NEW GOLD RAINY RIVER MINE
APPENDIX N
PINEWOOD BIOLOGICAL, SULFATE AND MERCURY MONITORING REPORT

PINEWOOD RIVER ANNUAL TERMS OF REFERENCE AND BIOLOGICAL MONITORING REPORT (2023)

REPORT PREPARED FOR:

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PINEWOOD RIVER ANNUAL TERMS OF REFERENCE AND BIOLOGICAL MONITORING REPORT (2023)

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EXECUTIVE SUMMARY

The Rainy River Mine (RRM) is owned by New Gold Inc. (New Gold). The mine is located approximately 65 km northwest of Fort Frances and 420 km northwest of Thunder Bay, Ontario. The RRM is located within the Pinewood River watershed which flows past the mine, eventually draining into the Rainy River approximately 40 km downstream.

Operations at RRM presently include an open pit and underground mining with ore processed at the Rainy River Mill, located on site. The mine has an anticipated mine life of around 16 years (AMEC 2014). The mine came into commercial production in September 2017 and is currently subject to amended Environmental Compliance Approval (ECA) Number 2290-CAVKGN as issued April 14, 2022 by the Ontario Ministry of Environment, Conservation, and Parks (MECP). The Amended ECA includes an allowable throughput of up to 32,400 tonnes of ore per day with a quarterly average throughput of up to 27,000 tonnes per day.

The current Environmental Compliance Approval (ECA, #2290-CAVKGN) issued on April 14, 2022 and the former ECA (# 5178-9TUPD9) contain(ed) a number of conditions to assess the potential effects of the mine, particularly discharge and flow regime change, on the receiver, the Pinewood River. This report has been prepared to meet:

- ECA, #2290-CAVKGN Condition 9(3) and Condition 12(8) – A long-term study to evaluate the potential effects of flow reductions on the biological communities within the Pinewood River watershed;
- ECA #2290-CAVKGN Condition 10(9) and Condition 12(10) – Potential loadings of sulfate and mercury to the Pinewood River watershed; and,
- Paragraph 35(2)(b) Fisheries Act Authorization #15-HCAA-00039 Condition 2.2.4.

These three above requirements are to be assessed in accordance with the following Terms of Reference (TOR) submitted to MECP as well as in compliance with the terms and schedule within the New Gold Fisheries Offset Plan (AMEC 2015).

- Terms of Reference: Study to Assess Potential Mercury Loadings to the Pinewood River Watershed. Per Environmental Compliance Approval #5178-9TUPD9 Condition 8(5). Version 1, August 2016
- Pinewood River Biological Monitoring Plan. Per Environmental Compliance Approval #5781-9VJQ2J Condition 10(5) and #5178-9TUPD9 Condition 8(7). Version 2. December 2016.

Overview of the Pinewood River Annual Monitoring Study

The annual assessment of a potential mine-related impact on the Pinewood River includes an assessment of:

- water depth in both impounded and non-impounded habitat at four locations in the Pinewood River; (hereafter, Water Level Monitoring);
- site catchment and Pinewood River surface water quality including two reference and four possibly mine-influenced downstream locations (hereafter, Mercury and Sulfate Catchment and Surface Water Assessment and Loadings Assessment);
- the fish community (hereafter, Fish Community Survey); and,
- small-bodied fish tissue mercury concentrations (hereafter, Fish Tissue Analysis).

Conclusions

The current study provided the following conclusions:

- Water level loggers indicate that Area 1–4 non-impounded and impounded habitats continue to exhibit seasonal differences in water level fluctuations mirroring precipitation variations in 2023 and over longer 2021–2023 periods. Area 3 tends to exhibit the highest variability in water level while Area 2 tends to have the highest water levels and lowest variability. Water levels and fluctuations continue to suggest no distinct pattern to suggest the impounded or non-impounded areas are affected by mine-related activities. Beaver activity along the Pinewood River has contributed to the pooling of water along sections of the river and is a possible factor influencing water levels in this vicinity.
- In 2023, mining is likely not a major contributing factor to surface water concentrations of mercury in the Pinewood River. Both site catchment and surface water total and dissolved mercury water concentrations tended to be below detection limits and Provincial Water Quality Objectives (PWQO) and Canadian Council of Ministers of the Environment (CCME) guidelines. The tailings management area site catchment water samples tended to have higher and more variable concentrations than other site catchments (e.g., sediment pond #1 and #2) but still below the PWQO.
- In 2023, site catchment and surface water methylmercury concentrations also continue to remain low and in most cases below the values observed at the reference locations. All concentrations were below CCME guidelines of 4 ng/L. An evaluation of the potential for enhanced methylation (>50% methylmercury:total mercury) revealed sampled site catchments were consistently near 4% and that surface water stations were more variable with none exceeding the 50% ratio.

- Total and dissolved mercury loads (i.e., kg/day) attributed to mine discharge and background water were proportional to discharge and background water flows, respectively, because median and 90th percentile concentrations were <DL in all samples.

- Sulfate loads (i.e., kg/day) attributed to mine discharge were higher than background during months of discharge. During months with discharge rates averaging approximately 8–19% total river flow (April to June), the mine attributed sulfate loads averaged approximately 87–99% of the total load in the river. During months with discharge rates averaging 42–48% of total flow (i.e., near ECA 1:1 limits, October and November), mine attributed sulfate loads averaged nearly 100% of the total load in the river. Sulfate concentrations in surface water at exposure sites tended to return to reference levels in the months after discharge.

- Fish communities in the reference and exposure areas continue to be diverse with 12 to 14 species being identified and with various age classes present. Density and dominant species varied between areas and between years.

- In 2023, Common Shiner (*Luxilus cornutus*) and Central Mudminnow (*Umbra limi*) mean tissue concentrations at all areas were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015) and the 0.2 mg/kg fish-protective level (Beckvar et al. 2005).

- Common Shiner fish tissue mercury concentrations were influenced by a combination of sample location, length, and sample year. Despite being below the 0.5 mg/kg consumption guideline, PWNF has consistently higher mean tissue mercury concentrations than PWREF; its magnitude of difference (MOD) relative to PWREF is typically above 25% based on multiple models (pairwise comparisons from a 2023-data ANCOVA model and from a 2019–2023 ANCOVA model). In 2023, analysis for Central Mudminnow lacked sufficient statistical power to compare across areas. Continued monitoring in 2024 and a comprehensive trend analysis should review a potential effect of mining activities on Common Shiner at PWNF.

Recommendations

The below are suggestions to modify or improve the program:

1) Determine feasibility for obtaining lower detection limits for total and dissolved mercury (currently 5 ng/L or 0.000005 mg/L) to better align with detection limits of methylmercury (currently 0.02 ng/L although tends to be higher due to sample matrix effects like chemical interference, colour, and turbidity). The terms of reference identified method detection limits of 0.1 ng/L as appropriate. This will make the calculation of the methylmercury:total mercury more accurate. If not possible, consider requesting non-censored analytical values that could be used in a robust statistical framework for estimating summary statistics (e.g., regression on order statistics for censored data) rather than simple substitution.

2) Re-commence sampling of the TMA for methylmercury during the open water season to facilitate comparisons across site catchments and successes that New Gold has for mitigation through comparisons to Pinewood River surface water.

3) Continue to ensure that site catchments and surface water locations are sampled at least monthly during the open water season to meet the terms of reference objectives.

4) Continue to additionally sample Central Mudminnow for between-species comparisons across sites but increase the number of fish targeted to at least 15 across representative fish sizes.

5) As an alternative to the two-way ANCOVA run here using 2019–2023 data, subsequent years should consider using a Linear Mixed Effects Model (LMM). This hierarchical analysis approach is able to generate similar predictions for generating magnitude of differences at different fish sizes, test the main effect of Area, and account for complex sampling structure without introducing complex interaction terms (i.e., Areas by Years by Length).

6) Continue to monitor and augment the study as necessary based on the mine established discharge practices.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 Introduction

1.1 Background Information

The Rainy River Mine (RRM) is a gold-silver mine located in northwestern Ontario in the District of Rainy River, approximately 65 km northwest of Fort Frances and 420 km west of Thunder Bay (Error! Reference source not found.). Located within the Pinewood River watershed, the Pinewood River flows past the RRM and continues for approximately 40 km until the confluence with Rainy River. The mine occupies approximately 6,050 hectares of land and is owned by New Gold Inc. (New Gold).

The RRM began processing ore in September 2017, fifty years after it was first explored in 1967. In 2005, the project was acquired by Rainy River Resources Ltd. with initial baseline studies conducted in 2008. In 2013, the RRM was acquired by New Gold. An Environmental Assessment (EA) report, which included baseline conditions, was submitted in 2014 (AMEC, 2014). Provincial and Federal EA approvals were granted in 2015 leading to the RRM site construction.

Effluent discharge at the mine is intermittent and is regulated by the mine's current provincial ECA (Number 2290-CAVKGN) issued by the MECP April 14, 2022. This ECA provides flow and seasonal requirements for discharge. Discharge of both treated water and site run-off is intermittent and based on precipitation (i.e., river flow) rather than mine production with the mine being self-sufficient from a water recycling point of view. The locations of the four discharge points (currently three active: SED2, EDL1, EDL2) are provided in **Figure 1-1**.

1.2 Objectives of the Current Report

Compliance with New Gold's ECA conditions as well as conditions of their Fisheries Act Authorization #15-HCAA-00039 require several annual aquatic studies to be conducted on the Pinewood River. The study components described herein are intended to meet the requirements of Condition 9(3) and Condition 10(9) of the current ECA and were conducted following methods established in previously submitted Terms of Reference (TOR; AMEC, 2016, 2016b).

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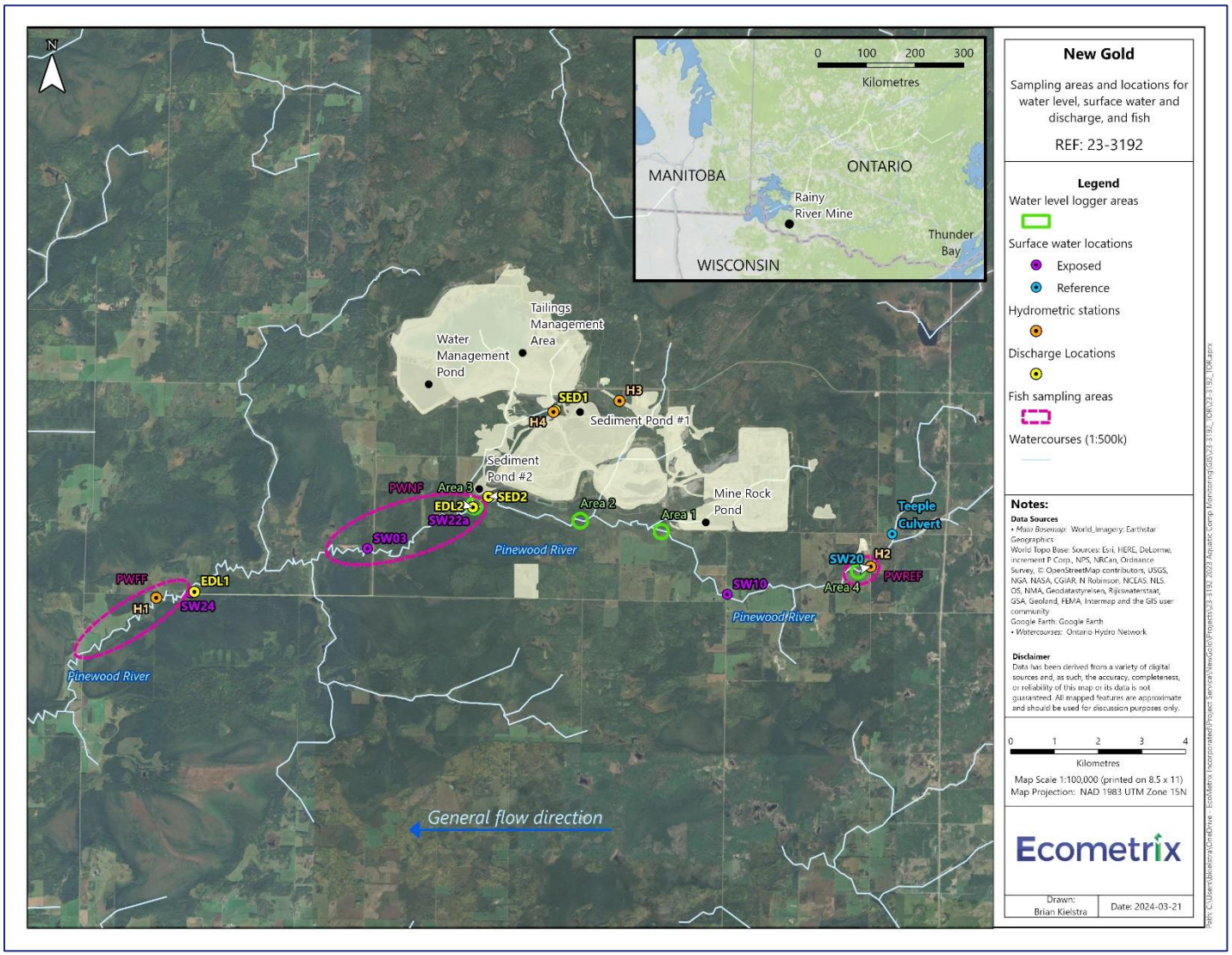

Figure 1-1: Water level, surface water and discharge, and fish collection locations near Rainy River Mine, 2023.

2.0 General Approach to Pinewood River Annual Monitoring Program

The 2023 Pinewood Annual River Monitoring Program consisted of surveys designed to evaluate potential effects associated with changes in flow of the Pinewood River and catchment and effluent discharge on the resident Pinewood River fish community. The four components were:

1. Water Level Monitoring;
2. Mercury and Sulfate Catchment and Surface Water Assessment and Loadings Assessment;
3. Fish Community Survey; and,
4. Fish Tissue Analysis.

The Water Level Monitoring and Mercury and Sulfate Catchment and Surface Water Assessment and Loadings Assessment components were completed from January to December 2023. To address changes to water level, previously installed water level loggers were monitored in both impounded and non-impounded locations within four distinct areas along the Pinewood River (**Figure 1-1**). To address changes in mercury and sulfate concentrations, water samples were collected from site catchments (i.e., distinct areas on the mine site that collect/retain water) as well as four potential exposure stations and two upstream reference stations along the Pinewood River (**Figure 1-1**). Measurements were compared across sites in 2023 and against the time series from previous reports.

The Fish Community Survey and Fish Tissue Analysis component sampling occurred during July 2023; the typical low water season as outlined in the Terms of Reference (TOR) (AMEC, 2016). Three areas along the Pinewood River near the mine were sampled: two exposure areas downstream of each of the major effluent discharges, and one reference area, upstream of the mine site and outside the influence of the mine operations. These areas were the same as those used in previous iterations of the monitoring program:

- the Reference area (PWREF) upstream of RRM.
- a Near-field area (PWNF), downstream of the EDL2 Loslo Creek discharge; and,
- a Far-field area (PWFF), downstream of the EDL1 discharge (**Figure 1-1**).

The fish community assessment utilized, at the minimum, the prescribed amount of fishing effort required according to the TOR (AMEC, 2016b). The amount of minimum effort is provided in **Table 2-1**.

Details of the individual components for the assessments are provided in subsequent sections.

Table 2-1: Summary of annual Pinewood River monitoring program components.

Attribute	Monitoring Requirement	Report Schedule
Fish Habitat	Water Level monitoring (2 loggers per area; 1 for non-impounded [Type 1] habitat and 1 for impounded [Type 2] habitat).	Annual Reports are due to both the MECP and the DFO on or before March 31 of each year.
Fish Species Presence (Richness), Life Cycle Usage (Length frequency histograms), Abundance (Catch Per Unit Effort), and Tissue Quality (Mercury concentrations)	Fish Sampling will be conducted annually during the summer for 5 years.	
	Tissue quality sample size per area: 50 adult Common Shiner	
	Minimum effort per area: • Minnow traps (600 trap hours) • Seine nets (9 x 15 m net hauls) • Electrofishing (3000 seconds) • Gill nets (6 standard sets, multiple mesh panels for 12 to 16 hours per set)	

3.0 Water Level Monitoring

The following section outlines work completed and results of the Water Level Monitoring component. The key results are as follows:

- Non-impounded Type 1 Habitat and Impounded Type 2 Habitat continue to show seasonal variability in water levels in 2023 and over longer 2021–2023 periods examined. Area 3 tends to exhibit the highest variability in water level.
- Area 2 Non-impounded Type 1 Habitat and Impounded Type 2 Habitat continue to have the highest water levels and lowest variability in 2023 and over longer 2021–2023 periods. Area 2 Impounded Type 2 Habitat had a significant positive long-term trend in water level.
- Water levels and fluctuations continue to suggest no distinct pattern identified to suggest the impounded or non-impounded areas are affected by mine-related activities.

Further details are outlined in **Sections 3.1–3.3** below.

3.1 Sample Collection

In 2017, eight Solinst 3001 LT Levelogger Edge M10 water level loggers were installed to monitor water levels in the Pinewood River. Pairs of loggers were installed in four areas with one logger installed in a narrow non-impounded area (Type 1 Habitat) and the other installed in an impounded area (Type 2 Habitat; AMEC, 2018; **Figure 1-1**). A central barometric logger was deployed to correct water level for atmospheric pressure changes. Loggers recorded water pressure and temperature at 15-minute intervals. Loggers were retrieved and data were downloaded and provided to Ecometrix by the RRM Environment Department.

3.2 Data Analysis

Ecometrix exported raw data from logger download files using Solinst Levelogger Software. Data were screened for abnormal values. Levelogger and barometric sensor values were converted to water column equivalent (mH2O). Levelogger values were barometrically corrected by subtracting the barometric mH2O from the levelogger mH20 (Solinst Canada Ltd., 2023).

Plots and summary statistics for 2023 as well as for data from previous Ecometrix reports (years 2021–2023) were used to evaluate trends in water level over time. In some cases, previous reports contained missing data (e.g., Area 4) or abnormal values that were screened out. In 2023, no data were screened out. Medians were calculated per month to evaluate positive/negative trends in water level per year and over the whole time series using a Spearman rank correlation test; monthly medians were used to reduce signal-to-noise and to avoid smaller-scale autocorrelation properties (i.e., that level depends on the previous level to a certain extent) when the goals are related to general trends in water level.

3.3 Results

In 2023, plots of Non-impounded Type 1 Habitat and Impounded Type 2 Habitat continued to reflect annual cycles and precipitation patterns as in previous reports. Generally, water levels increased coincident with snowmelt and gradually declined until October after which levels rose. Precipitation events were associated with shorter increases and subsequent decreases in water level (**Figure 3-1)**. These trends were similar over the longer period from 2021–2023 (**Figure 3-2**).

For Non-impounded Type 1 Habitat ordered from upstream to downstream, the 2023 median and range of water level in Area 4 was 0.740 (0.566–1.895) mH2O, in Area 1 was 1.037 (0.761–1.881), in Area 2 was 1.647 (1.265–2.043), and in Area 3 was 1.280 (0.663–2.2600) indicating that, in general, water level in Area 2 > Area 3 > Area 1 >Area 4 with largely overlapping ranges during spring freshet and precipitation events (**Figure 3-1**). The coefficient of variation (CV) was 0.253 for Area 4, 0.203 for Area 1, 0.109 for Area 2, 0.180 for Area 3 indicating that, in general, water level fluctuations in Area 4 > Area 1 ≈ Area 3 > Area 2 (**Table 3-1**, **Figure 3-1**). This contrasts slightly to the general pattern of Area 3 being the most variable (**Table 3-1**, **Figure 3-2**). Area 2 tends to have the highest water level and less susceptibility to precipitation events based on longer term trends (**Table 3-1**, **Figure 3-2**). There were no statistically significant monotonic trends in water level in any Area (all p-values > 0.05; **Table 3-2**).

For Impounded Type 2 Habitat, the 2023 median and range of water level in Area 4 was 0.448 (0.002–1.435), in Area 1 was 0.891 (0.584–1.748), in Area 2 was 2.408 (2.179–2.624), and in Area 3 was 0.806 (0.230–2.141) indicating that, in general, water level in Area 2 > Area 1 ≈ Area 3 >Area 4 with largely overlapping ranges during spring freshet (**Figure 3-1**). The CV was 0.604 for Area 4, 0.194 for Area 1, 0.038 for Area 2, and 0.276 for Area 3 indicating that, in general, water fluctuations in Area 4 > Area3 >Area 1 > Area2. Again this contrasts slightly to the general pattern of Area 3 being most variable (**Table 3-1**, **Figure 3-2**). Again, Area 2 tends to have the highest water level and less susceptibility to precipitation events based on longer term trends (**Table 3-1**, **Figure 3-2**). There was a statistically significant increasing monotonic trend in water level in Area 2 (p-value < 0.05; **Table 3-2**) but not in other Areas.

The relatively marginal fluctuations and abrupt change in water level at Area 2 was also observed in previous years (Minnow, 2021). Beaver activity along the Pinewood River has contributed to the pooling of water along sections of the river and is possibly a factor influencing water levels in this vicinity.

Together, these findings continue to suggest no distinct pattern in the impounded or non-impounded areas indicating of an effect of mine-related activities.

Table 3-1: Water levelogger summary statistics by Area and Habitat Type from 2021–2023. Areas are ordered upstream (reference Area 4) to downstream (exposure Area 1–3). Habitat Types are 1 – Non-impounded and 2 – Impounded.

Area	Type	Year	N	Mean	SD	CV	Min	Q25	Q50	Q75	Q95	Max
4	1	2021	--	--	--	--	--	--	--	--	--	--
4	1	2022	2712	0.942	0.085	0.091	0.804	0.878	0.915	0.992	1.105	1.143
4	1	2023	35040	0.808	0.204	0.253	0.566	0.677	0.740	0.861	1.181	1.895
4	2	2021	--	--	--	--	--	--	--	--	--	--
4	2	2022	33561	0.987	0.154	0.156	0.743	0.862	0.948	1.098	1.259	1.617
4	2	2023	35040	0.441	0.266	0.604	0.002	0.222	0.448	0.600	0.937	1.435
1	1	2021	34158	1.249	0.345	0.276	0.434	1.126	1.341	1.508	1.615	1.753
1	1	2022	33661	1.367	0.135	0.099	1.119	1.270	1.342	1.420	1.652	1.901
1	1	2023	35040	1.132	0.229	0.203	0.761	0.935	1.037	1.346	1.467	1.881
1	2	2021	33297	0.894	0.312	0.349	0.284	0.621	1.045	1.120	1.254	1.398
1	2	2022	35183	1.039	0.157	0.151	0.842	0.937	0.989	1.060	1.383	1.801
1	2	2023	35040	0.892	0.173	0.194	0.584	0.789	0.891	0.969	1.186	1.748
2	1	2021	34158	1.364	0.196	0.144	1.021	1.166	1.393	1.514	1.673	1.741
2	1	2022	33667	1.632	0.154	0.095	1.291	1.513	1.669	1.757	1.817	2.117
2	1	2023	35040	1.642	0.179	0.109	1.265	1.466	1.647	1.810	1.867	2.043
2	2	2021	33297	2.013	0.194	0.097	1.674	1.817	2.045	2.162	2.320	2.387
2	2	2022	33669	2.275	0.154	0.068	1.942	2.148	2.308	2.406	2.470	2.615
2	2	2023	35040	2.390	0.092	0.038	2.179	2.306	2.408	2.468	2.506	2.624
3	1	2021	34158	0.790	0.318	0.403	0.346	0.524	0.708	0.936	1.503	1.934
3	1	2022	35187	1.256	0.392	0.312	0.661	0.948	1.256	1.388	2.043	3.008
3	1	2023	35040	1.276	0.229	0.180	0.663	1.178	1.280	1.326	1.603	2.600
3	2	2021	33297	0.339	0.313	0.923	0.000	0.097	0.241	0.476	1.042	1.481
3	2	2022	32212	0.776	0.404	0.521	0.200	0.431	0.759	0.926	1.598	2.551
3	2	2023	35040	0.813	0.225	0.276	0.230	0.724	0.806	0.854	1.133	2.141

Notes:
N is number of observations.
SD is standard deviation.
CV is coefficient of variation
Q represent quantiles (i.e., percentiles).
Units except for CV in mH2O.

Table 3-2: Water levelogger correlations between water depth and time by Area and Habitat Type from 2021–2023. Areas are ordered upstream (reference Area 4) to downstream (exposure Area 1–3). Habitat Types are 1- Non-impounded and 2 – Impounded. See notes.

Area	Type	Spearman's ρ	Bootstrapped p-value
4	1	-0.479	0.0990
4	2	-0.181	0.3995
1	1	-0.181	0.2861
1	2	-0.187	0.2750
2	1	0.309	0.0684
2	2	0.564	**0.0004**
3	1	0.184	0.2855
3	2	0.175	0.3158

Notes: Spearman's ρ (rho) is a measure of the correlation between two variables. Here, it is a correlation with time. A high positive value indicates water level has increased through time. Spearman's ρ ranges from -1 to 1, where values closer to 1 indicate a higher correlation strength. Generally, correlation coefficients > |0.3| indicate moderate and > |0.5| indicate strong correlations. There is no assumption of the shape of the trend (i.e., linear, exponential). The p-value can be considered a measure of the statistical significance of the trend, with a low number indicating the relationship is not likely due to random chance.

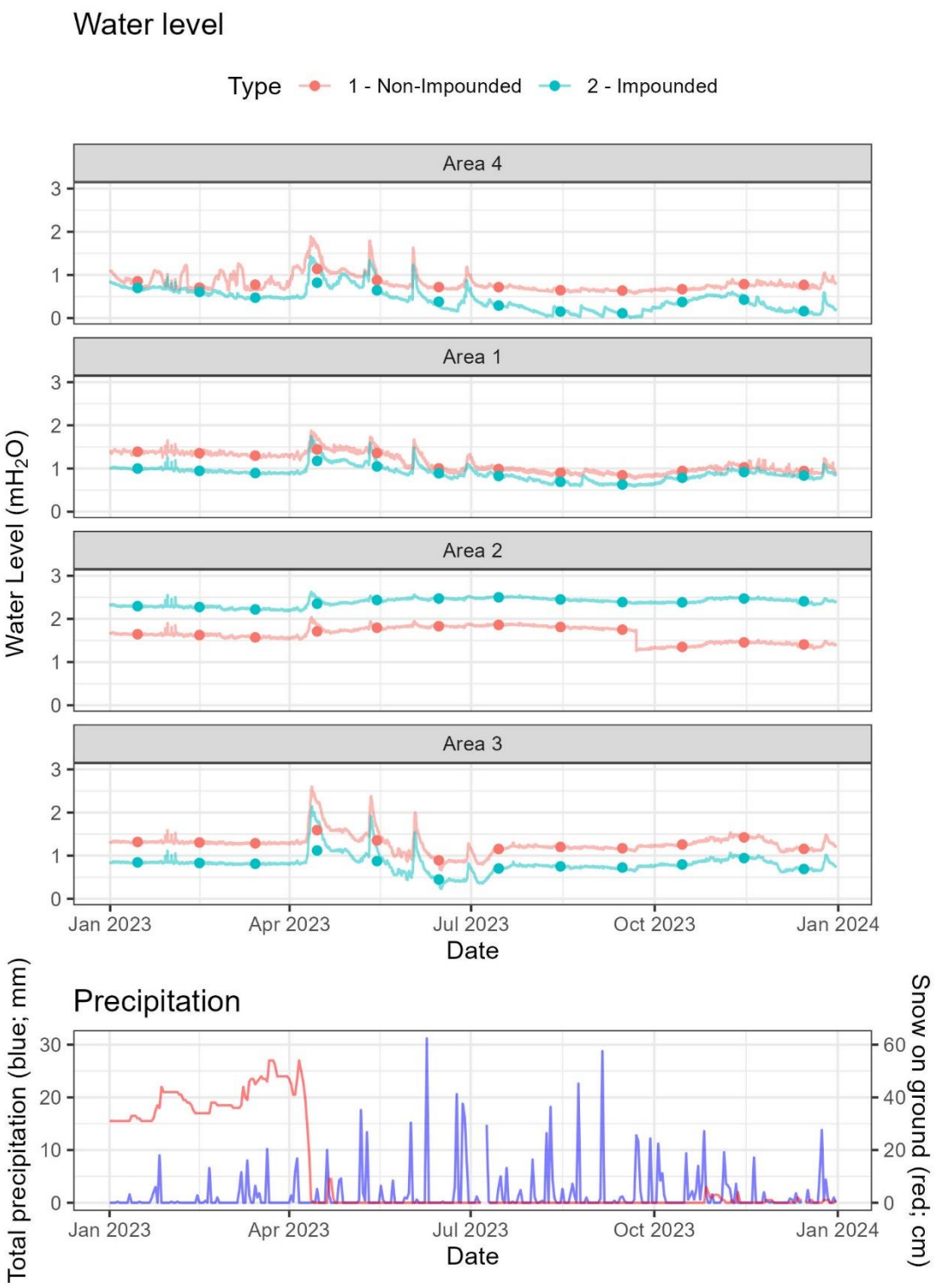

Figure 3-1: Water level logger data from the Pinewood River in Non-impounded Type 1 and Impounded Type 2 habitat types in 2023. Precipitation data from nearby (<30 km) BARWICK weather station. Areas are ordered upstream (reference Area 4) to downstream (exposure Area 1–3). Dots are monthly medians.

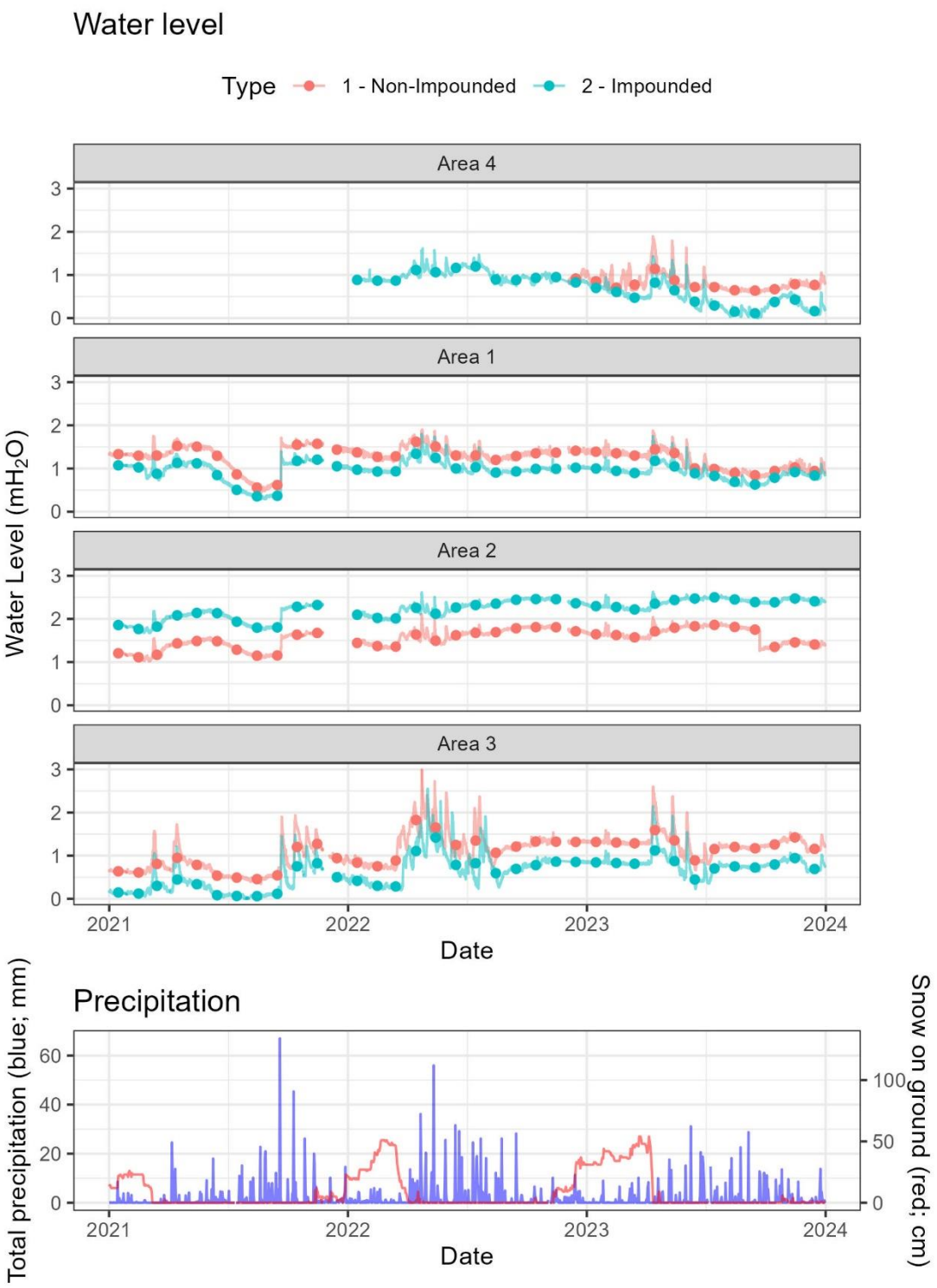

Figure 3-2: Water level logger data from the Pinewood River in Non-impounded Type 1 and Impounded Type 2 habitat types from 2021–2023. Precipitation data from nearby <30 km) BARWICK weather station. Areas are ordered upstream (reference Area 4) to downstream (exposure Area 1–3). Dots are monthly medians.

