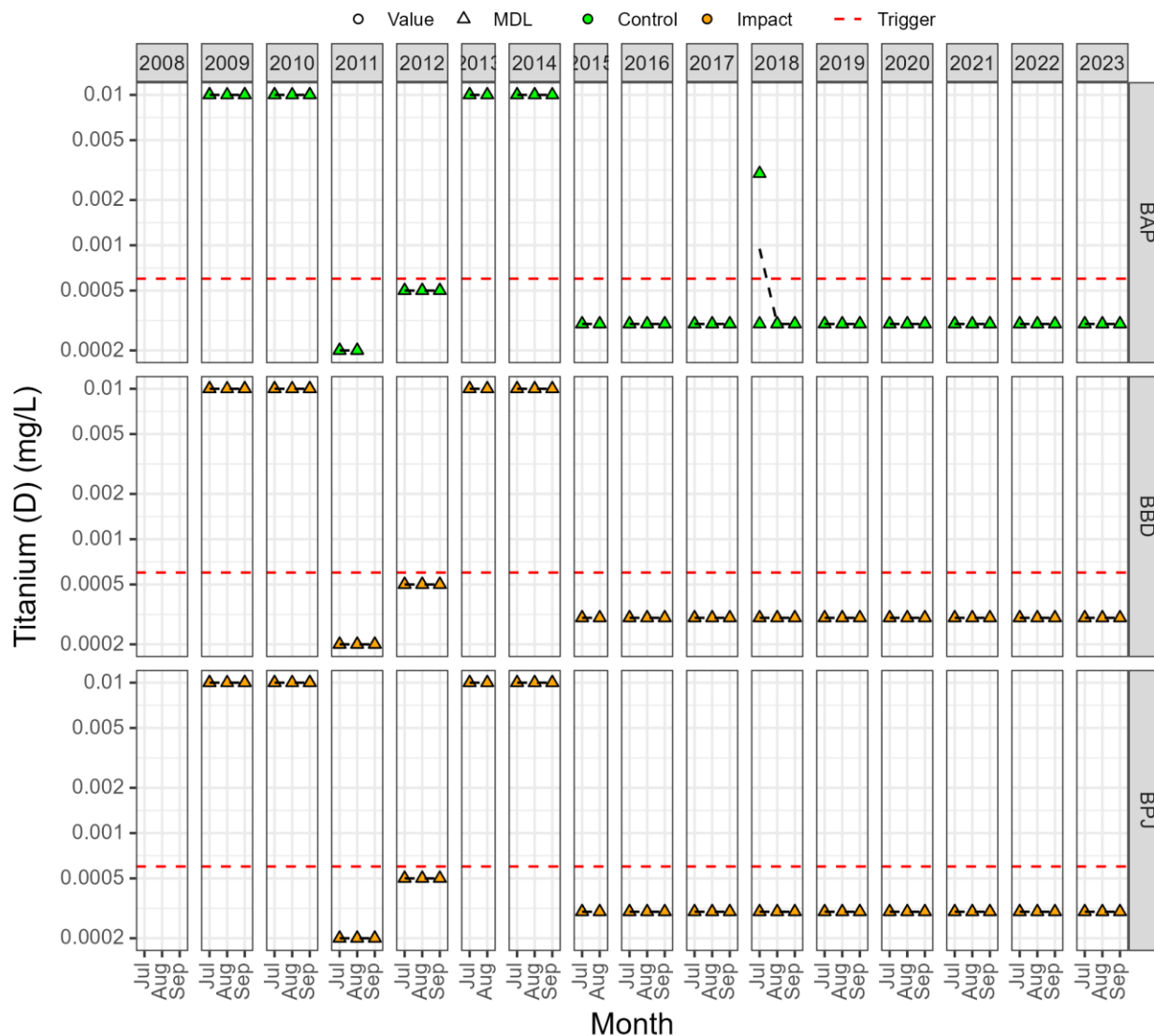


Figure B3-75. Dissolved uranium (mg/L).

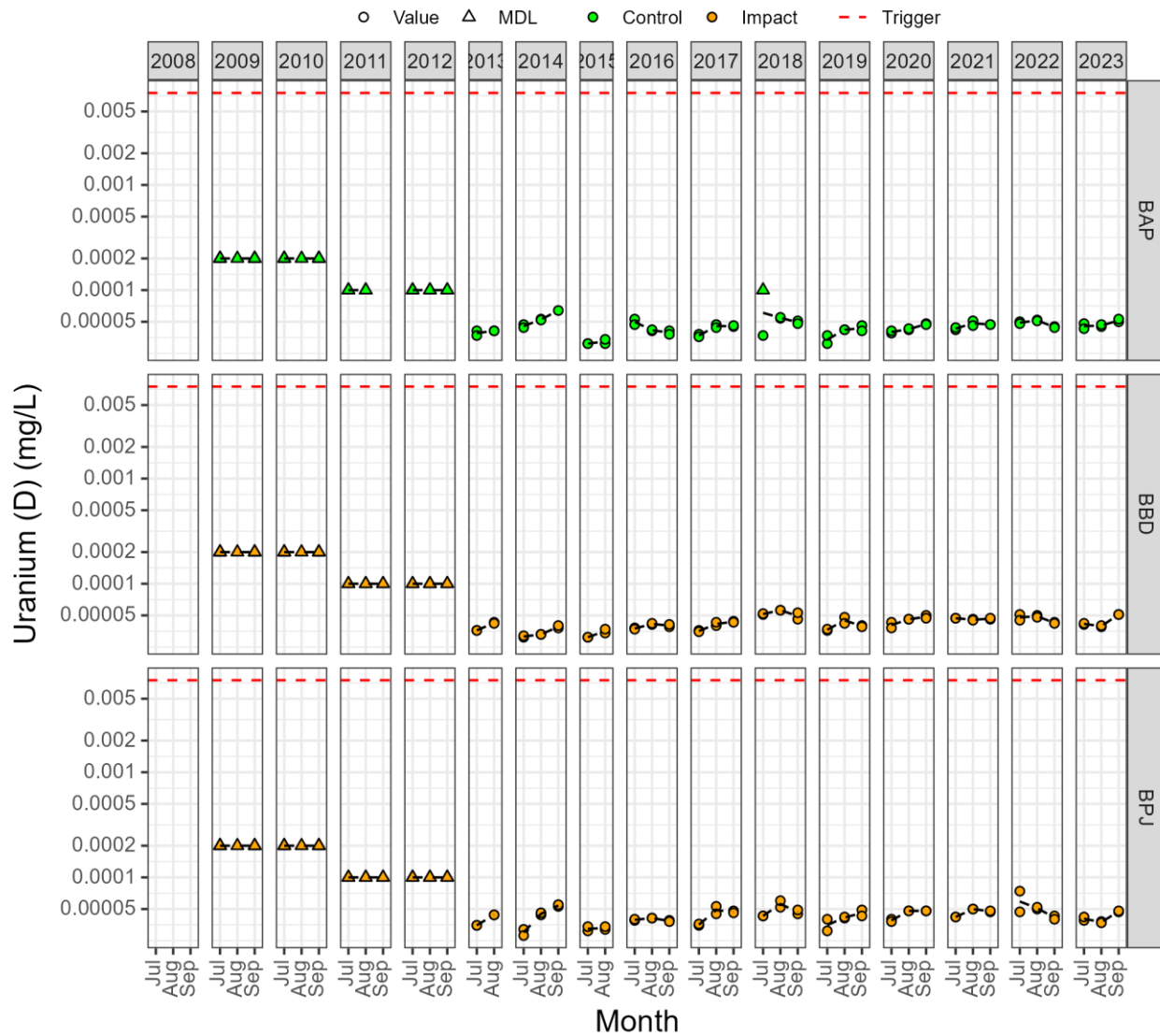


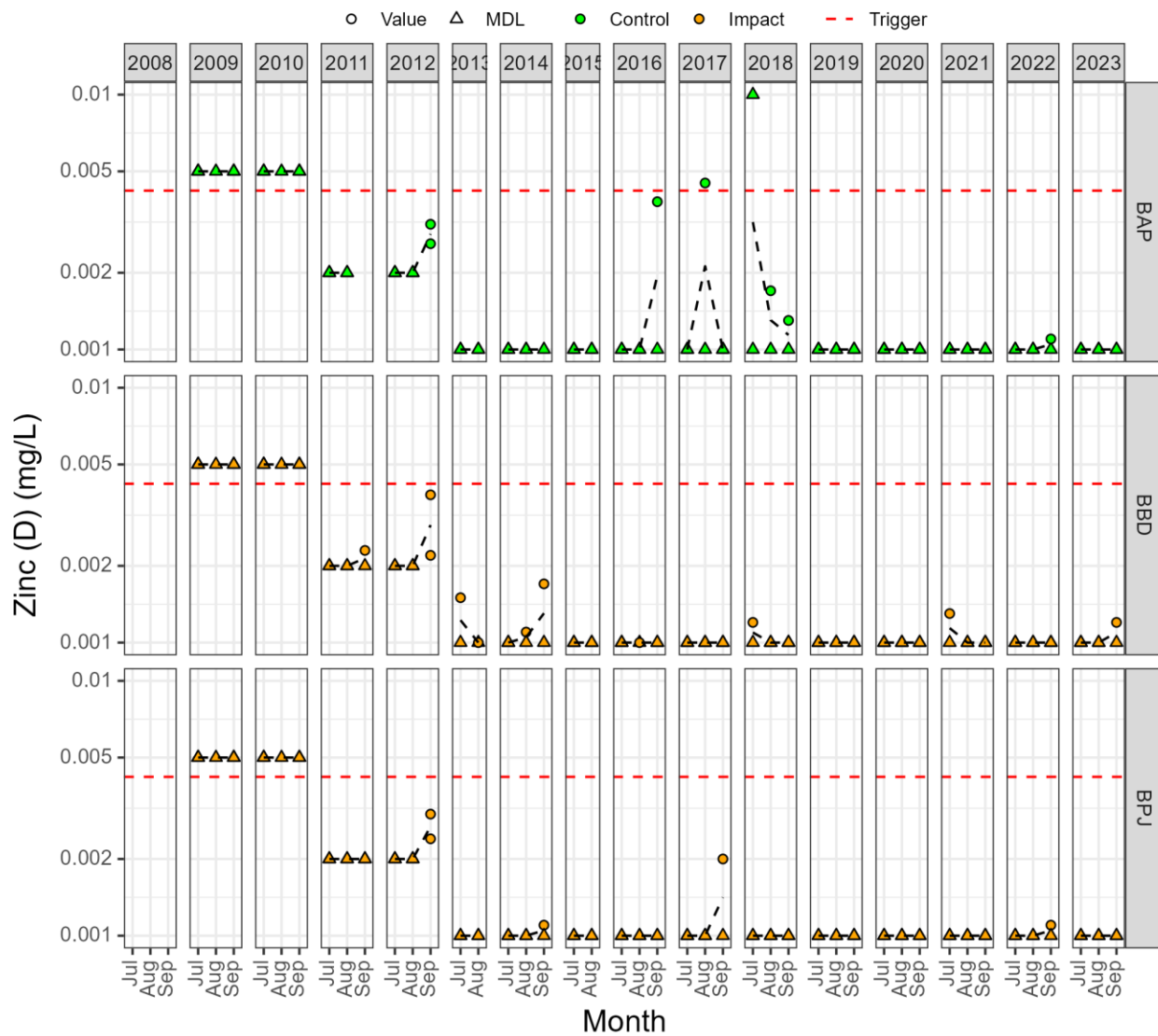
Figure 1 displays a 3x15 grid of plots showing Vanadium (D) (mg/L) from 2008 to 2023 for three locations: BAP, BBD, and BPJ. The y-axis is logarithmic, ranging from 0.0002 to 0.05 mg/L. The x-axis shows months from July to September for each year. The legend indicates: Value (circle), MDL (triangle), Control (green circle), Impact (orange circle), and Trigger (red dashed line).

BAP (Top Row): Shows Vanadium (D) levels. A significant spike is observed in 2018, reaching approximately 0.005 mg/L, which is above the MDL (0.001 mg/L) and near the Trigger (0.05 mg/L). Other years show values mostly below 0.001 mg/L.

BBD (Middle Row): Shows Vanadium (D) levels. Values are generally low, mostly below 0.001 mg/L, with a slight increase in 2009 and 2014 reaching approximately 0.001 mg/L. No values exceed the MDL (0.001 mg/L) or the Trigger (0.05 mg/L).

BPJ (Bottom Row): Shows Vanadium (D) levels. Values are generally low, mostly below 0.001 mg/L, with a slight increase in 2009 and 2014 reaching approximately 0.001 mg/L. No values exceed the MDL (0.001 mg/L) or the Trigger (0.05 mg/L).

Figure B3-77. Dissolved zinc (mg/L).



APPENDIX C

SEDIMENT CHEMISTRY DATA

Appendix C1

Sediment Chemistry – Meadowbank Study Area Lakes

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SEDIMENT PROGRAM OVERVIEW

Below is an overview of the various sediment sampling programs at Meadowbank dating back to baseline sampling in 2008:

- **2008** – Baseline coring was conducted in July 2008 prior to onset of East Dike construction to characterize baseline surface metals concentrations at all monitoring areas.
- **2009** – The 2009 coring program was implemented to monitor potential changes to surface sediment chemistry that may have occurred as a result of the East Dike sedimentation event in August 2008. The 2009 study was conducted only at SP, TE, TPE, and INUG. TPE and INUG were used as the reference areas for SP and TE.
- **2010 to 2013** – The 2010 to 2013 sediment grab sampling programs covered all NF, MF, and FF Meadowbank study lakes as well as the reference areas INUG and PDL. Sediment coring was completed as part of the 2012 program.
- **2014** – The 2014 program was advanced a year ahead to align with EEM program. It covered all Meadowbank study lakes, sampling areas, and reference areas. Additional sampling was completed at TPE in 2014 to help assess whether the apparent changes in sediment chromium concentrations were related to spatially biased sampling or were a real temporal trend. Two zones in TPE were targeted for coring: the zone sampled initially in 2008 and 2009 (prior to dike construction; TPE-B) and the zone sampled in 2010 (TPE). Results from this analysis helped inform the design of the targeted chromium bioavailability study conducted at TPE in 2015.
- **2015** – The routine 2015 sediment sampling program was limited to the NF study lakes in accordance with the new approach outlined in the *CREMP Plan* (Azimuth, 2015b). In addition to routine sampling, a targeted bioavailability and toxicity testing program was completed on TPE sediments to help determine whether the apparent increase in chromium concentrations adversely affects the benthic invertebrate community. Sediment grab samples were collected from two zones in TPE and from the reference areas. Samples were analyzed for total metals and other conventional parameters, as per the routine CREMP program, and sequential extraction testing was performed to determine the bioavailability of sediment chromium. Bulk sediment was sent to a toxicity testing laboratory where two tests were run using *Chironomus dilutus* and *Hyalella azteca*.
- **2016** – Sediment sampling in 2016 was limited to grab sampling at the Meadowbank study lakes.
- **2017** – Sediment grab and core sampling was completed at all Meadowbank study area lakes. Samples were spaced throughout each basin. Grabs for chemistry and benthic invertebrates were collected at the same location. Core samples were opportunistically collected from some

of the grab sampling locations. The remaining replicates were spaced throughout the basin in areas with the targeted depth and substrate composition.

- **2018** – Sediment grab sampling at the Meadowbank study lakes was conducted concurrently with the benthic invertebrate community sampling locations. Targeted studies were conducted at TPE and WAL to follow up on recommendations in the 2017 CREMP (Azimuth, 2018c). The 2017 CREMP study found that chromium concentrations in the sediments at TPE and the arsenic concentrations at WAL appeared elevated compared to pre-development baseline concentrations. Sediment coring (10 replicates per location¹) was conducted to verify the 2017 results, and toxicity testing was conducted following the method used in 2015.
- **2019** – Sediment grab sampling was completed at the Meadowbank study lakes concurrently with benthic invertebrate community sampling. The targeted bioavailability study completed in 2018 indicated lower mean chromium concentrations at TPE than were observed in 2017 but appeared to confirm that concentrations were higher than before-impact concentrations. Another year of coring was completed at TPE to provide three consecutive years of chemistry data to evaluate temporal changes in sediment chromium concentrations. Sediment coring at WAL in 2018 confirmed there are no temporal changes in sediment metals at WAL attributable to activities at the mine; no follow-up was completed in 2019.
- **2020** – Sediment grab and core sampling was completed at the NF and reference areas only. Samples were spaced throughout each basin. Grabs for chemistry and benthic invertebrates were collected at the same location. Core samples were opportunistically collected from some of the grab sampling locations. The remaining replicates were spaced throughout the basin in areas with the targeted depth and substrate composition. Targeted studies focusing on chromium in sediment at TPE were completed in 2019 and concluded that, while concentrations of chromium have increased relative to the baseline period and are most likely mining-related, current concentrations of chromium in sediment and porewater do not pose risks to the benthos at TPE.
- **2021** – Sediment grab sampling was completed at the NF and reference areas only. Samples were spaced throughout each basin. Grabs for chemistry and benthic invertebrates were collected at the same location. In 2021, due to a laboratory error, some of the sediment samples were discarded prior finalizing the request for analysis. As such, only one batch of sediment samples was analyzed which included the NF areas at Meadowbank (SP, TPE, and TPN [only

¹ A “replicate” is a discrete core sample following the standard operating procedure (SOP) in Azimuth 2015b.

grain size]). Samples from reference areas INUG and PDL, and from NF area WAL were accidentally discarded by the laboratory prior to analysis (See [Appendix A](#) and [Appendix C2](#) in the 2021 CREMP report for details, Azimuth 2022a).

- **2022** – Sediment grab sampling was conducted at the NF and reference areas. The NF study lake sediment was analyzed for grain size and total organic carbon (TOC) with the remaining sediment archived for chemistry. Full chemistry analysis was performed for the reference lakes (INUG and PDL), however due to elevated moisture content, grain size analysis could not be performed.
- **2023** – Sediment core and grab sampling were conducted at the NF and reference areas. Sediment grab samples for habitat characteristics were analyzed for moisture, total organic carbon (TOC), and grain size; composite grab samples for chemistry were analyzed for aggregate organics, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Sediment core samples were analyzed for moisture, pH, and total metals.