4.0 Mercury and Sulfate Catchment and Surface Water Assessment and Loadings Assessment

4.1 Context

The following is summarized from text and references within the original Terms of Reference document (AMEC, 2016).

Environmental mercury is found in three principal states:

- Inorganic ionic mercury (mainly Hg^{2+});
- Elemental mercury (Hg^{o}); and
- Methylmercury.

The methylmercury form is of most concern as it is readily taken up and biomagnified by fish and wildlife (i.e., absorbed faster than excreted) and subsequently by human consumers.

Methylmercury is primarily formed from converting inorganic mercury to methylmercury in reducing environments by sulfate reducing bacteria (SRB). Examples of reducing environments include organic soils that can provide the largest reservoir for active flux of methylmercury in the environment.

Additional sulfate to waterbodies can increase SRB growth and the subsequent release of methylmercury; maximum methylation rates occur at redox boundaries associated with fluctuating water levels. At RRM, it is expected that sulfate in drainage waters will increase as a result of ore and mine rock sulfide (S^{2-}) oxidation and that releases will vary with time and location.

The optimal sulfate concentration for mercury methylation by SRB is approximately 10–50 mg/L. Below this level, SRB growth is inhibited while, above this level, sediment sulfide concentrations may limit mercury availability for methylation – it is hypothesized high sulfide concentrations form charged Hg-S ligand pairs that are unable to pass through SRB cell membranes.

Sulfate can be converted to sulfide by SRB in organic sediments where formaldehyde (CH_2O) is present:

$$2CH_2O + SO_4^{2-} \rightarrow H_2S + 2HCO_3^-,$$

which can result in sulfide ions reacting with metal ions to form insoluble metal sulfide precipitates according to:

$$M^{2+} + S^{2-} \rightarrow MS_{precipitate}.$$

Mercury sulfide is stable compared to other metal sulphides and unavailable for methylation if anoxic conditions are maintained in the sediments. Upon oxidation, sulfide is converted to sulfate and mercury becomes available for methylation.

Mine effluent treatment works (e.g., Water Management Pond) or mineral stockpiles that drain to effluent treatment facilities can contain and/or generate mine contact waters with elevated sulfate concentrations which can increase mercury methylation. Freshwater diversion ponds not part of effluent treatment facilities, when flooded, can also increase mercury methylation through their anoxic conditions.

The purpose of the following sections is to assess 2023 mercury and sulfate concentrations in site catchments (i.e., distinct areas on the mine site that collect/retain water) and the discharge-recipient Pinewood River and, where possible, compare these concentrations to longer term trends.

4.2 Overview of findings

The following sections outline work completed and results of the Mercury and Sulfate Catchment and Surface Water Assessment component. The key results are as follows:

- Site catchment total and dissolved mercury water concentrations across all sites and months were below detection limits, except for in the tailings management area (TMA), and therefore below both PWQO of 200 ng/L and CCME guideline of 26 ng/L dissolved mercury. The TMA was below the PWQO but had higher and more variable concentrations than other site catchments.

- Site catchment methylmercury was not sampled as often as total and dissolved mercury. To the best of our knowledge, there were no samples taken at the TMA for methylmercury during 2023. All other locations were sampled at least once and were <1 ng/L, well below the CCME 4 ng/L guideline.

- Site catchment sulfate concentrations tended to be consistent through time at each location but widely ranged across locations. As expected, mine effluent treatment works had elevated sulfate concentrations with the mine rock pond (MRP), TMA, and water management pond (WMP) tending to be higher than the British Columbia Ministry of Environment and Climate Change Strategy (BCMECCS) guideline of 429 mg/L at 250 mg/L hardness.

- Surface water total and dissolved mercury concentrations at all sites except for two samples were below detection limits and below the PWQO of 200 ng/L and CCME guideline of 26 ng/L.

- Surface water methylmercury concentrations were above detection limits with no statistical difference between reference sites and exposure sites. There were temporal differences associated with Month due to modest increased concentrations in June and July, but all concentrations were below CCME guidelines of 4 ng/L.

- Surface water sulfate concentrations fell below the BCMECCS guideline that changes depending on water hardness. A high proportion of samples (86%) were also below the 128 mg/L (at hardness 0–30 mg/L, the lowest guideline). Statistical differences were observed for Area and Month and largely driven by higher concentrations downstream of EDL2 in June, July, and November relative to reference sites.

- Total and dissolved mercury loads (i.e., kg/day) attributed to mine discharge and background water were proportional to discharge and background water flows, respectively, because median and 90th percentile concentrations were <DL in all samples.

- Sulfate loads (i.e., kg/day) attributed to mine discharge were higher than background during months of discharge. During months with discharge rates averaging approximately 8–19% total river flow (April to June), the mine attributed sulfate loads averaged approximately 87–99% of the total load in the river. During months with discharge rates averaging 42–48% of total flow (i.e., near ECA 1:1 limits, October and November), mine attributed sulfate loads averaged nearly 100% of the total load in the river. Sulfate concentrations in surface water at exposure sites tended to return to reference levels in the months after discharge.

- An evaluation of the potential for enhanced methylation (>50% methylmercury:total mercury) revealed site catchments were consistently near 4% and that surface water stations were more variable with none exceeding the 50% ratio.

Further details are outlined in **Sections 4.1–4.7** below.

4.3 Sample Collection

In 2023, RRM Environmental Department staff collected the routine water quality samples for the Mercury and Sulfate Catchment and Surface Water Assessment component as part of their sampling requirements for monitoring programs.

For the catchment assessment, samples were taken from the Tailings Management Area (TMA amalgamating all TMA Cell 1 and Cell 2 per discussions with RRM Environmental Department Staff), Mine Rock Pond (MRP), Water Management Pond (WMP), Sediment Pond 1 (SED1), and Sediment Pond 2 (SED2) (**Figure 1-1**).

For the surface water assessment, samples were collected at two reference locations upstream of the mine (Teeple Culvert and SW20) and four stations proceeding downstream from potential mine influence along the Pinewood River (SW10, SW22A, SW03 and SW24). Sample locations in relation to the mine infrastructure are provided in **Figure 1-1** and are the same as those used in previous annual assessments.

Each sample was collected below the surface into an upstream facing pre-labelled sample bottle to avoid floating material and contamination by the sample collector. Preservative was added in the field following collection, if required. Samples were kept in coolers with ice and transported

to the RRM environmental laboratory. Upon arrival at the laboratory on site samples were either shipped the same day or stored in the refrigerator prior to shipment to ALS in Thunder Bay. Available sample values for mercury (total, dissolved, and total methylmercury), sulfate (as SO_4), and hardness (as $CaCO_3$) were taken from laboratory reports for analysis.

4.4 Data Analysis

4.4.1 Site Catchments and Surface Water Assessment

For site catchments and surface water, each of the five water quality parameters (total mercury, dissolved mercury, methylmercury, sulfate, and hardness) were summarized on an annual basis and evaluated graphically. Concentrations reported were also compared to PWQOs (OMOEE, 1994), the CCME (CCME 2024), and, for sulfate, the BCMECCS water quality guidelines (BCMECCS 2023). For all parameters, when a value was <DL the DL value was used as a conservative estimate for the evaluation. These values were used when generating summary statistics.

For surface water, parameters were evaluated graphically both within the 2023 sampling year and by comparing the mean values at each sampling locations for each parameter since the program began in 2017.

Following AMEC (2016), two-way Analysis of Variance (ANOVA) was undertaken to examine differences in means between reference (Teeple Culvert and SW20) and exposure (SW10, SW22A, SW03, and SW24) and across months. Only methylmercury and sulfate models were completed because almost all values for total mercury and dissolved mercury were below detection limits (DL). Statistical differences were assessed at the $p = 0.05$ significance level. For sulfate, values were log10-transformed to better meet the normality and equal variance assumptions of ANOVA.

4.4.2 Discharge Loadings Assessment

A loadings assessment of mine discharge relative to background was completed for total mercury, dissolved mercury, and sulfate in 2023. Methylmercury could not be assessed as there was no coincident sampling in the mine discharges (SED2, EDL2, and EDL1) to facilitate its assessment. In general, average monthly flow readings (units: m^3/day) were multiplied by monthly concentrations (median and 90^{th} percentile; units: mg/L) and subsequently converted to monthly loading rates (units: kg/day) for the three parameters. Loadings from mine discharge were compared to loadings from background.

RRM uses flow readings taken downstream of EDL1 (H1) to guide permitted discharge per their ECA. Flow readings are also gathered upstream of mine influence at H2 (in Water Level Monitoring Area 4). Discharge sites from upstream to downstream are SED1 which doesn't currently discharge; and SED2, EDL2, and EDL1 which discharge intermittently as a function of H1 flow. H2 is representative of water entering the zone of mine influence whereas H1 is representative of flow as the Pinewood River migrates outside of mine influence.

Monthly average flow rates were calculated during 2023 for mine discharge locations and background. Since H1 encompasses flow from all upstream sources including mine discharge locations and background, background flow was calculated as:

$$\text{Background} = H1 - (SED1 + SED2 + EDL2 + EDL1), \quad (1)$$

where the units of each are in m^3/day.

Monthly median and 90th percentile concentrations were also calculated in mg/L during 2023 for mine discharge locations and background. For all constituents, when a value was <DL the DL was conservatively substituted for the sample. Background concentration was assumed to be the average of the two upstream reference sites (Teeple Culvert and SW20).

Average monthly loading rates were subsequently calculated from monthly average flow rates and monthly median and 90th percentile concentrations and converted to units of monthly average kg/day.

4.5 Results

4.5.1 Site Catchments and Surface Water Assessment

4.5.1.1 Site Catchments

In 2023, site catchment surface water concentrations of total and dissolved mercury at all locations except the TMA were below detection limits of 5 ng/L and therefore below the PWQO of 200 ng/L and CCME guideline of 26 ng/L (**Table 4-1**, **Figure 4-1**). The TMA was well below the 200 ng/L guideline (median: 19.4 ng/L) but had higher and more variable concentrations for total and dissolved mercury than other sites (**Table 4-1**, **Figure 4-1**).

Methylmercury was not sampled as often as total and dissolved mercury. To the best of our knowledge, there were no samples taken at the TMA for methylmercury during 2023. All other locations were sampled at least once and were <1 ng/L, well below the CCME 4 ng/L guideline (**Table 4-1**, **Figure 4-1)**.

Sulfate concentrations tended to be consistent through time at each location but range widely across locations (**Table 4-1**, **Figure 4-2**). For example, median and range concentrations at SED1 was 32 (28–91) mg/L whereas the TMA was 903 (174–1130) mg/L. Generally, concentrations were SED1 < SED2 < MRP < WMP < TMA. Concentrations at MRP, TMA, and WMP were generally above the BCMECCS guideline for the protection of aquatic life of 429 mg/L sulfate at the highest 250 mg/L hardness.

Table 4-1: Catchment water parameter summary statistics, 2023.

Catchment	Parameter	N	N < DL	Mean	SD	CV	Min	Q25	Q50	Q75	Q95	Max
MRP	Mercury - Total (ng/L)	11	11	5	0	0	5	5	5	5	5	5
SED1	Mercury - Total (ng/L)	11	11	5	0	0	5	5	5	5	5	5
SED2	Mercury - Total (ng/L)	18	18	5	0	0	5	5	5	5	5	5
TMA	Mercury - Total (ng/L)	87	5	19.5	9.8	0.5	5	11.0	19.4	25.7	33.7	50.0
WMP	Mercury - Total (ng/L)	26	26	5	0	0	5	5	5	5	5	5
MRP	Mercury - Dissolved (ng/L)	11	11	5	0	0	5	5	5	5	5	5
SED1	Mercury - Dissolved (ng/L)	11	11	5	0	0	5	5	5	5	5	5
SED2	Mercury - Dissolved (ng/L)	18	18	5	0	0	5	5	5	5	5	5
TMA	Mercury - Dissolved (ng/L)	87	9	13.5	7.3	0.5	5	8.5	11.9	17.2	26.5	50.0
WMP	Mercury - Dissolved (ng/L)	26	26	5	0	0	5	5	5	5	5	5
MRP	Methylmercury - Total (ng/L)	1	0	0.036	--	--	0.036	0.036	0.036	0.036	0.036	0.036
SED1	Methylmercury - Total (ng/L)	5	1	0.248	0.137	0.555	0.175	0.177	0.194	0.200	0.434	0.493
SED2	Methylmercury - Total (ng/L)	6	1	0.213	0.086	0.404	0.124	0.158	0.188	0.251	0.335	0.357
WMP	Methylmercury - Total (ng/L)	5	3	0.087	0.067	0.778	0.020	0.065	0.068	0.080	0.176	0.200
MRP	Hardness (mg/L)	11	0	916	360	0	239	669	973	1145	1370	1370
SED1	Hardness (mg/L)	11	0	218	121	1	86	151	160	251	437	448
SED2	Hardness (mg/L)	18	0	330	43	0	194	313	338	348	376	408
TMA	Hardness (mg/L)	87	0	571	71	0	135	545	569	614	667	680
WMP	Hardness (mg/L)	26	0	530	77	0	205	513	539	570	600	615
MRP	Sulfate - Total (mg/L)	11	0	811	345	0	179	611	805	1045	1240	1240
SED1	Sulfate - Total (mg/L)	11	0	46	25	1	28	30	32	62	87	91
SED2	Sulfate - Total (mg/L)	18	0	231	40	0	104	214	242	252	278	290
TMA	Sulfate - Total (mg/L)	87	0	895	112	0	174	833	903	966	1000	1130
WMP	Sulfate - Total (mg/L)	26	0	693	101	0	227	681	723	740	748	779

Notes:
For all summary statistics, the detection limit (DL) is conservatively substituted for the parameter value when calculating the statistic.
N is number of observations.
DL is detection limit.
SD is standard deviation.
CV is coefficient of variation
Q represent quantiles (i.e., percentiles).
-- indicates no data available.

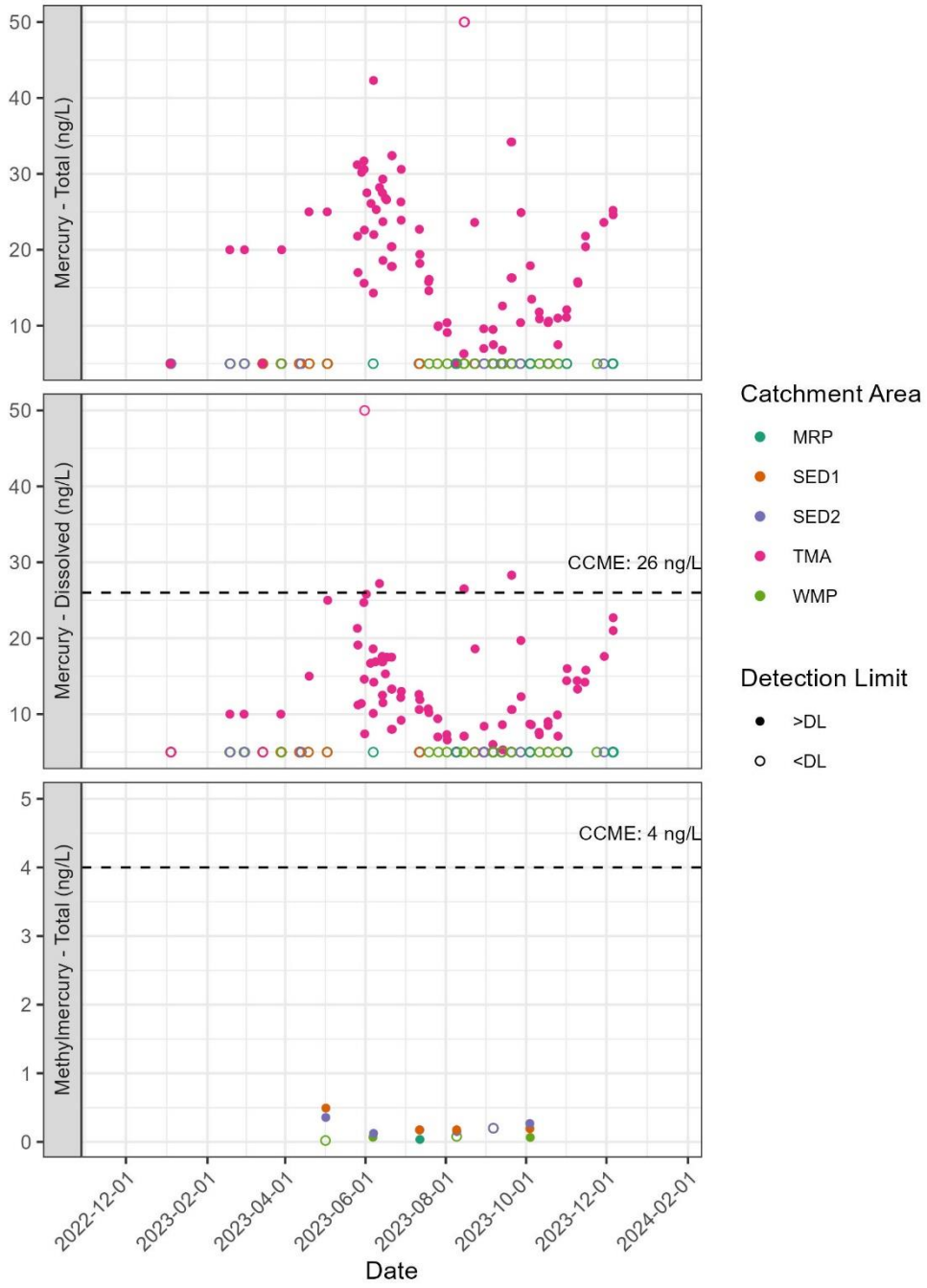

Figure 4-1: Concentrations for mercury species at catchment locations, 2023.

Note: The Ontario PWQO for Dissolved Mercury is 200 ng/L. CCME guideline presented for reference. Catchment areas are Mine Rock Pond (MRP), Sediment Pond #1 (SED1), Sediment Pond #2 (SED2), Tailings Management Area (TMA), and Water Management Pond (WMP).

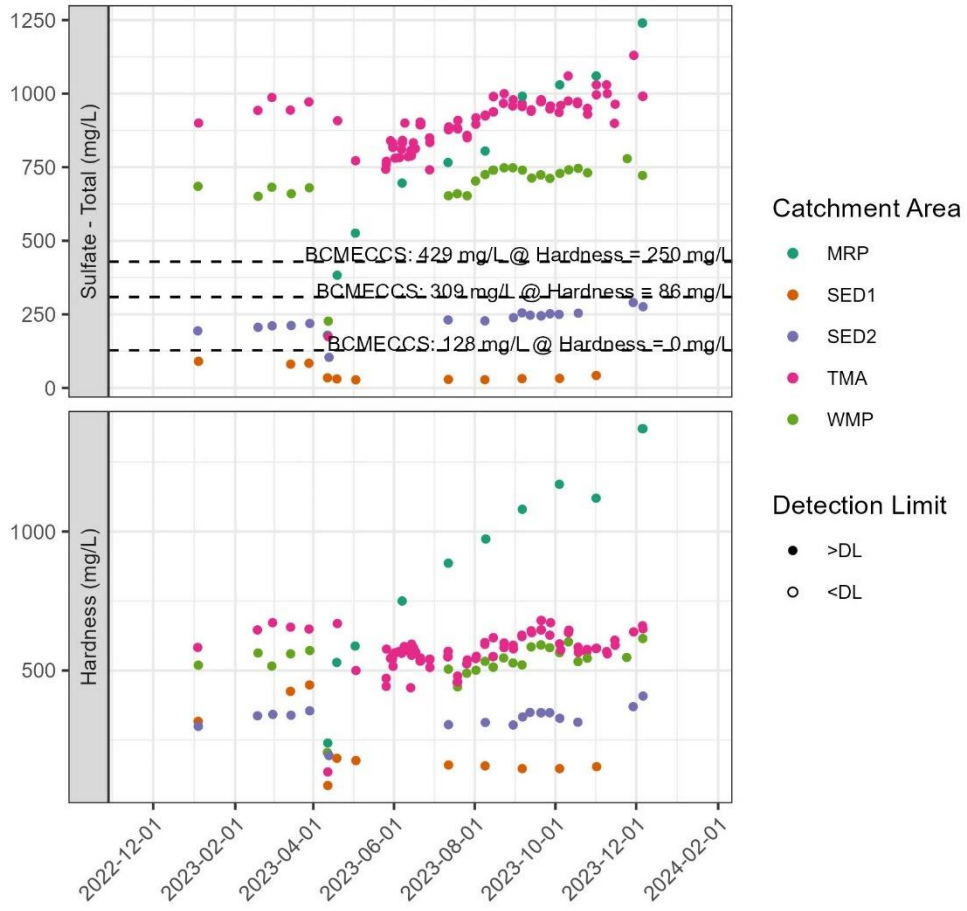

Figure 4-2: Concentrations for sulfate and hardness at catchment locations, 2023.

Note: The Ontario PWQO for Dissolved Mercury is 200 ng/L. CCME and BCMECCS guidelines presented for reference. For sulfate, guidelines are at most conservative (0 mg/L hardness), the minimum observed hardness in 2023 (86 mg/L), and the upper limit of hardness for the guideline (250 mg/L). Catchment areas are Mine Rock Pond (MRP), Sediment Pond #1 (SED1), Sediment Pond #2 (SED2), Tailings Management Area (TMA), and Water Management Pond (WMP).

4.5.1.2 Surface water

In 2023, surface water concentrations of total and dissolved mercury at all sites except for two samples were below detection limits of 5 ng/L and therefore below the PWQO of 200 ng/L and CCME guideline of 26 ng/L, respectively (**Table 4-2**, **Figure 4-3**). Across years, mean concentrations are relatively stable, at or near detection limits, and below guidelines; and any large changes in mean concentrations (e.g., 2020) appear to be driven by DL changes rather than site conditions (e.g., in 2020, many reported DL were 30 ng/L) (**Figure 4-5**).

In 2023, all samples had detectable concentrations of methylmercury (DL = 0.02 ng/L) although all were below the CCME guideline of 4 ng/L (**Table 4-2**, **Figure 4-3**). There was no statistical difference between Areas (reference vs. exposure; $F = 0.19$, $p = 0.66$) but there was a statistical difference between Months ($F = 4.67$, $p < 0.001$). This was largely due to modest increased concentrations in June (a discharge month) and July (not a discharge month) 2023 compared to other months. Across years, mean concentrations were also relatively stable (similar mean concentrations ± 1 SD) with mean concentrations below the CCME guidelines of 4 ng/L (**Figure 4-5**).

In 2023, nearly all samples had detectable concentrations of sulfate. The BCMECCS guideline for the protection of aquatic life for sulfate changes depending on water hardness (blue line in **Figure 4-4**). All sulfate concentrations were below the guideline up to 250 mg/L hardness after which site-specific guidelines are recommended (BCMECCS 2024). If the line were extended, the samples in 2023 would still fall under this curve (**Figure 4-6**). One hundred percent of samples were below 429 mg/L sulfate guideline (at hardness 370 mg/L, the highest observed in 2023 across all sites), 97% samples were below 309 mg/L guideline (at hardness 86 mg/L, the lowest observed in 2023) and 86% were below 128 mg/L (at hardness 30 mg/L, the lowest guideline). Nevertheless, there were statistical differences between Areas ($F = 53.66$, $p < 0.001$) and Months ($F = 10.01$, $p < 0.001$). Area and Month differences were largely driven by higher concentrations downstream of EDL2 at sites SW22A, SW03, and SW24 in May, June, and November, 2023 (**Figure 4-3**). Averaging across months, the magnitude of difference at exposure sites was 191% relative to reference sites based on mean sulfate concentrations (3.66 mg/L reference versus 10.69 mg/L exposure). Across years, results show low values and variability in sulfate concentrations at upstream reference sites versus downstream exposure sites, but mean concentrations remain below BCMECCS guidelines (**Figure 4-5**).

Table 4-2: Surface water parameter summary statistics for locations ordered from upstream to downstream, 2023.

Surface Water Location	Parameter	N	N < DL	Mean	SD	CV	Min	Q25	Q50	Q75	Q95	Max
Teeple Culvert - Reference	Mercury - Total (ng/L)	6	5	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW20 - Reference	Mercury - Total (ng/L)	11	11	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW10	Mercury - Total (ng/L)	12	12	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW22A	Mercury - Total (ng/L)	12	12	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW03	Mercury - Total (ng/L)	12	12	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW24	Mercury - Total (ng/L)	13	13	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
Teeple Culvert - Reference	Mercury - Dissolved (ng/L)	6	5	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW20 - Reference	Mercury - Dissolved (ng/L)	11	11	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW10	Mercury - Dissolved (ng/L)	12	12	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW22A	Mercury - Dissolved (ng/L)	12	11	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW03	Mercury - Dissolved (ng/L)	12	12	5.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0	5.0
SW24	Mercury - Dissolved (ng/L)	13	12	5.0	0.1	0.0	5.0	5.0	5.0	5.0	5.2	5.5
Teeple Culvert - Reference	Methylmercury - Total (ng/L)	6	0	0.524	0.394	0.753	0.136	0.205	0.436	0.796	1.031	1.090
SW20 - Reference	Methylmercury - Total (ng/L)	5	0	0.488	0.331	0.678	0.124	0.288	0.413	0.640	0.908	0.975
SW10	Methylmercury - Total (ng/L)	6	0	0.467	0.226	0.485	0.198	0.291	0.480	0.582	0.750	0.800
SW22A	Methylmercury - Total (ng/L)	7	0	0.551	0.497	0.901	4.40E-05	0.298	0.479	0.617	1.306	1.550
SW03	Methylmercury - Total (ng/L)	6	0	0.845	0.677	0.801	6.80E-05	0.308	0.875	1.375	1.610	1.660
SW24	Methylmercury - Total (ng/L)	6	0	0.434	0.148	0.341	0.162	0.401	0.484	0.530	0.550	0.557
Teeple Culvert - Reference	Sulfate - Total (mg/L)	6	0	3.4	3.3	1.0	0.9	1.1	1.6	5.9	7.7	7.9
SW20 - Reference	Sulfate - Total (mg/L)	11	3	3.8	3.7	1.0	0.3	0.5	3.3	6.5	9.5	9.7
SW10	Sulfate - Total (mg/L)	12	0	5.0	2.9	0.6	1.6	2.9	4.5	6.4	10.0	10.2
SW22A	Sulfate - Total (mg/L)	12	0	90.2	128.5	1.4	2.6	5.0	12.4	179.3	316.2	358.0
SW03	Sulfate - Total (mg/L)	12	1	50.0	87.1	1.7	0.3	4.4	5.3	52.7	198.5	281.0
SW24	Sulfate - Total (mg/L)	13	0	66.1	112.1	1.7	1.4	2.4	3.7		293.8	340.0
Teeple Culvert - Reference	Hardness (mg/L)	0	0	--	--	--	--	--	--	--	--	--
SW20 - Reference	Hardness (mg/L)	11	0	153.1	31.3	0.2	85.9	135	159	177	182.5	185
SW10	Hardness (mg/L)	11	0	166.9	33.8	0.2	101	152	165	184	212	226
SW22A	Hardness (mg/L)	11	0	242.6	62.6	0.3	147	214	238	251	352	370
SW03	Hardness (mg/L)	11	0	216.5	44.2	0.2	143	201	218	222.5	284	322
SW24	Hardness (mg/L)	12	0	203.5	62.8	0.3	117	170.5	186.5	211	317.4	346

Notes:
For all summary statistics, the detection limit (DL) is conservatively substituted for the parameter value when calculating the statistic.
N is number of observations.
DL is detection limit.
SD is standard deviation.
CV is coefficient of variation
Q represent quantiles (i.e., percentiles).
-- indicates no data available.

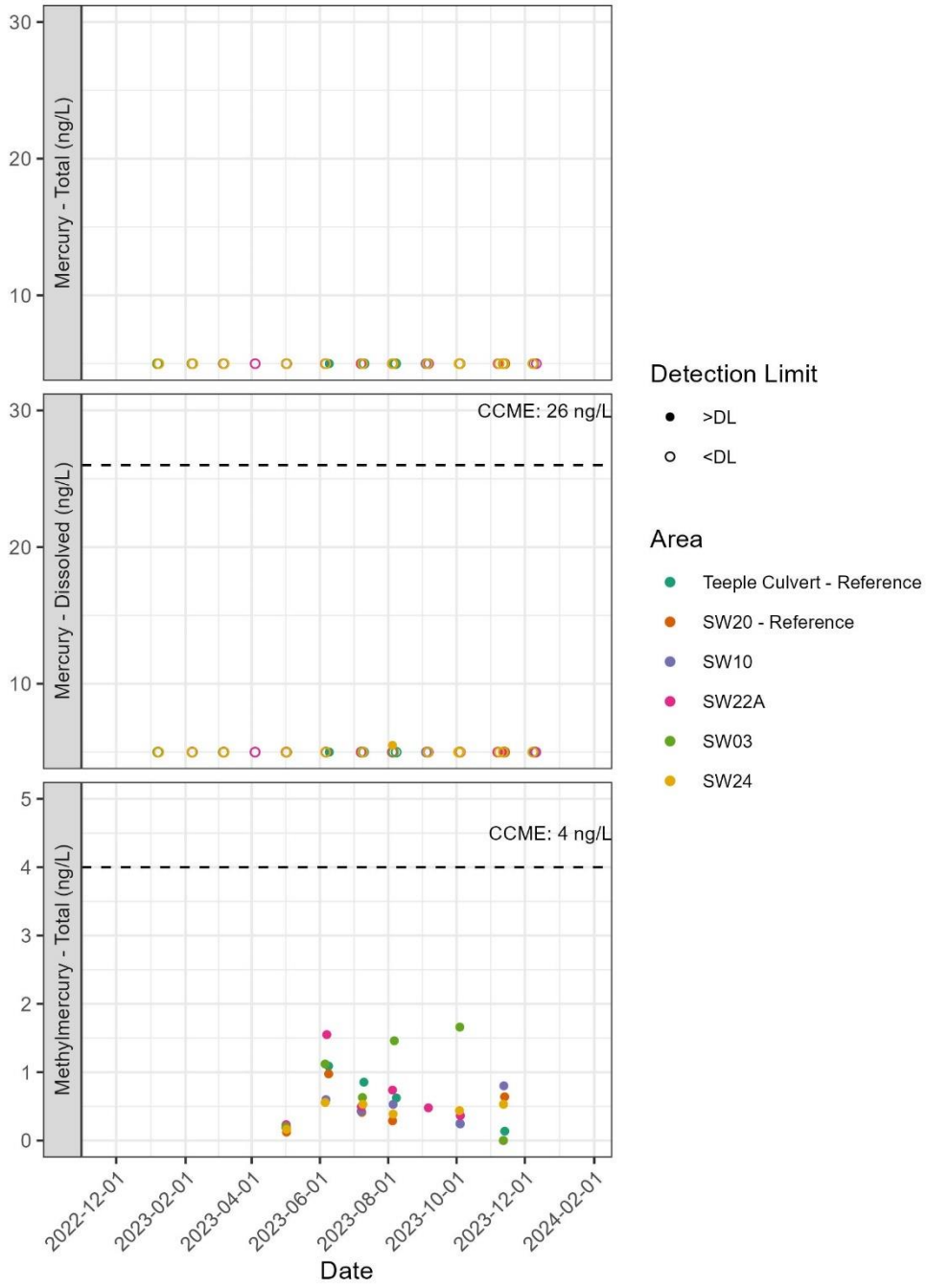

Figure 4-3: Concentrations for mercury species at surface water sampling locations, 2023

Note: The Ontario PWQO for Dissolved Mercury is 200 ng/L. CCME and BCMECCS guidelines presented for reference. Areas are ordered from most upstream to most downstream.