TABLES

Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Inuggugayualik Lake (INUG)									
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	INUG-SC-1	INUG-SC-2	INUG-SC-3	INUG-SC-4	INUG-SC-5	INUG-SC-6	INUG-SC-7	INUG-SC-8	INUG-SC-9	INUG-SC-10
Date						22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-111	VA23C0344-112	VA23C0344-113	VA23C0344-114	VA23C0344-115	VA23C0344-116	VA23C0344-117	VA23C0344-118	VA23C0344-119	VA23C0344-120
Physical Tests															
Moisture (%)						85	85	84	85	84	83	84	83	83	76
pH						5.1	5.2	5.3	5.6	5.2	5.6	5.5	5.4	5.2	6.1
Total Metals (mg/kg dw)															
Aluminum						22800	18900	24000	23700	19200	18900	25600	16200	20300	24900
Antimony						0.16	0.17	0.19	0.19	0.18	0.18	0.15	0.17	0.18	0.20
Arsenic*	5.9	17	121	45		55	95	27	12	236	117	14	274	109	31
Barium						133	118	138	142	109	114	149	101	110	126
Beryllium						1.3	1.1	1.4	1.4	1.1	1.2	1.5	0.95	1.2	1.5
Bismuth						1.2	1.1	1.3	1.3	1.0	1.1	1.3	0.89	1.1	1.3
Boron						8.8	7.1	8.0	8.3	8.2	7.3	9.0	7.2	8.5	7.8
Cadmium*	0.60	3.5	1.1	0.66		0.24	0.28	0.25	0.36	0.19	0.14	0.26	0.13	0.22	0.18
Calcium						1810	1540	1970	2240	1640	1700	2230	1700	1800	1650
Chromium*	37	90	135	61		103	90	114	114	91	91	119	77	95	117
Cobalt						15	18	13	13	13	21	11	13	14	20
Copper*	36	197	83	257		45	43	50	50	40	41	49	35	41	54
Iron						79000	114000	53400	38100	144000	124000	37400	167000	87700	65100
Lead †	35	91	25	37	35	13	13	15	15	13	13	15	11	14	15
Lithium						26	21	27	27	21	20	30	18	22	29
Magnesium						9580	8060	10400	10200	8050	7940	10700	6870	8510	9820
Manganese						1410	1900	930	653	1110	2880	515	1740	1210	2080
Mercury	0.17	0.49	0.10	0.12	0.17	0.029	0.033	0.031	0.033	0.031	0.030	0.028	0.031	0.035	0.024
Molybdenum						9.4	11	3.1	2.9	14	15	2.8	18	5.6	6.8
Nickel						82	94	85	96	73	73	86	56	82	82
Phosphorus						734	1280	1530	984	2470	1250	965	2650	2040	604
Potassium						3510	2770	3540	3440	2940	2830	3860	2520	3160	3560
Selenium						0.71	0.74	0.69	0.52	0.63	0.72	0.60	0.63	0.64	0.43
Silver						0.15	0.16	0.20	0.18	0.15	0.14	0.20	0.13	0.15	<0.10
Sodium						170	137	161	167	134	122	167	109	158	115
Strontium						24	20	25	26	22	22	28	21	24	23
Sulfur						<1000	1100	1000	1000	<1000	1000	<1000	1000	1000	<1000
Thallium						0.23	0.21	0.22	0.24	0.18	0.18	0.23	0.14	0.21	0.28
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium						639	415	569	582	471	484	654	402	518	619
Tungsten						<0.50	<0.50	0.59	0.51	<0.50	0.53	<0.50	<0.50	<0.50	<0.50
Uranium						15	14	16	16	14	14	17	12	14	20
Vanadium						36	30	39	38	31	32	40	26	32	38
Zinc †	123	315	114	142	123	86	87	93	102	80	79	93	68	82	95
Zirconium						2.3	1.8	2.9	3.2	1.6	1.5	3.8	1.3	1.9	3.2
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)						0.20		0.29			0.078	0.12		0.27	

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.
*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.
†† CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.
123 Bolded and shaded concentrations also exceed the threshold value.
Italicized numbers are below detection limits.



Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Pipedream Lake (PDL)									
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	PDL-SC-1	PDL-SC-2	PDL-SC-3	PDL-SC-4	PDL-SC-5	PDL-SC-6	PDL-SC-7	PDL-SC-8	PDL-SC-9	PDL-SC-10
22-Aug-2023						22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	
Date	ISQG	PEL	MBK	WAL		VA23C0344-101	VA23C0344-102	VA23C0344-103	VA23C0344-104	VA23C0344-105	VA23C0344-106	VA23C0344-107	VA23C0344-108	VA23C0344-109	VA23C0344-110
ALS Sample ID															
Physical Tests															
Moisture (%)						82	82	80	82	81	79	80	78	76	80
pH						5.5	5.1	5.1	5.1	5.2	5.2	5.3	5.4	5.2	5.6
Total Metals (mg/kg dw)															
Aluminum						18400	20200	17200	15800	17200	19300	19500	19800	19600	19400
Antimony						0.32	0.29	0.26	0.27	0.27	0.26	0.27	0.27	0.28	0.29
Arsenic*	5.9	17	121	45		327	135	107	297	117	44	36	61	50	46
Barium						108	107	75	79	79	81	90	99	87	93
Beryllium						0.92	0.95	0.79	0.78	0.83	0.90	0.91	0.96	0.92	0.90
Bismuth						0.85	0.92	0.76	0.73	0.78	0.83	0.82	0.86	0.84	0.85
Boron						7.2	7.8	6.3	5.7	6.4	6.7	7.3	7.6	7.9	7.7
Cadmium*	0.60	3.5	1.1	0.66		0.27	0.28	0.15	0.19	0.21	0.15	0.19	0.21	0.20	0.24
Calcium						2180	1910	1920	1760	1980	2070	2260	2250	2130	2330
Chromium*	37	90	135	61		115	127	111	105	112	122	118	123	123	123
Cobalt						22	21	13	17	14	16	16	21	16	15
Copper*	36	197	83	257		49	51	40	40	42	44	43	47	44	44
Iron						95100	66500	60200	80700	62100	51300	49000	52100	43900	43100
Lead †	35	91	25	37	35	16	16	14	14	14	15	15	15	15	15
Lithium						23	25	21	20	21	24	23	24	24	23
Magnesium						9610	10500	9340	8790	9460	10200	10200	10300	10100	10100
Manganese						2340	1260	784	1320	866	810	1980	3300	1410	1720
Mercury	0.17	0.49	0.10	0.12	0.17	0.028	0.023	0.020	0.022	0.022	0.018	0.020	0.019	0.020	0.020
Molybdenum						10	4.7	5.0	6.1	5.0	3.7	3.0	4.1	3.3	3.2
Nickel						100	104	73	81	80	79	83	98	87	89
Phosphorus						758	650	598	1010	687	485	509	544	524	582
Potassium						2480	2720	2270	2050	2240	2520	2560	2660	2580	2580
Selenium						0.74	0.58	0.41	0.53	0.52	0.42	0.48	0.45	0.50	0.49
Silver						0.22	0.20	0.16	0.18	0.17	0.15	0.17	0.13	0.13	0.16
Sodium						94	100	83	78	86	94	97	103	98	103
Strontium						22	21	20	18	20	22	24	24	24	25
Sulfur						<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium						0.18	0.20	0.16	0.15	0.16	0.17	0.17	0.19	0.18	0.18
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium						430	512	440	426	454	512	522	535	541	548
Tungsten						<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.60	<0.50	<0.50	<0.50
Uranium						8.0	8.5	6.8	6.8	7.1	7.6	7.5	8.2	7.9	7.7
Vanadium						33	35	31	29	32	34	34	35	35	35
Zinc †	123	315	114	142	123	82	85	69	69	74	77	76	79	77	77
Zirconium						1.1	1.3	1.3	1.1	1.2	1.6	<1.0	1.0	1.1	1.0
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)									0.18	0.16	0.074			0.16	0.16

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.

† CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.



Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Third Portage Lake - East Basin (TPE)										
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	TPE-SC-1	TPE-SC-2	TPE-SC-3	TPE-SC-4	TPE-SC-5	TPE-SC-6	TPE-SC-7	TPE-SC-8	TPE-SC-9	TPE-SC-10	
Date						11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-071	VA23C0344-072	VA23C0344-073	VA23C0344-074	VA23C0344-075	VA23C0344-076	VA23C0344-077	VA23C0344-078	VA23C0344-079	VA23C0344-080	
Physical Tests																
Moisture (%)						86	86	85	85	85	88	82	69	87	87	
pH						5.6	6.1	5.2	5.8	5.5	5.4	5.7	5.2	5.1	5.0	
Total Metals (mg/kg dw)																
Aluminum						23700	22300	25600	24700	27000	25200	28600	29600	23500	24700	
Antimony						0.26	0.29	0.19	0.21	0.18	0.20	0.19	0.15	0.20	0.17	
Arsenic*	5.9	17	121	45		29	51	19	22	18	25	41	17	29	18	
Barium						128	104	120	119	126	115	131	146	127	113	
Beryllium						1.6	1.2	1.9	1.8	1.9	1.7	2.2	2.0	1.8	1.8	
Bismuth						2.1	1.5	2.5	2.2	2.5	2.1	2.5	2.5	2.1	2.3	
Boron						9.1	6.9	8.2	8.3	10	8.7	9.1	11	7.5	8.4	
Cadmium*	0.60	3.5	1.1	0.66		0.40	0.59	0.22	0.25	0.20	0.25	0.15	0.11	0.36	0.20	
Calcium						2390	2590	1880	3100	1940	2220	1910	2010	1810	1770	
Chromium*	37	90	135	61		146	297	112	127	105	156	108	91	130	92	
Cobalt						16	23	16	17	16	17	18	15	26	16	
Copper*	36	197	83	257		47	42	50	48	50	48	60	55	54	54	
Iron						49000	53000	41600	39600	42800	44000	85500	45300	58300	43100	
Lead †	35	91	25	37	35	21	21	20	20	21	20	20	21	20	19	
Lithium						39	32	45	43	50	42	52	62	40	46	
Magnesium						10800	14600	10500	10500	10200	11400	11200	11300	10400	9590	
Manganese						5010	5700	1960	2740	1570	2440	2200	1430	4130	906	
Mercury	0.17	0.49	0.10	0.12	0.17	0.025	0.027	0.015	0.016	0.014	0.019	0.012	0.0080	0.019	0.015	
Molybdenum						4.7	4.7	3.8	3.8	3.7	3.9	8.0	4.6	4.6	3.9	
Nickel						98	178	74	87	72	92	64	58	102	62	
Phosphorus						419	477	384	337	376	433	475	304	442	385	
Potassium						3860	2860	4080	3910	4330	3970	4640	5280	3700	4140	
Selenium						0.75	0.54	0.45	0.60	0.42	0.67	0.35	<0.20	0.70	0.72	
Silver						0.13	0.26	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	
Sodium						160	127	142	146	156	163	147	149	147	168	
Strontium						18	17	16	17	18	18	16	18	15	16	
Sulfur						1500	1900	1500	1700	1600	1900	<1000	<1000	1200	1000	
Thallium						0.40	0.36	0.39	0.39	0.39	0.38	0.40	0.41	0.42	0.37	
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium						794	596	845	823	904	756	935	1230	772	909	
Tungsten						0.66	0.96	0.54	0.58	<0.50	0.52	<0.50	<0.50	<0.50	<0.50	
Uranium						13	10	17	14	17	14	19	19	15	17	
Vanadium						39	42	39	39	41	39	45	46	38	40	
Zinc †	123	315	114	142	123	102	98	105	101	105	101	119	110	107	104	
Zirconium						2.3	2.5	3.1	2.6	2.7	2.9	3.6	4.5	3.1	3.4	
Speciated Metals (µg/kg dw)																
Methylmercury (as MeHg)																

Notes:

- CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level
- Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.
- Thresholds are set equal to CCME ISQG guidelines, where available.
 *** CCME guideline not used as threshold value because threshold value would be lower than trigger value.
 ** CCME guideline not used as threshold value at Wally Lake.
 123 Bolded concentrations exceed the trigger value.
 123 Bold and shaded concentrations also exceed the threshold value.
Italicized numbers are below detection limits.

Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Third Portage Lake - North Basin (TPN)									
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	TPN-SC-1	TPN-SC-2	TPN-SC-3	TPN-SC-4	TPN-SC-5	TPN-SC-6	TPN-SC-7	TPN-SC-8	TPN-SC-9	TPN-SC-10
12-Aug-2023						12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	
Date	ISQG	PEL	MBK	WAL		VA23C0344-081	VA23C0344-082	VA23C0344-083	VA23C0344-084	VA23C0344-085	VA23C0344-086	VA23C0344-087	VA23C0344-088	VA23C0344-089	VA23C0344-090
ALS Sample ID															
Physical Tests															
Moisture (%)						70	39	37	42	69	73	56	66	83	85
pH						6.1	5.8	6.1	6.2	5.8	5.7	6.1	5.9	5.8	5.9
Total Metals (mg/kg dw)															
Aluminum						12300	8740	19600	16400	14500	13200	13500	14100	17600	20100
Antimony						0.13	<0.10	<0.10	0.10	0.12	0.11	0.12	0.11	0.17	0.19
Arsenic*	5.9	17	121	45		14	6.2	8.2	11	13	15	14	12	16	18
Barium						38	29	84	70	56	50	51	55	65	75
Beryllium						0.54	0.46	0.94	0.79	0.80	0.74	0.67	0.76	1.0	1.3
Bismuth						0.46	0.32	0.82	0.67	0.84	0.72	0.66	0.73	1.0	1.2
Boron						<5.0	<5.0	<5.0	<5.0	5.1	<5.0	5.4	6.0	7.4	8.3
Cadmium*	0.60	3.5	1.1	0.66		0.15	0.053	0.072	0.092	0.070	0.071	0.071	0.071	0.063	0.070
Calcium						1470	868	1370	1290	1260	1220	1280	1230	1630	1790
Chromium*	37	90	135	61		115	53	79	74	89	89	84	78	108	120
Cobalt						9.7	4.9	11	13	7.5	6.9	8.5	8.4	9.1	9.9
Copper*	36	197	83	257		21	12	23	22	32	29	27	29	44	55
Iron						22600	14700	28000	26400	23400	21000	23000	21700	30500	32700
Lead †	35	91	25	37	35	8.7	5.2	12	11	11	10	9.5	9.8	14	15
Lithium						17	19	46	36	23	20	22	23	25	30
Magnesium						8580	5480	9660	8460	7200	6800	6880	6710	8430	9320
Manganese						395	196	610	681	226	212	435	388	329	320
Mercury	0.17	0.49	0.10	0.12	0.17	0.010	<0.0050	0.0061	0.0088	0.010	0.011	0.011	0.011	0.017	0.017
Molybdenum						2.3	1.5	2.3	2.0	2.4	2.6	2.0	1.9	2.4	3.1
Nickel						55	30	63	68	43	41	42	40	51	60
Phosphorus						333	156	133	204	312	374	259	226	700	749
Potassium						1360	1200	3350	2710	2020	1790	1890	2080	2400	2780
Selenium						0.23	<0.20	<0.20	<0.20	<0.20	0.24	0.20	0.21	0.52	0.64
Silver						0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	0.18
Sodium						67	<50	115	100	79	78	70	81	114	133
Strontium						11	8.5	14	12	12	12	12	12	14	16
Sulfur						<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium						0.10	0.089	0.24	0.20	0.15	0.13	0.13	0.14	0.17	0.20
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium						321	372	990	759	446	396	478	502	469	501
Tungsten						<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	0.51
Uranium						5.6	3.6	8.8	6.9	9.3	8.6	8.4	9.7	12	15
Vanadium						22	15	33	28	25	23	23	23	30	33
Zinc †	123	315	114	142	123	53	40	88	86	59	52	55	57	67	77
Zirconium						1.5	2.8	11	7.6	2.2	1.6	1.6	1.5	1.5	2.3
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.
*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.
†† CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.
123 Bold and shaded concentrations also exceed the threshold value.
Italicized numbers are below detection limits.



Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Second Portage Lake (SP)									
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	SP-SC-1	SP-SC-2	SP-SC-3	SP-SC-4	SP-SC-5	SP-SC-6	SP-SC-7	SP-SC-8	SP-SC-9	SP-SC-10
Date						14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-061	VA23C0344-062	VA23C0344-063	VA23C0344-064	VA23C0344-065	VA23C0344-066	VA23C0344-067	VA23C0344-068	VA23C0344-069	VA23C0344-070
Physical Tests															
Moisture (%)						84	85	87	84	84	87	84	84	87	86
pH						5.2	5.4	5.6	5.9	5.8	6.0	5.8	5.6	5.8	6.1
Total Metals (mg/kg dw)															
Aluminum						26400	23000	30700	23300	24300	25300	24400	25500	28600	29600
Antimony						0.23	0.20	0.21	0.22	0.29	0.24	0.22	0.28	0.21	0.24
Arsenic*	5.9	17	121	45		176	140	28	35	38	37	36	71	31	34
Barium						122	110	144	103	121	115	107	121	126	133
Beryllium						2.0	1.9	2.4	1.7	1.7	1.9	1.8	1.9	2.3	2.3
Bismuth						2.1	2.0	2.6	2.0	2.0	2.1	2.0	2.0	2.4	2.5
Boron						9.3	7.9	9.8	7.5	8.4	8.9	9.3	9.9	11	12
Cadmium*	0.60	3.5	1.1	0.66		0.24	0.14	0.11	0.16	0.27	0.22	0.22	0.22	0.22	0.23
Calcium						1880	1680	2570	2300	2460	2640	2600	2720	2580	2580
Chromium*	37	90	135	61		75	66	92	77	110	91	99	107	87	85
Cobalt						19	14	13	13	16	13	13	16	17	18
Copper*	36	197	83	257		76	67	81	60	62	65	61	65	73	78
Iron						145000	123000	57800	70000	60500	69900	59300	94800	57300	58300
Lead †	35	91	25	37	35	19	17	23	19	20	21	20	21	22	22
Lithium						34	31	46	36	35	39	39	39	46	49
Magnesium						8930	7970	11100	9010	10300	9910	9920	10700	10200	10400
Manganese						1470	1110	1100	1660	3740	2170	1540	1560	3310	2700
Mercury	0.17	0.49	0.10	0.12	0.17	0.023	0.020	0.023	0.028	0.039	0.035	0.032	0.039	0.032	0.029
Molybdenum						16	13	7.1	6.0	7.2	5.9	5.5	8.1	5.8	6.5
Nickel						66	49	60	50	77	61	60	67	61	60
Phosphorus						1440	1950	685	496	582	540	513	634	587	553
Potassium						4250	3760	4970	3780	3800	4020	3940	4090	4760	4840
Selenium						0.77	0.81	0.41	0.46	0.62	0.61	0.59	0.65	0.52	0.54
Silver						0.13	0.13	0.16	0.11	0.19	0.18	0.14	0.24	0.12	<0.10
Sodium						153	142	181	149	161	165	161	179	187	174
Strontium						17	17	21	18	20	20	20	21	21	21
Sulfur						1100	<1000	<1000	1000	1400	1300	1100	1400	1400	1300
Thallium						0.33	0.29	0.36	0.30	0.32	0.32	0.31	0.31	0.38	0.40
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium						811	696	920	682	712	695	717	710	726	835
Tungsten						0.57	0.59	0.56	0.56	0.60	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium						19	17	22	16	15	17	15	15	20	21
Vanadium						37	33	45	35	38	37	37	39	38	42
Zinc †	123	315	114	142	123	127	99	125	103	108	109	103	110	118	121
Zirconium						2.6	2.4	3.8	2.4	2.1	2.4	2.0	2.3	2.1	2.0
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)															

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

**" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.**123** Bolded and shaded concentrations also exceed the threshold value.*Italicized numbers are below detection limits.*

Table C1-1. Sediment core chemistry results, Meadowbank study lakes, 2023.