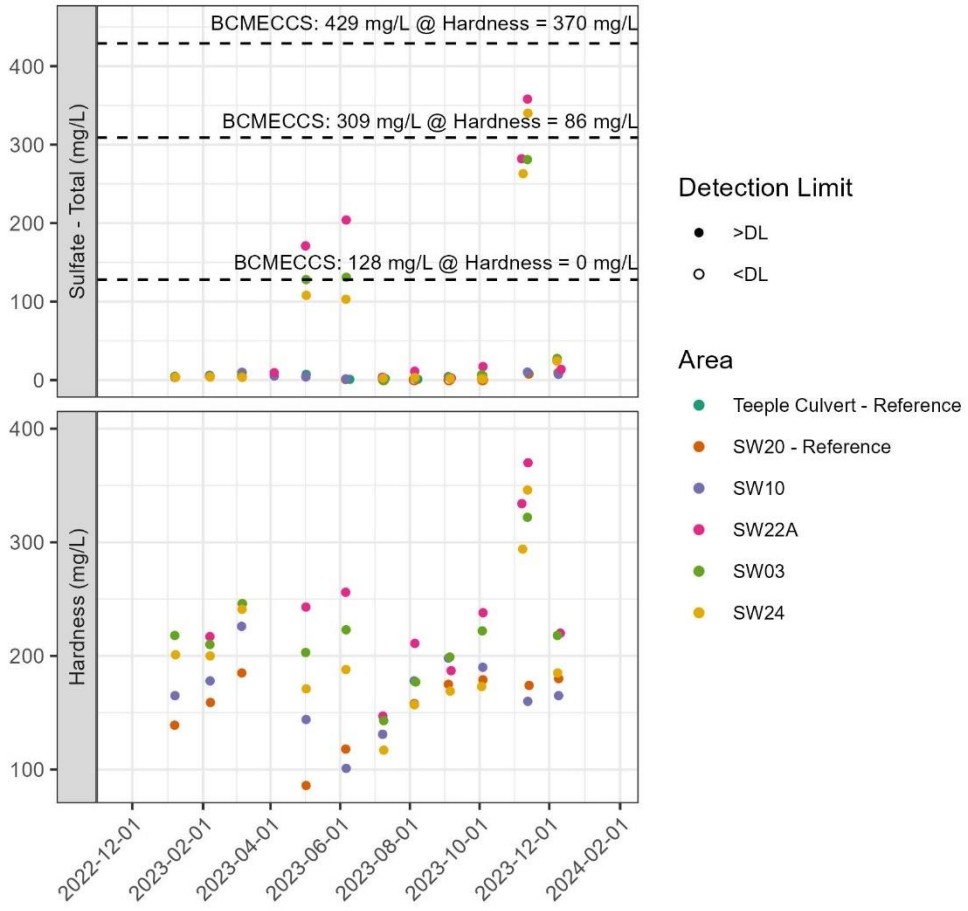

Figure 4-4: Concentrations for sulfate and hardness at surface water sampling locations, 2023

Note: The Ontario PWQO for Dissolved Mercury is 200 ng/L. CCME and BCMECCS guidelines presented for reference. For sulfate, guidelines are at most conservative (0 mg/L hardness), the minimum observed hardness in 2023 (86 mg/L), and the maximum observed hardness in 2023 (370 mg/L). Areas are ordered from most upstream to most downstream.

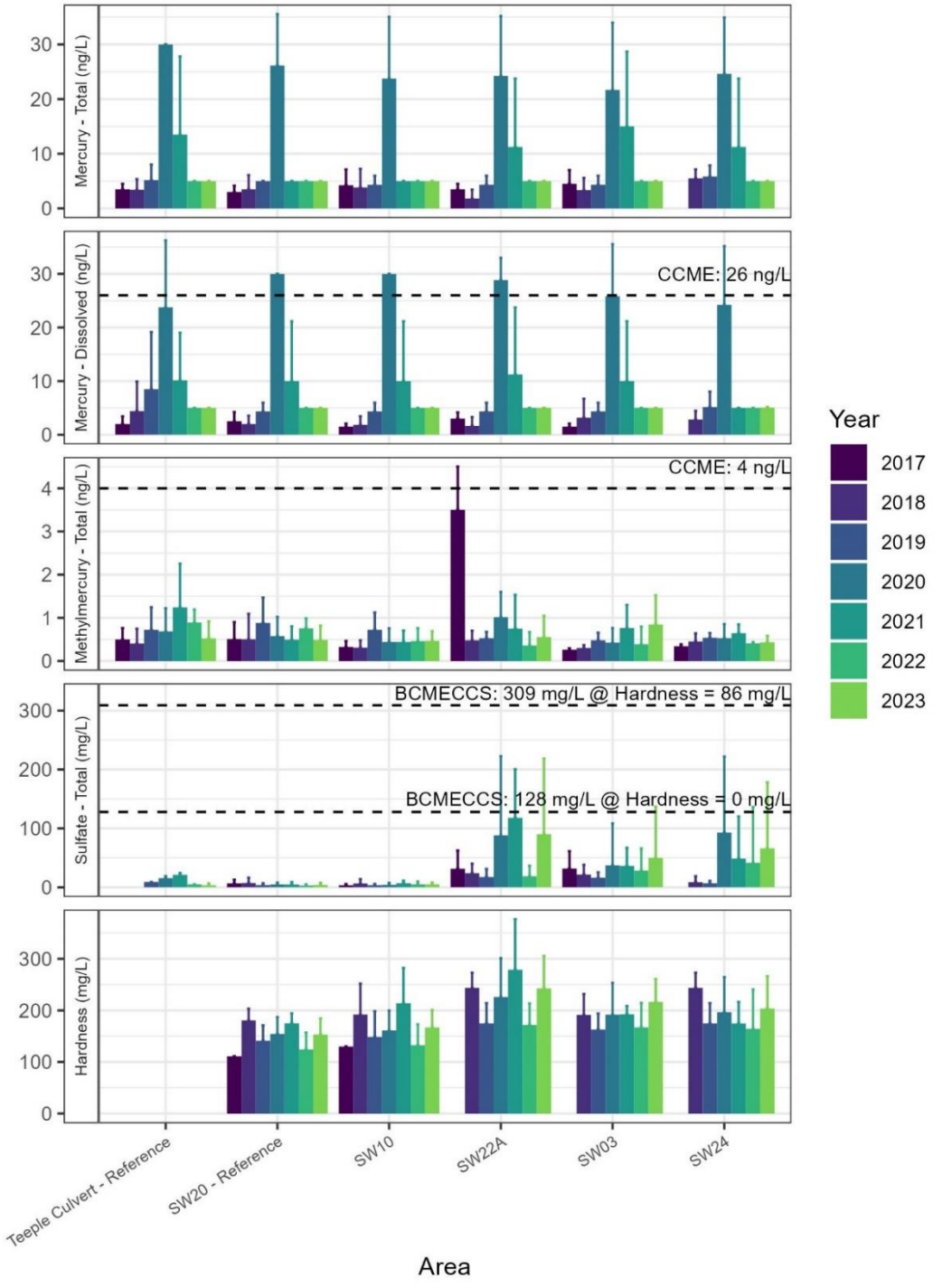

Figure 4-5: Concentrations for mercury species, sulfate, and hardness at surface water sampling locations (mean+ 1 standard deviation), 2017 to 2023.

Note: The Ontario PWQO for Dissolved Mercury is 200 ng/L. CCME and BCMECCS guidelines presented for reference. For sulfate, guidelines are at most conservative (0 mg/L hardness) and the minimum observed hardness in 2023 (86 mg/L). Areas are ordered from most upstream to most downstream.

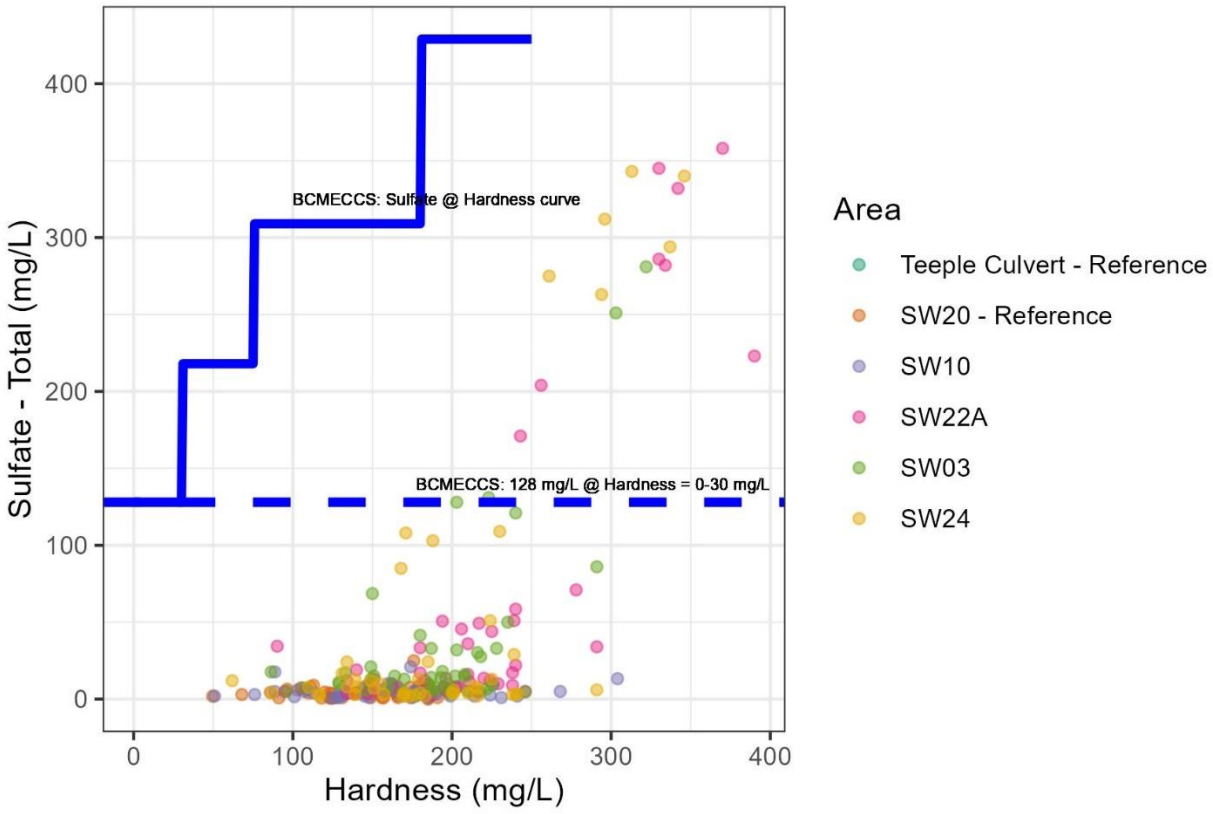

Figure 4-6: Concentrations of sulfate against hardness at surface water locations, 2023. Blue line is BCMECCS guideline for sulfate at different hardness levels. Dashed line is the guideline as it would be applied to reference hardness levels.

4.5.2 Loadings Assessment

4.5.2.1 Local Hydrology and Discharge Volumes

Monthly average flow rates were variable in terms of mine discharge and background. The mine did not discharge from January to March and in December. Mine discharge represented approximately 8–19% of average monthly flow rate during April–June, approximately 0–5% during July–September, and approximately 43–48% during October and November. Further detail is provided in **Table 4-3**.

Table 4-3: Monthly average flow rates (m^3/day) for background and mine discharge locations. Locations are ordered from upstream to downstream.

Month	Mine Discharge				Totals			Percentages	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total Flow	Discharge	Background
Jan	0	0	0	0	0	92,613	92,613	100.0%	0.0%
Feb	0	0	0	0	0	11,761	11,761	100.0%	0.0%
Mar	0	0	0	0	0	11,406	11,406	100.0%	0.0%
Apr	0	6,837	13,270	14,920	35,027	380,357	415,384	91.6%	8.4%
May	0	4,174	19,644	25,620	49,438	254,767	304,205	83.7%	16.3%
Jun	0	1,733	9,821	13,945	25,499	109,711	135,209	81.1%	18.9%
Jul	0	0	0	0	0	34,531	34,531	100.0%	0.0%
Aug	0	0	2,040	0	2,040	36,203	38,243	94.7%	5.3%
Sep	0	0	1,227	0	1,227	27,946	29,173	95.8%	4.2%
Oct	0	2,854	12,989	0	15,844	17,159	33,003	52.0%	48.0%
Nov	0	3,532	13,198	18,929	35,660	47,858	83,518	57.3%	42.7%
Dec	0	0	0	0	0	29,832	29,832	100.0%	0.0%

4.5.2.2 Total Mercury and Dissolved Mercury

All median monthly concentrations for total mercury and dissolved mercury were below the detection limit of 0.000005 mg/L (i.e., 5 ng/L; **Table 4-4**). Substituting the DL for all of the values resulted in loadings being directly proportional to average monthly flow rates for both constituents. (**Table 4-5**). The same result is found when using the 90th percentile concentrations for total and dissolved mercury (**Table 4-6**, **Table 4-7**). The same result is also found when using the median and 90th percentiles for dissolved mercury (**Table 4-8** to **Table 4-11**).

4.5.2.3 Sulfate

All monthly median sulfate concentrations were above the detection limit of 0.3 mg/L except for the September background sample (**Table 4-12**). During months with discharge rates of approximately 8–19% total flow (April to June), the mine attributed sulfate loads averaged approximately 87–99% of the total load in the river. During months with discharge rates of 42–48% of total flow (i.e., near ECA 1:1 limits, October and November), mine attributed sulfate loads averaged nearly 100% of the total load in the river.

The 90th percentile findings were nearly identical to those trends discussed using median data. During months with discharge rates of approximately 8–19% total flow (April to June), the loads averaged approximately 86–99% the total river load. During months with discharge rates of 42–48% of total flow (October and November), mine attributed sulfate loads averaged nearly 100%.

Considering the discharge months of April, May, and June, the downstream surface stations SW22A (downstream of EDL2 and SED2), SW03 (further downstream), and SW24 (downstream of EDL1), median concentrations were at or higher than the BCMECCS reference of 128 mg/L sulfate. However, in July the median concentrations were near reference concentrations (**Figure 4-7**). Similarly, the November samples contained higher sulfate concentrations with a subsequent decline to near reference concentrations in December. Currently, downstream concentrations appear to quickly return to background after discharge is ended (i.e., within 1 month based on these coarse timesteps).

Table 4-4: Median concentrations of total mercury at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	<0.000005
Feb	--	--	--	--	<0.000005
Mar	--	--	--	--	<0.000005
Apr[1]	--	<0.000005	<0.000005	<0.000005	<0.000005
May	--	<0.000005	<0.000005	<0.000005	<0.000005
Jun	--	<0.000005	<0.000005	<0.000005	<0.000005
Jul	--	--	--	--	<0.000005
Aug	--	--	--	--	<0.000005
0Sep	--	--	--	--	<0.000005
Oct[2]	--	<0.000005	<0.000005	<0.000005	<0.000005
Nov	--	<0.000005	<0.000005	<0.000005	<0.000005
Dec	--	--	--	--	<0.000005

Table 4-5: Average monthly loadings using median concentrations of total mercury at discharge and background locations, 2023

Month	Mine Discharge (kg/day, on average)				Totals (kg/day, on average)			Percentages (%, on average)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharge	Background
Jan	--	--	--	--	--	0.000463	0.000463	100.0%	0.0%
Feb	--	--	--	--	--	0.000059	0.000059	100.0%	0.0%
Mar	--	--	--	--	--	0.000057	0.000057	100.0%	0.0%
Apr[1]	--	0.000034	0.000066	0.000075	0.000175	0.001902	0.002077	91.6%	8.4%
May	--	0.000021	0.000098	0.000128	0.000247	0.001274	0.001521	83.7%	16.3%
Jun	--	0.000009	0.000049	0.000070	0.000127	0.000549	0.000676	81.1%	18.9%
Jul	--	--	--	--	0.000000	0.000173	0.000173	100.0%	0.0%
Aug	--	--	--	--	0.000000	0.000181	0.000181	100.0%	0.0%
Sep	--	--	--	--	0.000000	0.000140	0.000140	100.0%	0.0%
Oct[2]	--	0.000014	0.000065	0.000000	0.000079	0.000086	0.000165	52.0%	48.0%
Nov	--	0.000018	0.000066	0.000095	0.000178	0.000239	0.000418	57.3%	42.7%
Dec	--	--	--	--	--	0.000149	0.000149	100.0%	0.0%

Notes for **Table 4-4** and **Table 4-5**:
For all calculations, the detection limit (DL) is conservatively substituted for the parameter value.
-- indicates no data available.
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

Table 4-6: 90th percentile concentrations of total mercury at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	<0.000005
Feb	--	--	--	--	<0.000005
Mar	--	--	--	--	<0.000005
Apr[1]	--	<0.000005	<0.000005	<0.000005	<0.000005
May	--	<0.000005	<0.000005	<0.000005	<0.000005
Jun	--	<0.000005	<0.000005	<0.000005	<0.000005
Jul	--	--	--	--	<0.000005
Aug	--	--	--	--	<0.000005
Sep	--	--	--	--	<0.000005
Oct[2]	--	<0.000005	<0.000005	<0.000005	<0.000005
Nov	--	<0.000005	<0.000005	<0.000005	<0.000005
Dec	--	--	--	--	<0.000005

Table 4-7: Average monthly loadings using 90th percentile concentrations of total mercury at discharge and background locations, 2023

Month	Mine Discharge (kg/day, on average)				Totals (kg/day, on average)			Percentages (%, on average)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharge	Background
Jan	--	--	--	--	--	0.000463	0.000463	100.0%	0.0%
Feb	--	--	--	--	--	0.000059	0.000059	100.0%	0.0%
Mar	--	--	--	--	--	0.000057	0.000057	100.0%	0.0%
Apr[1]	--	0.000034	0.000066	0.000075	0.000175	0.001902	0.002077	91.6%	8.4%
May	--	0.000021	0.000098	0.000128	0.000247	0.001274	0.001521	83.7%	16.3%
Jun	--	0.000009	0.000049	0.000070	0.000127	0.000549	0.000676	81.1%	18.9%
Jul	--	--	--	--	0.000000	0.000173	0.000173	100.0%	0.0%
Aug	--	--	--	--	0.000000	0.000181	0.000181	100.0%	0.0%
Sep	--	--	--	--	0.000000	0.000140	0.000140	100.0%	0.0%
Oct[2]	--	0.000014	0.000065	0.000000	0.000079	0.000086	0.000165	52.0%	48.0%
Nov	--	0.000018	0.000066	0.000095	0.000178	0.000239	0.000418	57.3%	42.7%
Dec	--	--	--	--	--	0.000149	0.000149	100.0%	0.0%

Notes for **Table 4-6** and **Table 4-7**:
For all calculations, the detection limit (DL) is conservatively substituted for the parameter value.
-- indicates no data available.
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

Table 4-8: Median concentrations of dissolved mercury at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	<0.000005
Feb	--	--	--	--	<0.000005
Mar	--	--	--	--	<0.000005
Apr[1]	--	<0.000005	<0.000005	<0.000005	<0.000005
May	--	<0.000005	<0.000005	<0.000005	<0.000005
Jun	--	<0.000005	<0.000005	<0.000005	<0.000005
Jul	--	--	--	--	<0.000005
Aug	--	--	--	--	<0.000005
Sep	--	--	--	--	<0.000005
Oct[2]	--	<0.000005	<0.000005	<0.000005	<0.000005
Nov	--	<0.000005	<0.000005	<0.000005	<0.000005
Dec	--	--	--	--	<0.000005

Table 4-9: Average monthly loadings using median concentrations of dissolved mercury at discharge and background locations, 2023.

Month	Mine Discharge (kg/day, on average)				Totals (kg/day, on average)			Percentages (%, on average)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharge	Background
Jan	--	--	--	--	--	0.000463	0.000463	100.0%	0.0%
Feb	--	--	--	--	--	0.000059	0.000059	100.0%	0.0%
Mar	--	--	--	--	--	0.000057	0.000057	100.0%	0.0%
Apr[1]	--	0.000034	0.000066	0.000075	0.000175	0.001902	0.002077	91.6%	8.4%
May	--	0.000021	0.000098	0.000128	0.000247	0.001274	0.001521	83.7%	16.3%
Jun	--	0.000009	0.000049	0.000070	0.000127	0.000549	0.000676	81.1%	18.9%
Jul	--	--	--	--	0.000000	0.000173	0.000173	100.0%	0.0%
Aug	--	--	--	--	0.000000	0.000181	0.000181	100.0%	0.0%
Sep	--	--	--	--	0.000000	0.000140	0.000140	100.0%	0.0%
Oct[2]	--	0.000014	0.000065	0.000000	0.000079	0.000086	0.000165	52.0%	48.0%
Nov	--	0.000018	0.000066	0.000095	0.000178	0.000239	0.000418	57.3%	42.7%
Dec	--	--	--	--	--	0.000149	0.000149	100.0%	0.0%

Notes for **Table 4-8** and **Table 4-9**:
For all calculations, the detection limit (DL) is conservatively substituted for the parameter value.
-- indicates no data available.
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

Table 4-10: 90th percentile concentrations of dissolved mercury at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	<0.000005
Feb	--	--	--	--	<0.000005
Mar	--	--	--	--	<0.000005
Apr[1]	--	<0.000005	<0.000005	<0.000005	<0.000005
May	--	<0.000005	<0.000005	<0.000005	<0.000005
Jun	--	<0.000005	<0.000005	<0.000005	<0.000005
Jul	--	--	--	--	<0.000005
Aug	--	--	--	--	<0.000005
Sep	--	--	--	--	<0.000005
Oct[2]	--	<0.000005	<0.000005	<0.000005	<0.000005
Nov	--	<0.000005	<0.000005	<0.000005	<0.000005
Dec	--	--	--	--	<0.000005

Table 4-11: Average monthly loadings using 90th percentile concentrations of dissolved mercury at discharge and background locations, 2023.

Month	Mine Discharge (kg/day, on average)				Totals (kg/day, on average)			Percentages (%, on average)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharge	Background
Jan	--	--	--	--	--	0.000463	0.000463	100.0%	0.0%
Feb	--	--	--	--	--	0.000059	0.000059	100.0%	0.0%
Mar	--	--	--	--	--	0.000057	0.000057	100.0%	0.0%
Apr[1]	--	0.000034	0.000066	0.000075	0.000175	0.001902	0.002077	91.6%	8.4%
May	--	0.000021	0.000098	0.000128	0.000247	0.001274	0.001521	83.7%	16.3%
Jun	--	0.000009	0.000049	0.000070	0.000127	0.000549	0.000676	81.1%	18.9%
Jul	--	--	--	--	0.000000	0.000173	0.000173	100.0%	0.0%
Aug	--	--	--	--	0.000000	0.000181	0.000181	100.0%	0.0%
Sep	--	--	--	--	0.000000	0.000140	0.000140	100.0%	0.0%
Oct[2]	--	0.000014	0.000065	0.000000	0.000079	0.000086	0.000165	52.0%	48.0%
Nov	--	0.000018	0.000066	0.000095	0.000178	0.000239	0.000418	57.3%	42.7%
Dec	--	--	--	--	--	0.000149	0.000149	100.0%	0.0%

Notes for **Table 4-10** and **Table 4-11**:
For all calculations, the detection limit (DL) is conservatively substituted for the parameter value.
-- indicates no data available.
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

Table 4-12: Median concentrations of sulfate at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	3.3
Feb	--	--	--	--	5.15
Mar	--	--	--	--	9.7
Apr[1]	--	122	662.5	666.5	7.75
May	--	172	544	566	5.8
Jun	--	186	539.5	545	0.8
Jul	--	--	--	--	1.455
Aug	--	--	--	--	0.68
Sep	--	--	--	--	0.3
Oct[2]	--	267	756	758.5	0.765
Nov	--	282	756	758.5	7.835
Dec	--	--	--	--	9.36

Table 4-13: Average monthly loadings using median concentrations of sulfate at discharge and background locations, 2023

Month	Mine Discharge (kg/day, on average)				Totals (kg/day, on average)			Percentages (%, on average)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharges	Background
Jan	--	--	--	--	--	305.6	305.6	100.0%	0.0%
Feb	--	--	--	--	--	60.6	60.6	100.0%	0.0%
Mar	--	--	--	--	--	110.6	110.6	100.0%	0.0%
Apr[1]	--	834.2	8,791.5	9,944.1	19,569.8	2,947.8	22,517.6	13.1%	86.9%
May	--	717.9	10,686.4	14,500.9	25,905.1	1,477.7	27,382.8	5.4%	94.6%
Jun	--	322.3	5,298.2	7,600.2	13,220.7	87.8	13,308.4	0.7%	99.3%
Jul	--	--	--	--	0.0	50.2	50.2	100.0%	0.0%
Aug	--	--	--	--	0.0	24.6	24.6	100.0%	0.0%
Sep	--	--	--	--	0.0	8.4	8.4	100.0%	0.0%
Oct[2]	--	762.1	9,820.0	0.0	10,582.1	13.1	10,595.3	0.1%	99.9%
Nov	--	996.1	9,978.0	14,357.8	25,331.9	375.0	25,706.9	1.5%	98.5%
Dec	--	--	--	--	--	279.2	279.2	100.0%	0.0%

Notes for **Table 4-12** and **Table 4-13**:
For all calculations, the detection limit (DL) is conservatively substituted for the parameter value.
-- indicates no data available.
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

Table 4-14: 90th percentile concentrations of total sulfate at discharge and background locations, 2023.

Month	Mine Discharge (mg/L)				Background (mg/L)
	SED1	SED2	EDL2	EDL1	
Jan	--	--	--	--	3.3
Feb	--	--	--	--	5.2
Mar	--	--	--	--	9.7
Apr[1]	--	133.2	666.1	666.9	8.3
May	--	176.0	623.8	634.0	6.9
Jun	--	186.0	545.5	609.8	0.9
Jul	--	--	--	--	1.9
Aug	--	--	--	--	1.0
Sep	--	--	--	--	0.3
Oct[2]	--	268.0	769.2	774.4	1.1
Nov	--	282.8	769.2	774.4	7.9
Dec	--	--	--	--	9.4

Table 4-15: Average monthly loadings using 90th percentile concentrations of total sulfate at discharge and background locations, 2023

Month	Mine Discharge (kg/day)				Totals (kg/day)			Percentages (%)	
	SED1	SED2	EDL2	EDL1	Discharge	Background	Total	Discharges	Background
Jan	--	--	--	--	--	305.6	305.6	100.0%	0.0%
Feb	--	--	--	--	--	60.6	60.6	100.0%	0.0%
Mar	--	--	--	--	--	110.6	110.6	100.0%	0.0%
Apr[1]	--	910.7	8,839.3	9,950.1	19,700.1	3,160.8	22,860.9	13.8%	86.2%
May	--	734.5	12,254.0	16,243.0	29,231.5	1,763.0	30,994.5	5.7%	94.3%
Jun	--	322.3	5,357.1	8,503.9	14,183.3	99.2	14,282.4	0.7%	99.3%
Jul	--	--	--	--	0.0	65.3	65.3	100.0%	0.0%
Aug	--	--	--	--	0.0	35.6	35.6	100.0%	0.0%
Sep	--	--	--	--	0.0	8.4	8.4	100.0%	0.0%
Oct[2]	--	765.0	9,991.5	0.0	10,756.5	19.5	10,776.0	0.2%	99.8%
Nov	--	998.9	10,152.3	14,658.7	25,809.9	377.8	26,187.8	1.4%	98.6%
Dec	--	--	--	--	--	279.2	279.2	100.0%	0.0%

Notes for **Table 4-14** and **Table 4-15**:
-- indicates no samples
1. No Background samples available for April so assumed the average of March and May values.
2. No October samples available for SED2, EDL2, or EDL1 so used the earliest value from November.

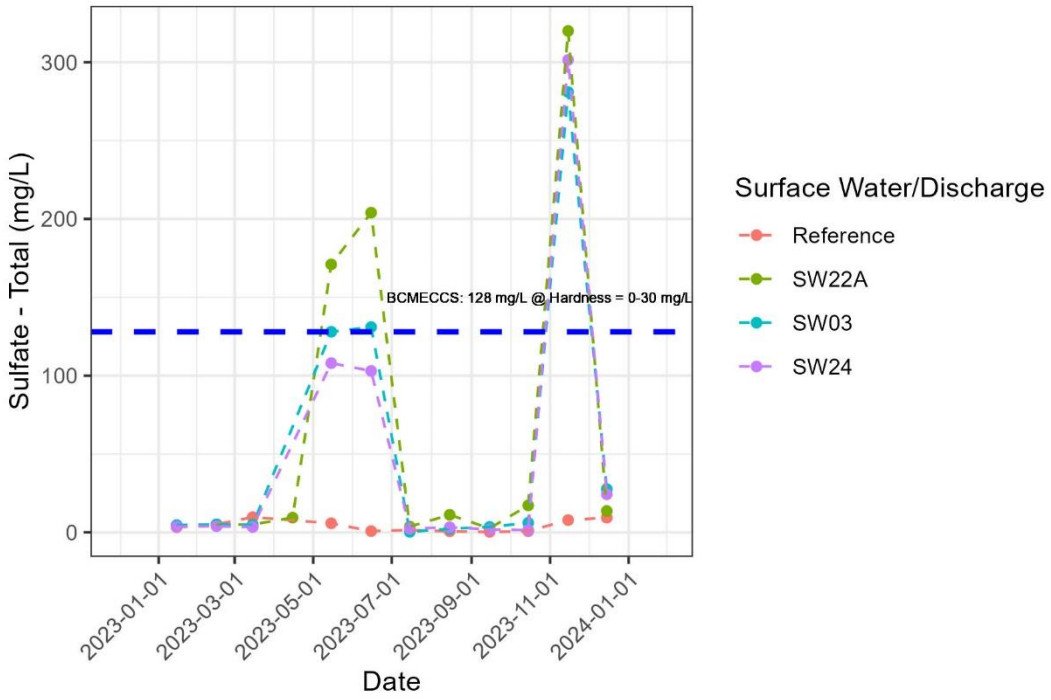

Figure 4-7: Monthly median concentrations of sulfate at surface water locations upstream (median of Teeple Culvert and SW20 samples) and downstream of SED2 and EDL2 (SW22A and SW03) and also EDL1 (SW24).

4.6 Performance of Mitigation Measures

In 2023, the total and dissolved mercury concentrations from the sampled site catchments (MRP, SED1, SED2, and WMP) with one exception were similar to those measured in the Pinewood River (Teeple Culvert, SW20, SW10, SW22A, SW03, and SW24) – i.e., nearly all samples were less than detection and therefore less than water quality guidelines. The TMA site catchment had higher concentrations but did not tend to exceed the PWQO of 26 ng/L for dissolved mercury.

Sulfate concentrations at site catchments were higher than surface water samples in the Pinewood River. This is expected as mine contact water drains to recipient waterbodies and is subsequently recycled on site.

Similar to AMEC (2019), available data was used to determine whether enhanced methylation is occurring during 2023 at site catchments or in the Pinewood River. As discussed, enhanced methylation may occur in optimal ranges of sulfur concentrations by sulfate reducing bacteria. Monthly medians were used per area to calculate the ratio of total methylmercury to total mercury. A percentage of 50% may indicate enhanced methylation.

In 2023, most sampled site catchments were at or near 4% total methylmercury:total mercury. The ratios tended to be similar through time and no samples exceeded the 50% ratio. Similarly, no samples at the surface water sites exceeded the 50% ratio. Surface water sites were more variable across sites and through time – June tended to have highest ratios with a maximum ratio of 31% at SW22A immediately downstream of SED2 and EDL2.