Lake & Basin	Screening Criteria					Wally Lake (WAL)										
Area-Replicate ID	CCME ¹		MBK Triggers ²		Thresholds ³	WAL-SC-1	WAL-SC-2	WAL-SC-3	WAL-SC-4	WAL-SC-5	WAL-SC-6	WAL-SC-7	WAL-SC-8	WAL-SC-9	WAL-SC-10	
Date						21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023
ALS Sample ID	ISQG	PEL	MBK	WAL		VA23C0344-091	VA23C0344-092	VA23C0344-093	VA23C0344-094	VA23C0344-095	VA23C0344-096	VA23C0344-097	VA23C0344-098	VA23C0344-099	VA23C0344-100	
Physical Tests																
Moisture (%)						88	89	92	91	92	91	89	90	86	87	
pH						6.3	6.2	6.6	6.0	6.3	6.3	6.4	6.2	6.2	6.4	
Total Metals (mg/kg dw)																
Aluminum						19000	20200	14500	17400	22000	20200	22400	23900	24700	21700	
Antimony						0.34	0.38	0.38	0.33	0.44	0.45	0.37	0.41	0.37	0.19	
Arsenic*	5.9	17	121	45		27	32	30	30	30	31	45	52	23	26	
Barium						108	112	79	90	118	110	122	131	125	106	
Beryllium						1.4	1.6	1.1	1.3	1.6	1.5	1.7	1.8	1.7	1.7	
Bismuth						1.7	1.9	1.3	1.5	1.9	1.8	2.1	2.2	2.2	1.9	
Boron						10	9.7	12	11	14	14	11	12	7.6	6.9	
Cadmium*	0.60	3.5	1.1	0.66		0.36	0.37	0.41	0.45	0.55	0.53	0.44	0.55	0.93	0.15	
Calcium						3990	4680	5540	4240	4750	4580	4160	4560	3560	3620	
Chromium*	37	90	135	61		50	55	43	47	57	53	59	64	63	55	
Cobalt						8.3	9.4	8.0	8.8	9.8	9.0	9.0	10	8.9	7.9	
Copper*	36	197	83	257		106	118	98	109	145	131	144	158	152	110	
Iron						28900	33000	23800	24800	29800	30000	41700	44100	30200	32500	
Lead †	35	91	25	37	35	26	29	24	27	32	31	33	36	33	27	
Lithium						31	35	24	28	35	31	33	36	44	37	
Magnesium						7350	8060	6230	7150	8470	7640	8000	8660	9440	8210	
Manganese						395	365	268	268	322	333	340	415	323	288	
Mercury	0.17	0.49	0.10	0.12	0.17	0.053	0.055	0.076	0.070	0.071	0.078	0.066	0.064	0.034	0.038	
Molybdenum						6.3	7.2	7.1	6.7	8.2	8.2	12	12	7.0	8.9	
Nickel						46	52	44	46	54	50	51	59	56	45	
Phosphorus						595	647	807	665	611	629	758	802	523	581	
Potassium						2980	3010	2340	2690	3370	3100	3380	3530	3710	3150	
Selenium						0.55	0.62	0.59	0.75	0.92	0.78	0.90	0.97	0.81	0.62	
Silver						0.42	0.52	0.48	0.59	0.71	0.66	0.58	0.64	0.47	0.37	
Sodium						160	165	151	166	196	180	166	183	139	135	
Strontium						25	26	26	25	28	27	26	29	24	24	
Sulfur						1600	1700	3600	3000	2200	2100	1600	2200	1200	1300	
Thallium						0.25	0.28	0.21	0.25	0.31	0.28	0.30	0.34	0.32	0.27	
Tin						<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium						602	534	366	431	573	547	547	567	679	479	
Tungsten						0.89	0.95	1.1	1.0	1.1	1.1	0.95	1.0	1.1	0.88	
Uranium						12	14	11	12	15	14	16	18	16	14	
Vanadium						27	29	21	24	30	28	32	34	33	29	
Zinc †	123	315	114	142	123	102	116	96	107	125	112	125	133	117	107	
Zirconium						2.7	4.8	4.5	5.9	4.8	3.9	3.4	3.9	5.6	5.8	
Speciated Metals (µg/kg dw)																
Methylmercury (as MeHg)																

Notes:

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2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017. Trigger values were developed for Wally Lake (WAL) separate from the other Meadowbank project lakes.

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**" CCME guideline not used as threshold value because threshold value would be lower than trigger value.

"†" CCME guideline not used as threshold value at Wally Lake.

123 Bolded concentrations exceed the trigger value.**123** Bolded and shaded concentrations also exceed the threshold value.*Italicized numbers are below detection limits.*

Table C1-2. Sediment grab results, Meadowbank study lakes, 2023.

Lake & Basin	Inuggugayualik Lake (INUG)					Pipedream Lake (PDL)					Third Portage Lake - East Basin (TPE)				
Area-Replicate ID	INUG-1	INUG-2	INUG-3	INUG-4	INUG-5	PDL-1	PDL-2	PDL-3	PDL-4	PDL-5	TPE-1	TPE-2	TPE-3	TPE-4	TPE-5
Date	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	22-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023	11-Aug-2023
ALS Sample ID	VA23C0329-031	VA23C0329-032	VA23C0329-033	VA23C0329-034	VA23C0329-035	VA23C0329-025	VA23C0329-026	VA23C0329-027	VA23C0329-028	VA23C0329-029	VA23C0329-013	VA23C0329-014	VA23C0329-015	VA23C0329-016	VA23C0329-017
Physical Tests															
Moisture (%)	81	83	81	82	67	75	78	75	76	72	82	82	83	81	81
Particle Size (%)															
clay (<0.004mm)	18	23	20	21	34	19	15	15	16	16	29	30	26	25	31
silt (0.063mm - 0.004mm)	81	72	78	78	57	78	74	74	75	71	68	68	72	67	64
sand (2.0mm - 0.063mm)	<1.0	4.9	2.2	1.5	8.5	2.7	11	11	9.8	13	2.7	2.8	2.0	8.0	4.4
gravel (>2mm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon															
TOC (% dw)	3.3	3.7	3.2	3.6	1.6	2.8	2.7	2.6	2.4	2.3	3.5	3.3	3.6	3.1	2.8

Notes:
Italicized numbers are below detection limits.



Table C1-2. Sediment grab results, Meadowbank study lakes, 2023.

Lake & Basin	Third Portage Lake - North Basin (TPN)					Second Portage Lake (SP)					Wally Lake (WAL)				
Area-Replicate ID	TPN-1	TPN-2	TPN-3	TPN-4	TPN-5	SP-1	SP-2	SP-3	SP-4	SP-5	WAL-1	WAL-2	WAL-3	WAL-4	WAL-5
Date	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	14-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023	21-Aug-2023
ALS Sample ID	VA23C0329-019	VA23C0329-020	VA23C0329-021	VA23C0329-022	VA23C0329-023	VA23C0329-001	VA23C0329-002	VA23C0329-003	VA23C0329-004	VA23C0329-005	VA23C0329-007	VA23C0329-008	VA23C0329-009	VA23C0329-010	VA23C0329-011
Physical Tests															
Moisture (%)	26	25	67	36	82	85	83	82	84	85	87	91	89	88	81
Particle Size (%)															
clay (<0.004mm)	16	12	8.6	16	19	28	28	23	30	24	12	16	14	15	15
silt (0.063mm - 0.004mm)	26	31	41	50	61	69	70	75	68	75	84	81	83	82	79
sand (2.0mm - 0.063mm)	58	56	50	34	20	3.0	2.6	2.2	2.5	1.9	4.1	3.0	2.5	3.0	6.3
gravel (>2mm)	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon															
TOC (% dw)	0.60	0.53	1.8	0.72	3.2	3.6	4.1	4.0	3.9	4.4	6.8	11	8.7	7.4	4.6

Notes:
Italicized numbers are below detection limits.



Table C1-3. Hydrocarbon and PAH results for composite sediment grabs at Meadowbank study area lakes, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines ¹		INUG-COMP	PDL-COMP	TPE-COMP	TPN-COMP	SP-COMP	WAL-COMP
Date			22-Aug-2023	22-Aug-2023	11-Aug-2023	12-Aug-2023	14-Aug-2023	21-Aug-2023
ALS Sample ID	ISQG	PEL	VA23C0329-036	VA23C0329-030	VA23C0329-018	VA23C0329-024	VA23C0329-006	VA23C0329-012
Physical Parameters								
Moisture (%)	-	-	81	78	85	56	86	89
Aggregate Organics (mg/kg)								
Mineral Oil and Grease	-	-	<500	<500	<500	<500	<500	<500
Hydrocarbons (mg/kg)								
EPH10-19	-	-	<320	<260	<380	<200	<400	<580
EPH19-32	-	-	<320	<260	<380	<200	<400	<580
LEPH	-	-	<320	<260	<380	<200	<400	<580
HEPH	-	-	<320	<260	<380	<200	<400	<580
Polycyclic Aromatic Hydrocarbons (mg/kg)								
Acenaphthene	0.0067	0.089	<0.0158	<0.0133	<0.0188	<0.0063	<0.0198	<0.0291
Acenaphthylene	0.0059	0.13	<0.0158	<0.0133	<0.0188	<0.0063	<0.0198	<0.0291
Acridine	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Anthracene	0.047	0.25	<0.0158	<0.0133	<0.0188	<0.0063	<0.0198	<0.0291
Benz(a)anthracene	0.032	0.39	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Benzo(a)pyrene	0.032	0.78	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Benzo(b+j)fluoranthene	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Benzo(b+j+k)fluoranthene	-	-	<0.023	<0.018	<0.027	<0.015	<0.028	<0.041
Benzo(g,h,i)perylene	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Benzo(k)fluoranthene	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Chrysene	0.057	0.86	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Dibenz(a,h)anthracene	0.0062	0.14	<0.0158	<0.0133	<0.0188	<0.0063	<0.0198	<0.0700
Fluoranthene	0.11	2.36	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Fluorene	0.021	0.144	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Indeno(1,2,3-c,d)pyrene	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.045
Methylnaphthalene, 1-	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Methylnaphthalene, 2-	0.020	0.20	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Naphthalene	0.035	0.39	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Phenanthrene	0.042	0.52	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Pyrene	0.053	0.88	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
Quinoline	-	-	<0.016	<0.013	<0.019	<0.010	<0.020	<0.029
PAH Surrogates (%)								
Acridine-d9	-	-	113	100	110	110	108	124
Chrysene-d12	-	-	114	101	116	114	114	117
Naphthalene-d8	-	-	128	114	116	109	116	130
Phenanthrene-d10	-	-	116	104	120	118	121	129

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

Bolded concentrations exceed the ISQG guideline.*Italicized numbers are below detection limits.*

Appendix C2

Sediment Chemistry – Whale Tail Study Area Lakes

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SEDIMENT PROGRAM OVERVIEW

Below is an overview of the various sediment sampling programs at Whale Tail dating back to baseline sampling in 2015:

- **2015** – Baseline grab sampling was conducted at the NF lakes WTS, MAM, and NEM to characterize TOC, grain size, and baseline metals concentrations. A composite sample from each of the study lakes was also analyzed for hydrocarbons and PAHs. These analyses were conducted for each of the study lakes during each year of sampling to present.
- **2016** – Baseline grab sampling was expanded to include the MF lakes A20, A76, and DS1 along with the continued sampling at the NF lakes.
- **2017** – Baseline coring results in 2017 were used to establish trigger concentrations in each of the Whale Tail study lakes in anticipation of future mine developments. Unlike Meadowbank in which trigger values were applied over multiple lakes in the study area, at the Whale Tail lakes sediment chemistry was too heterogeneous to apply triggers over broad spatial scales. Instead, lake specific triggers were derived.
- **2018** – NF lake WTS moved to the “Impact” category following dike construction at Whale Tail Lake which began on July 27. All other Whale Tail lakes remained in the “Control” category. Sampling conducted via grab sampling.
- **2019** – All of the NF and MF Whale Tail study lakes were characterized as “Impact”. Sampling conducted via grab sampling.
- **2020** – Core sampling was conducted across the Whale Tail study lakes with results formally compared to lake specific triggers. Increases in mean concentrations of arsenic, chromium, and copper were found in some study lakes, however there was evidence that the observed concentrations may have been due to natural spatial heterogeneity. Findings were considered preliminary until further coring data is available during the 2023 coring cycle.
- **2021** – Grab sampling was conducted throughout the Whale Tail study lakes. In 2021, due to a laboratory error, some of the sediment samples were discarded prior finalizing the request for analysis. As such, results were missing for MAM, A20, and DS1.
- **2022** – Grab sampling was conducted throughout the Whale Tail study lakes. Concentrations of metals were generally similar to results from the baseline period and early operations.
- **2023** – Sediment core and grab sampling were conducted at the Whale Tail study lakes. Sediment grab samples for habitat characteristics were analyzed for moisture, total organic carbon (TOC), and grain size; composite grab samples for chemistry were analyzed for aggregate

organics, hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). Sediment core samples were analyzed for moisture, pH, and total metals.

TABLES

Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Lake A20 (Impoundment)										
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	A20 Triggers	A20-SC-1	A20-SC-2	A20-SC-3	A20-SC-4	A20-SC-5	A20-SC-6	A20-SC-7	A20-SC-8	A20-SC-9	A20-SC-10
Date	ISQG	PEL			16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID					VA23C0344-031	VA23C0344-032	VA23C0344-033	VA23C0344-034	VA23C0344-035	VA23C0344-036	VA23C0344-037	VA23C0344-038	VA23C0344-039	VA23C0344-040
Physical Tests														
Moisture (%)					87	87	86	87	89	88	87	88	88	86
pH					5.1	5.1	5.2	5.3	5.9	5.6	5.3	5.2	5.8	5.3
Total Metals (mg/kg dw)														
Aluminum					18700	19200	20800	22300	19400	25600	20900	27900	21800	27500
Antimony					0.26	0.21	0.20	0.21	0.24	0.22	0.20	0.22	0.32	0.22
Arsenic*	5.9	17	5.9	43	109	84	57	31	39	29	127	22	39	33
Barium					199	183	148	164	185	216	172	242	216	194
Beryllium					1.6	1.7	2.0	2.1	2.0	2.5	2.0	3.0	1.9	2.3
Bismuth					0.92	0.91	0.96	1.0	0.92	1.2	0.93	1.2	0.99	1.3
Boron					8.3	7.0	6.8	8.0	8.9	9.5	7.6	9.5	8.4	7.8
Cadmium*	0.60	3.5	0.60	0.37	0.26	0.23	0.17	0.18	0.15	0.27	0.16	0.21	0.21	0.12
Calcium					2710	2340	2080	2510	6060	2880	2500	2910	3000	2470
Chromium*	37	90	37	53	49	49	52	55	51	64	54	70	64	70
Cobalt					23	21	24	15	14	14	15	13	21	16
Copper*	36	197	36	42	36	38	46	47	39	48	41	58	41	52
Iron					140000	132000	99700	56800	84200	63900	131000	57900	80200	62200
Lead	35	91	35	25	18	18	17	18	18	22	18	24	18	23
Lithium					15	16	16	18	15	21	16	21	19	24
Magnesium					6430	6670	6760	7450	6200	8420	7010	8580	7730	9120
Manganese					4960	3600	1950	1060	1490	1210	1720	525	6100	1790
Mercury	0.17	0.49	0.17	0.11	0.062	0.052	0.043	0.047	0.060	0.052	0.046	0.056	0.060	0.045
Molybdenum					7.5	6.8	6.4	5.9	5.4	5.1	8.3	6.0	5.7	5.0
Nickel					43	39	35	39	34	43	35	44	45	43
Phosphorus					2010	1370	755	896	867	1060	1490	1340	793	772
Potassium					2980	2850	2950	3240	2860	3800	3000	3980	3410	3970
Selenium					0.88	0.83	0.87	0.78	0.73	0.69	0.75	0.91	0.81	0.57
Silver					0.24	0.21	0.12	0.14	0.27	0.30	0.20	0.30	0.19	0.12
Sodium					202	187	167	197	212	244	193	250	232	206
Strontium					28	24	22	25	30	29	26	30	32	27
Sulfur					1800	1800	1700	1800	2100	1700	1900	1600	1800	1700
Thallium					0.28	0.27	0.28	0.28	0.24	0.31	0.25	0.32	0.30	0.32
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					455	419	454	512	428	642	439	619	526	560
Tungsten					<0.50	<0.50	<0.50	<0.50	<0.50	0.60	<0.50	0.61	<0.50	<0.50
Uranium					11	12	15	16	13	16	14	19	13	16
Vanadium					28	28	30	32	29	37	30	42	32	39
Zinc*	123	315	123	103	87	87	98	101	91	106	98	125	92	110
Zirconium					1.5	2.3	2	2.2	1.8	2.5	2.6	3.5	1.8	2.6
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	0.51	0.86	-	0.88	-	0.28	0.70

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.



Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Whale Tail Lake - South Basin (WTS)										
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	WTS Triggers	WTS-SC-1	WTS-SC-2	WTS-SC-3	WTS-SC-4	WTS-SC-5	WTS-SC-6	WTS-SC-7	WTS-SC-8	WTS-SC-9	WTS-SC-10
Date					12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-011	VA23C0344-012	VA23C0344-013	VA23C0344-014	VA23C0344-015	VA23C0344-016	VA23C0344-017	VA23C0344-018	VA23C0344-019	VA23C0344-020
Physical Tests														
Moisture (%)					86	85	79	77	85	85	85	85	85	84
pH					5.9	6.1	6.4	6.1	5.9	5.7	6.0	5.7	5.6	5.9
Total Metals (mg/kg dw)														
Aluminum					16700	14400	16200	15100	12600	13800	16300	12400	17800	15600
Antimony					0.63	0.85	0.82	0.34	0.80	0.48	1.2	0.59	0.65	0.42
Arsenic*	5.9	17	5.9	83.1	120	101	58	15	527	450	258	374	75	130
Barium					129	277	110	70	194	118	205	124	164	82
Beryllium					1.3	1.1	0.96	1.0	0.99	1.1	1.1	1.1	1.2	1.2
Bismuth					0.49	0.44	0.38	0.46	0.40	0.46	0.46	0.42	0.53	0.51
Boron					7.5	6.2	5.7	5.5	6.5	6.6	6.8	7.2	6.8	5.7
Cadmium*	0.60	3.5	0.60	0.93	0.33	0.40	0.21	0.082	0.29	0.24	0.37	0.28	0.25	0.19
Calcium					4290	3850	3920	2640	4080	3080	4260	3660	3400	2860
Chromium*	37	90	37	80.6	90	105	173	72	102	71	184	76	118	74
Cobalt					24	53	21	9.2	32	21	31	18	26	20
Copper*	36	197	36	48.5	37	35	30	29	32	34	38	33	40	38
Iron					81300	125000	38900	25000	178000	159000	149000	186000	70000	98200
Lead	35	91	35	24.0	14	14	12	11	12	12	14	12	14	12
Lithium					15	12	16	15	10	11	14	10	16	13
Magnesium					7120	7140	9980	6730	6480	5730	10000	5530	8160	5930
Manganese					3020	16200	2900	588	6900	2690	6820	2800	6490	1750
Mercury	0.17	0.49	0.17	0.123	0.062	0.075	0.046	0.030	0.075	0.068	0.076	0.072	0.071	0.050
Molybdenum					4.2	6.4	5.2	2.0	10.0	7.3	9.3	7.1	5.3	4.2
Nickel					80	112	98	48	100	69	130	69	86	54
Phosphorus					774	939	780	620	1530	1540	1960	2140	914	960
Potassium					2220	1970	2090	1910	1750	1880	2240	1680	2350	1890
Selenium					0.76	0.84	0.47	0.33	0.91	0.82	0.89	1.0	0.66	0.96
Silver					0.22	0.19	0.16	0.13	0.20	0.22	0.22	0.22	0.20	0.18
Sodium					159	124	120	123	122	141	141	125	150	118
Strontium					36	46	35	29	41	33	46	37	38	29
Sulfur					1500	1600	<1000	1000	1600	1400	1600	1800	1700	1500
Thallium					0.22	0.25	0.19	0.13	0.20	0.17	0.24	0.15	0.22	0.17
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					424	345	580	478	337	350	498	317	413	323
Tungsten					<0.50	<0.50	0.61	<0.50	<0.50	<0.50	0.69	<0.50	<0.50	<0.50
Uranium					9.7	8.3	7.6	8.0	7.8	8.7	8.9	8.4	11	10.0
Vanadium					27	26	34	25	23	22	33	21	30	24
Zinc*	123	315	123	196	84	89	78	69	81	77	98	80	87	84
Zirconium					1	1.1	1.6	1.6	1.1	1.2	1.8	1.6	1.6	1.5
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)				-	-	<0.066	0.86	-	0.30	0.36	-	2.5	-	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.



Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Kangislulik Lake (MAM/KAN) *										
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	MAM Triggers	MAM-SC-1	MAM-SC-2	MAM-SC-3	MAM-SC-4	MAM-SC-5	MAM-SC-6	MAM-SC-7	MAM-SC-8	MAM-SC-9	MAM-SC-10
Date	ISQG	PEL			15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023
ALS Sample ID					VA23C0344-001	VA23C0344-002	VA23C0344-003	VA23C0344-004	VA23C0344-005	VA23C0344-006	VA23C0344-007	VA23C0344-008	VA23C0344-009	VA23C0344-010
Physical Tests														
Moisture (%)					90	90	91	91	91	90	89	88	89	88
pH					6.3	6.2	6.1	6.0	6.2	6.2	6.1	6.4	5.8	5.4
Total Metals (mg/kg dw)														
Aluminum					20000	19500	22000	19300	20700	18500	20200	19500	29400	29500
Antimony					1.9	3.1	1.5	2.7	2.8	2.2	1.9	1.6	0.60	0.61
Arsenic*	5.9	17	5.9	140	114	151	163	252	143	118	131	97	128	129
Barium					134	134	157	145	136	136	144	117	198	206
Beryllium					1.3	1.3	1.5	1.3	1.2	1.2	1.3	1.2	2.1	2.0
Bismuth					0.42	0.42	0.52	0.47	<1.21	0.40	0.44	0.40	0.74	0.73
Boron					22	25	21	21	<30.2	22	21	19	16	17
Cadmium*	0.60	3.5	0.60	0.43	0.26	0.25	0.33	0.24	0.32	0.23	0.41	0.21	0.63	0.55
Calcium					4420	6060	4220	4350	4330	4360	4660	6140	4370	3720
Chromium*	37	90	37	194	196	203	196	195	202	178	205	178	228	229
Cobalt					14	14	14	16	15	13	16	14	38	47
Copper*	36	197	36	77	60	59	73	64	69	60	80	60	101	109
Iron					40700	45800	50800	59000	46100	39600	43600	35400	58100	58800
Lead	35	91	35	26	17	16	19	17	18	15	58	16	24	23
Lithium					19	19	20	18	20	18	19	20	27	25
Magnesium					10800	10800	10800	10400	11200	10100	10900	10000	13600	13700
Manganese					612	658	519	918	607	570	703	606	466	500
Mercury	0.17	0.49	0.17	0.13	0.086	0.082	0.082	0.076	0.094	0.080	0.083	0.083	0.071	0.067
Molybdenum					5.1	6.5	6.1	7.7	5.9	5.1	8.0	4.2	8.3	8.3
Nickel					117	117	124	123	128	112	127	114	186	202
Phosphorus					781	851	822	861	1000	907	742	702	784	891
Potassium					2970	2960	3090	2750	3440	2900	2880	2900	4070	4560
Selenium					0.89	0.90	0.82	0.89	<1.21	0.78	0.78	0.75	1.4	1.5
Silver					0.41	0.41	0.46	0.41	<0.60	0.40	1.2	0.42	0.88	0.85
Sodium					194	198	192	178	<302	186	188	195	224	249
Strontium					40	44	37	38	40	38	38	40	38	34
Sulfur					2800	2800	2700	2600	<6000	2800	2500	2300	2300	2500
Thallium					0.22	0.21	0.25	0.21	<0.302	0.20	0.26	0.21	0.60	0.54
Tin					<2.0	<2.0	<2.0	<2.0	<12.1	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					486	538	507	438	856	511	475	508	800	1170
Tungsten					0.83	1.1	1.2	1.1	<3.02	1.1	40	0.80	0.55	1.1
Uranium					12	12	14	13	12	11	12	11	20	21
Vanadium					40	41	43	40	44	39	41	37	55	58
Zinc*	123	315	123	139	106	106	126	114	124	107	137	101	212	201
Zirconium					3.3	2.3	3.9	3.4	<6.0	2.6	3.2	2.7	6.5	3
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)				-	-	-	1.8	-	2.2	1.2	-	-	0.37	0.32

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.

* Previously referred to as Mammoth Lake (MAM). Acronyms MAM or KAN used interchangeably.



Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Lake A76										
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	A76 Triggers	A76-SC-1	A76-SC-2	A76-SC-3	A76-SC-4	A76-SC-5	A76-SC-6	A76-SC-7	A76-SC-8	A76-SC-9	A76-SC-10
Date	ISQG	PEL			13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023
ALS Sample ID					VA23C0344-041	VA23C0344-042	VA23C0344-043	VA23C0344-044	VA23C0344-045	VA23C0344-046	VA23C0344-047	VA23C0344-048	VA23C0344-049	VA23C0344-050
Physical Tests														
Moisture (%)					92	92	88	89	87	88	88	89	90	90
pH					6.2	6.5	5.8	5.9	5.6	5.5	5.5	5.5	5.5	5.9
Total Metals (mg/kg dw)														
Aluminum					17400	16100	14600	18100	18100	16300	18900	16600	18400	20700
Antimony					0.41	0.18	0.28	0.39	0.37	0.29	0.29	0.20	0.37	0.34
Arsenic*	5.9	17	5.9	461	53	40	637	356	448	659	381	452	358	146
Barium					155	147	137	164	153	170	199	156	195	181
Beryllium					1.1	0.97	0.87	1.1	1.1	1.0	1.3	1.0	1.1	1.4
Bismuth					0.44	0.37	0.46	0.59	0.59	0.54	0.60	0.52	0.60	0.63
Boron					14	11	<5.0	5.8	6.8	5.7	7.0	6.4	8.3	9.3
Cadmium*	0.60	3.5	0.60	0.44	0.27	0.23	0.23	0.32	0.27	0.29	0.27	0.30	0.34	0.24
Calcium					4530	4270	2450	3060	2700	2860	2660	3400	3280	3800
Chromium*	37	90	37	103	92	77	76	98	99	89	103	86	97	113
Cobalt					8.0	7.9	29	22	20	25	23	26	21	10
Copper*	36	197	36	76	57	50	50	62	60	58	74	65	69	76
Iron					36800	30800	156000	100000	119000	139000	126000	150000	126000	68600
Lead	35	91	35	26	16	14	15	19	18	17	18	18	19	20
Lithium					14	13	11	14	14	12	13	11	13	14
Magnesium					7180	6950	6030	7660	7420	6600	7040	6270	7010	7400
Manganese					325	369	3600	2850	2400	3300	2640	1810	2030	465
Mercury	0.17	0.49	0.17	0.11	0.059	0.047	0.044	0.045	0.043	0.044	0.042	0.050	0.054	0.055
Molybdenum					3.4	2.6	4.9	5.4	5.3	5.3	7.4	5.5	5.8	5.3
Nickel					70	66	84	109	100	120	116	106	111	84
Phosphorus					752	661	784	977	870	1240	1250	1150	1120	834
Potassium					2640	2380	2180	2670	2760	2480	2760	2430	2820	3040
Selenium					0.70	0.53	0.94	0.89	0.90	0.84	0.94	0.98	0.96	0.84
Silver					0.48	0.43	0.25	0.28	0.25	0.27	0.36	0.34	0.40	0.49
Sodium					198	174	126	154	149	145	146	146	170	187
Strontium					29	28	20	24	22	20	22	24	25	27
Sulfur					2600	2500	1400	1900	1900	1700	1900	2300	2200	2200
Thallium					0.21	0.19	0.23	0.31	0.29	0.31	0.30	0.27	0.31	0.27
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					335	315	318	338	390	333	393	348	398	411
Tungsten					<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium					9.8	9.1	8.0	10	10	9.8	11	10	11	12
Vanadium					30	26	26	32	33	29	34	29	32	36
Zinc*	123	315	123	112	83	73	79	97	94	95	116	112	109	116
Zirconium					3.1	3.1	2.6	2.1	1.5	2.5	3.7	4.1	2	2.8
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.



Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Lake DS1										
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	DS1 Triggers	DS1-SC-1	DS1-SC-2	DS1-SC-3	DS1-SC-4	DS1-SC-5	DS1-SC-6	DS1-SC-7	DS1-SC-8	DS1-SC-9	DS1-SC-10
Date	ISQG	PEL			17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID					VA23C0344-021	VA23C0344-022	VA23C0344-023	VA23C0344-024	VA23C0344-025	VA23C0344-026	VA23C0344-027	VA23C0344-028	VA23C0344-029	VA23C0344-030
Physical Tests														
Moisture (%)					78	80	78	69	78	81	74	73	70	70
pH					6.0	5.8	6.2	5.3	5.8	4.9	5.0	5.3	5.5	5.2
Total Metals (mg/kg dw)														
Aluminum					17100	17300	16800	19100	15700	17400	19900	19700	21000	20900
Antimony					0.30	0.33	0.29	0.29	0.30	0.30	0.33	0.33	0.33	0.33
Arsenic*	5.9	17	5.9	198	243	200	123	27	59	53	19	19	17	18
Barium					265	330	230	163	204	190	98	108	99	91
Beryllium					1.0	1.1	1.1	1.1	0.94	0.94	1.1	1.1	1.1	1.1
Bismuth					0.67	0.71	0.70	0.76	0.66	0.67	0.72	0.74	0.71	0.74
Boron					21	23	16	16	15	18	21	22	23	23
Cadmium*	0.60	3.5	0.60	0.45	0.40	0.40	0.34	0.35	0.27	0.30	0.22	0.23	0.18	0.15
Calcium					2430	2550	2410	2380	3220	2540	3100	3380	3610	3630
Chromium*	37	90	37	80	67	65	69	84	66	70	82	83	89	90
Cobalt					17	20	16	18	20	20	18	19	18	18
Copper*	36	197	36	26	17	18	19	18	15	15	17	17	17	17
Iron					74600	84500	67700	40400	62400	55600	45700	46200	43800	44600
Lead	35	91	35	26	16	17	17	19	16	16	18	18	17	18
Lithium					20	20	19	22	19	19	22	22	24	24
Magnesium					10500	10400	10600	12100	10100	10700	12000	11800	12600	12600
Manganese					14900	20800	7430	1580	34200	34000	7720	16500	19500	1970
Mercury	0.17	0.49	0.17	0.12	0.075	0.081	0.076	0.065	0.065	0.075	0.067	0.068	0.050	0.060
Molybdenum					13	15	11	2.3	11	8.7	1.8	2.0	2.0	1.6
Nickel					50	53	52	60	47	51	53	53	55	52
Phosphorus					1950	1940	1660	703	1050	946	974	897	843	914
Potassium					2650	2770	2420	2580	2340	2570	2980	2970	3100	3050
Selenium					0.44	0.54	0.41	0.34	0.49	0.40	0.37	0.38	0.36	0.33
Silver					0.13	0.14	0.14	0.15	0.13	0.14	0.14	0.14	0.14	0.15
Sodium					133	130	122	125	113	119	126	128	129	128
Strontium					33	34	29	30	39	34	37	40	41	39
Sulfur					<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Thallium					0.18	0.21	0.19	0.23	0.19	0.20	0.20	0.20	0.19	0.20
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					462	458	406	606	445	477	604	622	710	687
Tungsten					0.82	0.76	0.61	<0.50	0.56	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium					4.4	4.7	4.6	4.7	4.2	3.9	4.4	4.4	4.2	4.3
Vanadium					36	37	37	42	35	37	41	41	42	42
Zinc*	123	315	123	101	85	89	89	97	75	80	83	80	77	80
Zirconium					3.7	3.3	5.1	11	6.2	3.9	3.9	4.2	4.5	4.9
Speciated Metals (µg/kg dw)														
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-

Notes:

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ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.



Table C2-1. Sediment core chemistry results, Whale Tail study lakes, 2023.