A potential error that could arise using this approach is that the detection limit was substituted directly for the concentration per sample. This is generally a conservative approach except for this calculation where the denominator is artificially inflated. Substituting for ½ DL effectively doubles the ratio per calculation. If a ratio of 50% is to be considered an effective benchmark, then a more robust approach to generate summary statistics using censored data should be explored (e.g., regression on order statistics; Helsel, 2012). Alternatively. discussion with ALS should be undertaken to obtain uncensored data, i.e., true laboratory instrument outputs regardless of value, for these analyses.

Table 4-16: Percent methylmercury of total mercury in site catchments and surface water locations in the Pinewood River, 2023.

Month	Catchments				Surface Water					
	MRP	SED1	SED2	WMP	Teeple Culvert (Reference)	SW20 (Reference)	SW10	SW22A	SW03	SW24
May	--	9.9	--	--	3.8	2.5	4.0	4.6	4.0	3.2
June	--	--	--	--	21.8	19.5	12.0	31.0	22.4	11.1
July	0.7	3.5	3.5		17.1	8.3	8.6	9.9	12.6	10.6
August	--	3.5	3.0	1.6	12.5	5.8	10.6	14.8	29.2	7.8
September	--	4.0	4.0	4.0	5.8	--	--	9.6	--	--
October	--	3.9	5.4	1.3	5.0	--	4.9	7.3	12.6	10.6
November	--	--	--	--	2.7	12.8	16.0	0.0	0.0	10.6

4.7 Recommendations for Additional Mitigation Measures

Currently there is limited evidence that mining operations are increasing total and dissolved mercury downstream of mine operations (**Section 4.5.1** and **Section 4.5.2**). However, the mining operations are adding sulfate to the Pinewood River above background. Discharge waters tend to be above the 10–50 mg/L sulfate for optimal methylation. It is possible that sulfate could temporarily increase methylation activity when sulfate is discharged. If The 10% higher methylmercury:total mercury ratio is mine-sulfate related, then it appears to be assimilated by SW03 (e.g., in July 2023, **Table 4–16**). No sites are over the enhanced methylation 50% ratio but this depends on the denominator in the calculation.

Site catchments, discharge water, and surface water concentrations should be continued to be monitored and should consider achieving lower detection limits to verify the denominator in the enhanced methylation calculation.

5.0 Fish Community Survey

The following section outlines work completed and results of the Fish Community Survey component. The key results are as follows:

- PWREF, PWNF, and PWFF had similar species compositions and species richness in 2023. PWREF had 14 species, PWNF had 12 species, and PWFF had 14 species not including the general category of undetermined Young-of-the-Year (YOY).
- Despite fish abundance being lower within PWNF and PWFF in 2023, this trend has been apparent since 2017. The relative difference to PWREF remains similar to previous years and through time.
- Length-density plots (analogous to length-frequency histograms) indicate that multiple age classes of a variety of species were captured in 2023 across all areas.

Further details are outlined in **Sections 5.1**–**5.3** below.

5.1 Sample Collection

The fish communities at Pinewood River reference (PWREF), near-field (PWNF), and far-field (PWFF) areas were surveyed utilizing a backpack electrofisher unit, seine nets, baited overnight minnow trap effort and multi-mesh gill net sets. The backpack electrofishing unit was adjusted to appropriate voltage, frequency, and duty cycle settings based on target fish size, water conductivity, and temperature to minimize the risk of harm to fish. Seine nets, with a minimum area of 15 m^2, were hauled in each study area. At least nine seine nets were cast in each area. Minnow traps were baited with dry dog food prior to deployment and checked every 24 hours.

All fish captured were identified and enumerated. Live non-sentinel and excess sentinel species fish were released back into the area from which they were collected. Incidental mortalities were recorded and disposed of as per the conditions of the Licence to Collect Fish for Scientific Purposes No. 1103805 issued by the Ontario Ministry of Natural Resources and Forestry.

Common Shiner and Central Mudminnow were retained for further processing.

5.2 Data Analysis

Following AMEC (2016), the catch per unit effort (CPUE) for each fishing method (electrofishing, gill netting, seine netting, and minnow trapping) were calculated per area. Species richness (number of individual species) per area were calculated to determine if species presence is maintained in each area. Length frequency distributions per species per area were graphed with the understanding that qualitative comparisons of results will show any large discrepancies in year classes.

5.3 Results

The fish community in PWREF included (listed in order of abundance) Common Shiner , Brook Stickleback (*Culaea inconstans*), Northern Redbelly Dace (*Chrosomus eos*), Creek Chub (*Semotilus atromaculatus*), Central Mudminnow, White Sucker (Catostomus commersonii), undetermined Young-of-the-year (YOY), Finescale Dace (*Chrosomus neogaeus*), Northern Pike (*Esox lucius*), Brassy Minnow (*Hybognathus hankinsoni*), Johnny Darter (*Etheostoma nigrum*), Golden Shiner (*Notemigonus crysoleucas*), Brown Bullhead (*Ameiurus nebulosus*), Blackside Darter (*Percina maculate*), and Pearl Dace (*Margariscus margarita*) (**Table 5-1**). Fourteen species were identified among the 1,720 individual fish captured (**Table 5-1**). The CPUE was 0.58 fish per hour of gill netting effort, 2.53 fish per 60 seconds of electrofishing effort, 133.33 fish per seine netting effort, and 0.51 fish per minnow trap hour (**Table 5-2** to **Table 5-5**). Seine net CPUE may be underestimated as full pulls were not possible at all locations due to some instances of deep water.

The fish community in PWNF included (listed in order of abundance) Brown Bullhead, Brook Stickleback, Johny Darter, undetermined YOY, White Sucker, Common Shiner, Creek Chub, Golden Shiner, Northern Pike, Blackside Darter, Central Mudminnow, Logperch (*Percina caprodes*), and Trout Perch (*Percopsis omiscomaycus*). There were 12 species identified among the 1,082 fish caught (**Table 5-1**). The CPUE for the various effort types were 0.39 fish per gill net hours, 8.37 fish per 60 seconds of electrofishing effort, 32.93 fish per seine netting effort, and 0.06 fish per minnow trap effort (**Table 5-2** to **Table 5-5**). Again, seine net CPUE may be underestimated as full pulls were not possible at all locations due to some instances of deep water.

The fish community in PWFF included (listed in order of abundance) Blackside Darter, Golden Shiner, White Sucker, Northern Pike, Common Shiner, Brown Bullhead, undetermined YOY, Central Mudminnow, Johnny Darter, Trout Perch, Rock Bass (*Ambloplites rupestris*), Creek Chub, Logperch, and Shorthead Redhorse (*Moxostoma macrolepidotum*). There were 14 species identified among the 102 fish caught (**Table 5-1**). The CPUE at this site included 0.13 fish per gill net setting, 0.45 fish per 60 seconds electrofishing, 5.8 fish per seine net hauls, and 0.0016 fish per minnow trap hours (**Table 5-2** to **Table 5-5**).

A total of 2,904 fish representing 14 species were captured during the 2023 Pinewood River fish community survey across the three areas (PWREF, PWNF, PWFF) (**Table 5-1**). Length-density plots indicate that multiple age classes of a variety of species were captured in 2023 (**Figure C-1 to Figure C-2**). Fish abundance has been lower within the PWNF and PWFF areas in all years since 2017. With the exception of changes in fish abundance and that lower species counts are detected in some years and not others, the fish community has largely been similar in all years from 2017 to 2023 indicating Rainy River Mine operations have minimal impact on the resident fish communities within the Pinewood River.

Table 5-1: Total catch by species in the Pinewood River, 2023

Species	2019			2020			2021			2022			2023		
	PWREF	PWNF	PWFF	PWREF	PWNF	PWFF	PWREF	PWNF	PWFF	PWREF	PWNF	PWFF	PWREF	PWNF	PWFF
Blacknose Dace	8	5	0	0	1	0	0	0	0	0	0	0	0	0	0
Blackside Darter	0	3	66	0	13	21	0	4	0	0	0	8	3	29	27
Brassy Minnow	49	6	72	79	16	15	14	0	0	3	0	0	16	0	0
Brook Stickleback	478	7	4	361	0	5	1360	0	0	211	1	5	323	191	0
Brown Bullhead	0	81	0	1	153	0	2	11	14	29	212	6	5	352	5
Central Mudminnow	40	50	24	117	33	32	79	7	30	86	50	6	83	15	5
Common Shiner	82	112	51	107	54	55	54	80	21	74	162	63	683	65	6
Creek Chub	55	55	3	12	3	1	9	3	7	21	2	3	176	61	1
Fathead Minnow	12	0	41	54	1	0	13	0	0	16	1	2	0	0	0
Finescale Dace	35	0	0	279	21	0	982	1	4	10	0	0	34	0	0
Golden Shiner	3	53	12	4	402	10	9	67	5	9	7	1	6	50	18
Johnny Darter	0	17	293	0	131	319	0	15	27	0	0	3	7	136	4
Logperch	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Mimic Shiner	20	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Northern Pike	0	56	7	44	35	8	0	21	25	5	11	5	17	32	12
Northern Redbelly Dace	193	0	6	114	0	0	0	0	0	64	0	0	211	0	0
Pearl Dace	42	0	0	46	0	0	149	17	4	282	2	1	1	0	0
River Darter	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0
Rock Bass	0	0	1	0	0	0	0	0	4	0	0	5	0	0	2
Shorthead Redhorse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Trout Perch	0	8	126	0	6	31	0	0	0	0	0	2	0	1	2
Walleye	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
White Sucker	68	98	127	26	93	51	4	35	33	25	10	2	83	74	12
YOY (undifferentiated Cyprinid)	898	1	46	487	99	8	36	138	298	340	78	83	72	75	5
Total Catch	**1983**	**552**	**882**	**1731**	**1061**	**556**	**2711**	**399**	**490**	**1175**	**536**	**196**	**1720**	**1082**	**102**
Richness (no YOY)	**13**	**13**	**15**	**13**	**14**	**11**	**11**	**11**	**12**	**13**	**10**	**15**	**14**	**12**	**14**

Table 5-2: Fish effort and catch summary for gill netting in the Pinewood River, 2023

Area	Gill Netting																	
	Effort (hours)						Total catch						CPUE (#fish/hours)					
	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023
PWREF	81	117	114	120	107	110.2	16	476	153	81	134	64	0.2	4.1	1.3	0.7	1.25	0.58
PWNF	96	129	109	130	100	108.2	4	24	28	59	17	42	0.04	0.2	0.3	0.5	0.17	0.39
PWFF	-	77	102	118	120	125.9	-	6	18	34	0	16	-	0.1	0.2	0.3	0.08	0.13

Table 5-3: Fish effort and catch summary for electrofishing in the Pinewood River, 2023

Area	Electrofishing																	
	Effort (seconds)						Total catch						CPUE (#fish/60 seconds)					
	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023
PWREF	3030	3000	3003	4017	3141	3043	57	185	119	44	222	128	1.1	3.7	2.4	0.7	4.24	2.52
PWNF	6108	5510	3325	3421	4193	3607	10	85	113	13	34	503	0.1	0.9	2	0.2	0.49	8.37
PWFF	-	3002	3000	3468	3346	3336	-	99	51	102	15	26	-	2	1	1.8	0.27	0.47

Table 5-4: Fish effort and catch summary for seine netting in the Pinewood River, 2023

Area	Seine Netting																	
	Effort (hauls)						Total Catch						CPUE (#fish/haul)					
	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023
PWREF	9	9	9	9	9	9	201	1272	1335	1591	666	1200	22.3	141.3	148.3	176.8	74.00	133.33
PWNF	9	16	12	9	17	15	19	325	897	322	258	494	2.1	20.3	74.8	5.8	15.18	32.93
PWNF	-	16	13	9	11	10	-	753	484	365	135	58	-	47.1	37.2	40.6	12.27	5.8

Table 5-5: Fish effort and catch summary for minnow trapping in the Pinewood River, 2023

Area	Minnow Trapping																	
	Effort (hours)						Total Catch						CPUE (#fish/hour)					
	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023	2017	2019	2020	2021	2022	2023
PWREF	659	971	792	733	1054	632.92	360	57	124	995	153	328	0.5	0.1	0.2	1.36	0.15	0.51
PWNF	622	3480	701	660	2088	715	18	83	22	5	227	43	0.03	0.02	0.03	0.01	0.11	0.060
PWFF	-	1633	654	729	1833	643.33	-	14	3	9	40	1	-	0.01	0.005	0.01	0.02	0.0016

6.0 Fish Tissue Analysis

The following section outlines work completed and results of the Fish Tissue Analysis component. Common Shiner was the primary target species for the analysis like previous reports. Common Shiner is typically found in the three study areas in sufficient density. Per the 2021 and 2022 report recommendations, a secondary target species of Central Mudminnow was used to assess bioaccumulation potential along with Common Shiner for examining species-specific life history/niche bias associated with sampling a single species.

For reference, a whole-body mercury level of 0.2 mg/kg wet weight (wwt) has been suggested to be protective of juvenile and adult fish (i.e., those that eat other smaller fish) using mostly literature-based sublethal endpoints (growth, reproduction, development, behaviour; Beckvar et al., 2005). Hereafter, this will be called the *fish-protective level*. Health Canada has also established a standard of 0.5 mg/kg wwt as the maximum acceptable concentration of mercury in commercially sold fish, enforceable by the Canadian Food Inspection Agency (Health Canada, 2007). Although this guideline is only applicable to commercially sold fish, 0.5 mg/kg wwt is also the level at which the MECP recommends a complete consumption restriction for vulnerable populations (i.e., women of child-bearing age and children under 15; MECP 2015). Common Shiner are not typically consumed by humans, yet this guideline is referenced to provide some perspective on mercury body burden levels in edible fish.

The key results are as follows:

- In 2023, Common Shiner mean tissue mercury concentrations at all Areas were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015). At PWNF, three fish (21%) were above 0.2 mg/kg fish-protective level.
- In 2023, Common Shiner had a 46% higher mean tissue mercury concentration at PWNF than at PWREF and 123% higher than PWFF. Despite mean concentrations tending to be below the 0.2 mg/kg fish protective level as well as the 0.5 mg/kg Health Canada level, this was consistent with the general trend of PWNF having higher concentrations than PWREF and PWFF across years and fish sizes.
- In 2023, Central Mudminnow mean tissue mercury concentrations at all sites were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015) and the 0.2 mg/kg fish-protective level.
- In 2023, analysis of Central Mudminnow lacked sufficient statistical power to determine differences between PWREF and PWNF. Area:Year mean tissue concentrations predictions from a combined 2022-2023 analysis suggested differences would be indicative of a year-to-year change rather than an Area based result.

Further details are outlined in **Sections 6.1**–**6.3** below.

6.1 Sample Collection

The original sample design targeted up to 30 young-of-year (YOY) and 50 age 1+ Brook Stickleback (AMEC 2016) in each of the PWREF, PWNF, and PWFF areas. Due to low sample sizes, subsequent studies targeted up to 50 Common Shiner of various sizes per area (Minnow 2020, Minnow 2021, Ecometrix 2022, Ecometrix 2023). Ecometrix (2023) sampled up to five Central Mudminnow per area and recommended sampling up to 10 Central Mudminnow in subsequent studies per area.

During the fish community assessment, up to 50 Common Shiner and 10 Central Mudminnow were used for tissue metals analysis per area. All retained fish were measured for fork length and total length to the nearest millimetre using a fish measuring board. Weight was determined to the nearest milligram using an appropriately calibrated analytical balance. Each fish head containing the otolith aging structures was placed in a labelled bag. The remainder of the body without internal organs was placed in an appropriately, labelled bag for the purposes of tissue chemistry analysis. Both samples were kept frozen.

At the conclusion of the field collection, tissue samples were submitted to Bureau Veritas (BV), a laboratory that specialized in tissue analysis along with a chain-of-custody (COC) record. Total mercury and moisture analyses were conducted on a homogenized portion of each fish. The mercury concentrations were provided in wet weight values using the Cold Vapor Atomic Fluorescence methodology. Otoliths along with a COC were shipped to AAE Tech Services Inc. for fish age determination.

6.2 Data Analysis

6.2.1 Common Shiner

The original sample design recommended two-way Analysis of Variance (ANOVA) investigating the main effects of Area and Age and their interaction on tissue mercury concentrations (AMEC 2016). A log-linear relationship is well established in the literature, where mercury tends to increase with body size (Tang et al., 2013). Following the change in target species to Common Shiner, subsequent reports used Analysis of Covariance (ANCOVA;) to conduct statistical comparisons of mercury concentrations at common fish size (i.e., fork length) between PWREF, PWNF, and PWFF (Minnow 2020, Minnow 2021, Ecometrix 2022, Ecometrix 2023).

For the 2023 data, an ANCOVA was run with log10-transformed wet weight tissue mercury concentration as the response variable, Area as a factor variable (i.e., PWREF, PWNF, and PWFF), log10-transformed Fork Length as a covariate, and their interaction. A statistically significant interaction ($p < 0.1$) would indicate Area differences are dependent on fish size. Since there was no interaction found ($p > 0.1$), the model without an interaction term was fit and used to predict mean tissue concentrations for PWREF, PWNF, and PWFF areas at the average Fork Length across all areas (6.97 cm). The magnitude of difference (MOD) between areas was calculated using these estimates. It was calculated as:

$$MOD = (Exposure - Reference)/Reference \times 100,$$

where PWNF and PWFF were substituted as *Exposure* depending on the model and PWREF was *Reference*, respectively. Differences in tissue mercury concentrations between areas was considered not to be biologically relevant if MODs were lower than the critical effect size (CES) of 25%. If a MOD value was larger than the CES, tissue mercury concentrations were considered to differ significantly and be biologically relevant. This is analogous to CES found in MDMER technical guidance for other sublethal effects (EC, 2012).

The linear relationships in the above ANCOVA analysis were visually compared with those reports using 2019–2022 data. The relationships varied between sites within the same year and varied between years within the same site. For example, the mercury-length relationship in PWREF was positive using 2021 data but negative using 2022 data. These varied and potentially juxtaposed relationships make between-year interpretation difficult.

Therefore, to facilitate comparisons between sites within and across years, a two-way ANCOVA of Area, Year, the Fork Length covariate, and their interactions was run. Tissue mercury concentration predictions were generated for each Area:Year combination for a 5 cm Fork Length fish (the average minimum size across all sites and years), an 8 cm Fork Length fish (the average size across all sites and years), and a 11 cm Fork Length fish (the average maximum size across all sites and years). MODs were calculated using these predictions. Together, these pairwise comparisons provide a reasonable accounting of the last five years for identifying trends while the number of pairwise comparisons are relatively small; this analysis approach is in the spirit of the Before-After-Control-Impact and Generalized Additive Model analysis approaches identified in AMEC (2016).

6.2.2 Central Mudminnow

A similar analysis was undertaken to that outlined in **6.2.1**. For the 2023 Central Mudminnow data, an ANCOVA was run with log10-transformed wet weight tissue mercury concentration as the response variable, Area as a factor variable (i.e., PWREF, PWNF, and PWFF), log10-transformed Total Length as a covariate, and their interaction. However, there were too few data with insufficient Total Length overlap against other areas to include PWFF in the final model.

Similar to above, for the 2022–2023 data a two-way ANCOVA of Area, Year, Fork Length covariate, and their interactions were run for PWREF and PWNF to facilitate comparisons through time. MODS were also calculated for these comparisons. PWFF was excluded as insufficient fish and/or insufficient Total Length overlap was available for both years.

6.3 Results

6.3.1 Common Shiner

In 2023, Common Shiner mean tissue mercury concentrations at all Areas were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015) and 0.2 mg/kg fish-protective level (Beckvar et al., 2005). However, at PWNF, three individual fish (21%) were above 0.2 mg/kg (**Table 6-1**).

For the 2023 ANCOVA, a model was fit using all data and another model was fit using only the overlapping size range across sites because PWFF fish tended to be smaller. Upon evaluation, it was more reasonable to use all data since subsetting by overlapping length introduced a spurious downward trend of mercury with length at PWNF. Therefore, using all data, there was a significant Area effect (F = 9.7, p < 0.001), a significant Fork Length effect (F = 12.1, p < 0.001), and no significant interaction (F = 0.5 p = 0.60). The ANCOVA model was used to generate predictions for a 6.97 cm fish (average across Areas). Using these predictions, PWNF concentrations were 45.9% greater than PWREF and 123.3% greater than PWFF. PWFF concentrations were 34.7% less than PWREF (**Table 6-2** and **Figure 6-1**). Although efforts were made to ensure reasonable comparison (e.g., at common length), results related to PWFF should be interpreted with caution due to small sample size and smaller fish (4 fish with < 8 cm whereas other areas had fish ~12 cm).

The 2019–2023 ANCOVA model was used to generate Area:Year predictions for 5 cm, 8 cm, and 11 cm fish. Some factor combinations had no observations (e.g., PWFF:2023:11 cm) so were not predicted. The magnitude of difference between sites varied from year to year. On average, PWNF was 143% greater than PWREF (range: 1–316%) for 5 cm fish, 84% greater for 8 cm fish (range: 34–101%), and 61% greater for 11 cm fish (range: -20–220%). PWFF was 84% greater than PWREF for 5 cm fish (range: -34–371%), 9% for 8 cm fish (range: -35–80%), and 1% (range: -50–56%) for 12 cm fish (**Table 6-3** and **Figure 6-2**). Across years, the PWNF > PWREF is the most consistent relationship for nearly all fish sizes and years but it is still variable in strength year-to-year. Using the 8 cm fish as a representative example, the magnitude of difference was 34%, 98%, 101% and 39% in years 2020, 2021, 2022, and 2023, respectively (**Table 6-3**).

Table 6-1: Tissue mercury concentrations summary statistics for Common Shiners using 2019–2023 data.

Year	Area	N	Mean	SD	Minimum	Median	Maximum
2019[a]	PWREF	0	--	--	--	--	--
2019	PWNF	50	0.433	0.129	0.250	0.410	0.720
2019	PWFF	51	0.199	0.058	0.080	0.200	0.380
2020	PWREF	50	0.084	0.034	0.027	0.084	0.167
2020	PWNF	50	0.108	0.030	0.049	0.102	0.177
2020	PWFF	50	0.056	0.017	0.038	0.051	0.139
2021	PWREF	50	0.076	0.026	0.043	0.074	0.203
2021	PWNF	50	0.151	0.035	0.076	0.145	0.236
2021	PWFF	11	0.100	0.024	0.077	0.091	0.150
2022	PWREF	50	0.109	0.042	0.052	0.102	0.249
2022	PWNF	48	0.216	0.075	0.117	0.202	0.493
2022	PWFF	53	0.140	0.078	0.066	0.125	0.567
2023	PWREF	50	0.093	0.032	0.025	0.091	0.194
2023	PWNF	14	0.138	0.057	0.076	0.123	0.267
2023	PWFF	4	0.055	0.007	0.048	0.055	0.062

Notes:
N is number of samples.
SD is standard deviation.
-- indicates no data available.
a. PWREF 2019 samples were accidentally left out of freezer, subsequently degraded, and were not analyzed (Minnow 2019)

Table 6-2: Results of models comparing tissue mercury concentrations in Common Shiners from Pinewood River between PWREF, PWNF, and PWFF.

Model	Endpoint		Sample Size			Adj. R^2	Slopes Equal? Interaction Model		Areas Equal? Parallel Model		Magnitude of Difference (MOD; %)		
	Response	Covariate	PWREF	PWNF	PWFF		p	Equal?	p	Equal?	PWNF vs. PWREF	PWFF vs. PWREF	PWNF vs. PWFF
1. 2023	log_{10} Tissue Mercury	log_{10} Fork Length	50	14	4	0.29	0.60	Yes	--	--	45.9[a]	-34.7[a]	123.3[a]
2. 2019–2023	log_{10} Tissue Mercury	log_{10} Fork Length	50	14	4	0.78	<0.0001	No	<0.0001	Yes	See **Table 6-3**for pairwise comparisons		

Notes:
a. MOD calculated for a 6.97 cm fish, the average length across all sites.

Table 6-3: Magnitude of difference results based on marginal concentrations at different fish sizes from 2019-2023 model 2 Table 6-2.

Year	5 cm			8 cm			11 cm		
	PWNF vs PWREF	PWFF vs PWREF	PWNF vs. PWFF	PWNF vs PWREF	PWFF vs PWREF	PWNF vs. PWFF	PWNF vs PWREF	PWFF vs PWREF	PWNF vs. PWFF
2019[a]	--	--	232.0	--	--	131.7	--	--	81.6
2020	190.5	26.6	129.5	34.3	-23.8	76.2	-20.4	-45.9	47.3
2021	316.1	370.8	-11.6	97.9	80.0	9.9	19.6	-6.2	27.4
2022	1.3	-28.3	41.4	101.2	14.1	76.4	220.3	56.3	104.9
2023	63.0	-34.3	148.0	39.3	-34.8	113.9	25.3	--	--
Mean (2019-2023)	**142.7**	**83.7**	**107.9**	**68.2**	**8.9**	**81.6**	**61.2**	**1.4**	**65.3**

Notes:
-- indicates no data available.
Bolded mean values indicate ≥|25%| difference relative to the second area.
a. PWREF 2019 samples were accidentally left out of freezer, subsequently degraded, and were not analyzed (Minnow 2019)

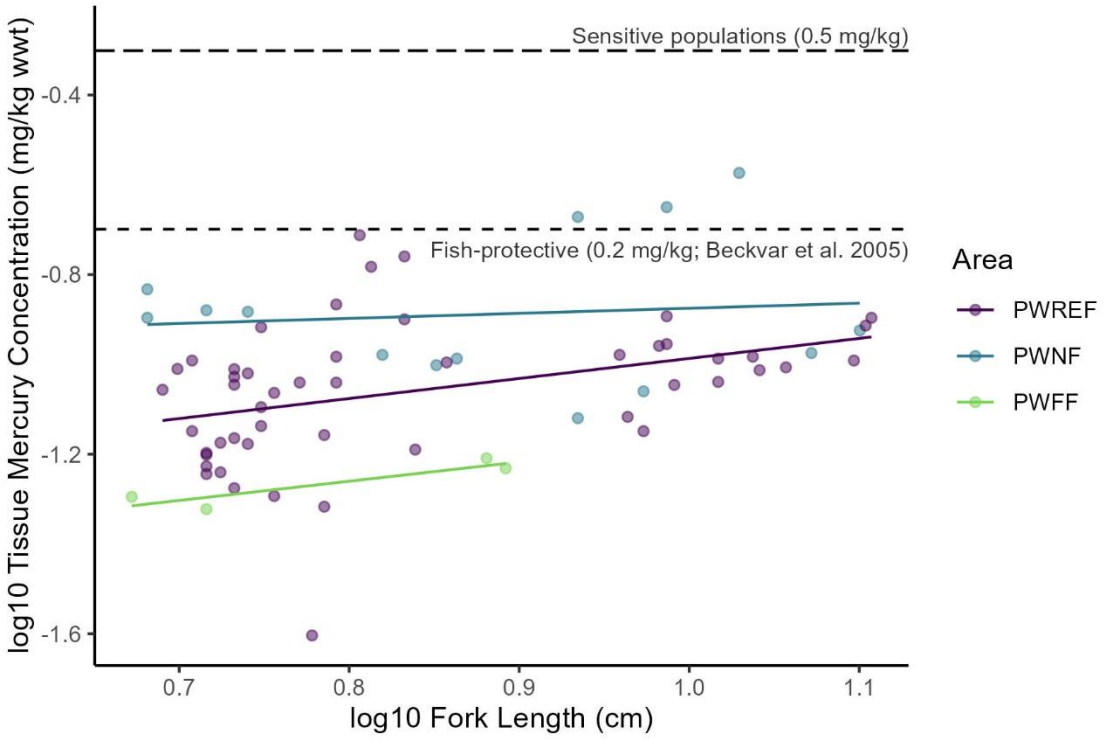

Figure 6-1: log10 tissue mercury concentrations at log10 fork length for Common Shiners with predicted linear relationships by Area. Predicted relationships are estimated from model 1 Table 6-2.

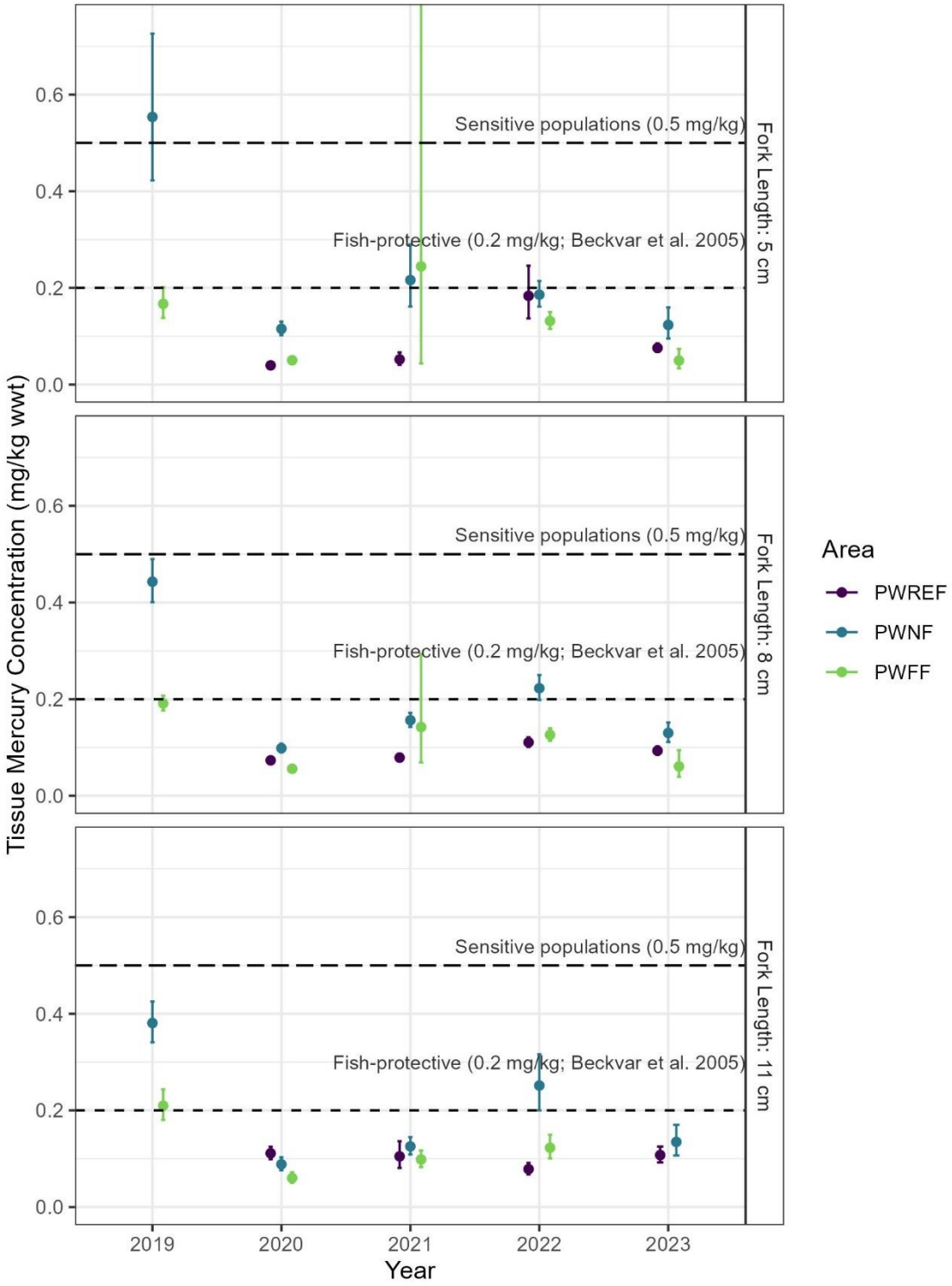

Figure 6-2: Estimated marginal mean and 95% confidence interval tissue mercury concentrations for Common Shiner at PWREF, PWNF, and PWFF areas and years 2019–2023. Marginal means are estimated from model 2 Table 6-2.

6.3.2 Central Mudminnnow

In 2023, Central Mudminnow mean tissue mercury concentrations at all sites were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015) and the 0.2 mg/kg fish-protective level (**Table 6-4**; Beckvar et al., 2005).

For the 2023 ANCOVA model, results suggested no relationship between tissue mercury concentrations and Total Length over the ranges of fish analyzed (5–10.6 cm). They also suggested no difference in mean tissue mercury concentrations between PWREF and PWNF but that there was insufficient statistical power to detect that difference. Using power analysis guidelines available in Environmental Effects Monitoring technical guidance documents (Environment Canada, 2012), the ANCOVA minimum detectable effect size was +44% and -30%; a post-hoc power analysis suggested that a sample size of 21 fish per group would be necessary to detect a 25% difference in mean tissue concentration. Nevertheless, a plot of tissue mercury concentrations against Total Length is provided in Error! Reference source not found..

The 2022–2023 ANCOVA model was used to generate Area:Year tissue mercury concentration predictions for a common fish length of 7.4 cm since there was no relationship with Fork Length ($p > 0.10$) or interactions with Fork Length ($p > 0.10$). Similar to Common Shiner, the magnitude of difference between sites varied. In 2022, the PWNF was 157% higher than PWREF and in 2023 it was 2.63% higher. Mean tissue concentrations remain below the fish protective level of 0.2 mg/kg .

Table 6-4: Tissue mercury concentrations summary statistics for Central Mudminnow using 2022–2023 data.

Year	Area	N	Mean	SD	Minimum	Median	Maximum
2022	PWREF	5	0.067	0.010	0.052	0.066	0.080
2022	PWNF	5	0.102	0.022	0.067	0.107	0.121
2022	PWFF	2	0.094	0.007	0.089	0.094	0.098
2023	PWREF	10	0.106	0.035	0.059	0.096	0.165
2023	PWNF	10	0.102	0.017	0.081	0.100	0.136
2023	PWFF	4	0.069	0.011	0.058	0.068	0.082

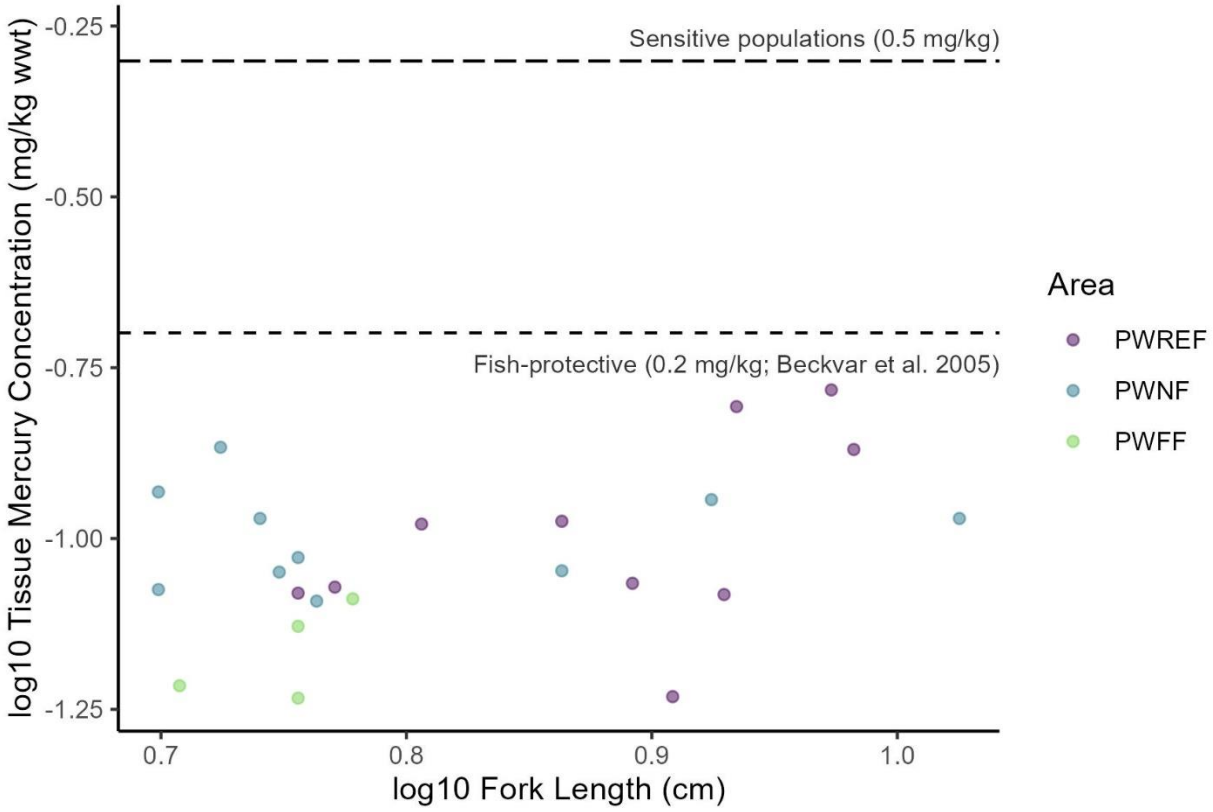

Figure 6-3: log10 tissue mercury concentrations at log10 Total Length for Central Mudminnow. No predicted relationships are plotted as not statistically significant relationship was observed.

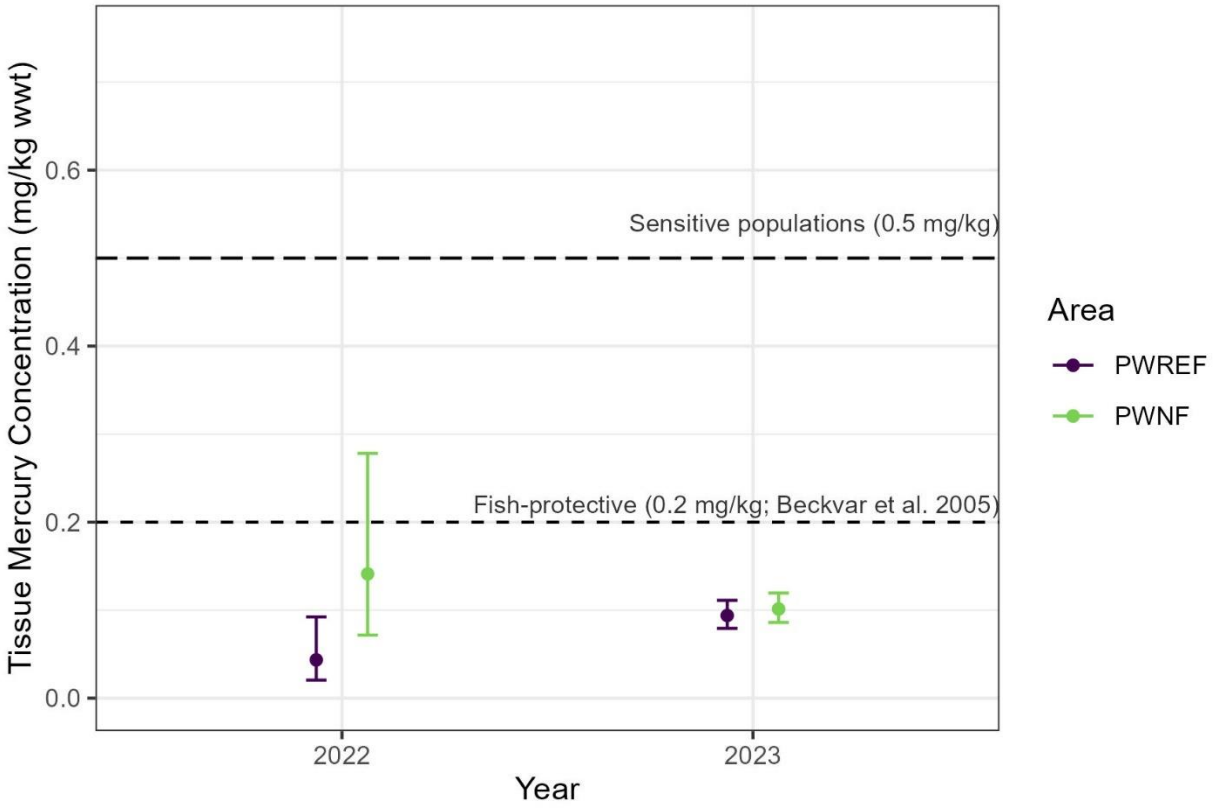

Figure 6-4: Estimated marginal mean and 95% confidence interval tissue mercury concentrations for Central Mudminnow at PWREF and PWNF areas and years 2022–2023.

7.0 Conclusions and Recommendations

7.1 Conclusions

The current study provided the following conclusions:

- Water level loggers indicate that Area 1–4 non-impounded and impounded habitats continue to exhibit seasonal differences in water level fluctuations mirroring precipitation variations in 2023 and over longer 2021–2023 periods. Area 3 tends to exhibit the highest variability in water level while Area 2 tends to have the highest water levels and lowest variability. Water levels and fluctuations continue to suggest no distinct pattern to suggest the impounded or non-impounded areas are affected by mine-related activities. Beaver activity along the Pinewood River has contributed to the pooling of water along sections of the river and is a possible factor influencing water levels in this vicinity.

- In 2023, mining is likely not a major contributing factor to surface water concentrations of mercury in the Pinewood River. Both site catchment and surface water total and dissolved mercury water concentrations tended to be below detection limits and PWQO and CCME guidelines. The TMA tended to be higher with more variable concentrations but still below the PWQO.

- In 2023, site catchment and surface water methylmercury concentrations also continue to remain low and in most cases below the values observed at the reference locations. All concentrations were below CCME guidelines of 4 ng/L. An evaluation of the potential for enhanced methylation (>50% methylmercury:total mercury) revealed sampled site catchments were consistently near 4% and that surface water stations were more variable with none exceeding the 50% ratio.

- Total and dissolved mercury loads (i.e., kg/day) attributed to mine discharge and background water were proportional to discharge and background water flows, respectively, because median and 90th percentile concentrations were <DL in all samples.

- Sulfate loads (i.e., kg/day) attributed to mine discharge were higher than background during months of discharge. During months with discharge rates averaging approximately 8–19% total river flow (April to June), the mine attributed sulfate loads averaged approximately 87–99% of the total load in the river. During months with discharge rates averaging 42–48% of total flow (i.e., near ECA 1:1 limits, October and November), mine attributed sulfate loads averaged nearly 100% of the total load in the river. Sulfate concentrations in surface water at exposure sites tended to return to reference levels in the months after discharge.

- Fish communities in the reference and exposure areas continue to be diverse with 12 to 14 species being identified and with various age classes present. Density and dominant species varied between areas and between years.

- In 2023, Common Shiner and Central Mudminnow mean tissue concentrations at all Areas were below the consumption guidelines for sensitive populations of 0.5 mg/kg (MECP 2015) and the 0.2 mg/kg fish-protective level (Beckvar et al. 2005).

- Common Shiner fish tissue mercury concentrations were influenced by a combination of sample location, length, and sample year. Despite being below the 0.5 mg/kg consumption guideline, PWNF has consistently higher mean tissue mercury concentrations than PWREF; its magnitude of difference (MOD) relative to PWREF is typically above 25% based on multiple models (pairwise comparisons from a 2023-data ANCOVA model and from a 2019–2023 ANCOVA model). In 2023, analysis for Central Mudminnow lacked sufficient statistical power to compare across areas. Continued monitoring and a comprehensive trend analysis should review a potential effect of mining activities on Common Shiner at PWNF.

7.2 Recommendations

The below are suggestions to modify or improve the program:

1) Determine feasibility for obtaining lower detection limits for total and dissolved mercury (currently 5 ng/L or 0.000005 mg/L) to better align with detection limits of methylmercury (currently 0.02 ng/L although tends to be higher due to sample matrix effects like chemical interference, colour, and turbidity). The terms of reference identified method detection limits of 0.1 ng/L as appropriate. This will make the calculation of the methylmercury:total mercury more accurate. If not possible, consider requesting non-censored analytical values that could be used in a robust statistical framework for estimating summary statistics (e.g., regression on order statistics for censored data) rather than simple substitution.

2) Re-commence sampling of the TMA for methylmercury during the open water season to facilitate comparisons across site catchments and successes that New Gold has for mitigation through comparisons to Pinewood River surface water.

3) Continue to ensure that site catchments and surface water locations are sampled at least monthly during the open water season to meet the terms of reference objectives.

4) Continue to additionally sample Central Mudminnow for between-species comparisons across sites but increase the number of fish targeted to at least 15 across representative fish sizes.

5) As an alternative to the two-way ANCOVA run here using 2019–2023 data, subsequent years should consider using a Linear Mixed Effects Model (LMM). This hierarchical analysis approach is able to generate similar predictions for generating magnitude of differences at different fish sizes, test the main effect of Area, and account for complex sampling structure without introducing complex interaction terms (i.e., Areas by Years by Length).

6) Continue to monitor and augment the study as necessary based on the mine established discharge practices.

8.0 References

AMEC. 2014. Rainy River Project: Final Environmental Assessment Report (Environmental Impact Statement) Version 2. January 2014.

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9.0 APPENDICES

Appendix A Detailed Data – Mercury and Sulfate Catchment and Surface Water Assessment and Loadings Assessment

Table A1: Select water chemistry parameters for site catchments, 2023

Site	Sample ID	Date	Mercury – Total (mg/L)	Mercury – Dissolved (mg/L)	Methylmercury – Total (ug/L)	Hardness (mg/L)	Sulfate – Total (mg/L)
MRP	MRP_EFF_20230412	2023-04-12	<0.000005	<0.000005	--	239	179
MRP	MRP_EFF_20230419	2023-04-19	<0.000005	<0.000005	--	529	383
MRP	MRP_EFF_20230503	2023-05-03	<0.000005	<0.000005	--	588	526
MRP	MRP_EFF_20230607	2023-06-07	<0.0000050	<0.0000050	--	750	696
MRP	MRP_EFF_20230712	2023-07-12	<0.0000050	<0.0000050	--	886	766
MRP	MRP_EFF_20230712	2023-07-12	--	--	0.000036	--	--
MRP	MRP_EFF_20230809	2023-08-09	<0.0000050	<0.0000050	--	973	805
MRP	MRP_EFF_20230906	2023-09-06	<0.0000050	<0.0000050	--	1080	991
MRP	MRP_EFF_20231004	2023-10-04	<0.0000050	<0.0000050	--	1170	1030
MRP	MRP_EFF_20231101	2023-11-01	<0.0000050	<0.0000050	--	1120	1060
MRP	MRP_EFF_20231206	2023-12-06	<0.0000050	<0.0000050	--	1370	1240
MRP	MRP_EFF_20231206	2023-12-06	<0.0000050	<0.0000050	--	1370	1240
SED1	SED 1	2023-01-04	<0.000005	<0.000005	--	317	90.5
SED1	SP1_EFF_20230315	2023-03-15	<0.000005	<0.000005	--	425	80.7
SED1	SP1_EFF_20230329	2023-03-29	<0.000005	<0.000005	--	448	83.8
SED1	SP1_EFF_20230412	2023-04-12	<0.000005	<0.000005	--	86.2	34.3
SED1	SP1_EFF_20230419	2023-04-19	<0.000005	<0.000005	--	184	30.7
SED1	SP1_MM_20230502	2023-05-02	--	--	4.93E-04	--	--
SED1	SP1_EFF_20230503	2023-05-03	<0.000005	<0.000005	--	176	27.5
SED1	SP1_EFF_20230712	2023-07-12	<0.0000050	<0.0000050	--	160	28.8
SED1	SP1_EFF_20230712	2023-07-12	--	--	0.000175	--	--
SED1	SP1_EFF_20230809	2023-08-09	<0.0000050	<0.0000050	--	157	27.9
SED1	SP1_MM_20230809	2023-08-09	--	--	0.000177	--	--
SED1	SP1_EFF_20230906	2023-09-06	<0.0000050	<0.0000050	--	147	31.6
SED1	SP1_MM_20230906	2023-09-06	--	--	<0.000200	--	--
SED1	SP1_EFF_20231004	2023-10-04	<0.0000050	<0.0000050	--	147	32.3
SED1	SP1_MM_20231004	2023-10-04	--	--	0.000194	--	--
SED1	SP1_EFF_20231101	2023-11-01	<0.0000050	<0.0000050	--	154	42.3
SED2	SED 2	2023-01-04	<0.000005	<0.000005	--	299	194
SED2	SP2_EFF_20230218	2023-02-18	<0.000005	<0.000005	--	337	206
SED2	SP2_EFF_20230301	2023-03-01	<0.000005	<0.000005	--	342	211
SED2	SP2_EFF_20230315	2023-03-15	<0.000005	<0.000005	--	339	212
SED2	SP2_EFF_20230329	2023-03-29	<0.000005	<0.000005	--	355	219
SED2	SP2_EFF_20230412	2023-04-13	<0.000005	<0.000005	--	194	104
SED2	SP2_MM_20230502	2023-05-02	--	--	3.57E-04	--	--
SED2	SP2_MM_20230606	2023-06-07	--	--	0.000124	--	--
SED2	SP2_EFF_20230712	2023-07-12	<0.0000050	<0.0000050	--	305	231
SED2	SP2_EFF_20230712	2023-07-12	--	--	0.000176	--	--
SED2	SP2_EFF_20230809	2023-08-09	<0.0000050	<0.0000050	--	313	228
SED2	SP2_MM_20230809	2023-08-09	--	--	0.000152	--	--
SED2	SP2_EFF_20230830	2023-08-30	<0.0000050	<0.0000050	--	304	239
SED2	SP2_EFF_20230906	2023-09-06	<0.0000050	<0.0000050	--	333	255
SED2	SP2_MM_20230906	2023-09-06	--	--	<0.000200	--	--
SED2	SP2_EFF_20230913	2023-09-12	<0.0000050	<0.0000050	--	349	247
SED2	SP2_EFF_0230920	2023-09-20	<0.0000050	<0.0000050	--	348	245
SED2	SP2_EFF_20230920	2023-09-20	<0.0000050	<0.0000050	--	348	245
SED2	SP2_EFF_20230927	2023-09-27	<0.0000050	<0.0000050	--	348	252
SED2	SP2_EFF_20231004	2023-10-04	<0.0000050	<0.0000050	--	328	250
SED2	SP2_MM_20231004	2023-10-04	--	--	0.000268	--	--
SED2	SP2_EFF_20231018	2023-10-18	<0.0000050	<0.0000050	--	314	254
SED2	SP2_EFF_20231129	2023-11-29	<0.0000050	<0.0000050	--	370	290
SED2	SP2_EFF_20231206	2023-12-06	<0.0000050	<0.0000050	--	408	276
TMA	CELL 2	2023-01-04	0.000005	<0.000005	--	583	900
TMA	TMA CELL 2_EFF_20230218	2023-02-18	0.000020	0.000010	NA	646	943
TMA	TMA CELL 2_EFF_20230301	2023-03-01	0.000020	0.000010	NA	672	987
TMA	TMA CELL 2_EFF_20230315	2023-03-15	0.000005	<0.000005	NA	656	944
TMA	TMA CELL 2_EFF_20230329	2023-03-29	0.000020	0.000010	NA	649	972
TMA	TMA CELL 2_EFF_20230412	2023-04-12	<0.000005	<0.000005	NA	135	174
TMA	TMA CELL 1_EFF_20230419	2023-04-19	0.000025	0.000015	NA	669	908
TMA	TMA CELL 2_EFF_20230503	2023-05-03	0.000025	0.000025	NA	500	772
TMA	CELL 2 NORTH_EFF_20230526	2023-05-26	0.000017	0.000011	--	472	743
TMA	CELL 2 RECLAIM_EFF_20230526	2023-05-26	0.000031	0.000021	--	443	770
TMA	TMA CELL 1_EFF_20230526	2023-05-26	0.000022	0.000019	NA	577	760
TMA	CELL 2 RECLAIM_EFF_20230529	2023-05-29	0.000030	0.000011	--	544	840

Site	Sample ID	Date	Mercury – Total (mg/L)	Mercury – Dissolved (mg/L)	Methylmercury – Total (ug/L)	Hardness (mg/L)	Sulfate – Total (mg/L)
TMA	CELL 2 NORTH_EFF_20230531	2023-05-31	0.000032	0.000025	--	515	824
TMA	CELL 2 RECLAIM_EFF_20230531	2023-05-31	0.000031	0.000015	--	554	832
TMA	TMA CELL 1_EFF_20230531	2023-05-31	0.000023	<0.0000500	NA	553	823
TMA	TMA CELL 2_EFF_20230531	2023-05-31	0.000016	0.000007	NA	540	817
TMA	CELL 2 RECLAIM_EFF_20230602	2023-06-02	0.000028	0.000026	--	564	781
TMA	CELL 2 RECLAIM_EFF_20230605	2023-06-05	0.000026	0.000017	--	568	783
TMA	CELL 2 NORTH_EFF_20230607	2023-06-07	0.000022	0.000010	--	565	832
TMA	CELL 2 RECLAIM_EFF_20230607	2023-06-07	0.000042	0.000019	--	562	841
TMA	TMA CELL 1_EFF_20230607	2023-06-07	0.000014	0.000014	NA	565	811
TMA	CELL 2 RECLAIM_EFF_20230906	2023-06-09	0.000025	0.000017	--	586	900
TMA	CELL 2 RECLAIM_EFF_20230612	2023-06-12	0.000028	0.000027	--	572	786
TMA	CELL 2 NORTH_EFF_20230614	2023-06-14	0.000024	0.000012	--	561	789
TMA	CELL 2 RECLAIM_EFF_20230614	2023-06-14	0.000029	0.000017	--	438	807
TMA	CELL 2 RECLAIM_EFF_20230614	2023-06-14	0.000029	0.000017	--	555	807
TMA	TMA CELL 1_EFF_20230614	2023-06-14	0.000019	0.000013	NA	595	791
TMA	TMA CELL 2_EFF_20230614	2023-06-14	0.000028	0.000018	NA	574	789
TMA	CELL 2 RECLAIM_EFF_20230616	2023-06-16	0.000027	0.000015	--	582	833
TMA	CELL 2 RECLAIM_EFF_20230617	2023-06-17	0.000027	0.000018	--	566	813
TMA	CELL 2 RECLAIM_EFF_20230617	2023-06-17	0.000027	0.000018	--	566	813
TMA	CELL 2 NORTH_EFF_	2023-06-21	0.000018	0.000008	--	545	894
TMA	CELL 2 NORTH_EFF_20230621	2023-06-21	0.000018	0.000008	--	545	894
TMA	CELL 2 RECLAIM_EFF_	2023-06-21	0.000032	0.000018	--	534	901
TMA	CELL 2 RECLAIM_EFF_20230621	2023-06-21	0.000032	0.000018	--	534	901
TMA	TMA CELL 1_EFF_	2023-06-21	0.000020	0.000013	NA	536	903
TMA	TMA CELL 1_EFF_20230621	2023-06-21	0.000020	0.000013	NA	536	903
TMA	CELL 2 NORTH_EFF_20230628	2023-06-28	0.000026	0.000009	--	511	741
TMA	TMA CELL 1_EFF_20230628	2023-06-28	0.000024	0.000012	NA	539	834
TMA	TMA CELL 2_EFF_20230628	2023-06-28	0.000031	0.000013	NA	541	850
TMA	CELL 2 NORTH_EFF_20230712	2023-07-12	0.000023	0.000011	--	569	884
TMA	TMA CELL 1_EFF_20230712	2023-07-12	0.000018	0.000013	NA	549	877
TMA	TMA CELL 2_EFF_20230712	2023-07-12	0.000019	0.000012	NA	552	887
TMA	CELL 2 NORTH_EFF_20230719	2023-07-19	0.000015	0.000011	--	459	884
TMA	CELL 2 RECLAIM_EFF_20230719	2023-07-19	0.000016	0.000011	--	480	909
TMA	TMA CELL 1_EFF_20230719	2023-07-19	0.000016	0.000010	NA	457	880
TMA	CELL 2 NORTH_EFF_20230726	2023-07-26	0.000010	0.000007	--	538	858
TMA	TMA CELL 2_EFF_20230726	2023-07-26	0.000010	0.000009	NA	524	850
TMA	CELL 2 NORTH_EFF_20230802	2023-08-02	0.000009	0.000007	--	543	918
TMA	CELL 2 RECLAIM_EFF_20230802	2023-08-02	0.000010	0.000007	--	551	896
TMA	CELL 2 NORTH_EFF_20230809	2023-08-09	<0.0000050	<0.0000050	--	601	924
TMA	CELL 2 RECLAIM_EFF_20230809	2023-08-09	0.000005	<0.0000050	--	594	927
TMA	CELL 2 NORTH_EFF_20230816	2023-08-15	<0.0000500	0.000027	--	618	990
TMA	CELL 2 NORTH_EFF_20230816	2023-08-15	<0.0000500	0.000027	--	618	990
TMA	CELL 2 RECLAIM_EFF_20230816	2023-08-15	0.000006	0.000007	--	550	938
TMA	CELL 2 RECLAIM_EFF_20230816	2023-08-15	0.000006	0.000007	--	550	938
TMA	CELL 2 NORTH_EFF_20230823	2023-08-23	0.000024	0.000019	--	599	1000
TMA	CELL 2 RECLAIM_EFF_20230823	2023-08-23	<0.0000050	<0.0000050	--	582	967
TMA	CELL 2 NORTH_EFF_20230830	2023-08-30	0.000010	0.000008	--	591	979
TMA	CELL 2 RECLAIM_EFF_20230830	2023-08-30	0.000007	<0.0000050	--	578	958
TMA	CELL 2 NORTH_EFF_20230906	2023-09-06	0.000010	0.000006	--	627	956
TMA	CELL 2 RECLAIM_EFF_20230906	2023-09-06	0.000008	<0.0000050	--	622	966
TMA	CELL 2 RECLAIM_EFF_20230913	2023-09-13	0.000007	0.000005	--	643	945
TMA	TMA CELL 2_EFF_20230913	2023-09-13	0.000013	0.000009	NA	636	940
TMA	CELL 2 NORTH_EFF_20230920	2023-09-20	0.000034	0.000028	--	680	973
TMA	CELL 2 NORTH_EFF_20230920	2023-09-20	0.000034	0.000028	--	680	973
TMA	CELL 2 RECLAIM_EFF_20230920	2023-09-20	0.000016	0.000011	--	646	979
TMA	CELL 2 RECLAIM_EFF_20230920	2023-09-20	0.000016	0.000011	--	646	979
TMA	CELL 2 RECLAIM_EFF_20230927	2023-09-27	0.000010	0.000012	--	627	958
TMA	TMA CELL 2_EFF_20230927	2023-09-27	0.000025	0.000020	NA	672	948
TMA	CELL 2 NORTH_EFF_20231004	2023-10-04	0.000018	0.000009	--	596	936
TMA	CELL 2 RECLAIM_EFF_20231004	2023-10-05	0.000014	0.000009	--	574	960
TMA	CELL 2 RECLAIM_EFF_20231011	2023-10-11	0.000011	0.000008	--	645	975
TMA	TMA CELL 2_EFF_20231011	2023-10-11	0.000012	0.000007	NA	636	1060
TMA	CELL 2 NORTH_EFF_20231018	2023-10-18	0.000011	0.000009	--	584	966
TMA	CELL 2 RECLAIM_EFF_20231018	2023-10-18	0.000010	0.000009	--	565	972
TMA	CELL 2 RECLAIM_EFF_20231025	2023-10-25	0.000008	0.000007	--	576	930
TMA	TMA CELL 2_EFF_20231025	2023-10-25	0.000011	0.000010	NA	567	950
TMA	CELL 2 NORTH_EFF_20231101	2023-11-01	0.000011	0.000016	--	579	996
TMA	CELL 2 RECLAIM_EFF_20231101	2023-11-01	0.000012	0.000014	--	580	1030
TMA	CELL 2 RECLAIM_EFF_20231109	2023-11-09	0.000016	0.000013	--	568	1030
TMA	TMA CELL 2_EFF_20231109	2023-11-09	0.000016	0.000014	NA	560	1000
TMA	CELL 2 NORTH_EFF_20231115	2023-11-15	0.000022	0.000016	--	609	899
TMA	CELL 2 RECLAIM_EFF_20231115	2023-11-15	0.000020	0.000014	--	591	964
TMA	CELL 2 RECLAIM_20231129	2023-11-29	0.000024	0.000018	--	639	1130

Site	Sample ID	Date	Mercury – Total (mg/L)	Mercury – Dissolved (mg/L)	Methylmercury – Total (ug/L)	Hardness (mg/L)	Sulfate – Total (mg/L)
TMA	CELL 2 RECLAIM_EFF_20231206	2023-12-06	0.000025	0.000021	--	661	991
TMA	TMA CELL 2_EFF_20231206	2023-12-06	0.000025	0.000023	NA	650	991
WMP	WMP	2023-01-04	<0.000005	<0.000005	NA	519	685
WMP	WMP SURFACE_EFF_20230218	2023-02-18	<0.000005	<0.000005	NA	563	651
WMP	WMP SURFACE_EFF_20230301	2023-03-01	<0.000005	<0.000005	NA	516	682
WMP	WMP SURFACE_EFF_20230315	2023-03-15	<0.000005	<0.000005	NA	560	660
WMP	WMP SURFACE_EFF_20230329	2023-03-29	<0.000005	<0.000005	NA	572	680
WMP	WMP SURFACE_EFF_20230412	2023-04-12	<0.000005	<0.000005	NA	205	227
WMP	WMP_MM_20230502	2023-05-02	--	--	<0.000020	--	--
WMP	WMP_MM_20230606	2023-06-07	--	--	0.000068	--	--
WMP	WMP SURFACE_EFF_20230712	2023-07-12	<0.0000050	<0.0000050	NA	505	653
WMP	WMP SURFACE_EFF_20230719	2023-07-19	<0.0000050	<0.0000050	NA	441	660
WMP	WMP SURFACE_EFF_20230726	2023-07-26	<0.0000050	<0.0000050	NA	490	653
WMP	WMP SURFACE_EFF_20230802	2023-08-02	<0.0000050	<0.0000050	NA	501	703
WMP	WMP SURFACE_EFF_20230809	2023-08-09	<0.0000050	<0.0000050	NA	533	725
WMP	WMP_MM_20230809	2023-08-09	--	--	<0.000080	--	--
WMP	WMP SURFACE_EFF_20230816	2023-08-15	<0.0000050	<0.0000050	NA	512	740
WMP	WMP SURFACE_EFF_20230816	2023-08-15	<0.0000050	<0.0000050	NA	512	740
WMP	WMP SURFACE_EFF_20230823	2023-08-23	<0.0000050	<0.0000050	NA	545	748
WMP	WMP SURFACE_EFF_20230830	2023-08-30	<0.0000050	<0.0000050	NA	527	748
WMP	WMP SURFACE_EFF_20230906	2023-09-06	<0.0000050	<0.0000050	NA	520	740
WMP	WMP_MM_20230906	2023-09-06	--	--	<0.000200	--	--
WMP	WMP SURFACE_EFF_20230913	2023-09-13	<0.0000050	<0.0000050	NA	585	713
WMP	WMP_P36_EFF_0230920	2023-09-20	<0.0000050	<0.0000050	NA	592	724
WMP	WMP_P36_EFF_20230920	2023-09-20	<0.0000050	<0.0000050	NA	592	724
WMP	WMP_P36_EFF_20230927	2023-09-27	<0.0000050	<0.0000050	NA	582	712
WMP	WMP SURFACE_EFF_20231004	2023-10-04	<0.0000050	<0.0000050	NA	564	729
WMP	WMP_MM_20231004	2023-10-04	--	--	0.000065	--	--
WMP	WMP_P36_EFF_20231011	2023-10-11	<0.0000050	<0.0000050	NA	603	741
WMP	WMP_P36_EFF_20231018	2023-10-18	<0.0000050	<0.0000050	NA	532	746
WMP	WMP_P36_EFF_20231025	2023-10-25	<0.0000050	<0.0000050	NA	544	731
WMP	WMP_P36_EFF_20231122	2023-11-24	<0.0000050	<0.0000050	NA	547	779
WMP	WMP SURFACE_EFF_20231206	2023-12-06	<0.0000050	<0.0000050	NA	615	722

Table A2: Select water chemistry parameters for surface water locations, 2017–2023