Lake & Basin	Screening Criteria			Nemo Lake (NEM)											
Area-Replicate ID	CCME ¹		Thresholds ³ (All Lakes)	NEM Triggers	NEM-SC-1	NEM-SC-2	NEM-SC-3	NEM-SC-4	NEM-SC-5	NEM-SC-6	NEM-SC-7	NEM-SC-8	NEM-SC-9	NEM-SC-10	
Date					16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	ISQG	PEL			VA23C0344-051	VA23C0344-052	VA23C0344-053	VA23C0344-054	VA23C0344-055	VA23C0344-056	VA23C0344-057	VA23C0344-058	VA23C0344-059	VA23C0344-060	
Physical Tests															
Moisture (%)					91	90	90	91	91	90	89	87	89	88	
pH					6.1	6.1	6.2	6.4	5.9	6.4	6.4	6.3	6.2	6.1	
Total Metals (mg/kg dw)															
Aluminum					11600	10100	11800	10900	11500	11100	10600	11400	11600	8640	
Antimony					0.38	0.39	0.41	0.35	0.41	0.32	0.16	0.28	0.32	<0.10	
Arsenic*	5.9	17	5.9	61	70	107	54	29	110	53	41	33	26	18	
Barium					91	83	93	86	80	84	89	81	85	65	
Beryllium					0.65	0.55	0.61	0.60	0.55	0.60	0.56	0.63	0.66	0.47	
Bismuth					0.25	0.22	0.24	0.23	<0.20	0.22	0.20	0.21	0.28	<0.20	
Boron					12	10	12	11	13	11	8.4	11	8.5	<5.0	
Cadmium*	0.60	3.5	0.60	0.41	0.28	0.22	0.26	0.23	0.20	0.24	0.22	0.17	0.27	0.16	
Calcium					4600	3940	4740	3940	4000	4140	3710	3560	3240	2880	
Chromium*	37	90	37	130	126	128	150	114	174	132	115	130	114	88	
Cobalt					9.3	11	10	7.5	11	9.6	8.3	7.9	7.2	8.8	
Copper*	36	197	36	43	37	32	38	37	32	34	32	32	41	24	
Iron					29900	37900	25400	19400	40700	25500	22700	21300	19300	14000	
Lead	35	91	35	22	10.0	8.9	10	9.3	8.3	9.1	8.6	7.8	8.2	4.6	
Lithium					11	9.5	12	11	11	11	11	12	12	8.1	
Magnesium					7620	7240	8760	7160	9180	8010	7260	7780	7080	7140	
Manganese					419	601	525	240	497	401	469	358	256	578	
Mercury	0.17	0.49	0.17	0.10	0.034	0.031	0.035	0.028	0.032	0.029	0.021	0.022	0.020	0.0078	
Molybdenum					3.5	3.6	3.4	2.7	3.6	2.9	2.5	2.3	2.3	1.2	
Nickel					87	91	92	76	93	88	80	79	79	73	
Phosphorus					690	746	735	587	779	694	610	486	421	225	
Potassium					1370	1180	1380	1230	1370	1270	1140	1280	1250	610	
Selenium					0.63	0.51	0.54	0.52	0.55	0.56	0.42	0.42	0.49	<0.20	
Silver					0.17	0.14	0.16	0.17	0.15	0.15	0.14	0.14	0.16	<0.10	
Sodium					102	89	91	81	88	83	83	85	84	53	
Strontium					33	28	31	28	30	31	28	29	26	22	
Sulfur					2300	2300	2500	2200	2700	2400	2100	1600	1700	1800	
Thallium					0.096	0.087	0.10	0.082	0.088	0.088	0.074	0.078	0.075	<0.050	
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	
Titanium					233	191	255	216	292	226	177	259	194	56	
Tungsten					<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Uranium					4.2	3.7	4.0	3.9	3.5	3.7	3.5	3.7	4.3	2.1	
Vanadium					24	22	26	23	26	23	21	24	23	6.8	
Zinc*	123	315	123	89	60	57	63	57	55	57	52	51	52	43	
Zirconium					<1.0	1.1	<1.0	1.2	<1.0	1.2	1.6	<1.0	<1.0	<1.0	
Speciated Metals (µg/kg dw)															
Methylmercury (as MeHg)					-	-	-	-	-	-	-	-	-	-	

Notes:

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ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger and threshold values for Whale Tail lakes were developed for the 2019 CREMP, using baseline data collected in 2017 (Azimuth, 2020).

3. Thresholds are set equal to CCME ISQG guidelines, where available.

* CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the lake specific trigger.

123 Bolded and shaded concentrations also exceed the threshold if threshold is greater than lake specific trigger.

Italicized numbers are below detection limits.



Table C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Lake A20 (Impoundment)					Whale Tail Lake - South Basin (WTS)				
Area-Replicate ID	A20-1	A20-2	A20-3	A20-4	A20-5	WTS-1	WTS-2	WTS-3	WTS-4	WTS-5
Date	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023	12-Aug-2023
ALS Sample ID	VA23C0329-055	VA23C0329-056	VA23C0329-057	VA23C0329-058	VA23C0329-059	VA23C0329-043	VA23C0329-044	VA23C0329-045	VA23C0329-046	VA23C0329-047
Physical Tests										
Moisture (%)	86	86	87	87	85	81	79	81	82	79
Particle Size (%)										
clay (<0.004mm)	20	27	25	24	27	16	13	16	18	13
silt (0.063mm - 0.004mm)	78	72	74	74	72	80	72	82	77	85
sand (2.0mm - 0.063mm)	1.3	1.4	1.1	1.6	1.3	4.6	16	1.5	4.6	2.7
gravel (>2mm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon										
TOC (% dw)	5.3	5.0	5.2	5.3	4.8	4.3	3.6	4.6	4.3	5.3

Notes:*Italicized numbers are below detection limits.*

Table C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Kangislulik Lake (MAM/KAN)*					Lake A76				
Area-Replicate ID	MAM-1	MAM-2	MAM-3	MAM-4	MAM-5	A76-1	A76-2	A76-3	A76-4	A76-5
Date	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	15-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023	13-Aug-2023
ALS Sample ID	VA23C0329-049	VA23C0329-050	VA23C0329-051	VA23C0329-052	VA23C0329-053	VA23C0329-061	VA23C0329-062	VA23C0329-063	VA23C0329-064	VA23C0329-065
Physical Tests										
Moisture (%)	88	90	88	88	89	89	86	86	87	89
Particle Size (%)										
clay (<0.004mm)	13	14	14	14	15	20	21	22	19	21
silt (0.063mm - 0.004mm)	86	85	84	77	83	79	78	77	80	78
sand (2.0mm - 0.063mm)	1.5	1.3	1.8	8.9	2.2	1.0	1.3	1.0	1.3	1.0
gravel (>2mm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon										
TOC (% dw)	11	9.7	10	8.7	9.5	8.5	5.6	5.6	6.7	7.3

Notes:*Italicized numbers are below detection limits.*

* Previously referred to as Mammoth Lake (MAM). Acronyms MAM or KAN used interchangeably.



Table C2-2. Sediment grab results, Whale Tail study lakes, 2023.

Lake & Basin	Lake DS1					Nemo Lake (NEM)				
Area-Replicate ID	DS1-1	DS1-2	DS1-3	DS1-4	DS1-5	NEM-1	NEM-2	NEM-3	NEM-4	NEM-5
Date	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	VA23C0329-067	VA23C0329-068	VA23C0329-069	VA23C0329-070	VA23C0329-071	VA23C0329-037	VA23C0329-038	VA23C0329-039	VA23C0329-040	VA23C0329-041
Physical Tests										
Moisture (%)	69	60	63	64	59	85	89	85	86	84
Particle Size (%)										
clay (<0.004mm)	17	17	17	17	18	8.8	8.8	6.3	9.1	7.6
silt (0.063mm - 0.004mm)	82	82	81	81	81	74	68	59	66	59
sand (2.0mm - 0.063mm)	1.0	1.0	2.4	2.2	1.2	17	23	35	25	33
gravel (>2mm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Organic Carbon										
TOC (% dw)	1.9	1.9	1.6	1.9	1.2	9.9	9.3	6.8	7.6	6.5

Notes:*Italicized numbers are below detection limits.*

Table C2-3. Hydrocarbon and PAH results for composite sediment grabs at Whale Tail study area lakes, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines ¹		Lowest Detection Limit	A20-COMP	WTS-COMP	MAM-COMP	A76-COMP	DS1-COMP	NEM-COMP
Date				16-Aug-2023	12-Aug-2023	15-Aug-2023	13-Aug-2023	17-Aug-2023	16-Aug-2023
ALS Sample ID	ISQG	PEL		VA23C0329-060	VA23C0329-048	VA23C0329-054	VA23C0329-066	VA23C0329-072	VA23C0329-042
Physical Parameters									
Moisture (%)	-	-	0.25	87	85	90	89	68	89
Aggregate Organics (mg/kg)									
Mineral Oil and Grease	-	-	500	750	<500	<500	740	<500	<500
Hydrocarbons (mg/kg)									
EPH10-19	-	-	200	<440	<370	<520	<480	<200	<500
EPH19-32	-	-	200	<440	<370	<520	<480	<200	<500
LEPH	-	-	200	<440	<370	<520	<480	<200	<500
HEPH	-	-	200	<440	<370	<520	<480	<200	<500
Polycyclic Aromatic Hydrocarbons (mg/kg)									
Acenaphthene	0.0067	0.089	0.005	<0.0221	<0.0213	<0.0262	<0.0242	<0.0085	<0.0253
Acenaphthylene	0.0059	0.13	0.005	<0.0221	<0.0213	<0.0262	<0.0242	<0.0085	<0.0253
Acridine	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Anthracene	0.047	0.25	0.004	<0.0221	<0.0213	<0.0262	<0.0242	<0.0085	<0.0253
Benz(a)anthracene	0.032	0.39	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Benzo(a)pyrene	0.032	0.78	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Benzo(b+j)fluoranthene	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Benzo(b+j+k)fluoranthene	-	-	0.015	<0.031	<0.030	<0.037	<0.034	<0.015	<0.035
Benzo(g,h,i)perylene	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Benzo(k)fluoranthene	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Chrysene	0.057	0.86	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Dibenz(a,h)anthracene	0.0062	0.14	0.005	<0.0221	<0.0213	<0.0262	<0.0242	<0.0085	<0.0253
Fluoranthene	0.11	2.36	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Fluorene	0.021	0.144	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Indeno(1,2,3-c,d)pyrene	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Methylnaphthalene, 1-	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Methylnaphthalene, 2-	0.020	0.20	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Naphthalene	0.035	0.39	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Phenanthrene	0.042	0.52	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Pyrene	0.053	0.88	0.01	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
Quinoline	-	-	0.010	<0.022	<0.021	<0.026	<0.024	<0.010	<0.025
B(a)P total potency equivalents [B(a)P TPE]	-	-	0.020	0.027	0.026	0.032	0.029	<0.020	0.030
IACR (CCME)	-	-	0.15	0.26	0.25	0.31	0.28	<0.150	0.30
PAH Surrogates (%)									
Acridine-d9	-	-	0.010	122	107	117	119	111	116
Chrysene-d12	-	-	0.010	126	109	116	123	112	122
Naphthalene-d8	-	-	0.010	123	118	117	123	112	122
Phenanthrene-d10	-	-	0.010	129	112	123	129	118	127

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.
ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

Appendix C3

Sediment Chemistry – Baker Lake

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TABLES

Table C3-1. Sediment core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Bake Lake - Akilahaaarjuk Point (BAP)									
	CCME ¹		BL Triggers and Thresholds		BAP-SC-1	BAP-SC-2	BAP-SC-3	BAP-SC-4	BAP-SC-5	BAP-SC-6	BAP-SC-7	BAP-SC-8	BAP-SC-9	BAP-SC-10
Date					17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers ²	Thresholds ³	WP2320790-001	WP2320790-002	WP2320790-003	WP2320790-004	WP2320790-005	WP2320790-006	WP2320790-007	WP2320790-008	WP2320790-009	WP2320790-010
Physical Tests														
Moisture (%)					30	36	27	28	28	28	33	41	32	26
pH					6.2	5.7	6.4	6.6	6.5	6.0	5.6	5.4	6.5	6.7
Total Metals (mg/kg dw)														
Aluminum					4,480	5,300	4,140	5,010	3,770	4,370	5,260	6,220	4,250	4,180
Antimony					0.14	0.14	0.14	0.15	0.13	0.14	0.15	0.16	0.13	0.15
Arsenic*	5.9	17	7.6		2.9	4.4	5.0	6.1	3.9	4.5	3.5	3.9	4.7	3.0
Barium					325	335	343	386	314	330	368	356	284	322
Beryllium					0.29	0.34	0.28	0.32	0.25	0.29	0.37	0.40	0.29	0.27
Bismuth					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron					6.4	7.4	6.2	6.7	5.6	6.6	8.4	9.2	6.1	5.9
Cadmium	0.6	3.5	0.32	0.6	0.027	0.036	<0.020	0.029	<0.020	<0.020	0.030	0.042	0.027	0.026
Calcium					1,950	2,010	1,920	2,290	1,980	1,830	2,040	2,230	1,810	1,950
Chromium	37.3	90	26.8	37.3	14	15	13	15	12	13	15	17	13	14
Cobalt					3.6	4.2	3.5	4.0	3.3	3.4	4.0	4.5	3.9	3.6
Copper	35.7	197	20.3	35.7	5.7	5.3	4.4	4.6	4.2	4.2	6.4	6.7	3.7	3.5
Iron					12,100	13,800	12,700	15,500	12,800	12,700	13,500	14,200	12,400	12,800
Lead	35	91.3	19.5	35.0	3.6	4.3	3.6	4.4	3.6	3.7	4.4	5.3	3.8	3.9
Lithium					6.9	7.7	6.0	7.2	5.9	6.4	7.9	9.1	6.4	6.3
Magnesium					2,800	3,070	2,460	2,890	2,330	2,590	3,000	3,360	2,540	2,490
Manganese					124	173	210	260	154	158	123	128	717	434
Mercury	0.17	0.486	0.088	0.17	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0061	<0.0050	<0.0050
Molybdenum					0.33	0.39	0.42	0.44	0.32	0.40	0.40	0.48	0.83	0.50
Nickel					8.6	9.3	7.6	8.6	7.2	7.8	9.4	11	8.1	7.6
Phosphorus					679	726	714	811	748	666	720	745	614	634
Potassium					1,020	1,260	950	1,100	850	1,030	1,290	1,550	960	910
Selenium					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver					<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium					71	89	63	78	61	76	78	98	66	60
Strontium					40	42	40	44	37	42	46	48	40	39
Thallium					<0.050	0.057	<0.050	<0.050	<0.050	<0.050	0.057	0.067	<0.050	<0.050
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					277	313	278	327	239	271	291	348	236	278
Uranium					1.0	1.3	0.98	1.2	1.1	1.0	1.3	1.6	0.94	1.00
Vanadium					17	18	16	20	16	17	18	21	16	18
Zinc	123	315	73.1	123	20	23	17	21	16	18	22	27	18	17
Zirconium					3.7	4.1	3.7	3.4	3.4	4.0	4.6	4.7	2.6	3.0

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.**123** Bolded and shaded concentrations also exceed the threshold value.*Italicized numbers are below detection limits.*

Table C3-1. Sediment core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Baker Lake - East Shore									
	CCME ¹		BL Triggers and Thresholds		BES-SC-1	BES-SC-2	BES-SC-3	BES-SC-4	BES-SC-5	BES-SC-6	BES-SC-7	BES-SC-8	BES-SC-9	BES-SC-10
Date					18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023	18-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers ²	Thresholds ³	WP2320790-011	WP2320790-012	WP2320790-013	WP2320790-014	WP2320790-015	WP2320790-016	WP2320790-017	WP2320790-018	WP2320790-019	WP2320790-020
Physical Tests														
Moisture (%)					40	28	48	51	42	35	34	40	37	35
pH					6.6	6.9	6.4	6.5	6.6	6.6	6.7	6.7	6.8	6.8
Total Metals (mg/kg dw)														
Aluminum					6,850	4,880	8,100	8,330	6,910	5,690	6,600	7,240	6,530	5,940
Antimony					0.14	0.12	0.16	0.16	0.14	0.14	0.13	0.15	0.13	0.12
Arsenic*	5.9	17	7.6		4.2	2.9	5.0	5.2	4.1	3.5	3.8	4.2	3.8	3.4
Barium					172	167	127	152	174	147	155	173	149	170
Beryllium					0.41	0.27	0.43	0.44	0.40	0.30	0.38	0.40	0.35	0.32
Bismuth					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron					8.1	5.5	8.8	8.6	8.0	7.3	7.6	7.8	7.6	6.8
Cadmium	0.6	3.5	0.32	0.6	0.041	0.029	0.055	0.054	0.039	0.035	0.043	0.048	0.045	0.038
Calcium					2,400	2,070	2,580	2,490	2,340	2,250	2,220	2,350	2,320	2,120
Chromium	37.3	90	26.8	37.3	19	16	22	22	20	17	19	21	18	18
Cobalt					5.3	4.0	6.3	6.5	5.4	4.7	5.1	5.8	5.1	4.8
Copper	35.7	197	20.3	35.7	5.9	3.8	7.4	7.4	5.8	4.9	6.0	6.2	5.5	5.3
Iron					14,600	12,100	16,600	17,300	14,600	13,000	13,700	15,300	14,000	12,900
Lead	35	91.3	19.5	35.0	5.5	3.8	6.6	6.9	5.6	4.8	5.0	5.7	4.9	5.0
Lithium					11	7.5	12	12	11	8.6	9.7	11	9.6	8.7
Magnesium					4,130	3,200	4,590	4,710	4,000	3,540	3,870	4,480	3,820	3,590
Manganese					430	594	642	562	409	351	404	446	383	375
Mercury	0.17	0.486	0.088	0.17	0.0077	<0.0050	0.0093	0.0097	0.0078	0.0056	0.0073	0.0078	0.0070	0.0056
Molybdenum					0.54	0.44	0.73	0.75	0.55	0.53	0.58	1.2	0.46	0.48
Nickel					12	9.6	13	14	12	10	12	13	11	11
Phosphorus					708	702	789	800	718	693	673	720	722	718
Potassium					1,430	990	1,630	1,670	1,400	1,170	1,370	1,450	1,360	1,200
Selenium					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver					<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium					100	90	126	134	98	80	91	106	95	80
Strontium					42	31	44	47	40	36	40	42	38	37
Thallium					0.062	<0.050	0.076	0.079	0.062	0.056	0.062	0.065	0.058	0.054
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					344	281	400	374	356	324	359	333	341	310
Uranium					1.3	0.93	1.6	1.7	1.3	1.2	1.2	1.4	1.2	1.1
Vanadium					21	17	24	24	21	19	20	22	20	18
Zinc	123	315	73.1	123	29	21	33	35	29	25	27	32	27	26
Zirconium					2.5	2.2	2.2	2.3	2.1	2.4	2.3	2.5	2.3	2.4

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.



Table C3-1. Sediment core chemistry results, Baker Lake, 2023.