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
Teeple Culvert (Reference)	2017-07-26	0.000004	4	0.000004	4	0.00000088	0.88	-	-
Teeple Culvert (Reference)	2017-08-31	0.000004	4	0.000002	2	0.00000046	0.46	-	-
Teeple Culvert (Reference)	2017-09-29	0.000004	4	0.000001	1	0.00000034	0.34	-	-
Teeple Culvert (Reference)	2017-10-30	0.000002	2	0.000001	1	0.00000032	0.32	-	-
Teeple Culvert (Reference)	2018-05-10	0.000002	2	0.000014	14	0.00000045	0.45	-	-
Teeple Culvert (Reference)	2018-06-12	0.000006	6	0.000001	1	0.0000003	0.3	-	-
Teeple Culvert (Reference)	2018-07-17	0.000002	2	<0.000001	<1	0.00000097	0.97	-	-
Teeple Culvert (Reference)	2018-09-11	0.000002	2	0.000002	2	0.00000021	0.21	-	-
Teeple Culvert (Reference)	2018-10-16	0.000005	5	0.000004	4	0.0000001	0.1	-	-
Teeple Culvert (Reference)	2019-05-16	<0.000001	<1	<0.000001	<1	0.00000044	0.44	-	-
Teeple Culvert (Reference)	2019-06-11	0.000005	5	0.00003	30	0.00000095	0.95	-	-
Teeple Culvert (Reference)	2019-07-08	<0.000005	<5	<0.000005	<5	0.00000169	1.69	-	-
Teeple Culvert (Reference)	2019-08-13	<0.000005	<5	<0.000005	<5	0.00000052	0.52	9	-
Teeple Culvert (Reference)	2019-09-19	<0.000005	<5	<0.000005	<5	0.0000004	0.4	-	-
Teeple Culvert (Reference)	2019-10-08	0.00001	10	<0.000005	<5	0.00000034	0.34	-	-
Teeple Culvert (Reference)	2020-06-17	<0.00003	<30	<0.00003	<30	0.000000792	0.792	-	-
Teeple Culvert (Reference)	2020-07-07	<0.00003	<30	0.000005	5	0.00000152	1.52	-	-
Teeple Culvert (Reference)	2020-08-11	<0.00003	<30	<0.00003	<30	0.000000659	0.659	13	-
Teeple Culvert (Reference)	2020-09-15	-	-	-	-	0.00000035	0.35	-	-
Teeple Culvert (Reference)	2020-10-14	<0.00003	<30	<0.00003	<30	0.000000106	0.106	18	-
Teeple Culvert (Reference)	2021-05-11	<0.000005	<5	<0.000005	<5	0.000000706	0.706	19.1	-
Teeple Culvert (Reference)	2021-06-08	0.0000055	5.5	0.0000204	20.4	0.00000241	2.41	-	-
Teeple Culvert (Reference)	2021-10-20	<0.00003	<30	<0.000005	<5	0.000000609	0.609	23.3	-

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
Teeple Culvert (Reference)	2022-06-08	<0.000005	<5	<0.000005	<5	0.00000097	0.97	-	-
Teeple Culvert (Reference)	2022-07-05	<0.000005	<5	<0.000005	<5	0.00000110	1.1	-	-
Teeple Culvert (Reference)	2022-09-06	<0.000005	<5	<0.000005	<5	0.00000105	1.05	-	-
Teeple Culvert (Reference)	2022-10-04	<0.000005	<5	<0.000005	<5	0.00000046	0.455	5.09	-
Teeple Culvert (Reference)	2023-05-02	<0.000005	<5	<0.000005	<5	0.000000191	0.191	7.2	-
Teeple Culvert (Reference)	2023-06-09	<0.000005	5	0.000005	5	0.00000109	1.09	0.93	-
Teeple Culvert (Reference)	2023-07-10	<0.000005	<5	<0.000005	<5	0.000000854	0.854	2	-
Teeple Culvert (Reference)	2023-08-08	<0.000005	<5	<0.000005	<5	0.000000623	0.623	1.06	-
Teeple Culvert (Reference)	2023-10-04	<0.000005	<5	<0.000005	<5	0.000000248	0.248	1.23	-
Teeple Culvert (Reference)	2023-11-13	<0.000005	<5	<0.000005	<5	0.000000136	0.136	7.91	-
SW20 (Reference)	2017-07-26	0.000004	4	0.000004	4	0.000001	1	2	-
SW20 (Reference)	2017-08-31	0.000002	2	<0.000001	<1	0.00000065	0.65	1	-
SW20 (Reference)	2017-09-29	0.000004	4	<0.000001	<1	0.00000019	0.19	15	-
SW20 (Reference)	2017-10-30	0.000002	2	0.000004	4	0.00000019	0.19	8	111
SW20 (Reference)	2018-05-10	0.000004	4	0.000001	1	0.00000024	0.24	8	-
SW20 (Reference)	2018-06-12	0.000006	6	0.000004	4	0.00000169	1.69	3	149
SW20 (Reference)	2018-07-17	<0.000001	<1	<0.000001	<1	0.00000047	0.47	1	191
SW20 (Reference)	2018-08-07	<0.000001	<1	<0.000001	<1	0.00000021	0.21	1	175
SW20 (Reference)	2018-09-11	0.000002	2	<0.000001	<1	0.00000024	0.24	5	211
SW20 (Reference)	2018-10-16	0.000007	7	0.000004	4	0.00000017	0.17	25	176
SW20 (Reference)	2019-05-14	<0.000005	<5	<0.000001	<1	0.00000042	0.42	9	113
SW20 (Reference)	2019-06-11	0.000005	5	<0.000005	<5	0.00000129	1.29	4	135
SW20 (Reference)	2019-07-08	<0.000005	<5	<0.000005	<5	0.00000136	1.36	1	166
SW20 (Reference)	2019-08-13	<0.000005	<5	<0.000005	<5	0.00000157	1.57	0	185
SW20 (Reference)	2019-09-18	<0.000005	<5	<0.000005	<5	0.0000004	0.4	4	139
SW20 (Reference)	2019-10-08	<0.000005	<5	<0.000005	<5	0.00000025	0.25	4	110
SW20 (Reference)	2020-01-09	<0.00003	<30	<0.00003	<30	-	-	5	158
SW20 (Reference)	2020-02-05	<0.00003	<30	<0.00003	<30	-	-	6	178
SW20 (Reference)	2020-03-10	<0.00003	<30	<0.00003	<30	-	-	8	179
SW20 (Reference)	2020-04-08	0.000005	5	<0.00003	<30	-	-	3	68
SW20 (Reference)	2020-05-12	0.000005	5	<0.00003	<30	-	-	4	123
SW20 (Reference)	2020-06-16	<0.00003	<30	<0.00003	<30	0.000000648	0.648	1	125
SW20 (Reference)	2020-07-07	<0.00003	<30	<0.00003	<30	0.00000131	1.31	2	166

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
SW20 (Reference)	2020-08-11	<0.00003	<30	<0.00003	<30	0.000000396	0.396	1	149
SW20 (Reference)	2020-09-15	<0.00003	<30	<0.00003	<30	0.000000176	0.176	3	185
SW20 (Reference)	2020-10-14	<0.00003	<30	<0.00003	<30	0.000000357	0.357	7	186
SW20 (Reference)	2020-11-04	<0.00003	<30	<0.00003	<30	-	-	10	162
SW20 (Reference)	2020-11-10	<0.00003	<30	<0.00003	<30	-	-	8	162
SW20 (Reference)	2020-12-15	<0.00003	<30	<0.00003	<30	-	-	6	164
SW20 (Reference)	2021-05-11	<0.000005	<5	<0.00003	<30	0.000000258	0.258	8.6	146
SW20 (Reference)	2021-06-08	<0.000005	<5	<0.000005	<5	0.000000929	0.929	1.9	184
SW20 (Reference)	2021-07-13	<0.000005	<5	<0.000005	<5	0.000000542	0.542	0.7	185
SW20 (Reference)	2021-09-14	<0.000005	<5	<0.000005	<5	0.000000151	0.151	3.35	185
SW20 (Reference)	2021-10-20	<0.000005	<5	<0.000005	<5	0.000000591	0.591	9.75	-
SW20 (Reference)	2022-01-11	<0.000005	<5	<0.000005	<5	-	-	4.6	120
SW20 (Reference)	2022-02-08	<0.000005	<5	<0.000005	<5	-	-	4.5	140
SW20 (Reference)	2022-03-08	<0.000005	<5	<0.000005	<5	-	-	3.75	125
SW20 (Reference)	2022-04-05	<0.000005	<5	<0.000005	<5	-	-	6.45	96.4
SW20 (Reference)	2022-05-03	<0.000005	<5	<0.000005	<5	-	-	1.95	49.6
SW20 (Reference)	2022-06-07	0.0000050	5	0.0000050	5	0.000000495	0.495	0.85	91.2
SW20 (Reference)	2022-09-06	<0.000005	<5	<0.000005	<5	0.000000873	0.873	0.8	157
SW20 (Reference)	2022-07-05	<0.000005	<5	<0.000005	<5	0.000000904	0.904	0.75	123
SW20 (Reference)	2022-08-09	<0.000005	<5	<0.000005	<5	-	-	0.55	125
SW20 (Reference)	2022-12-10	<0.000005	<5	<0.000005	<5	-	-	4.55	164
SW20 (Reference)	2022-10-04	<0.000005	<5	<0.000005	<5	-	-	1.00	156
SW20 (Reference)	2022-11-11	<0.000005	<5	<0.000005	<5	-	-	3.90	144
SW20 (Reference)	2023-01-07	<0.000005	<5	<0.000005	<5	-	-	3.30	139
SW20 (Reference)	2023-02-07	<0.000005	<5	<0.000005	<5	-	-	5.15	159
SW20 (Reference)	2023-03-07	<0.000005	<5	<0.000005	<5	-	-	9.70	185
SW20 (Reference)	2023-05-02	<0.000005	<5	<0.000005	<5	-	-	4.40	85.9
SW20 (Reference)	2023-05-02	-	-	-	-	0.000000124	0.124	-	-
SW20 (Reference)	2023-06-06	<0.000005	<5	<0.000005	<5	-	-	0.67	118
SW20 (Reference)	2023-06-09	-	-	-	-	0.000000975	0.975	-	-
SW20 (Reference)	2023-07-08	<0.000005	<5	<0.000005	<5	-	-	0.91	131
SW20 (Reference)	2023-07-08	-	-	-	-	0.000000413	0.413	-	-
SW20 (Reference)	2023-08-05	<0.000005	<5	<0.000005	<5	0.000000288	0.288	<0.30	158
SW20 (Reference)	2023-09-04	<0.000005	<5	<0.000005	<5	-	-	<0.30	175
SW20 (Reference)	2023-10-04	<0.000005	<5	<0.000005	<5	-	-	<0.30	179
SW20 (Reference)	2023-11-13	<0.000005	<5	<0.000005	<5	0.000000064	0.64	7.76	174
SW20 (Reference)	2023-12-09	<0.000005	<5	<0.000005	<5	-	-	9.36	180
SW10	2017-07-26	0.000008	8	<0.000002	<2	0.00000052	0.52	1	-

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
SW10	2017-08-30	<0.000001	<1	<0.000001	<1	0.00000019	0.19	2	-
SW10	2017-09-29	0.000004	4	<0.000001	<1	0.00000029	0.29	4	-
SW10	2017-10-30	0.000004	4	0.000002	2	0.0000003	0.3	6	130
SW10	2018-05-09	0.000008	8	<0.000001	<1	0.00000044	0.44	6	109
SW10	2018-06-12	0.000004	4	0.000002	2	0.00000032	0.32	2	145
SW10	2018-07-17	<0.000001	<1	0.000001	1	0.00000057	0.57	2	214
SW10	2018-08-07	<0.000001	<1	<0.000001	<1	0.00000022	0.22	2	241
SW10	2018-09-11	<0.000001	<1	<0.000001	<1	0.00000014	0.14	5	268
SW10	2018-10-16	0.000008	8	0.000005	5	0.00000017	0.17	21	174
SW10	2019-05-14	<0.000001	<1	<0.000001	<1	0.00000067	0.67	6	103
SW10	2019-06-11	<0.000005	<5	<0.000005	<5	0.00000119	1.19	3	132
SW10	2019-07-08	<0.000005	<5	<0.000005	<5	0.00000122	1.22	1	185
SW10	2019-08-13	<0.000005	<5	<0.000005	<5	0.00000037	0.37	1	231
SW10	2019-09-18	<0.000005	<5	<0.000005	<5	0.00000061	0.61	5	133
SW10	2019-10-08	<0.000005	<5	<0.000005	<5	0.00000028	0.28	5	107
SW10	2020-01-09	0.000005	5	<0.00003	<30	-	-	5	176
SW10	2020-02-05	0.000005	5	<0.00003	<30	-	-	5	190
SW10	2020-03-10	<0.00003	<30	<0.00003	<30	-	-	8	203
SW10	2020-04-08	0.000005	5	<0.00003	<30	-	-	3	76
SW10	2020-05-14	<0.00003	<30	<0.00003	<30	-	-	4	113
SW10	2020-06-16	<0.00003	<30	<0.00003	<30	0.000000727	0.727	1	128
SW10	2020-07-07	<0.00003	<30	<0.00003	<30	0.000000829	0.829	1	148
SW10	2020-08-12	<0.00003	<30	<0.00003	<30	0.000000298	0.298	2	169
SW10	2020-09-15	<0.00003	<30	<0.00003	<30	0.000000174	0.174	2	199
SW10	2020-10-14	<0.00003	<30	<0.00003	<30	0.00000019	0.19	1	174
SW10	2020-11-10	<0.00003	<30	<0.00003	<30	-	-	10	162
SW10	2020-12-15	<0.00003	<30	<0.00003	<30	-	-	8	195
SW10	2021-05-11	<0.000005	<5	<0.000005	<5	0.000000353	0.353	6.75	144
SW10	2021-06-08	<0.000005	<5	<0.00003	<30	0.000000744	0.744	3.15	183
SW10	2021-07-13	<0.000005	<5	<0.000005	<5	0.000000289	0.289	2.65	224
SW10	2021-09-14	<0.000005	<5	<0.000005	<5	0.00000014	0.14	13.3	304
SW10	2021-10-20	<0.000005	<5	<0.000005	<5	0.000000687	0.687	7.95	-
SW10	2022-01-11	<0.000005	<5	<0.000005	<5	-	-	7.25	149
SW10	2022-02-08	<0.000005	<5	<0.000005	<5	-	-	6.2	157
SW10	2022-03-08	<0.000005	<5	<0.000005	<5	-	-	6.2	154
SW10	2022-04-05	<0.000005	<5	<0.000005	<5	-	-	4.95	88.7
SW10	2022-05-03	<0.000005	<5	<0.000005	<5	0.000000143	0.143	2.00	50.8
SW10	2022-06-07	0.0000050	5	0.0000050	5	0.000000453	0.453	17.7	88.7
SW10	2022-07-05	<0.000005	<5	<0.000005	<5	0.000000935	0.935	0.90	128
SW10	2022-08-09	<0.000005	<5	<0.000005	<5	-	-	0.75	124
SW10	2022-09-06	<0.000005	<5	<0.000005	<5	0.000000487	0.487	2.10	175
SW10	2022-10-04	-	-	-	-	0.000000	0.278	-	-
SW10	2022-10-03	<0.000005	<5	<0.000005	<5	-	-	3.05	171
SW10	2022-11-11	<0.000005	<5	<0.000005	<5	-	-	4.05	169
SW10	2023-01-07	<0.000005	<5	<0.000005	<5	-	-	4.65	165
SW10	2023-02-07	<0.000005	<5	<0.000005	<5	-	-	6.10	178
SW10	2023-03-07	<0.000005	<5	<0.000005	<5	-	-	9.80	226
SW10	2023-04-04	<0.000005	<5	<0.000005	<5	-	-	5.10	-
SW10	2023-05-02	<0.000005	<5	<0.000005	<5	-	-	4.15	144
SW10	2023-05-02	-	-	-	-	0.000000198	0.198	-	-
SW10	2023-06-06	<0.000005	<5	<0.000005	<5	-	-	1.56	101
SW10	2023-06-06	-	-	-	-	0.000000599	0.599	-	-
SW10	2023-07-08	<0.000005	<5	<0.000005	<5	-	-	1.89	131
SW10	2023-07-08	-	-	-	-	0.00000043	0.43	-	-
SW10	2023-08-05	<0.000005	<5	<0.000005	<5	0.000000529	0.529	2.36	178
SW10	2023-09-04	<0.000005	<5	<0.000005	<5	-	-	4.38	198
SW10	2023-10-04	<0.000005	<5	<0.000005	<5	-	-	3.1	190
SW10	2023-10-04	-	-	-	-	0.000000244	0.244	-	-
SW10	2023-11-12	<0.000005	<5	<0.000005	<5	0.00000008	0.8	10.2	160
SW10	2023-12-09	<0.000005	<5	<0.000005	<5	-	-	7.26	165
SW22A	2017-07-26	0.000004	4	0.000004	4	0.000004000	4	14	-
SW22A	2017-08-30	0.000004	4	0.000004	4	0.000004000	4	3	-
SW22A	2017-09-29	0.000004	4	0.000002	2	0.000004000	4	73	-
SW22A	2017-10-27	0.000002	2	0.000002	2	0.000002000	2	36	-
SW22A	2018-05-09	0.000001	1	0.000001	1	0.00000045	0.45	12	-
SW22A	2018-06-12	0.000002	2	0.000001	1	0.00000083	0.83	16	210
SW22A	2018-07-17	<0.000001	<1	<0.000001	<1	0.0000005	0.5	22	240
SW22A	2018-08-09	<0.000001	<1	<0.000001	<1	-	-	9	238
SW22A	2018-09-11	<0.000001	<1	<0.000001	<1	0.00000039	0.39	34	291
SW22A	2018-10-16	0.000005	5	0.000005	5	0.00000023	0.23	51	239
SW22A	2019-05-15	<0.000001	<1	<0.000001	<1	0.00000047	0.47	12	134
SW22A	2019-06-11	<0.000005	<5	<0.000005	<5	0.0000005	0.5	13	151
SW22A	2019-07-08	<0.000005	<5	<0.000005	<5	0.00000047	0.47	12	183

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
SW22A	2019-08-13	<0.000005	<5	<0.000005	<5	0.00000078	0.78	5	216
SW22A	2019-09-19	<0.000005	<5	<0.000005	<5	0.0000006	0.6	44	225
SW22A	2019-10-08	<0.000005	<5	<0.000005	<5	0.00000035	0.35	19	140
SW22A	2020-01-09	<0.00003	<30	<0.00003	<30	-	-	8	204
SW22A	2020-02-05	<0.00003	<30	<0.00003	<30	-	-	5	198
SW22A	2020-03-11	<0.00003	<30	<0.00003	<30	-	-	10	229
SW22A	2020-04-09	0.000005	5	<0.00003	<30	-	-	5	95
SW22A	2020-05-13	0.000005	5	<0.00003	<30	-	-	10	149
SW22A	2020-06-17	<0.00003	<30	0.000015	15	0.00000192	1.92	8	166
SW22A	2020-07-10	<0.00003	<30	<0.00003	<30	0.00000126	1.26	36	210
SW22A	2020-08-11	0.000005	5	<0.00003	<30	0.000000785	0.785	17	180
SW22A	2020-09-15	<0.00003	<30	<0.00003	<30	0.000000595	0.595	12	224
SW22A	2020-10-19	<0.00003	<30	<0.00003	<30	0.000000508	0.508	286	330
SW22A	2020-11-04	<0.00003	<30	<0.00003	<30	-	-	332	342
SW22A	2020-11-10	<0.00003	<30	<0.00003	<30	-	-	345	330
SW22A	2020-12-16	<0.00003	<30	<0.00003	<30	-	-	71	278
SW22A	2021-05-12	<0.000005	<5	<0.000005	<5	0.000000209	0.209	45.6	206
SW22A	2021-06-08	<0.00003	<30	<0.00003	<30	0.00000191	1.91	58.5	240
SW22A	2021-09-15	<0.000005	<5	<0.000005	<5	0.000000356	0.356	223	390
SW22A	2021-10-20	<0.000005	<5	<0.000005	<5	0.000000527	0.527	144	-
SW22A	2022-01-11	<0.000005	<5	<0.000005	<5	-	-	13.6	196
SW22A	2022-02-16	<0.000005	<5	<0.000005	<5	-	-	7.45	195
SW22A	2022-03-08	<0.000005	<5	<0.000005	<5	-	-	7.75	202
SW22A	2022-04-05	<0.000005	<5	<0.000005	<5	-	-	7.05	105
SW22A	2022-05-04	<0.000005	<5	<0.000005	<5	-	-	34.4	4:48
SW22A	2022-06-07	0.0000050	5	0.0000050	5	<0.00000002	<0.02	33.4	180
SW22A	2022-07-06	<0.000005	<5	<0.000005	<5	0.000000743	0.743	-	-
SW22A	2022-07-12	<0.000005	<5	<0.000005	<5	-	-	3.64	134
SW22A	2022-08-10	<0.000005	<5	<0.000005	<5	-	-	5.5000000	150.0000000
SW22A	2022-09-07	<0.000005	<5	<0.000005	<5	0.000000451	0.451	5.20	197
SW22A	2022-10-04	<0.000005	<5	<0.000005	<5	0.000000226	0.226	49.3	217
SW22A	2022-11-11	<0.000005	<5	<0.000005	<5	-	-	50.7	194
SW22A	2022-12-11	<0.000005	<5	<0.000005	<5	-	-	5.45	201
SW22A	2023-02-07	<0.000005	<5	<0.000005	<5	-	-	4.90	217
SW22A	2023-03-07	<0.000005	<5	<0.000005	<5	-	-	5.00	246
SW22A	2023-04-04	<0.000005	<5	<0.000005	<5	-	-	9.40	-
SW22A	2023-05-02	<0.000005	<5	<0.000005	<5	-	-	171	243
SW22A	2023-05-02	-	-	-	-	0.000000232	0.232	-	-
SW22A	2023-06-06	<0.000005	<5	<0.000005	<5	-	-	204	256
SW22A	2023-06-07	-	-	-	-	0.00000155	1.55	-	-
SW22A	2023-07-08	<0.000005	<5	<0.000005	<5	-	-	3.68	147
SW22A	2023-07-08	-	-	-	-	0.000000496	0.496	-	-
SW22A	2023-08-05	<0.000005	<5	<0.000005	<5	0.000000738	0.738	11.2	211
SW22A	2023-09-06	<0.000005	<5	<0.000005	<5	-	-	2.56	187
SW22A	2023-09-06	-		-	-	0.000000479	0.479		
SW22A	2023-10-04	<0.000005	<5	<0.000005	<5	-	-	17.2	238
SW22A	2023-10-04	-	-	-	-	0.000000364	0.364	-	-
SW22A	2023-11-07	<0.000005	<5	<0.000005	<5	-	-	282	334
SW22A	2023-11-12	<0.000005	<5	<0.000005	5	0.000000044	0.000044	358	370
SW22A	2023-12-11	<0.000005	<5	<0.000005	<5	-	-	13.6	220
SW03	2017-07-26	0.000008	8	0.000002	2	0.000000290	0.29	15	-
SW03	2017-08-29	0.000004	4	<0.000001	<1	0.000000230	0.23	5	-
SW03	2017-09-29	0.000004	4	<0.000001	<1	0.000000290	0.29	72	-
SW03	2017-10-27	0.000002	2	0.000002	2	0.000000240	0.24	35	-
SW03	2018-05-09	0.000004	4	0.000001	1	0.00000038	0.38	10	129
SW03	2018-06-12	0.000004	4	0.000002	2	0.00000037	0.37	8	160
SW03	2018-07-17	0.000001	1	<0.000001	<1	0.00000032	0.32	14	193
SW03	2018-08-07	0.000001	1	<0.000001	<1	0.00000025	0.25	15	202
SW03	2018-09-11	0.000003	3	0.00001	10	0.00000028	0.28	33	228
SW03	2018-10-16	0.000007	7	0.000004	4	0.00000021	0.21	50	235
SW03	2019-05-15	0.000001	1	0.000001	1	0.00000063	0.63	11	129
SW03	2019-06-11	0.000005	5	<0.000005	<5	0.00000057	0.57	15	151
SW03	2019-07-08	<0.000005	<5	<0.000005	<5	0.00000057	0.57	5	169
SW03	2019-08-13	<0.000005	<5	<0.000005	<5	0.00000016	0.16	16	208
SW03	2019-09-18	<0.000005	<5	<0.000005	<5	0.00000056	0.56	33	187
SW03	2019-10-08	<0.000005	<5	<0.000005	<5	0.00000039	0.39	17	133
SW03	2020-01-09	<0.00003	<30	<0.00003	<30	-	-	7	190
SW03	2020-02-04	0.000005	5	<0.00003	<30	-	-	6	201
SW03	2020-03-10	0.000005	5	<0.00003	<30	-	-	9	225
SW03	2020-04-07	<0.00003	<30	<0.00003	<30	-	-	5	96
SW03	2020-05-12	<0.000005	<5	<0.000005	<5	-	-	<0.3	117
SW03	2020-06-17	<0.000005	<5	<0.000005	<5	0.000000966	0.966	6	146
SW03	2020-07-07	<0.00003	<30	<0.00003	<30	0.000000493	0.493	32	203

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
SW03	2020-08-11	<0.00003	<30	<0.00003	<30	0.000000154	0.154	15	164
SW03	2020-09-15	<0.00003	<30	<0.00003	<30	0.000000151	0.151	18	194
SW03	2020-10-14	<0.00003	<30	<0.00003	<30	0.000000364	0.364	13	170
SW03	2020-11-10	<0.00003	<30	<0.00003	<30	-	-	251	303
SW03	2020-12-15	<0.00003	<30	<0.00003	<30	-	-	86	291
SW03	2021-05-11	<0.000005	<5	<0.000005	<5	0.000000282	0.282	41.5	180
SW03	2021-06-08	<0.00003	<30	<0.00003	<30	0.00000162	1.62	30.3	216
SW03	2021-07-13	<0.000005	<5	<0.000005	<5	0.000000916	0.916	9.15	186
SW03	2021-08-10	<0.00003	<30	<0.000005	<5	0.000000406	0.406	14.1	187
SW03	2021-10-20	<0.000005	<5	<0.000005	<5	0.000000595	0.595	86.3	-
SW03	2022-03-08	<0.000005	<5	<0.000005	<5	-	-	6.65	197
SW03	2022-01-11	<0.000005	<5	<0.000005	<5	-	-	14.9	208
SW03	2022-04-05	<0.000005	<5	<0.000005	<5	-	-	7.40	106
SW03	2022-05-03	<0.000005	<5	<0.000005	<5	-	-	17.7	86.4
SW03	2022-06-07	<0.000005	<5	<0.000005	<5	0.000000101	0.101	68.6	150
SW03	2022-07-05	<0.000005	<5	<0.000005	<5	-	-	21.0	149
SW03	2022-08-10	<0.000005	<5	<0.000005	<5	-	-	12.8	149
SW03	2022-09-06	<0.000005	<5	<0.000005	<5	0.000000676	0.676	4.85	188
SW03	2022-10-04	<0.000005	<5	<0.000005	<5	-	-	9.90	197
SW03	2022-11-12	<0.000005	<5	<0.000005	<5	-	-	121	240
SW03	2023-01-07	<0.000005	<5	<0.000005	<5	-	-	4.65	218
SW03	2023-02-07	<0.000005	<5	<0.000005	<5	-	-	5.10	210
SW03	2023-03-07	<0.000005	<5	<0.000005	<5	-	-	4.70	246
SW03	2023-05-02	<0.000005	<5	<0.000005	<5	-	-	128	203
SW03	2023-05-02	-	-	-	-	0.000000201	0.201	-	-
SW03	2023-06-06	<0.000005	<5	<0.000005	<5	-	-	131	223
SW03	2023-06-06	-	-	-	-	0.00000112	1.12	-	-
SW03	2023-07-09	<0.000005	<5	<0.000005	<5	-	-	<0.30	143
SW03	2023-07-09	-	-	-	-	0.00000063	0.63	-	-
SW03	2023-08-06	<0.000005	<5	<0.000005	<5	0.00000146	1.46	2.31	177
SW03	2023-09-05	<0.000005	<5	<0.000005	<5	-	-	3.48	199
SW03	2023-10-03	<0.000005	<5	<0.000005	<5	-	-	6.61	222
SW03	2023-10-04	<0.000005	<5	<0.000005	<5	0.00000166	1.66	5.5	-
SW03	2023-11-12	<0.000005	<5	<0.000005	<5	0.000000068	0.000068	281	322
SW03	2023-12-08	<0.000005	<5	<0.000005	<5	-	-	27.6	218
SW24	2017-07-26	-	-	-	-	0.000000370	0.37	-	-
SW24	2017-08-29	-	-	-	-	0.000000270	0.27	-	-
SW24	2017-09-29	-	-	-	-	0.000000350	0.35	-	-
SW24	2017-10-27	-	-	-	-	0.000000370	0.37	-	-
SW24	2018-05-09	0.000004	4	<0.000001	<1	0.00000034	0.34	7	-
SW24	2018-06-12	0.000006	6	0.000004	4	0.0000006	0.6	4	210
SW24	2018-07-17	0.000007	7	0.000003	3	0.00000038	0.38	3	240
SW24	2018-08-07	0.000003	3	<0.000001	<1	0.00000057	0.57	3	238
SW24	2018-09-11	0.000006	6	0.000003	3	0.00000066	0.66	6	291
SW24	2018-10-16	0.000007	7	0.000005	5	0.00000017	0.17	29	239
SW24	2019-05-15	0.00001	10	<0.000001	<1	0.00000047	0.47	8	134
SW24	2019-06-11	0.000005	5	0.00001	10	0.00000075	0.75	7	151
SW24	2019-07-08	<0.000005	<5	<0.000005	5	0.00000053	0.53	2	183
SW24	2019-08-13	<0.000005	<5	<0.000005	5	0.00000053	0.53	2	216
SW24	2019-09-20	<0.000005	<5	<0.000005	5	0.00000052	0.52	13	225
SW24	2019-10-08	<0.000005	<5	<0.000005	5	0.00000044	0.44	8	140
SW24	2020-01-09	<0.00003	<30	<0.00003	<30	-	-	4	170
SW24	2020-02-04	0.000005	5	<0.00003	<30	-	-	4	180
SW24	2020-03-10	<0.00003	<30	<0.00003	<30	-	-	7	216
SW24	2020-04-07	0.000005	5	<0.00003	<30	-	-	4	87
SW24	2020-05-12	0.00001	10	<0.00003	<30	-	-	85	168
SW24	2020-06-17	<0.00003	<30	0.000005	5	0.000000995	0.995	3	116
SW24	2020-07-07	<0.00003	<30	0.000005	5	0.000000693	0.693	10	155
SW24	2020-08-11	<0.00003	<30	<0.00003	<30	0.000000166	0.166	109	230
SW24	2020-09-15	<0.00003	<30	0.000005	5	0.000000471	0.471	3	139
SW24	2020-10-14	<0.00003	<30	<0.00003	<30	0.000000326	0.326	275	261
SW24	2020-11-04	<0.00003	<30	<0.00003	<30	-	-	343	313
SW24	2020-11-10	<0.00003	<30	<0.00003	<30	-	-	312	296
SW24	2020-12-16	<0.00003	<30	<0.00003	<30	-	-	51	224
SW24	2021-05-11	<0.000005	<5	<0.000005	<5	0.000000415	0.415	16.7	131
SW24	2021-06-08	<0.00003	<30	<0.000005	<5	0.000000726	0.726	13.1	179
SW24	2021-07-13	<0.000005	<5	<0.000005	<5	0.00000088	0.88	8.4	214
SW24	2021-10-20	<0.000005	<5	<0.000005	<5	0.000000555	0.555	156	-
SW24	2022-02-08	<0.000005	<5	<0.000005	<5	-	-	7.75	110
SW24	2022-03-08	<0.000005	<5	<0.000005	<5	-	-	5.7	201
SW24	2022-05-03	<0.000005	<5	<0.000005	<5	-	-	12	61.9
SW24	2022-06-07	<0.000005	<5	<0.000005	<5	0.000000392	0.392	24.2	134
SW24	2022-07-05	<0.000005	<5	<0.000005	<5	-	-	13	139

Area	Date	Total Mercury (mg/L)	Total Mercury (ng/L)	Dissolved Mercury (mg/L)	Dissolved Mercury (ng/L)	Total Methylmercury (mg/L)	Total Methylmercury (ng/L)	Sulfate (SO4) (mg/L)	Hardness (mg/L)
SW24	2022-09-06	<0.000005	<5	<0.000005	<5	0.000000430	0.43	2.55	176
SW24	2022-08-09	<0.000005	<5	<0.000005	<5	-	-	12	149
SW24	2022-10-04	<0.000005	<5	<0.000005	<5	-	-	3.1	170
SW24	2022-11-08	<0.000005	<5	<0.000005	<5	-	-	294	337
SW24	2023-01-08	<0.000005	<5	<0.000005	<5	-	-	3.65	201
SW24	2023-02-07	<0.000005	<5	<0.000005	<5	-	-	3.9	200
SW24	2023-03-07	<0.000005	<5	<0.000005	<5	-	-	3.4	241
SW24	2023-05-02	-	-	-	-	0.000000162	0.162	-	-
SW24	2023-05-02	<0.000005	<5	<0.000005	<5	-	-	108	171
SW24	2023-06-06	<0.000005	<5	<0.000005	<5	-	-	103	188
SW24	2023-06-06	-	-	-	-	0.000000557	0.557	-	-
SW24	2023-07-09	<0.000005	<5	<0.000005	<5	-	-	2.41	117
SW24	2023-07-09	-	-	-	-	0.000000053	0.53	-	-
SW24	2023-08-05	<0.000005	<5	0.0000055	5.5	0.000000388	0.388	3.27	157
SW24	2023-09-05	<0.000005	<5	<0.000005	<5	-	-	1.83	169
SW24	2023-10-03	<0.000005	<5	<0.000005	<5	-	-	1.62	173
SW24	2023-10-04	<0.000005	<5	<0.000005	<5	0.000000438	0.438	1.39	-
SW24	2023-11-08	<0.000005	<5	<0.000005	<5	-	-	263	294
SW24	2023-11-12	<0.000005	<5	<0.000005	<5	0.00000053	0.53	340	346
SW24	2023-12-08	<0.000005	<5	<0.000005	<5	-	-	24.30	185

Table A3: Select water chemistry parameters for discharge locations, 2023.

Site	Sample ID	Date	Mercury – Total (mg/L)	Mercury – Dissolved (mg/L)	Methylmercury – Total (ug/L)	Hardness (mg/L)	Sulfate – Total (mg/L)
EDL1	EDL1_EFF_20230612	2023-06-12	<0.0000050	<0.0000050	--	484	545
EDL2	EDL2_EFF_20230612	2023-06-12	<0.0000050	<0.0000050	--	491	547
EDL1	EDL1_EFF_20230619	2023-06-20	<0.0000050	<0.0000050	--	445	626
EDL1	EDL1_EFF_20230605_191	2023-06-05	<0.0000050	<0.0000050	--	500	532
EDL2	EDL2_EFF_20230605_192	2023-06-05	<0.0000050	<0.0000050	--	506	532
SED2	SP2 DISCHARGE_EFF_20230605_195	2023-06-05	<0.0000050	<0.0000050	--	335	186
EDL1	EDL1_EFF_20230519_171	2023-05-22	<0.0000050	<0.0000050	--	440	550
EDL2	EDL2_EFF_20230519_172	2023-05-22	<0.0000050	<0.0000050	--	445	544
EDL1	EDL1_EFF_20230529	2023-05-29	<0.0000050	<0.0000050	--	507	517
EDL2	EDL2_EFF_20230529	2023-05-29	<0.0000050	<0.0000050	--	486	522
EDL1	EDL1_EFF_20230515	2023-05-15	<0.0000050	<0.0000050	--	459	566
EDL2	EDL2_EFF_20230515	2023-05-15	<0.0000050	<0.0000050	--	457	568
SED2	SP2 DISCHARGE_EFF_20230515	2023-05-15	<0.0000050	<0.0000050	--	300	177
EDL2	EDL2_EFF_20230417_178	2023-04-17	<0.000005	<0.000005	--	551	667
EDL1	EDL1_EFF_20230417_177	2023-04-17	<0.000005	<0.000005	--	562	666
SED2	SP2 DISCHARGE_EFF_20230417_181	2023-04-17	<0.000005	<0.000005	--	233	122
EDL1	EDL1_EFF_20230508	2023-05-08	<0.000005	<0.000005	--	523	583
EDL2	EDL2_EFF_20230508	2023-05-08	<0.000005	<0.000005	--	533	543
SED2	SP2 DISCHARGE_EFF_20230508	2023-05-08	<0.000005	<0.000005	--	331	172
EDL2	EDL2_EFF_20230424	2023-04-24	<0.000005	<0.000005	--	577	658
SED2	SP2 DISCHARGE_EFF_20230424	2023-04-24	<0.000005	<0.000005	--	285	136
EDL1	EDL1_EFF_20230424	2023-04-24	<0.000005	<0.000005	--	585	667
SED2	SP2 DISCHARGE_EFF_20230414	2023-04-14	<0.000005	<0.000005	--	176	89.1
SED2	SP2 DISCHARGE_EFF_20230501_188	2023-05-01	<0.000005	<0.000005	--	280	150
EDL2	EDL2_EFF_20230501_185	2023-05-01	<0.000005	<0.000005	--	546	661
EDL1	EDL1_EFF_20230501_184	2023-05-01	<0.000005	<0.000005	--	535	668
EDL1	EDL1_EFF_20231106	2023-11-06	<0.0000050	<0.0000050	--	544	781
EDL2	EDL2_EFF_20231106	2023-11-06	<0.0000050	<0.0000050	--	548	756
EDL1	EDL1_EFF_20231103_212	2023-11-03	<0.0000050	<0.0000050	--	569	759
EDL2	EDL2_EFF_20231103_213	2023-11-03	<0.0000050	<0.0000050	--	554	735
SED2	SP2_EFF_20231105_216	2023-11-05	<0.0000050	<0.0000050	--	339	282
SED2	SP2 DISCHARGE_EFF_20231030	2023-10-30	<0.0000050	<0.0000050	--	332	266
EDL2	EDL2_EFF_20231113	2023-11-13	<0.0000050	<0.0000050	--	561	765
EDL1	EDL1_EFF_20231113	2023-11-13	<0.0000050	<0.0000050	--	565	758
SED2	SP2 DISCHARGE_EFF_20231113	2023-11-13	<0.0000050	<0.0000050	--	357	283
EDL2	EDL_EFF_20231113	2023-11-13	<0.0000050	<0.0000050	--	576	772
EDL1	EDL1_EFF_20231120	2023-11-20	<0.0000050	<0.0000050	--	545	739
EDL2	EDL2_EFF_20231120	2023-11-20	<0.0000050	<0.0000050	--	544	752
SED2	SP2 DISCHARGE_EFF_20231120	2023-11-20	<0.0000050	<0.0000050	--	330	277
SED2	SP2 DISCHARGE_EFF_20231022_209	2023-10-22	<0.0000050	<0.0000050	--	314	268
SED2	SP2 DISCHARGE_EFF_20231020	2023-10-20	<0.0000050	<0.0000050	--	317	268
SED2	SP2 DISCHARGE_EFF_20231024	2023-10-24	<0.0000050	<0.0000050	--	304	258
SED1	SP1_MM_20231004	2023-10-04	--	--	0.000194	--	--
SED2	SP2_MM_20230502	2023-05-02	--	--	0.000357	--	--
SED1	SP1_MM_20230502	2023-05-02	--	--	0.000493	--	--
SED2	SP2_MM_20230606	2023-06-07	--	--	0.000124	--	--
SED1	SP1_MM_20230906	2023-09-06	--	--	<0.000200	--	--
SED2	SP2_MM_20230906	2023-09-06	--	--	<0.000200	--	--
SED2	SP2_MM_20230809	2023-08-09	--	--	0.000152	--	--
SED1	SP1_MM_20230809	2023-08-09	--	--	0.000177	--	--
SED2	SP2_EFF_20230712	2023-07-12	--	--	0.000176	--	--
SED1	SP1_EFF_20230712	2023-07-12	--	--	0.000175	--	--

Appendix B Detailed Data – Fish Community Survey

Table B–1: Fishing effort locations for the Pinewood River, July 2023.

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF

Sample Type	GearID	Latitude (decimal degrees)	Longitude (decimal degrees)
Electrofishing	PINRREFEF04	48.81758	-93.9425
	PINRREFEF03	48.81758	-93.9425
	PINRREFEF02	48.81767	-93.943
	PINRREFEF01	48.81774	-93.9439
	PINRNFEF07	48.8207	-94.0933
	PINRNFEF06	48.82054	-94.0936
	PINRNFEF05	48.82027	-94.0947
	PINRNFEF04	48.82066	-94.0912
	PINRNFEF03	48.82057	-94.0891
	PINRNFEF02	48.82038	-94.0962
	PINRNFEF01	48.82088	-94.0967
	PINRFFEF05	48.81004	-94.1609
	PINRFFEF04	48.80827	-94.1631
	PINRFFEF03	48.80843	-94.163
	PINRFFEF02	48.81131	-94.1517
	PINRFFEF01	48.81119	-94.1501
Minnow Trap	PINRREFMT06	48.81843	-93.9402
	PINRREFMT05	48.81838	-93.9403
	PINRREFMT04	48.81851	-93.9402
	PINRREFMT03	48.81856	-93.9401
	PINRREFMT02	48.81817	-93.9406
	PINRREFMT01	48.81857	-93.94
	PINRNFMT06	48.8208	-94.0969
	PINRNFMT05	48.8208	-94.0967
	PINRNFMT04	48.82004	-94.0962
	PINRNFMT03	48.81996	-94.0942
	PINRNFMT02	48.82073	-94.0932
	PINRNFMT01	48.82056	-94.0915
	PINRFFMT06	48.79849	-94.1855
	PINRFFMT05	48.79858	-94.1861
	PINRFFMT04	48.81056	-94.1627
	PINRFFMT03	48.80985	-94.162
	PINRFFMT02	48.81141	-94.1517
	PINRFFMT01	48.81133	-94.1503
Gill Net	PINRREFGN06	48.81824	-93.9409
	PINRREFGN05	48.81848	-93.9448
	PINRREFGN04	48.81788	-93.9419
	PINRREFGN03	48.81856	-93.9402
	PINRREFGN02	48.81835	-93.9403
	PINRREFGN01	48.81822	-93.9406
	PINRNFGN06	48.82003	-94.0898
	PINRNFGN05	48.81962	-94.0871
	PINRNFGN04	48.82075	-94.0927
	PINRNFGN03	48.82026	-94.0962
	PINRNFGN02	48.82063	-94.0985
	PINRNFGN01	48.82057	-94.0987
	PINRFFGN06	48.7986	-94.1861
	PINRFFGN05	48.79837	-94.1864
	PINRFFGN04	48.80979	-94.1634
	PINRFFGN03	48.80941	-94.1618
	PINRFFGN02	48.81149	-94.1526
	PINRFFGN01	48.81069	-94.151
Seine Net	PINRREFSN09	48.81788	-93.942
	PINRREFSN08	48.81778	-93.9428
	PINRREFSN07	48.81769	-93.9432
	PINRREFSN06	48.8176	-93.9437
	PINRREFSN05	48.81786	-93.944
	PINRREFSN04	48.81822	-93.9444
	PINRREFSN03	48.81834	-93.9448
	PINRREFSN02	48.81821	-93.9408
	PINRREFSN01	48.81819	-93.9405
	PINRNFSN15	48.82062	-94.0974
	PINRNFSN14	48.8199	-94.0976
	PINRNFSN13	48.81955	-94.0982
	PINRNFSN12	48.81959	-94.0978
	PINRNFSN11	48.8199	-94.0976
	PINRNFSN10	48.82082	-94.0969

Sample Type	GearID	Latitude (decimal degrees)	Longitude (decimal degrees)
	PINRNFSN09	48.81958	-94.0978
	PINRNFSN08	48.81994	-94.0975
	PINRNFSN07	48.82065	-94.091
	PINRNFSN06	48.82077	-94.0919
	PINRNFSN05	48.81998	-94.0941
	PINRNFSN04	48.82055	-94.0974
	PINRNFSN03	48.82075	-94.0972
	PINRNFSN02	48.8208	-94.0969
	PINRNFSN01	48.82024	-94.0962
	PINRFFSN10	48.8116	-94.1593
	PINRFFSN09	48.80965	-94.1636
	PINRFFSN08	48.80902	-94.163
	PINRFFSN07	48.80979	-94.1598
	PINRFFSN06	48.79812	-94.1853
	PINRFFSN05	48.79888	-94.1828
	PINRFFSN04	48.81006	-94.1616
	PINRFFSN03	48.81124	-94.1515
	PINRFFSN02	48.8111	-94.1501
	PINRFFSN01	48.80985	-94.162

Table B–2: Detailed electrofishing data for the Pinewood River, July 2023.

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF

Location	GearID	Date	Effort (sec)	CPUE	BB	BM	BSB	BSD	CC	CMM	CS	FSD	GS	JD	LP	NP	NPD	NRBD	RB	SHRH	TP	WS	YOY	Total
PWREF	PINRREFEF01	7/23/2023	374	2.89	0	0	1	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	18
	PINRREFEF02	7/23/2023	526	2.28	1	0	5	0	0	11	0	0	0	1	0	0	0	2	0	0	0	0	0	20
	PINRREFEF03	7/23/2023	696	1.90	0	0	1	1	0	15	3	2	0	0	0	0	0	0	0	0	0	0	0	22
	PINRREFEF04	7/24/2023	1447	2.82	1	0	18	1	13	23	2	0	0	0	0	0	0	6	0	0	0	2	2	68
	Total		**3043**	**2.52**	**2**	**0**	**25**	**2**	**13**	**66**	**5**	**2**	**0**	**1**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**2**	**2**	**128**
PWNF	PINRNFEF01	7/21/2023	698	10.14	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118
	PINRNFEF02	7/21/2023	454	0.79	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	4	6
	PINRNFEF03	7/22/2023	436	3.03	7	0	0	0	1	11	1	0	0	1	0	0	0	0	0	0	0	0	1	22
	PINRNFEF04	7/22/2023	171	40.70	114	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	116
	PINRNFEF05	7/22/2023	747	15.42	0	0	191	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	192
	PINRNFEF06	7/22/2023	353	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	PINRNFEF07	7/23/2023	748	3.85	0	0	0	5	0	3	4	0	0	27	0	1	0	0	0	0	0	8	0	48
	Total		**3607**	**8.37**	**239**	**0**	**191**	**5**	**1**	**14**	**5**	**0**	**3**	**29**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**9**	**6**	**503**
PWFF	PINRFFEF01	7/21/2023	864	0.21	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
	PINRFFEF02	7/21/2023	580	0.21	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	PINRFFEF03	7/21/2023	671	0.36	0	0	0	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	4
	PINRFFEF04	7/21/2023	736	0.82	0	0	0	3	1	3	0	0	0	1	1	0	0	0	1	0	0	0	0	10
	PINRFFEF05	7/21/2023	485	0.87	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	7
	Total		**3336**	**0.47**	**0**	**0**	**0**	**12**	**1**	**4**	**2**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**2**	**0**	**26**

Fish Species are: Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), Common Shiner (CS), Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Logperch (LP), Northern Pike (NP), Northern Pearl Dace (NPD), Northern Redbelly Dace (NRBD), Rock Bass (RB), Shorthead Redhorse (SHRH), Trout Perch (TP), White Sucker (WS), Cyprinid YOY (YOY).

Table B–3: Detailed gill net data in Pinewood River, July 2023

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF

Location	GearID	Set Date	Set Time	Lift Date	Lift Time	Effort (hours)	CPUE	BB	BM	BSB	BSD	CC	CMM	CS	FSD	GS	JD	LP	NP	NPD	NRBD	RB	SHRH	TP	WS	YOY	Total
PWREF	PINRREFGN01	7/20/2023	15:40	7/21/2023	9:40	18.0	0.22	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	1	0	4
	PINRREFGN02	7/20/2023	15:45	7/21/2023	10:15	18.5	0.16	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
	PINRREFGN03	7/20/2023	16:00	7/21/2023	10:45	18.8	2.40	2	0	0	0	0	0	38	0	0	0	0	4	0	0	0	0	0	1	0	45
	PINRREFGN04	7/20/2023	16:45	7/21/2023	9:10	16.4	0.37	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	1	0	6
	PINRREFGN05	7/20/2023	16:55	7/21/2023	8:50	15.9	0.31	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5
	PINRREFGN06	7/21/2023	11:15	7/22/2023	9:50	22.6	0.04	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Total					**110.2**	0.58	**2**	**0**	**0**	**0**	**0**	**0**	**41**	**0**	**1**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**64**
PWNF	PINRNFGN01	7/22/2023	14:50	7/23/2023	8:10	17.3	0.46	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	8
	PINRNFGN02	7/22/2023	15:00	7/23/2023	8:45	17.8	0.17	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
	PINRNFGN03	7/22/2023	15:10	7/23/2023	8:25	17.3	0.17	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
	PINRNFGN04	7/22/2023	15:40	7/23/2023	9:45	18.1	0.55	1	0	0	0	0	0	0	0	1	0	0	8	0	0	0	0	0	0	0	10
	PINRNFGN05	7/22/2023	15:45	7/23/2023	10:05	18.3	0.71	1	0	0	0	0	0	0	0	1	0	0	10	0	0	0	0	0	1	0	13
	PINRNFGN06	7/22/2023	15:50	7/23/2023	11:15	19.4	0.26	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	5
	Total					**108.2**	0.39	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**0**	**25**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**42**
PWFF	PINRFFGN01	7/18/2023	12:40	7/19/2023	12:00	23.3	0.21	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	5
	PINRFFGN02	7/18/2023	13:00	7/19/2023	10:40	21.7	0.28	3	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	6
	PINRFFGN03	7/18/2023	14:15	7/19/2023	14:15	24.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFGN04	7/18/2023	14:38	7/19/2023	13:30	22.9	0.22	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	5
	PINRFFGN05	7/18/2023	16:00	7/19/2023	9:00	17.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFGN06	7/18/2023	16:15	7/19/2023	9:15	17.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total					**125.9**	0.13	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**7**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**16**

Fish Species are: Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), Common Shiner (CS), Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Logperch (LP), Northern Pike (NP), Northern Pearl Dace (NPD), Northern Redbelly Dace (NRBD), Rock Bass (RB), Shorthead Redhourse (SHRH), Trout Perch (TP), White Sucker (WS), Cyprinid YOY (YOY).

Table B–4: Detailed seine net in Pinewood River, July 2023.

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF

Location	GearID	Date	Effort # hauls	CPUE	BB	BM	BSB	BSD	CC	CMM	CS	FSD	GS	JD	LP	NP	NPD	NRBD	RB	SHRH	TP	WS	YOY	Total
Pinewood River Reference	PINRREFSN01	7/21/2023	1	89	1	0	38	1	17	0	4	0	0	0	0	0	0	0	0	0	0	0	28	89
	PINRREFSN02	7/21/2023	1	114	0	0	12	0	32	1	20	5	0	0	0	0	0	3	0	0	0	1	40	114
	PINRREFSN03	7/21/2023	1	192	0	0	0	0	0	0	174	2	0	0	0	0	0	15	0	0	0	1	0	192
	PINRREFSN04	7/21/2023	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
	PINRREFSN05	7/21/2023	1	76	0	0	48	0	22	0	6	0	0	0	0	0	0	0	0	0	0	0	0	76
	PINRREFSN06	7/22/2023	1	59	0	2	20	0	8	3	14	2	0	2	0	0	0	3	0	0	0	5	0	59
	PINRREFSN07	7/22/2023	1	63	0	1	16	0	4	2	26	1	0	3	0	0	0	9	0	0	0	1	0	63
	PINRREFSN08	7/22/2023	1	78	0	1	22	0	20	4	16	4	0	1	0	0	0	5	0	0	0	4	1	78
	PINRREFSN09	7/22/2023	1	526	0	1	7	0	34	0	339	15	3	0	0	0	0	63	0	0	0	63	1	526
	Total		**9**	**133.33**	**1**	**5**	**163**	**1**	**137**	**10**	**599**	**29**	**3**	**6**	**0**	**0**	**0**	**101**	**0**	**0**	**0**	**75**	**70**	**1200**
Pinewood River Near Field	PINRNFSN01	7/18/2023	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRNFSN02	7/18/2023	1	86	0	0	0	2	0	0	0	0	0	65	1	0	0	0	0	0	0	18	0	86
	PINRNFSN03	7/18/2023	1	53	34	0	0	1	0	0	7	0	0	4	0	0	0	0	0	0	0	3	4	53
	PINRNFSN04	7/18/2023	1	69	11	0	0	0	0	0	5	0	0	5	0	1	0	0	0	0	0	21	26	69
	PINRNFSN05	7/18/2023	1	31	0	0	0	2	0	0	0	0	3	0	0	1	0	0	0	0	0	8	17	31
	PINRNFSN06	7/18/2023	1	9	1	0	0	0	0	0	4	0	1	0	0	1	0	0	0	0	0	0	2	9
	PINRNFSN07	7/18/2023	1	31	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	31
	PINRNFSN08	7/19/2023	1	34	0	0	0	3	0	0	0	0	16	3	0	0	0	0	0	0	0	7	5	34
	PINRNFSN09	7/19/2023	1	26	0	0	0	1	0	0	0	0	11	0	0	1	0	0	0	0	0	6	7	26
	PINRNFSN10	7/23/2023	1	38	0	0	0	5	7	0	0	0	0	26	0	0	0	0	0	0	0	0	0	38
	PINRNFSN11	7/23/2023	1	5	0	0	0	1	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	5
	PINRNFSN12	7/23/2023	1	17	10	0	0	0	3	0	0	0	1	0	0	1	0	0	0	0	1	1	0	17
	PINRNFSN13	7/24/2023	1	52	0	0	0	0	24	1	21	0	0	1	0	0	0	0	0	0	0	0	5	52
	PINRNFSN14	7/24/2023	1	19	2	0	0	8	6	0	0	0	1	2	0	0	0	0	0	0	0	0	0	19
	PINRNFSN15	7/24/2023	1	24	0	0	0	1	20	0	0	0	0	1	0	0	0	0	0	0	0	0	2	24
	Total		**15**	**32.93**	**88**	**0**	**0**	**24**	**60**	**1**	**40**	**0**	**33**	**107**	**1**	**6**	**0**	**0**	**0**	**0**	**1**	**64**	**69**	**494**
Pinewood River Far Field	PINRFFSN01	7/19/2023	1	9	0	0	0	6	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	9
	PINRFFSN02	7/20/2023	1	13	0	0	0	0	0	1	0	0	11	0	0	1	0	0	0	0	0	0	0	13
	PINRFFSN03	7/20/2023	1	3	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	3
	PINRFFSN04	7/20/2023	1	3	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3
	PINRFFSN05	7/20/2023	1	10	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	1	1	3	10
	PINRFFSN06	7/20/2023	1	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
	PINRFFSN07	7/20/2023	1	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
	PINRFFSN08	7/20/2023	1	7	0	0	0	0	0	0	2	0	1	0	0	1	0	0	0	0	0	3	0	7
	PINRFFSN09	7/23/2023	1	7	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	7
	PINRFFSN10	7/23/2023	1	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
	Total		**10**	**5.8**	**0**	**0**	**0**	**15**	**0**	**1**	**3**	**0**	**15**	**3**	**0**	**4**	**0**	**0**	**0**	**1**	**2**	**9**	**5**	**58**

Fish Species are: Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), Common Shiner (CS), Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Logperch (LP), Northern Pike (NP), Northern Pearl Dace (NPD), Northern Redbelly Dace (NRBD), Rock Bass (RB), Shorthead Redhorse (SHRH), Trout Perch (TP), White Sucker (WS), Cyprinid YOY (YOY).

Table B–5: Detailed minnow trap data in Pinewood River, July 2023

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF

Location	GearID	Set Date	Set Time	Lift Date	Lift Time	Traps (No.)	Total Effort	CPUE	BB	BM	BSB	BSD	CC	CMM	CS	FSD	GS	JD	LP	NP	NPD	NRBD	RB	SHRH	TP	WS	YOY	Total
Pinewood River Reference	PINRREFMT01	7/19/2023	14:00	7/20/2023	11:20	5	106.67	0.14	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
	PINRREFMT02	7/19/2023	14:05	7/20/2023	12:15	5	110.83	0.70	0	7	16	0	14	0	37	0	2	0	0	0	0	0	0	0	0	2	0	78
	PINRREFMT03	7/19/2023	14:10	7/20/2023	11:25	5	106.25	0.03	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
	PINRREFMT04	7/19/2023	14:45	7/20/2023	11:35	5	104.17	0.04	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
	PINRREFMT05	7/19/2023	14:50	7/20/2023	12:25	5	107.92	0.32	0	0	29	0	0	1	0	2	0	0	0	0	0	1	0	0	0	1	0	34
	PINRREFMT06	7/19/2023	15:00	7/20/2023	12:30	5	107.5	1.80	0	4	69	0	12	6	1	0	0	0	0	0	1	101	0	0	0	0	0	194
					Total		**643.33**	**0.51**	**0**	**11**	**135**	**0**	**26**	**7**	**38**	**3**	**2**	**0**	**0**	**0**	**1**	**102**	**0**	**0**	**0**	**3**	**0**	**328**
Pinewood River Near Field	PINRNFMT01	7/19/2023	9:00	7/20/2023	8:30	5	117.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRNFMT02	7/19/2023	9:15	7/20/2023	8:45	5	117.5	0.24	8	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	28
	PINRNFMT03	7/19/2023	9:30	7/20/2023	9:00	5	117.5	0.10	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	PINRNFMT04	7/19/2023	10:00	7/20/2023	10:20	5	121.67	0.02	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	PINRNFMT05	7/19/2023	10:10	7/20/2023	10:10	5	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRNFMT06	7/19/2023	10:20	7/20/2023	10:30	5	120.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					Total		**715**	**0.06**	**23**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**43**
Pinewood River Far Field	PINRFFMT01	7/18/2023	11:30	7/19/2023	10:15	5	113.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFMT02	7/18/2023	13:15	7/19/2023	12:15	5	115	0.01	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	PINRFFMT03	7/18/2023	14:25	7/19/2023	14:30	5	120.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFMT04	7/18/2023	14:55	7/19/2023	13:40	5	113.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFMT05	7/18/2023	16:20	7/19/2023	9:20	5	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PINRFFMT06	7/18/2023	16:25	7/19/2023	9:25	5	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					Total		**632.92**	**0.0016**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Fish Species are: Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), Common Shiner (CS), Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Logperch (LP), Northern Pike (NP), Northern Pearl Dace (NPD), Northern Redbelly Dace (NRBD), Rock Bass (RB), Shorthead Redhourse (SHRH), Trout Perch (TP), White Sucker (WS), Cyprinid YOY (YOY).

Table B–6: Community fish measurements for all areas, 2023.

Note for consistency with raw data that PWREF = PINRREF, PWNF = PINRNF, and PWFF = PINRFF. Fish Species are: Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), Common Shiner (CS), Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Logperch (LP), Northern Pike (NP), Northern Pearl Dace (NPD), Northern Redbelly Dace (NRBD), Rock Bass (RB), Shorthead Redhorse (SHRH), Trout Perch (TP), White Sucker (WS), Cyprinid YOY (YOY).

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWFF	BB	BB-3	15	--	60.9	2023-07-19
PWFF	BB	BB-1	--	17.5	110	2023-07-19
PWFF	BB	BB-2	--	16	84	2023-07-19
PWFF	BSB	BSB-16	--	3.3	0.2	2023-07-21
PWFF	BSD	BSD-12	--	6.5	2.7	2023-07-21
PWFF	BSD	BSD-13	--	7.8	4.1	2023-07-21
PWFF	BSD	BSD-14	--	7	3	2023-07-21
PWFF	BSD	BSD-15	--	6.8	2.6	2023-07-21
PWFF	BSD	BSD-17	--	6.7	2.6	2023-07-21
PWFF	BSD	BSD-18	--	6.4	2.5	2023-07-21
PWFF	BSD	BSD-19	--	4.1	0.6	2023-07-21
PWFF	BSD	BSD-20	--	3.8	0.4	2023-07-21
PWFF	BSD	BSD-21	--	3.4	0.3	2023-07-21
PWFF	BSD	BSD-1	--	7.8	5.2	2023-07-20
PWFF	BSD	BSD-2	--	4	0.5	2023-07-20
PWFF	BSD	BSD-3	--	3.6	0.5	2023-07-20
PWFF	BSD	BSD-4	--	2.6	0.1	2023-07-20
PWFF	BSD	BSD-5	--	3.2	0.2	2023-07-20
PWFF	BSD	BSD-11	--	6.7	2.4	2023-07-20
PWFF	BSD	BSD-6	--	6.7	3	2023-07-20
PWFF	BSD	BSD-7	--	3.6	0.3	2023-07-20
PWFF	BSD	BSD-8	--	3.3	0.3	2023-07-20
PWFF	BSD	BSD-9	--	6.7	8.4	2023-07-20
PWFF	BSD	BSD-10	--	7.2	3.3	2023-07-20
PWFF	CC	CC-1	--	6.9	3.5	2023-07-21
PWFF	CMM	CMM-1	--	6	2.333	2023-07-20
PWFF	CMM	CMM-2	--	5.7	2.08	2023-07-21
PWFF	CMM	CMM-3	--	5.7	2.101	2023-07-21
PWFF	CMM	CMM-4	--	5.1	1.453	2023-07-21
PWFF	CMM	CMM-1	--	6	2.1	2023-07-20
PWFF	CS	CS-1	7.6	--	5.65	2023-07-20
PWFF	CS	CS-2	5.2	--	1.593	2023-07-20
PWFF	CS	CS-3	4.7	--	1.2	2023-07-21
PWFF	CS	CS-4	7.8	--	5.29	2023-07-21
PWFF	CS	CS-1	2.7	--	0.2	2023-07-20
PWFF	GS	GS-20	--	7.9	5.3	2023-07-21
PWFF	GS	GS-2	8.6	--	7.8	2023-07-19
PWFF	GS	GS-1	9	--	8.7	2023-07-19
PWFF	GS	GS-3	--	8.6	7.9	2023-07-20
PWFF	GS	GS-4	--	6.7	3	2023-07-20
PWFF	GS	GS-5	--	7.6	4.8	2023-07-20
PWFF	GS	GS-6	--	7.8	4.5	2023-07-20
PWFF	GS	GS-7	--	7.7	4	2023-07-20
PWFF	GS	GS-8	--	7.1	4.5	2023-07-20
PWFF	GS	GS-9	--	7.8	5.1	2023-07-20
PWFF	GS	GS-10	--	7.2	4.3	2023-07-20
PWFF	GS	GS-11	--	7.4	5.2	2023-07-20
PWFF	GS	GS-12	--	8.6	6.4	2023-07-20
PWFF	GS	GS-13	--	6.7	3	2023-07-20
PWFF	GS	GS-14	--	8.3	5.5	2023-07-20
PWFF	GS	GS-15	--	7.3	4.4	2023-07-20
PWFF	GS	GS-16	--	7.6	6	2023-07-20
PWFF	GS	GS-19	--	3.1	0.2	2023-07-20
PWFF	GS	GS-17	--	3.3	0.1	2023-07-20
PWFF	GS	GS-18	--	3.4	0.1	2023-07-20
PWFF	JD	JD-8	--	5.8	1.3	2023-07-21
PWFF	JD	JD-1	--	6.5	2.2	2023-07-20
PWFF	JD	JD-2	--	3.2	0.3	2023-07-20
PWFF	JD	JD-4	--	2.7	0.1	2023-07-20
PWFF	JD	JD-5	--	2.7	0.1	2023-07-20
PWFF	JD	JD-6	--	2.2	0.1	2023-07-20
PWFF	JD	JD-7	--	2.7	0.2	2023-07-20
PWFF	JD	JD-3	--	2.9	0.1	2023-07-20