Lake & Basin Area-Replicate ID Date	Screening Criteria				Baker Lake - Proposed Jetty									
	CCME ¹		BL Triggers and Thresholds		BPJ-SC-1	BPJ-SC-2	BPJ-SC-3	BPJ-SC-4	BPJ-SC-5	BPJ-SC-6	BPJ-SC-7	BPJ-SC-8	BPJ-SC-9	BPJ-SC-10
					19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers ²	Thresholds ³	WP2320790-021	WP2320790-022	WP2320790-023	WP2320790-024	WP2320790-025	WP2320790-026	WP2320790-027	WP2320790-028	WP2320790-029	WP2320790-030
Physical Tests														
Moisture (%)					47	47	51	55	39	38	39	25	60	53
pH					6.4	6.6	6.6	6.5	6.5	6.5	6.4	6.7	6.5	6.2
Total Metals (mg/kg dw)														
Aluminum					9,100	9,280	10,100	10,200	9,140	9,010	5,690	4,640	10,500	9,620
Antimony					0.15	0.15	0.15	0.14	0.14	0.12	<0.10	<0.10	0.14	0.14
Arsenic*	5.9	17	7.6		15	7.8	9.6	7.1	84	6.5	17	3.3	10	11
Barium					144	120	164	119	172	81	108	55	157	165
Beryllium					0.46	0.42	0.45	0.46	0.43	0.38	0.26	0.20	0.46	0.45
Bismuth					<0.20	0.20	0.22	0.22	0.20	<0.20	<0.20	<0.20	0.23	0.20
Boron					8.4	8.5	9.1	9.0	7.6	7.2	5.0	<5.0	9.3	8.8
Cadmium	0.6	3.5	0.32	0.6	0.11	0.088	0.089	0.11	0.063	0.054	0.046	0.030	0.092	0.087
Calcium					2,500	2,610	2,760	2,840	2,720	2,550	1,830	1,400	2,830	2,720
Chromium	37.3	90	26.8	37.3	22	24	24	24	21	20	14	12	26	23
Cobalt					8.3	7.9	8.9	8.1	8.3	6.4	5.2	3.7	8.6	8.3
Copper	35.7	197	20.3	35.7	12	12	11	12	9.4	8.8	5.2	4.3	11	11
Iron					21,600	19,000	21,900	19,300	37,600	16,600	17,100	10,900	20,800	20,900
Lead	35	91.3	19.5	35.0	8.6	9.2	9.9	9.6	8.6	8.0	5.4	3.8	9.7	8.7
Lithium					12	13	13	13	11	11	7.7	6.3	14	13
Magnesium					5,220	5,160	5,540	5,640	4,890	4,720	3,330	2,800	5,560	5,150
Manganese					1,390	1,070	4,730	1,520	2,260	1,900	3,210	516	3,080	3,880
Mercury	0.17	0.486	0.088	0.17	0.0086	0.0090	0.012	0.013	0.0067	0.0067	0.0060	<0.0050	0.013	0.012
Molybdenum					1.6	1.3	2.2	0.96	5.3	1.0	2.2	0.52	1.6	2.1
Nickel					15	15	16	16	13	13	8.6	7.2	16	15
Phosphorus					1,180	892	1000	944	2,260	947	767	454	939	985
Potassium					1,640	1,630	1,760	1,780	1,530	1,510	970	780	1,840	1,660
Selenium					<0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	<0.20	<0.20
Silver					<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10
Sodium					133	134	140	159	149	123	78	55	151	128
Strontium					45	44	47	48	47	43	38	30	48	45
Thallium					0.078	0.076	0.085	0.084	0.063	0.057	<0.050	<0.050	0.083	0.075
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					391	425	443	426	350	413	290	272	461	418
Uranium					1.9	1.8	2.0	1.9	1.7	1.6	1.0	0.82	2.0	1.8
Vanadium					26	25	26	26	25	23	18	15	26	25
Zinc	123	315	73.1	123	64	50	49	49	39	37	26	21	50	47
Zirconium					3.5	3.4	3.0	3.0	3.2	4.6	2.6	2.2	3.0	2.7

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.



Table C3-1. Sediment core chemistry results, Baker Lake, 2023.

Lake & Basin	Screening Criteria				Baker Lake - Barge Dock									
	CCME ¹		BL Triggers and Thresholds		BBD-SC-1	BBD-SC-2	BBD-SC-3	BBD-SC-4	BBD-SC-5	BBD-SC-6	BBD-SC-7	BBD-SC-8	BBD-SC-9	BBD-SC-10
Date					16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023
ALS Sample ID	ISQG	PEL	Triggers ²	Thresholds ³	WP2320790-031	WP2320790-032	WP2320790-033	WP2320790-034	WP2320790-035	WP2320790-036	WP2320790-037	WP2320790-038	WP2320790-039	WP2320790-040
Physical Tests														
Moisture (%)					38	37	21	23	36	21	25	20	20	20
pH					5.8	6.0	6.7	6.7	6.1	6.6	6.2	6.6	6.6	6.3
Total Metals (mg/kg dw)														
Aluminum					6,670	6,420	3,160	3,880	6,360	3,490	4,850	3,320	3,650	3,970
Antimony					0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10
Arsenic*	5.9	17	7.6		8.8	8.9	2.3	2.2	7.8	2.6	4.9	2.7	2.8	4.4
Barium					99	99	29	34	111	31	63	26	33	43
Beryllium					0.29	0.29	0.14	0.16	0.28	0.14	0.24	0.15	0.16	0.17
Bismuth					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Boron					5.8	5.7	<5.0	<5.0	5.9	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium	0.6	3.5	0.32	0.6	0.044	0.049	<0.020	<0.020	0.045	<0.020	0.027	<0.020	<0.020	<0.020
Calcium					2,380	2,400	810	1,070	2,280	950	1,570	875	905	1,030
Chromium	37.3	90	26.8	37.3	16	15	5.9	7.2	14	6.3	9.7	7.0	8.9	7.4
Cobalt					5.1	5.1	2.6	2.9	5.6	2.8	3.7	2.6	2.8	3.1
Copper	35.7	197	20.3	35.7	7.4	7.6	1.9	2.7	7.5	3.0	5.1	2.5	2.3	2.6
Iron					14,700	15,000	7,060	8,270	14,600	8,010	10,300	6,890	7,840	8,910
Lead	35	91.3	19.5	35.0	6.2	6.2	2.0	2.5	5.6	2.4	4.2	2.1	2.2	2.7
Lithium					9.0	8.8	5.0	6.2	9.4	5.7	7.1	5.7	5.9	6.3
Magnesium					3,780	3,590	2,330	2,670	3,620	2,400	2,930	2,330	2,580	2,670
Manganese					295	326	126	170	389	175	218	162	142	218
Mercury	0.17	0.486	0.088	0.17	0.0056	0.0069	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum					0.64	0.65	0.21	0.25	0.79	0.32	0.47	0.19	0.25	0.37
Nickel					9.9	9.3	4.7	5.2	9.3	4.8	6.7	4.7	5.2	5.4
Phosphorus					901	1000	264	314	877	307	541	258	294	379
Potassium					1,100	1,050	440	520	1,090	450	770	450	500	590
Selenium					<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Silver					<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium					99	93	<50	<50	84	<50	55	<50	<50	<50
Strontium					35	31	19	21	32	20	28	21	20	23
Thallium					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tin					<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium					337	322	156	196	342	162	232	147	163	155
Uranium					1.3	1.3	0.36	0.50	1.2	0.49	0.86	0.38	0.40	0.53
Vanadium					18	17	8.6	12	18	9.6	13	8.3	9.0	9.8
Zinc	123	315	73.1	123	29	29	14	17	27	17	22	16	16	17
Zirconium					3.6	2.8	2.1	2.1	3.3	2.0	2.7	2.0	2.5	2.5

Notes:

1. CCME (Canadian Council of Ministers of the Environment) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = interim sediment quality guideline; PEL = probable effect level

2. Trigger values developed in the *CREMP Design Document 2012* (Azimuth, 2012d) were updated in 2017.

3. Thresholds are set equal to CCME ISQG guidelines, where available.

*** CCME guideline not used as threshold value because threshold value would be lower than trigger value.

123 Bolded concentrations exceed the trigger value.

123 Bolded and shaded concentrations also exceed the threshold value.

Italicized numbers are below detection limits.

Table C3-2. Sediment particle size and total organic carbon content, Baker Lake, 2023.

Lake & Basin	Baker Lake - Akilahaarjuk Point (BAP)					Baker Lake - East Shore (BES)				
Area-Replicate ID	BAP-1	BAP-2	BAP-3	BAP-4	BAP-5	BES-1	BES-2	BES-3	BES-4	BES-5
Date	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	17-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023	16-Aug-2023
ALS Sample ID	WP2320803-007	WP2320803-008	WP2320803-009	WP2320803-010	WP2320803-011	WP2320803-001	WP2320803-002	WP2320803-003	WP2320803-004	WP2320803-005
Physical Tests										
Moisture (%)	28	29	27	38	29	39	40	33	35	41
pH	6.0	6.1	5.8	5.4	6.4	6.7	6.4	6.5	6.6	6.5
Particle Size (%)										
clay (<0.004mm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
silt (0.063mm - 0.004mm)	76	69	75	56	73	67	52	57	66	56
sand (2.0mm - 0.063mm)	22	28	22	39	24	29	42	38	30	39
gravel (>2mm)	2.0	3.1	2.7	5.1	3.4	4.2	6.6	5.2	3.8	5.7
Organic Carbon										
TOC (% dw)	0.43	0.44	0.37	0.76	0.37	0.46	0.56	0.56	0.47	0.48

Notes:

Italicized numbers are below detection limits.



Table C3-2. Sediment particle size and total organic carbon content, Baker Lake, 2023.

Lake & Basin	Baker Lake - Barge Dock (BBD)					Baker Lake - Proposed Jetty (BPJ)				
Area-Replicate ID	BBD-1	BBD-2	BBD-3	BBD-4	BBD-5	BPJ-1	BPJ-2	BPJ-3	BPJ-4	BPJ-5
Date	16-Aug-2023	16-Aug-2023	16-Aug-2023	17-Aug-2023	17-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023	19-Aug-2023
ALS Sample ID	WP2320803-013	WP2320803-014	WP2320803-015	WP2320803-016	WP2320803-017	WP2320803-019	WP2320803-020	WP2320803-021	WP2320803-022	WP2320803-023
Physical Tests										
Moisture (%)	22	18	25	18	32	45	55	38	48	43
pH	6.0	6.5	6.4	6.3	6.0	6.5	6.2	6.7	6.2	6.7
Particle Size (%)										
clay (<0.004mm)	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	1.7	<1.0	<1.0
silt (0.063mm - 0.004mm)	69	96	76	96	53	36	23	37	27	25
sand (2.0mm - 0.063mm)	27	4.1	22	3.2	43	54	65	50	61	62
gravel (>2mm)	3.4	<1.0	1.9	<1.0	4.2	11	12	12	12	13
Organic Carbon										
TOC (% dw)	0.35	0.11	0.23	0.097	0.48	0.70	0.75	0.42	0.66	0.72

Notes:

Italicized numbers are below detection limits.



Table C3-3. Hydrocarbon and PAH results from composite sediment grabs at Baker Lake, 2023.

Area-Replicate ID	CCME Sediment Quality Guidelines ¹		BAP-Comp	BES-Comp	BBD-Comp	BPJ-Comp
Date			17-Aug-2023	16-Aug-2023	17-Aug-2023	19-Aug-2023
ALS Sample ID	ISQG	PEL	WP2320803-012	WP2320803-006	WP2320803-018	WP2320803-024
Physical Parameters						
Moisture (%)	-	-	38	40	16	47
Aggregate Organics (mg/kg)						
Mineral Oil and Grease	-	-	<500	<500	<500	<500
Hydrocarbons (mg/kg)						
EPH10-19	-	-	<200	<200	<200	<200
EPH19-32	-	-	<200	<200	<200	<200
LEPH	-	-	<200	<200	<200	<200
HEPH	-	-	<200	<200	<200	<200
Polycyclic Aromatic Hydrocarbons (mg/kg)						
acenaphthene	0.0067	0.089	<0.0050	<0.0050	<0.0050	<0.0052
acenaphthylene	0.0059	0.13	<0.0050	<0.0050	<0.0050	<0.0052
acridine	-	-	<0.010	<0.010	<0.010	<0.010
anthracene	0.047	0.25	<0.0044	<0.0049	<0.0040	<0.0052
benz(a)anthracene	0.032	0.39	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.032	0.78	<0.010	<0.010	<0.010	<0.010
benzo(b+j)fluoranthene	-	-	<0.010	<0.010	<0.010	<0.010
benzo(b+j+k)fluoranthene	-	-	<0.015	<0.015	<0.015	<0.015
benzo(g,h,i)perylene	-	-	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	-	-	<0.010	<0.010	<0.010	<0.010
chrysene	0.057	0.86	<0.010	<0.010	<0.010	<0.010
dibenz(a,h)anthracene	0.0062	0.14	<0.0050	<0.0050	<0.0050	<0.0052
fluoranthene	0.11	2.36	<0.010	<0.010	<0.010	<0.010
fluorene	0.021	0.144	<0.010	<0.010	<0.010	<0.010
indeno(1,2,3-c,d)pyrene	-	-	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 1-	-	-	<0.010	<0.010	<0.010	<0.010
methylnaphthalene, 2-	0.020	0.20	<0.010	<0.010	<0.010	<0.010
naphthalene	0.035	0.39	<0.010	<0.010	<0.010	<0.010
phenanthrene	0.042	0.52	<0.010	<0.010	<0.010	<0.010
pyrene	0.053	0.88	<0.010	<0.010	<0.010	<0.010
quinoline	-	-	<0.010	<0.010	<0.010	<0.010
B(a)P total potency equivalents [B(a)P TPE]	-	-	<0.020	<0.020	<0.020	<0.020
IACR (CCME)	-	-	<0.150	<0.150	<0.150	<0.150
PAH Surrogates (%)						
acridine-d9	-	-	98	104	90	102
chrysene-d12	-	-	100	109	97	102
naphthalene-d8	-	-	100	106	94	117
phenanthrene-d10	-	-	101	109	96	109

Notes:

1. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, 1999, updated in 2002.

ISQG = Interim freshwater Sediment Quality Guideline; PEL = probably effect level concentration

Bolded concentrations exceed the ISQG guideline.

Italicized numbers are below detection limits.

APPENDIX D

PHYTOPLANKTON TAXONOMY DATA AND SUPPLEMENTAL PLOTS

Appendix D1

Phyto Data – Meadowbank Study Area Lakes

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Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m ³)								Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Inuggugayualik Lake											
INUG - 150	29-Jun-23	0	3.5	0	162	37	8.8	34	245	28	0.71
INUG - 151	29-Jun-23	0	3.1	0	172	49	18	47	290	30	0.74
INUG - 152	22-Aug-23	3.5	9.4	0	40	6.4	5.5	8.5	74	32	0.84
INUG - 153	22-Aug-23	1.7	4.6	0	64	6.7	10	3.1	90	33	0.80
INUG - 154	7-Sep-23	11	5.1	0	98	2.1	8.4	3.3	128	33	0.86
INUG - 155	7-Sep-23	14	4.7	0	105	8.7	16	1.6	150	31	0.87
Percent Density or Biomass		3.1	3.1	<0.1	66	11	6.8	10			
Pipedream Lake											
PDL - 115	10-Jul-23	0.38	0.43	0	135	31	8.7	8.1	184	24	0.63
PDL - 116	10-Jul-23	0.54	2.2	0	120	49	4.3	6.1	182	26	0.48
PDL - 117	22-Aug-23	6.6	7.4	0	130	4.6	4.7	13	166	30	0.87
PDL - 118	22-Aug-23	10	3.7	0	140	6.5	19	11	190	31	0.87
PDL - 119	6-Sep-23	5.9	4.4	0	63	24	3.5	13	114	28	0.89
PDL - 120	6-Sep-23	5.9	9.6	0	57	4.2	4.9	6.7	88	28	0.87
Percent Density or Biomass		3.2	3.0	<0.1	70	13	4.9	6.3			
Third Portage Lake - East Basin											
TPE - 162	3-Jul-23	0	0.073	0	80	39	2.8	21	142	21	0.63
TPE - 163	3-Jul-23	0	0.034	0	113	23	4.7	14	155	23	0.54
TPE - 164	13-Aug-23	0.070	9.1	0	60	31	11	2.9	115	31	0.73
TPE - 165	24-Aug-23	0.099	3.3	0	104	29	18	7.3	161	27	0.70
TPE - 166	7-Sep-23	0.88	4.1	0	75	35	15	5.6	135	25	0.63
TPE - 167	7-Sep-23	0.35	5.0	0	61	25	12	9.3	113	31	0.69
Percent Density or Biomass		0.17	2.6	<0.1	60	22	7.8	7.3			
Third Portage Lake - North Basin											
TPN - 162	3-Jul-23	0	0.39	0	129	6.1	5.9	17	158	23	0.71
TPN - 163	3-Jul-23	0	1.1	0	116	11	12	28	168	23	0.74
TPN - 164	24-Aug-23	0	6.0	0	128	30	7.8	13	185	26	0.66
TPN - 165	24-Aug-23	0	5.3	0	108	20	5.5	7.6	147	30	0.74
TPN - 166	7-Sep-23	0	2.4	0	113	21	6.3	1.3	144	21	0.75
TPN - 167	7-Sep-23	0	1.2	0	74	26	4.4	3.2	109	20	0.66
Percent Density or Biomass		<0.1	1.8	<0.1	73	13	4.6	7.7			



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Biomass (mg/m ³)								Taxa Richness	Simpson's Diversity
		Cyanophyte	Chlorophyte	Euglenophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	TOTAL		
Second Portage Lake											
SP - 162	5-Jul-23	0	0.44	0	109	21	37	25	192	25	0.76
SP - 163	5-Jul-23	0	2.1	0	108	23	12	8.4	154	26	0.81
SP - 164	13-Aug-23	3.9	9.2	0	76	9.7	23	13	135	34	0.87
SP - 165	13-Aug-23	1.3	7.6	0	127	17	31	16	199	35	0.87
SP - 166	7-Sep-23	0.089	1.2	0	54	9.9	19	3.3	87	21	0.84
SP - 167	7-Sep-23	0	0.88	0	73	17	11	3.8	105	22	0.79
Percent Density or Biomass		0.60	2.5	<0.1	63	11	15	8.0			
Wally Lake											
WAL - 131	6-Jul-23	0	2.5	0	181	31	13	35	262	33	0.79
WAL - 132	6-Jul-23	0	0.47	0	173	30	14	36	254	28	0.81
WAL - 133	21-Aug-23	0.064	16	0	101	17	22	24	180	39	0.89
WAL - 134	21-Aug-23	0.56	13	0	134	15	32	10	205	32	0.85
WAL - 135	9-Sep-23	0.50	17	0	118	14	21	2.1	173	32	0.85
WAL - 136	9-Sep-23	0.034	15	0	115	17	17	7.9	173	27	0.84
Percent Density or Biomass		<0.1	5.2	<0.1	66	9.9	9.6	9.2			
All Locations											
Relative Density or Biomass (%)		1.2	3.2	<0.1	66	13	8.2	8.2			



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Inuggugayualik Lake								
INUG - 150	29-Jun-23	0	29,736	2,267,976	300,808	32,536	4,600	2,635,656
INUG - 151	29-Jun-23	0	43,904	2,223,672	363,248	70,056	3,000	2,703,880
INUG - 152	22-Aug-23	235,688	144,880	697,648	94,808	9,784	1,600	1,184,408
INUG - 153	22-Aug-23	13,984	123,328	906,584	76,040	72,240	7,384	1,199,560
INUG - 154	7-Sep-23	244,336	174,216	1,211,512	29,936	44,304	400	1,704,704
INUG - 155	7-Sep-23	382,416	195,168	1,103,352	88,608	100,976	200	1,870,720
Percent Density or Biomass		7.8	6.3	74	8.4	2.9	0.15	
Pipedream Lake								
PDL - 115	10-Jul-23	2,000	43,504	1,912,360	300,144	38,320	2,000	2,298,328
PDL - 116	10-Jul-23	2,800	36,920	1,623,600	304,744	16,168	1,400	1,985,632
PDL - 117	22-Aug-23	32,384	296,344	1,402,280	75,040	22,552	8,984	1,837,584
PDL - 118	22-Aug-23	71,920	165,832	1,315,272	127,128	83,624	1,800	1,765,576
PDL - 119	6-Sep-23	36,968	195,568	661,728	265,824	15,168	1,400	1,176,656
PDL - 120	6-Sep-23	26,000	245,056	712,016	97,992	22,552	800	1,104,416
Percent Density or Biomass		1.7	9.7	75	12	2.0	0.16	
Third Portage Lake - East Basin								
TPE - 162	3-Jul-23	0	200	1,047,680	187,400	8,384	3,400	1,247,064
TPE - 163	3-Jul-23	0	7,184	1,376,944	202,568	9,384	9,384	1,605,464
TPE - 164	13-Aug-23	400	1,063,832	656,544	1,366,960	26,552	600	3,114,888
TPE - 165	24-Aug-23	600	373,768	784,456	1,326,056	15,984	1,600	2,502,464
TPE - 166	7-Sep-23	9,384	503,480	474,944	1,550,560	34,936	1,200	2,574,504
TPE - 167	7-Sep-23	1,600	302,728	619,224	1,093,784	13,784	1,200	2,032,320
Percent Density or Biomass		<0.1	17	38	44	0.83	0.13	
Third Portage Lake - North Basin								
TPN - 162	3-Jul-23	0	14,368	1,152,040	103,792	30,536	2,600	1,303,336
TPN - 163	3-Jul-23	0	50,288	1,112,136	123,544	26,952	3,600	1,316,520
TPN - 164	24-Aug-23	0	165,432	908,784	1,389,312	10,984	2,600	2,477,112
TPN - 165	24-Aug-23	0	223,304	857,896	929,736	9,584	1,600	2,022,120
TPN - 166	7-Sep-23	0	93,792	1,008,360	872,864	23,352	400	1,998,768
TPN - 167	7-Sep-23	0	65,056	778,272	1,024,328	22,152	600	1,890,408
Percent Density or Biomass		<0.1	5.6	53	40	1.1	0.10	



Table D1-1. Phytoplankton density (cells/L), biomass (mg/m3), and diversity by major taxa group, Meadowbank study lakes, 2023.

Area-Replicate	Date	Phytoplankton Density (cells/L)						TOTAL
		Cyanophyte	Chlorophyte	Chrysophyte	Diatom	Cryptophyte	Dinoflagellate	
Second Portage Lake								
SP - 162	5-Jul-23	0	14,568	1,125,904	146,696	136,528	17,568	1,441,264
SP - 163	5-Jul-23	0	172,416	1,190,560	97,808	53,488	1,400	1,515,672
SP - 164	13-Aug-23	86,608	726,584	855,096	69,656	127,128	2,200	1,867,272
SP - 165	13-Aug-23	7,184	977,624	1,660,104	314,112	157,864	2,400	3,119,288
SP - 166	7-Sep-23	400	35,920	840,928	289,960	50,304	600	1,218,112
SP - 167	7-Sep-23	0	29,136	732,968	200,168	12,984	600	975,856
Percent Density or Biomass		0.93	19	63	11	5.3	0.24	
Wally Lake								
WAL - 131	6-Jul-23	0	87,008	2,152,016	297,040	97,992	1,400	2,635,456
WAL - 132	6-Jul-23	0	100,576	1,777,648	311,008	112,160	1,600	2,302,992
WAL - 133	21-Aug-23	400	806,008	1,100,152	265,624	52,104	10,984	2,235,272
WAL - 134	21-Aug-23	3,400	367,384	1,123,504	92,408	78,256	1,800	1,666,752
WAL - 135	9-Sep-23	7,384	460,376	1,559,728	234,088	52,304	400	2,314,280
WAL - 136	9-Sep-23	200	395,120	1,487,888	278,792	55,288	1,400	2,218,688
Percent Density or Biomass		<0.1	17	69	11	3.4	0.13	
All Locations								
Relative Density or Biomass (%)		1.7	13	61	22	2.5	0.15	



Figure D1-1. Cyanophyte biomass (mg/m³) from Meadowbank study area lakes since 2006.

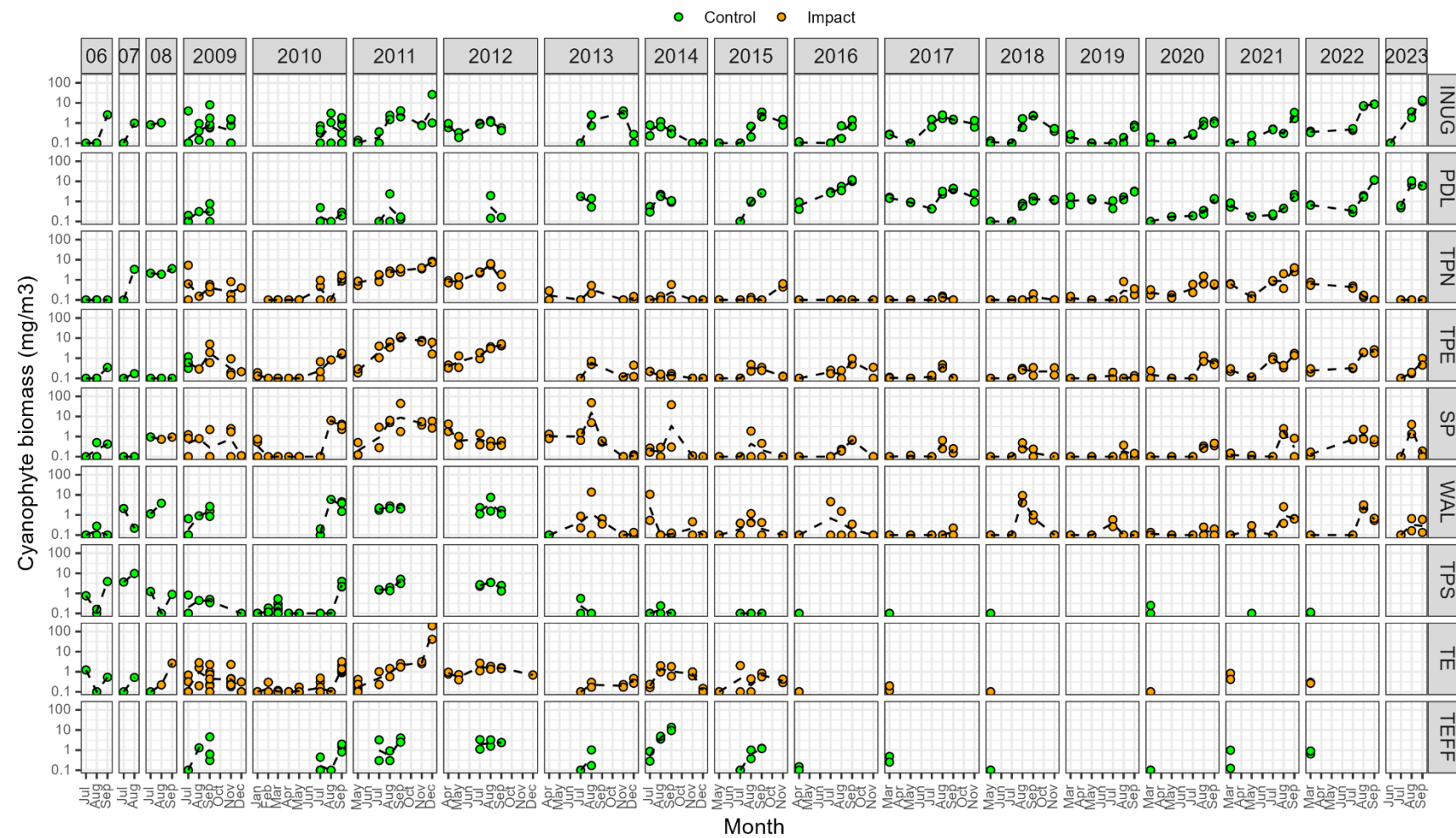


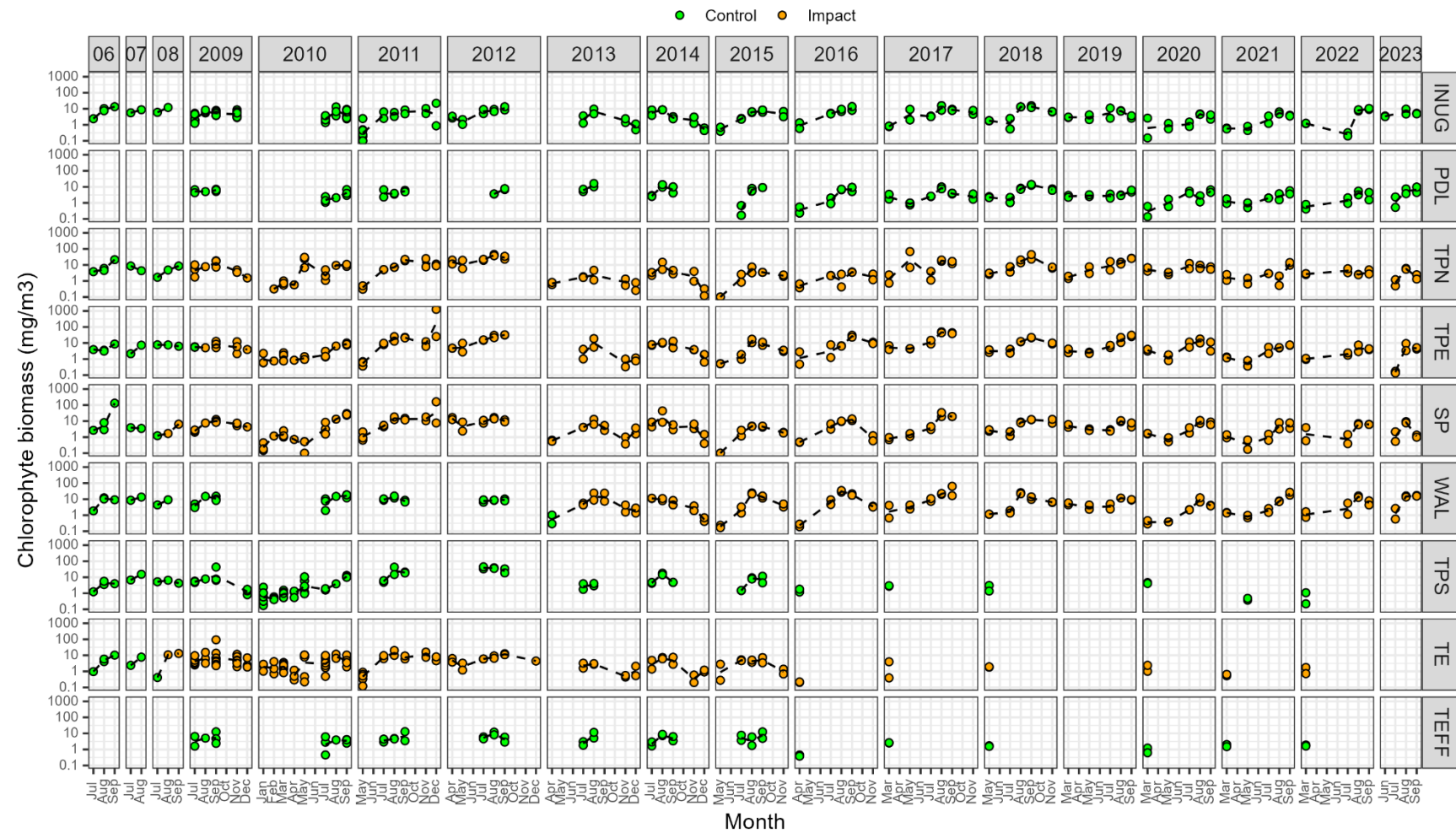
Figure D1-2. Chlorophyte biomass (mg/m³) from Meadowbank study area lakes since 2006.

Figure D1-3. Chrysophyte biomass (mg/m³) from Meadowbank study area lakes since 2006.

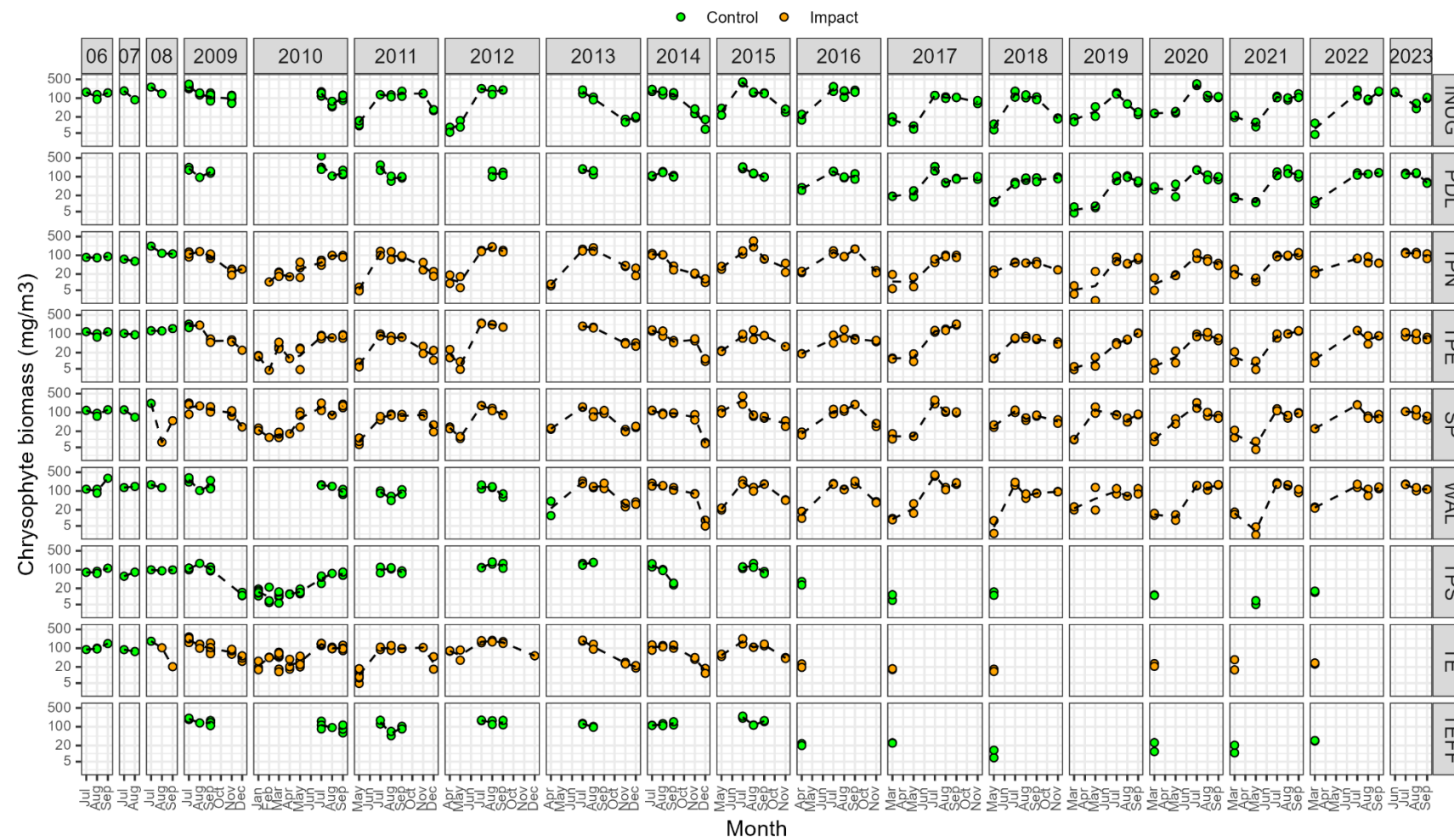


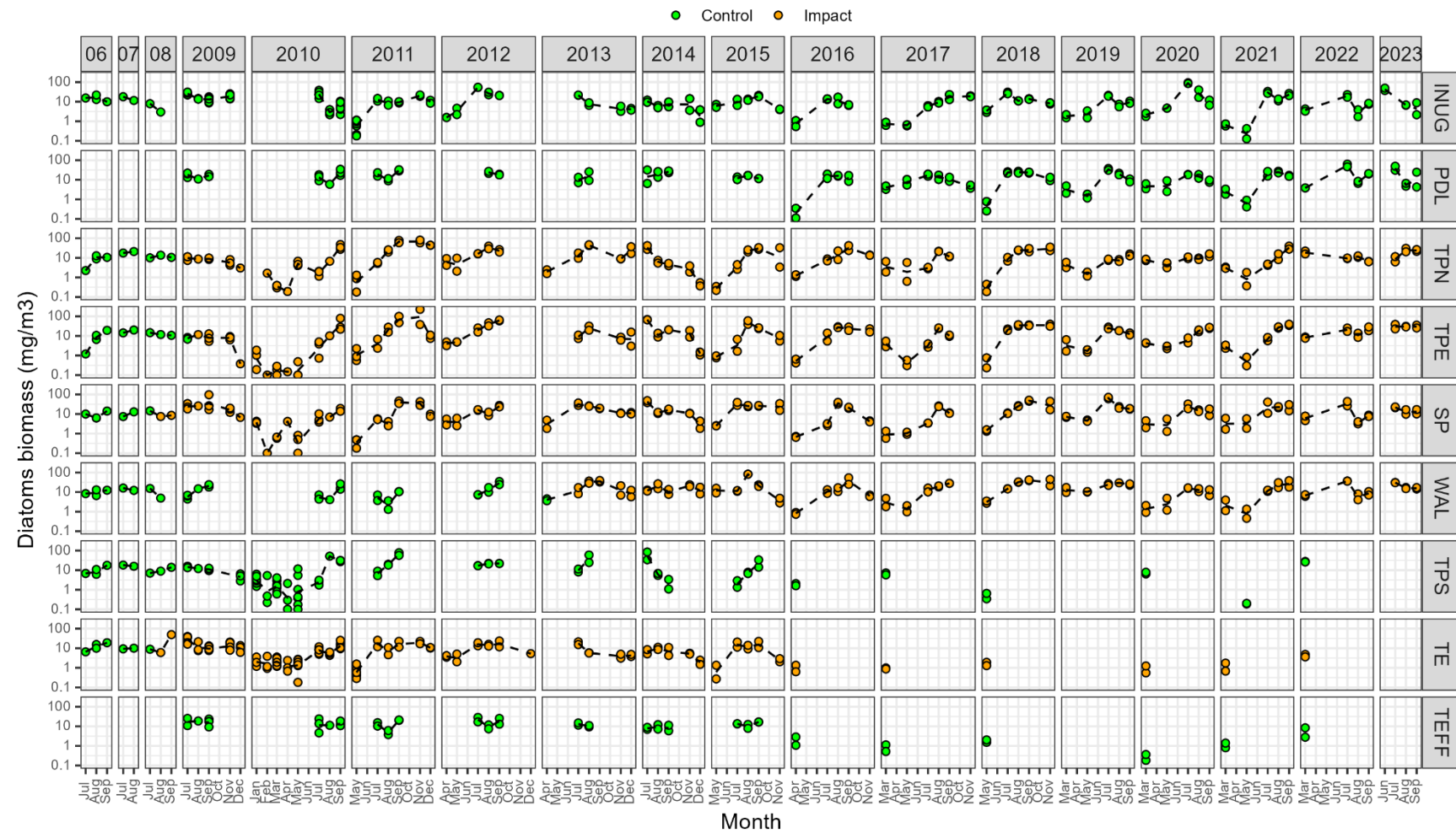
Figure D1-4. Diatom biomass (mg/m³) from Meadowbank study area lakes since 2006.

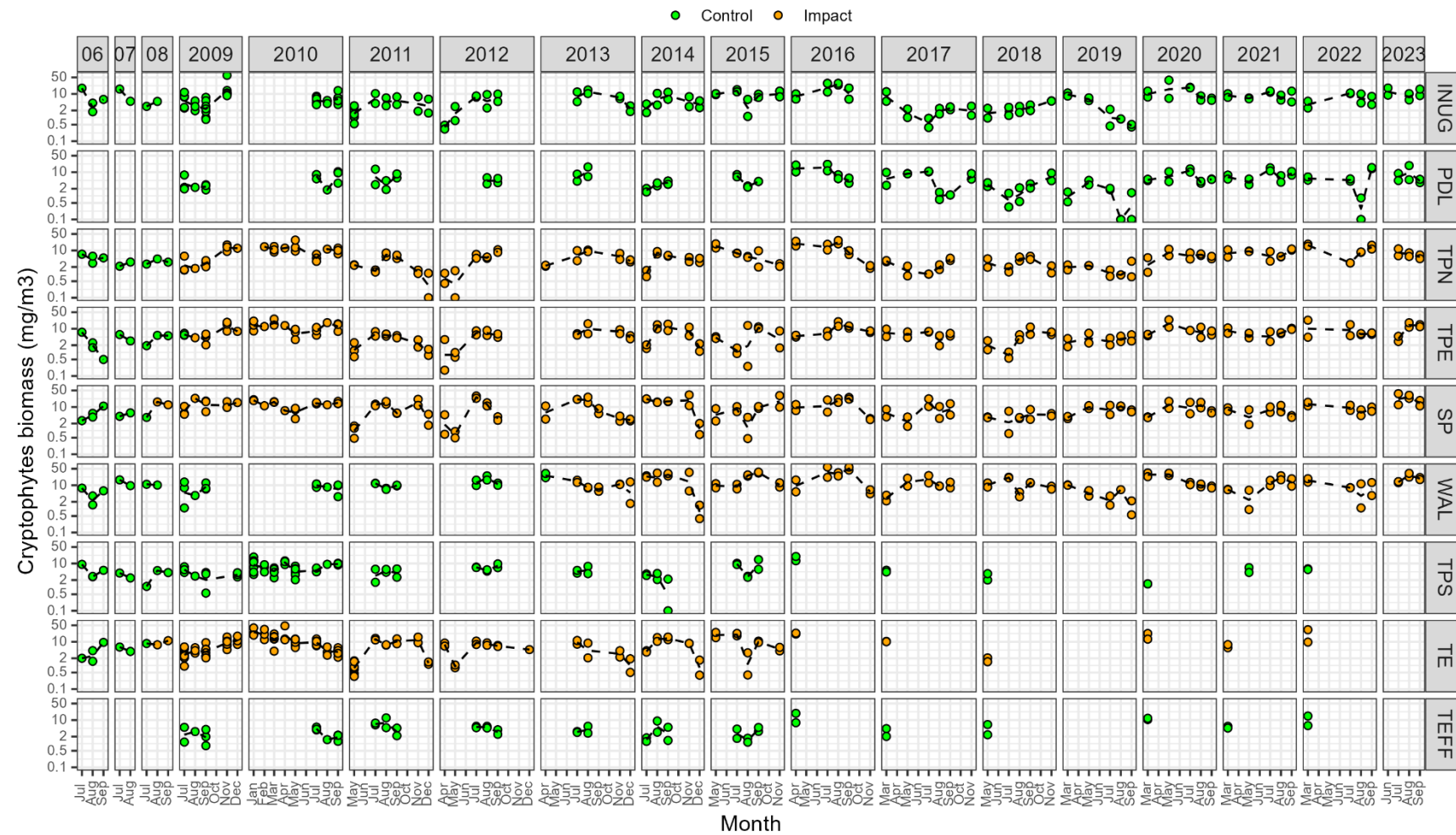
Figure D1-5. Cryptophyte biomass (mg/m³) from Meadowbank study area lakes since 2006.

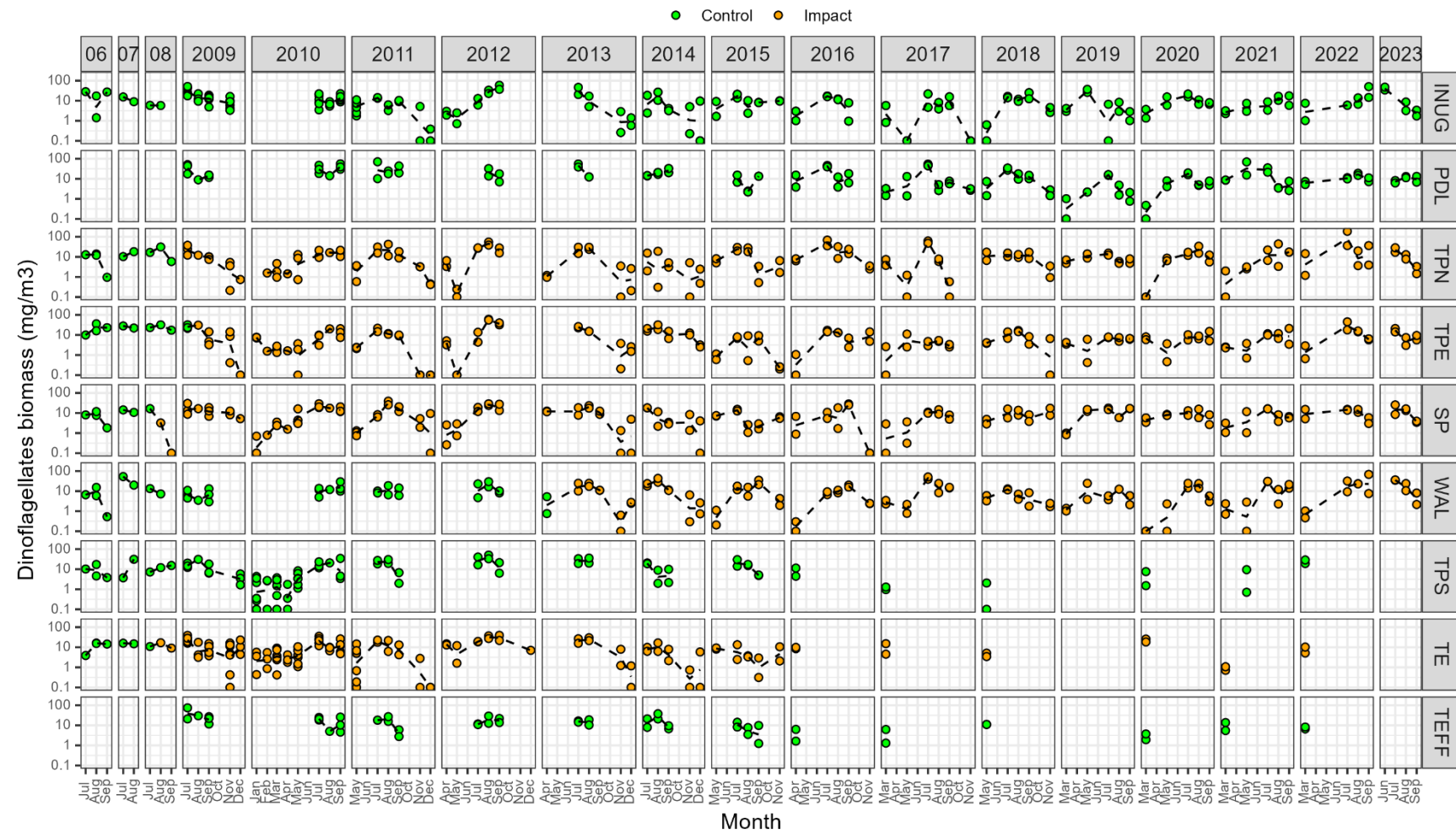
Figure D1-6. Dinoflagellate biomass (mg/m³) from Meadowbank study area lakes since 2006.

Figure D1-7. Phytoplankton density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

Note: High chlorophyll value in December 2011 at TPE omitted.

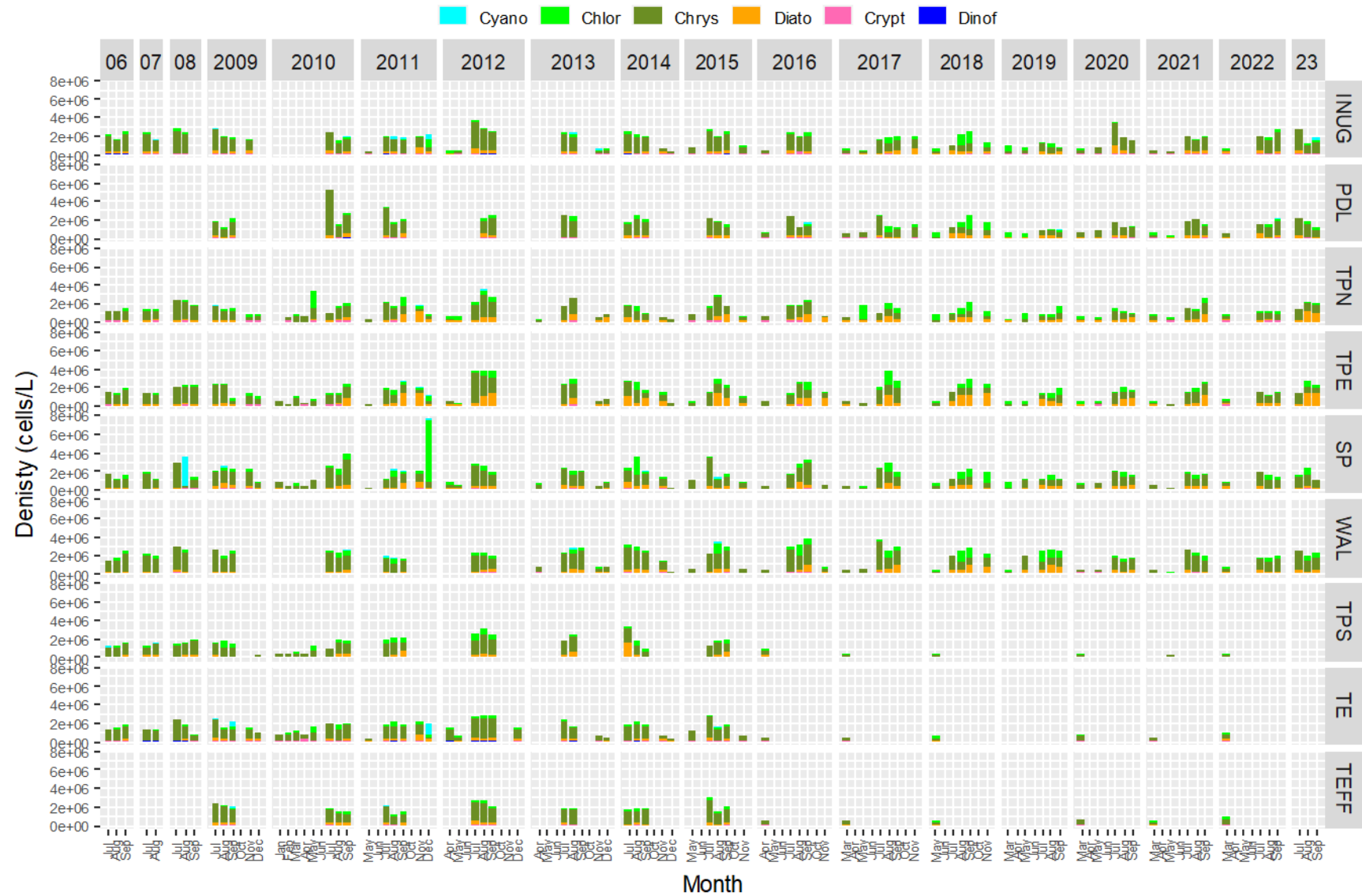


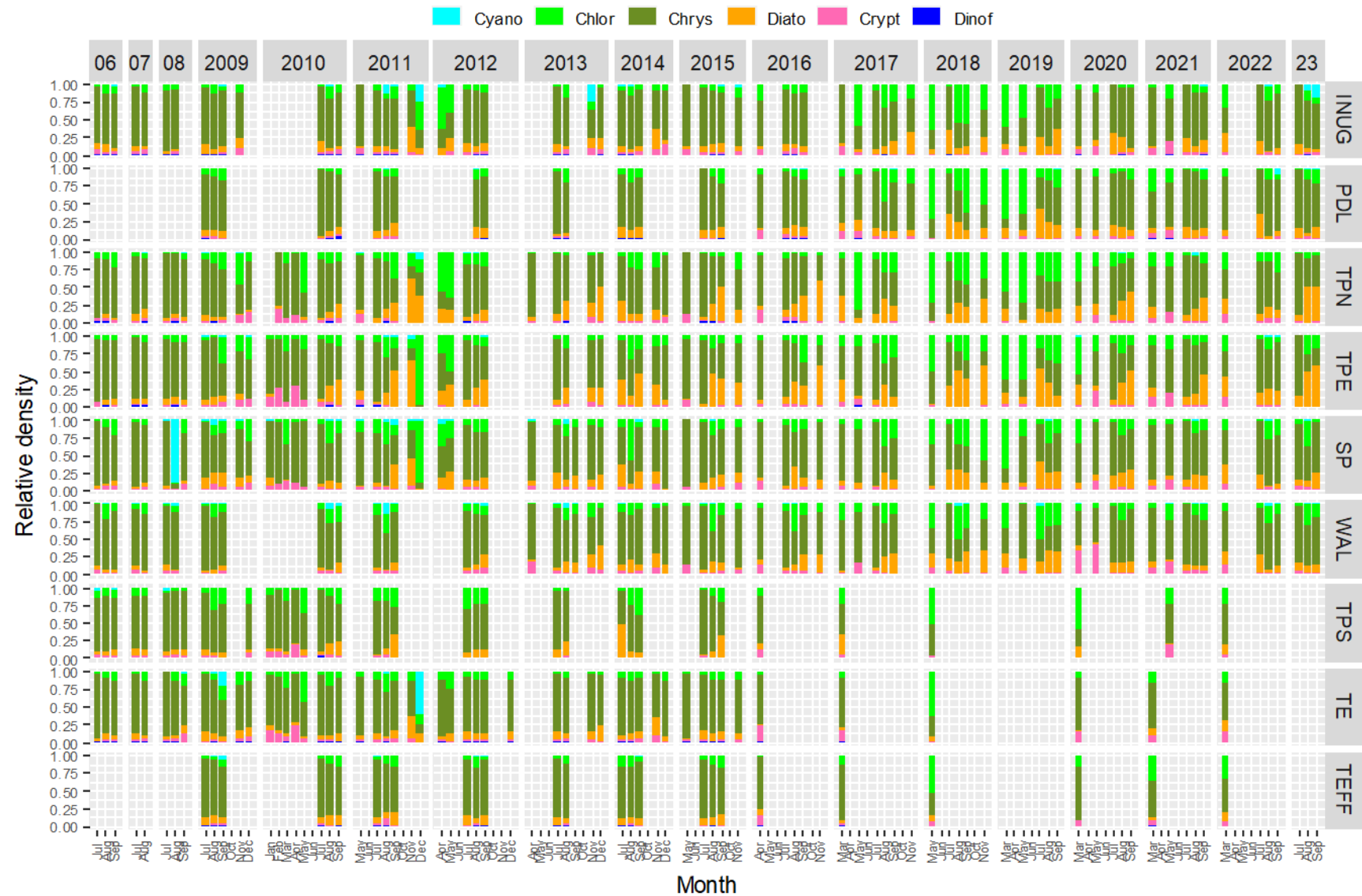
Figure D1-8. Relative phytoplankton density by major taxa group from Meadowbank study area lakes since 2006.

Figure D1-9. Cyanophyte density (cells/L) by major taxa group from Meadowbank study area lakes since 2006.