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWFF	LP	LP-1	--	6.3	2.8	2023-07-21
PWFF	NP	NP-11	10.2	--	6	2023-07-21
PWFF	NP	NP-3	29	--	230	2023-07-19
PWFF	NP	NP-1	29	--	203	2023-07-19
PWFF	NP	NP-2	29	--	214	2023-07-19
PWFF	NP	NP-4	28.9	--	196.7	2023-07-19
PWFF	NP	NP-5	26.5	--	155.6	2023-07-19
PWFF	NP	NP-6	31	--	256.2	2023-07-19
PWFF	NP	NP-7	8.9	--	4.9	2023-07-20
PWFF	NP	NP-8	24.5	--	91.8	2023-07-20
PWFF	NP	NP-11	13.4	--	15.1	2023-07-20
PWFF	NP	NP-9	8.7	--	3.7	2023-07-20
PWFF	NP	NP-10	37	--	7.3	2023-07-20
PWFF	RB	RB-2	--	7.4	8.3	2023-07-21
PWFF	RB	RB-1	24.6	--	348.6	2023-07-19
PWFF	SHRH	SHRH-1	8.7	--	8	2023-07-20
PWFF	TP	TP-1	5.9	--	2.3	2023-07-20
PWFF	TP	TP-2	6.7	--	2.7	2023-07-20
PWFF	WS	WS-2	10.2	--	12.7	2023-07-21
PWFF	WS	WS-3	9.4	--	9.2	2023-07-21
PWFF	WS	WS-1	8.3	--	5.9	2023-07-20
PWFF	YOY	YOY-1	3.3	--	0.3	2023-07-20
PWFF	YOY	YOY-2	2.9	--	0.3	2023-07-20
PWFF	YOY	YOY-3	2.5	--	0.1	2023-07-20
PWFF	YOY	YOY-4	3.5	--	0.2	2023-07-20
PWFF	YOY	YOY-5	2.2	--	0.1	2023-07-20
PWFF	YOY	YOY-6	2.9	--	0.1	2023-07-20
PWFF	YOY	YOY-7	2.2	--	0.1	2023-07-20
PWNF	BB	--	--	15.2	60	2023-07-21
PWNF	BB	--	--	147	92.1	2023-07-23
PWNF	BB	--	--	17.1	68.6	2023-07-23
PWNF	BB	--	--	8.7	10.3	2023-07-23
PWNF	BB	--	--	9.7	18.8	2023-07-20
PWNF	BB	--	--	8.2	10	2023-07-20
PWNF	BB	--	--	8.7	12.3	2023-07-20
PWNF	BB	--	--	8.8	10.5	2023-07-20
PWNF	BB	--	--	8.2	9.5	2023-07-20
PWNF	BB	--	--	8.6	10.3	2023-07-20
PWNF	BB	--	--	8.4	9.6	2023-07-20
PWNF	BB	--	--	9.9	15.6	2023-07-20
PWNF	BB	--	--	9.4	12.1	2023-07-20
PWNF	BB	--	--	8.6	10.2	2023-07-20
PWNF	BB	--	--	8.7	10.5	2023-07-20
PWNF	BB	--	--	9.4	11.5	2023-07-20
PWNF	BB	--	--	8.3	8.3	2023-07-20
PWNF	BB	--	--	6.7	5.5	2023-07-20
PWNF	BB	--	--	11.1	19.6	2023-07-20
PWNF	BB	--	--	8.8	12.1	2023-07-20
PWNF	BB	--	--	8.8	9.7	2023-07-20
PWNF	BB	--	--	8.6	7.4	2023-07-20
PWNF	BB	--	--	10	15.2	2023-07-20
PWNF	BB	--	--	9.6	11.9	2023-07-20
PWNF	BB	--	--	--	--	2023-07-20
PWNF	BB	--	--	--	--	2023-07-20
PWNF	BB	--	--	9.2	11.4	2023-07-18
PWNF	BB	--	--	8.1	7.2	2023-07-18
PWNF	BB	--	--	10.3	15.6	2023-07-18
PWNF	BB	--	--	7.3	5.8	2023-07-18
PWNF	BB	--	--	10.2	15.5	2023-07-18
PWNF	BB	--	--	9	10.3	2023-07-18
PWNF	BB	--	--	8.9	10.8	2023-07-18
PWNF	BB	--	--	10.8	18.4	2023-07-18
PWNF	BB	--	--	8.4	8.3	2023-07-18
PWNF	BB	--	--	9.2	11.8	2023-07-18
PWNF	BB	--	--	9.6	12.6	2023-07-18
PWNF	BB	--	--	8.8	9.5	2023-07-18
PWNF	BB	--	--	15.5	61.5	2023-07-18
PWNF	BB	--	--	8.4	9.3	2023-07-18
PWNF	BB	--	--	10.3	17.1	2023-07-18
PWNF	BB	--	--	9.5	13.4	2023-07-18

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	BB	--	--	8.6	10.2	2023-07-18
PWNF	BB	--	--	9.7	14	2023-07-18
PWNF	BB	--	--	15.3	53.7	2023-07-18
PWNF	BB	--	--	14.6	59.7	2023-07-18
PWNF	BB	--	--	8.6	15.9	2023-07-18
PWNF	BB	--	--	7.5	6.3	2023-07-18
PWNF	BB	--	--	13.8	37.9	2023-07-18
PWNF	BB	--	--	9.3	11	2023-07-18
PWNF	BB	--	--	8.6	8.8	2023-07-18
PWNF	BB	--	--	8.8	10.3	2023-07-18
PWNF	BB	--	--	9.8	14.6	2023-07-18
PWNF	BB	--	--	9.2	11.4	2023-07-18
PWNF	BB	--	--	9.9	14.9	2023-07-18
PWNF	BB	--	--	9.3	13.7	2023-07-18
PWNF	BB	--	--	10	15.3	2023-07-18
PWNF	BB	--	--	9.9	14.3	2023-07-18
PWNF	BB	--	--	9.4	12.7	2023-07-18
PWNF	BB	--	--	10.3	16.2	2023-07-18
PWNF	BB	--	--	12.4	27.7	2023-07-18
PWNF	BB	--	--	8.9	10	2023-07-18
PWNF	BB	--	--	10.7	17.6	2023-07-18
PWNF	BB	--	--	9.4	11.2	2023-07-18
PWNF	BB	--	--	9.2	9.9	2023-07-18
PWNF	BB	--	--	8.9	10.1	2023-07-18
PWNF	BB	--	--	9.6	12.8	2023-07-18
PWNF	BB	--	--	8.4	8.3	2023-07-18
PWNF	BB	--	--	7.9	7	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	2	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	2.3	0.1	2023-07-18
PWNF	BB	--	--	2.3	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	1.8	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2	0.1	2023-07-18
PWNF	BB	--	--	2.1	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	2.2	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	1.9	0.1	2023-07-18
PWNF	BB	--	--	2	0.1	2023-07-18
PWNF	BB	--	--	9.3	11.8	2023-07-19
PWNF	BB	--	--	10.6	17.5	2023-07-19
PWNF	BSD	--	--	7.4	4.3	2023-07-23
PWNF	BSD	--	--	3.9	0.6	2023-07-23
PWNF	BSD	--	--	3.8	0.5	2023-07-23
PWNF	BSD	--	--	3.9	0.5	2023-07-23
PWNF	BSD	--	--	4.1	0.6	2023-07-23
PWNF	BSD	--	--	4	0.6	2023-07-18
PWNF	BSD	--	--	4	0.5	2023-07-18
PWNF	BSD	--	--	4.2	0.5	2023-07-18
PWNF	BSD	--	--	4.2	0.5	2023-07-18
PWNF	BSD	--	--	4.4	0.6	2023-07-18

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	BSD	--	--	3.4	0.3	2023-07-19
PWNF	BSD	--	--	3.9	0.4	2023-07-19
PWNF	BSD	--	--	3.5	0.2	2023-07-19
PWNF	BSD	--	--	4.4	0.6	2023-07-19
PWNF	BSD	--	--	4.9	0.9	2023-07-23
PWNF	BSD	--	--	4.1	0.7	2023-07-23
PWNF	BSD	--	--	4.1	0.5	2023-07-23
PWNF	BSD	--	--	4	0.5	2023-07-23
PWNF	BSD	--	--	4.7	0.9	2023-07-23
PWNF	BSD	--	--	7.1	3.2	2023-07-23
PWNF	BSD	--	--	3.8	0.4	2023-07-24
PWNF	BSD	--	--	3.5	0.3	2023-07-24
PWNF	BSD	--	--	3.4	0.3	2023-07-24
PWNF	BSD	--	--	7.2	3.3	2023-07-24
PWNF	BSD	--	--	8.6	0.5	2023-07-24
PWNF	BSD	--	--	3.6	0.5	2023-07-24
PWNF	BSD	--	--	4.2	0.7	2023-07-24
PWNF	BSD	--	--	3.9	0.4	2023-07-24
PWNF	BSD	--	--	4.5	0.8	2023-07-24
PWNF	CC	--	2.9	--	0.2	2023-07-22
PWNF	CC	--	4.3	--	0.7	2023-07-23
PWNF	CC	--	4.8	--	1.2	2023-07-23
PWNF	CC	--	4.5	--	1.2	2023-07-23
PWNF	CC	--	4.1	--	0.5	2023-07-23
PWNF	CC	--	4.2	--	0.8	2023-07-23
PWNF	CC	--	4.6	--	1.1	2023-07-23
PWNF	CC	--	3.7	--	0.6	2023-07-23
PWNF	CC	--	3.7	--	0.5	2023-07-23
PWNF	CC	--	3.2	--	0.3	2023-07-23
PWNF	CC	--	4.6	--	1.2	2023-07-23
PWNF	CC	--	3.6	--	0.5	2023-07-24
PWNF	CC	--	2.9	--	0.2	2023-07-24
PWNF	CC	--	2.9	--	0.2	2023-07-24
PWNF	CC	--	2.5	--	0.1	2023-07-24
PWNF	CC	--	2.6	--	0.2	2023-07-24
PWNF	CC	--	3.1	--	0.4	2023-07-24
PWNF	CC	--	3	--	0.3	2023-07-24
PWNF	CC	--	3.4	--	0.5	2023-07-24
PWNF	CC	--	3.2	--	0.4	2023-07-24
PWNF	CC	--	3.8	--	0.6	2023-07-24
PWNF	CC	--	3.7	--	0.7	2023-07-24
PWNF	CC	--	3.7	--	0.7	2023-07-24
PWNF	CC	--	4.2	--	0.8	2023-07-24
PWNF	CC	--	3.8	--	0.6	2023-07-24
PWNF	CC	--	3.8	--	0.5	2023-07-24
PWNF	CC	--	4.3	--	1	2023-07-24
PWNF	CC	--	3.2	--	0.4	2023-07-24
PWNF	CC	--	3.3	--	0.4	2023-07-24
PWNF	CC	--	3	--	0.3	2023-07-24
PWNF	CC	--	3.7	--	0.4	2023-07-24
PWNF	CC	--	3.9	--	0.8	2023-07-24
PWNF	CC	--	3.3	--	0.4	2023-07-24
PWNF	CC	--	4.1	--	0.8	2023-07-24
PWNF	CC	--	3.7	--	0.5	2023-07-24
PWNF	CC	--	3.7	--	0.5	2023-07-24
PWNF	CC	--	5.1	--	1.5	2023-07-24
PWNF	CC	--	4.4	--	1	2023-07-24
PWNF	CC	--	4.1	--	1.3	2023-07-24
PWNF	CC	--	4.1	--	1	2023-07-24
PWNF	CC	--	4.6	--	1.1	2023-07-24
PWNF	CC	--	2.2	--	0.7	2023-07-24
PWNF	CC	--	4.3	--	1	2023-07-24
PWNF	CC	--	4.7	--	1.3	2023-07-24
PWNF	CC	--	4.4	--	1	2023-07-24
PWNF	CC	--	4.4	--	1.2	2023-07-24
PWNF	CC	--	4.3	--	0.9	2023-07-24
PWNF	CC	--	4.5	--	1.1	2023-07-24
PWNF	CC	--	4.2	--	0.9	2023-07-24
PWNF	CC	--	4.3	--	1.1	2023-07-24
PWNF	CC	--	4	--	0.8	2023-07-24

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	CMM	CMM-1	--	5.8	2.296	2023-07-22
PWNF	CMM	CMM-2	--	5.8	2.159	2023-07-22
PWNF	CMM	CMM-3	--	7.3	4.564	2023-07-22
PWNF	CMM	CMM-4	--	5.7	2.175	2023-07-22
PWNF	CMM	CMM-5	--	5	1.409	2023-07-22
PWNF	CMM	CMM-6	--	5.5	1.705	2023-07-22
PWNF	CMM	CMM-7	--	5.3	1.471	2023-07-22
PWNF	CMM	CMM-8	--	10.6	13.253	2023-07-22
PWNF	CMM	CMM-9	--	8.4	6.436	2023-07-23
PWNF	CMM	CMM-10	--	5.6	2.203	2023-07-23
PWNF	CMM	CMM-11	--	5	1.362	2023-07-23
PWNF	CMM	--	--	4.6	1	2023-07-22
PWNF	CS	CS-1	8.6	--	7.25	2023-07-18
PWNF	CS	CS-2	4.8	--	1.103	2023-07-18
PWNF	CS	CS-3	7.1	--	4.389	2023-07-18
PWNF	CS	CS-4	9.4	--	10.622	2023-07-18
PWNF	CS	CS-5	4.8	--	1.109	2023-07-18
PWNF	CS	CS-6	7.3	--	4.301	2023-07-18
PWNF	CS	CS-7	6.6	--	3.482	2023-07-18
PWNF	CS	CS-8	8.6	--	7.505	2023-07-18
PWNF	CS	CS-9	9.7	--	10.539	2023-07-18
PWNF	CS	CS-10	11.8	--	19.975	2023-07-18
PWNF	CS	CS-11	5.5	--	1.877	2023-07-23
PWNF	CS	CS-12	5.2	--	1.392	2023-07-23
PWNF	CS	CS-13	12.6	--	27.238	2023-07-23
PWNF	CS	CS-14	10.7	--	15.56	2023-07-23
PWNF	CS	--	3.1	--	0.3	2023-07-22
PWNF	CS	--	3.3	3.6	0.5	2023-07-18
PWNF	CS	--	3.2	3.5	0.3	2023-07-18
PWNF	CS	--	2.8	--	0.2	2023-07-24
PWNF	CS	--	2.7	--	0.2	2023-07-24
PWNF	CS	--	2.9	--	0.3	2023-07-24
PWNF	CS	--	2.6	--	0.2	2023-07-24
PWNF	CS	--	2.6	--	0.2	2023-07-24
PWNF	CS	--	3	--	0.3	2023-07-24
PWNF	CS	--	3.2	--	0.4	2023-07-24
PWNF	CS	--	1.9	--	0.1	2023-07-24
PWNF	CS	--	2.9	--	0.2	2023-07-24
PWNF	CS	--	2.7	--	0.3	2023-07-24
PWNF	CS	--	2.6	--	0.2	2023-07-24
PWNF	CS	--	2.5	--	0.2	2023-07-24
PWNF	CS	--	2.6	--	0.2	2023-07-24
PWNF	CS	--	2.5	--	0.1	2023-07-24
PWNF	CS	--	3.1	--	0.2	2023-07-24
PWNF	CS	--	2.6	--	0.1	2023-07-24
PWNF	CS	--	2.6	--	0.2	2023-07-24
PWNF	CS	--	2.8	--	0.2	2023-07-24
PWNF	CS	--	3.3	--	0.4	2023-07-24
PWNF	CS	--	2.3	--	0.1	2023-07-24
PWNF	CS	--	2.3	--	0.1	2023-07-24
PWNF	CS	--	2.9	--	0.3	2023-07-24
PWNF	CS	--	3.3	--	0.4	2023-07-24
PWNF	GS	--	--	5.7	1.5	2023-07-21
PWNF	GS	--	--	6.1	2.3	2023-07-22
PWNF	GS	--	--	6.6	3.5	2023-07-22
PWNF	GS	--	8.9	9.9	8.3	2023-07-23
PWNF	GS	--	9.2	10	11.2	2023-07-23
PWNF	GS	--	8.8	9.8	9.2	2023-07-23
PWNF	GS	--	10.5	11.9	16.1	2023-07-23
PWNF	GS	--	10.6	11.7	13.4	2023-07-23
PWNF	GS	--	8.9	10	10.2	2023-07-23
PWNF	GS	--	--	--	--	2023-07-23
PWNF	GS	--	--	--	--	2023-07-23
PWNF	GS	--	9.4	10.5	10.5	2023-07-23
PWNF	GS	--	8.9	10.1	9.8	2023-07-23
PWNF	GS	--	7.2	12.4	20.1	2023-07-23
PWNF	GS	--	9.4	10.3	11.9	2023-07-23
PWNF	GS	--	9.1	10.2	11	2023-07-23
PWNF	GS	--	10.4	11.5	16	2023-07-23
PWNF	GS	GS	5.9	6.7	2.3	2023-07-18

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	GS	GS	5.5	6.2	2	2023-07-18
PWNF	GS	GS	5.7	6.3	2.4	2023-07-18
PWNF	GS	GS	5.8	6.8	2.5	2023-07-18
PWNF	GS	GS	5.4	6.1	2	2023-07-18
PWNF	GS	GS	5.8	6.6	2.2	2023-07-18
PWNF	GS	GS	5.4	6.1	1.9	2023-07-18
PWNF	GS	GS	7.3	8.2	4.8	2023-07-18
PWNF	GS	--	3.4	3.7	0.3	2023-07-18
PWNF	GS	--	3	3.3	0.2	2023-07-18
PWNF	GS	--	3.5	3.9	0.5	2023-07-18
PWNF	GS	--	3.6	4.1	0.5	2023-07-18
PWNF	GS	--	5.3	6	1.8	2023-07-19
PWNF	GS	--	2.9	3.3	0.2	2023-07-19
PWNF	GS	--	5.1	5.5	1.2	2023-07-19
PWNF	GS	--	2.8	3	0.2	2023-07-19
PWNF	GS	--	2.4	2.6	0.2	2023-07-19
PWNF	GS	--	2.4	2.6	0.1	2023-07-19
PWNF	GS	--	7.1	8.1	5	2023-07-19
PWNF	GS	--	2.5	2.7	0.2	2023-07-19
PWNF	GS	--	2.2	2.4	0.1	2023-07-19
PWNF	GS	--	2.6	2.8	0.1	2023-07-19
PWNF	GS	--	2.8	3.1	0.2	2023-07-19
PWNF	GS	--	2.9	3.3	0.1	2023-07-19
PWNF	GS	--	2.7	3	0.1	2023-07-19
PWNF	GS	--	2.4	2.7	0.2	2023-07-19
PWNF	GS	--	2.7	2.9	0.3	2023-07-19
PWNF	GS	--	2.4	2.6	0.1	2023-07-19
PWNF	GS	--	2.3	2.5	0.1	2023-07-19
PWNF	GS	--	2.4	2.6	0.1	2023-07-19
PWNF	GS	--	3.3	3.6	0.3	2023-07-19
PWNF	GS	--	2.6	2.8	0.2	2023-07-19
PWNF	GS	--	2.2	2.5	0.1	2023-07-19
PWNF	GS	--	4.6	5.1	1.1	2023-07-19
PWNF	GS	--	2.7	3.1	0.2	2023-07-19
PWNF	GS	--	2.2	2.4	0.1	2023-07-19
PWNF	GS	--	2.4	3.2	0.2	2023-07-19
PWNF	GS	--	2.7	3	0.2	2023-07-19
PWNF	GS	--	5.6	6.2	1.9	2023-07-19
PWNF	GS	--	--	6.4	3.3	2023-07-23
PWNF	GS	--	--	5.5	1.9	2023-07-24
PWNF	JD	--	--	6.3	2.5	2023-07-22
PWNF	JD	--	--	4.8	0.9	2023-07-18
PWNF	JD	--	--	3.4	0.1	2023-07-18
PWNF	JD	--	--	2.8	0.1	2023-07-18
PWNF	JD	--	--	3.2	0.1	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	4.7	0.9	2023-07-18
PWNF	JD	--	--	2.8	0.1	2023-07-18
PWNF	JD	--	--	3	0.1	2023-07-18
PWNF	JD	--	--	3.5	0.4	2023-07-18
PWNF	JD	--	--	3.1	0.1	2023-07-18
PWNF	JD	--	--	3.4	0.2	2023-07-18
PWNF	JD	--	--	2.9	0.1	2023-07-18
PWNF	JD	--	--	3.2	0.2	2023-07-18
PWNF	JD	--	--	2.6	0.1	2023-07-18
PWNF	JD	--	--	2.8	0.1	2023-07-18
PWNF	JD	--	--	2.7	0.1	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	5.4	1.3	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.2	0.2	2023-07-18
PWNF	JD	--	--	3	0.1	2023-07-18
PWNF	JD	--	--	5.9	1.6	2023-07-18
PWNF	JD	--	--	5.7	1.4	2023-07-18
PWNF	JD	--	--	2.9	0.1	2023-07-18
PWNF	JD	--	--	2.7	0.1	2023-07-18
PWNF	JD	--	--	3.3	0.3	2023-07-18
PWNF	JD	--	--	2.3	0.1	2023-07-18

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	JD	--	--	3.3	0.3	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.2	0.3	2023-07-18
PWNF	JD	--	--	2.9	0.1	2023-07-18
PWNF	JD	--	--	2.7	0.1	2023-07-18
PWNF	JD	--	--	2.8	0.1	2023-07-18
PWNF	JD	--	--	2.6	0.1	2023-07-18
PWNF	JD	--	--	2.6	0.1	2023-07-18
PWNF	JD	--	--	2.7	0.1	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	2.6	0.1	2023-07-18
PWNF	JD	--	--	2.6	0.1	2023-07-18
PWNF	JD	--	--	3.2	0.3	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	2.8	0.2	2023-07-18
PWNF	JD	--	--	2.5	0.1	2023-07-18
PWNF	JD	--	--	3.4	0.3	2023-07-18
PWNF	JD	--	--	3.2	0.2	2023-07-18
PWNF	JD	--	--	3	0.2	2023-07-18
PWNF	JD	--	--	2.5	0.1	2023-07-18
PWNF	JD	--	--	3.2	0.2	2023-07-18
PWNF	JD	--	--	2.9	0.2	2023-07-18
PWNF	JD	--	--	2.9	0.1	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	3.1	0.2	2023-07-18
PWNF	JD	--	--	5.2	1.1	2023-07-18
PWNF	JD	--	--	3.4	0.3	2023-07-18
PWNF	JD	--	--	3.4	0.2	2023-07-18
PWNF	JD	--	--	2.7	0.1	2023-07-18
PWNF	JD	--	--	3.9	0.5	2023-07-18
PWNF	JD	--	--	3.3	0.2	2023-07-18
PWNF	JD	--	--	3.7	0.3	2023-07-18
PWNF	JD	--	--	5.4	1.3	2023-07-18
PWNF	JD	--	--	5.9	1.5	2023-07-19
PWNF	JD	--	--	2.7	0.1	2023-07-19
PWNF	JD	--	--	3.4	0.2	2023-07-19
PWNF	LP	--	3.9	4.3	0.7	2023-07-18
PWNF	NP	--	11.1	11.8	7.7	2023-07-23
PWNF	NP	--	26.8	28.6	185	2023-07-23
PWNF	NP	--	28.9	28.6	195	2023-07-23
PWNF	NP	--	31.4	33.5	235	2023-07-23
PWNF	NP	--	30	32.1	225	2023-07-23
PWNF	NP	--	28.4	31.1	210	2023-07-23
PWNF	NP	--	28.7	30.9	180	2023-07-23
PWNF	NP	--	28.7	34.1	166	2023-07-23
PWNF	NP	--	30.3	32.5	250	2023-07-23
PWNF	NP	--	29.3	31	210	2023-07-23
PWNF	NP	--	34.1	36.4	320	2023-07-23
PWNF	NP	--	27.8	29	159	2023-07-23
PWNF	NP	--	29.3	31.4	205	2023-07-23
PWNF	NP	--	30.3	32.6	230	2023-07-23
PWNF	NP	--	34.3	37.7	300	2023-07-23
PWNF	NP	--	32.5	35	240	2023-07-23
PWNF	NP	--	33.6	35.9	290	2023-07-23
PWNF	NP	--	32.4	34.9	560	2023-07-23
PWNF	NP	--	49	53	--	2023-07-23
PWNF	NP	--	3.9	42	400	2023-07-23
PWNF	NP	--	28.1	30.2	165	2023-07-23
PWNF	NP	--	31.3	34.3	240	2023-07-23
PWNF	NP	--	31.3	34.1	200	2023-07-23
PWNF	NP	--	30.3	32.3	205	2023-07-23
PWNF	NP	--	29.7	31.7	251	2023-07-23
PWNF	NP	--	30.9	32.9	190	2023-07-23
PWNF	NP	--	10.3	10.8	6.1	2023-07-18
PWNF	NP	--	8.2	8.6	3.2	2023-07-18
PWNF	NP	--	9	9.7	4.7	2023-07-18
PWNF	NP	--	24.7	26.3	105	2023-07-19
PWNF	NP	--	24.2	--	104	2023-07-23
PWNF	NP	--	8.4	--	4.2	2023-07-23

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWNF	NP	--	9.5	--	5.5	2023-07-24
PWNF	TP	--	4.4	--	1.3	2023-07-23
PWNF	WS	--	25.9	--	220	2023-07-21
PWNF	WS	--	20.8	22.2	120.8	2023-07-23
PWNF	WS	--	3.9	4.2	0.6	2023-07-18
PWNF	WS	--	4.4	4.7	0.9	2023-07-18
PWNF	WS	--	4.1	4.4	0.6	2023-07-18
PWNF	WS	--	4	4.3	0.6	2023-07-18
PWNF	WS	--	4	4.3	0.7	2023-07-18
PWNF	WS	--	3.4	3.6	0.3	2023-07-18
PWNF	WS	--	3.7	4	0.6	2023-07-18
PWNF	WS	--	4.9	5.2	1.2	2023-07-18
PWNF	WS	--	4.7	5.1	1.1	2023-07-18
PWNF	WS	--	4.9	5.3	1.4	2023-07-18
PWNF	WS	--	4.3	4.7	0.9	2023-07-18
PWNF	WS	--	3.8	4.1	0.5	2023-07-18
PWNF	WS	--	4.3	4.7	0.9	2023-07-18
PWNF	WS	--	3.7	4	0.5	2023-07-18
PWNF	WS	--	4.2	4.5	0.9	2023-07-18
PWNF	WS	--	3.7	4.1	0.7	2023-07-18
PWNF	WS	--	4	4.3	0.7	2023-07-18
PWNF	WS	--	4.1	4.4	0.8	2023-07-18
PWNF	WS	--	4.5	4.9	1.1	2023-07-18
PWNF	WS	--	3.8	4.1	0.6	2023-07-18
PWNF	WS	--	4.7	5.1	1.1	2023-07-18
PWNF	WS	--	3.8	4.1	0.6	2023-07-18
PWNF	WS	--	4.3	4.6	0.9	2023-07-18
PWNF	WS	--	3.8	4.2	0.7	2023-07-18
PWNF	WS	--	3.8	4.1	0.5	2023-07-18
PWNF	WS	--	4.2	4.5	0.8	2023-07-18
PWNF	WS	--	3.9	4.1	0.5	2023-07-18
PWNF	WS	--	3.4	3.6	0.2	2023-07-18
PWNF	WS	--	--	3.4	0.3	2023-07-18
PWNF	WS	--	5.2	5.5	1.5	2023-07-18
PWNF	WS	--	5.1	5.4	1.4	2023-07-18
PWNF	WS	--	4.6	5	1.1	2023-07-18
PWNF	WS	--	4.4	4.7	0.7	2023-07-18
PWNF	WS	--	3.2	3.4	0.5	2023-07-18
PWNF	WS	--	3.7	4	1	2023-07-18
PWNF	WS	--	3.9	4.1	0.6	2023-07-18
PWNF	WS	--	4.4	4.6	0.8	2023-07-18
PWNF	WS	--	3.8	4.2	0.7	2023-07-18
PWNF	WS	--	4.5	4.9	1.2	2023-07-18
PWNF	WS	--	4.1	4.4	0.7	2023-07-18
PWNF	WS	--	5	5.4	1.2	2023-07-18
PWNF	WS	--	9.4	10.1	10.5	2023-07-18
PWNF	WS	--	3.7	4	0.5	2023-07-18
PWNF	WS	--	3.9	4.3	0.6	2023-07-18
PWNF	WS	--	3.8	4.2	0.8	2023-07-18
PWNF	WS	--	4.1	4.4	1.5	2023-07-18
PWNF	WS	--	4.7	5.1	1.1	2023-07-18
PWNF	WS	--	4.2	4.5	0.7	2023-07-18
PWNF	WS	--	3.7	4.1	0.6	2023-07-18
PWNF	WS	--	4.7	5.2	1.2	2023-07-18
PWNF	WS	--	3.8	4.2	0.7	2023-07-19
PWNF	WS	--	3.3	3.6	0.3	2023-07-19
PWNF	WS	--	5.7	4	0.6	2023-07-19
PWNF	WS	--	3.6	3.9	0.6	2023-07-19
PWNF	WS	--	3.7	4.1	0.6	2023-07-19
PWNF	WS	--	4.4	4.6	0.7	2023-07-19
PWNF	WS	--	20	21.5	115	2023-07-19
PWNF	WS	--	3.3	3.5	0.3	2023-07-19
PWNF	WS	--	3.1	3.4	0.4	2023-07-19
PWNF	WS	--	3.2	3.4	0.3	2023-07-19
PWNF	WS	--	3.7	3.9	0.4	2023-07-19
PWNF	WS	--	3.9	4.2	0.6	2023-07-19
PWNF	WS	--	3.9	4.2	0.6	2023-07-19
PWNF	WS	--	18.1	--	80.6	2023-07-23
PWREF	BB	--	--	13.9	33.2	2023-07-23
PWREF	BB	--	--	13.9	36.3	2023-07-23

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	BB	--	--	17.9	65	2023-07-21
PWREF	BB	--	--	16.5	69.6	2023-07-21
PWREF	BB	--	--	15.3	51.6	2023-07-21
PWREF	BB	--	--	2.5	0.2	2023-07-21
PWREF	BM	--	5.8	6.4	2	2023-07-20
PWREF	BM	--	5.3	5.8	1.4	2023-07-20
PWREF	BM	--	5.2	5.7	1.5	2023-07-20
PWREF	BM	--	4.4	4.7	1	2023-07-20
PWREF	BM	--	5.2	5.7	1.6	2023-07-20
PWREF	BM	--	4.9	5.4	1.4	2023-07-20
PWREF	BM	--	4.3	4.7	0.9	2023-07-20
PWREF	BM	--	5	5.4	1.5	2023-07-20
PWREF	BM	--	4.4	4.7	0.8	2023-07-20
PWREF	BM	--	5.2	6.1	1.9	2023-07-20
PWREF	BM	--	6.1	6.5	2.2	2023-07-20
PWREF	BM	--	6.7	6.9	2.9	2023-07-22
PWREF	BM	--	7	7.6	4.4	2023-07-22
PWREF	BM	--	5.3	6.3	1.4	2023-07-22
PWREF	BM	--	4.4	4.6	0.8	2023-07-22
PWREF	BM	--	6	6.4	2.4	2023-07-22
PWREF	BSB	--	--	3.8	0.5	2023-07-23
PWREF	BSB	--	--	4.5	0.9	2023-07-20
PWREF	BSB	--	--	4.7	0.9	2023-07-20
PWREF	BSB	--	--	4.8	0.9	2023-07-20
PWREF	BSB	--	--	4.2	0.8	2023-07-20
PWREF	BSB	--	--	5.4	1.3	2023-07-20
PWREF	BSB	--	--	4.3	0.8	2023-07-20
PWREF	BSB	--	--	4.4	0.8	2023-07-20
PWREF	BSB	--	--	5.2	1.4	2023-07-20
PWREF	BSB	--	--	4.6	1.1	2023-07-20
PWREF	BSB	--	--	4.9	1.1	2023-07-20
PWREF	BSB	--	--	4.4	0.8	2023-07-20
PWREF	BSB	--	--	4.4	0.8	2023-07-20
PWREF	BSB	--	--	4.2	0.7	2023-07-20
PWREF	BSB	--	--	4.3	0.7	2023-07-20
PWREF	BSB	--	--	4.2	0.8	2023-07-20
PWREF	BSB	--	--	4.2	0.9	2023-07-20
PWREF	BSB	--	--	4.9	1	2023-07-20
PWREF	BSB	--	--	3.9	0.8	2023-07-20
PWREF	BSB	--	--	4.3	0.8	2023-07-20
PWREF	BSB	--	--	4.9	0.9	2023-07-20
PWREF	BSB	--	--	3.9	0.7	2023-07-20
PWREF	BSB	--	--	4.3	0.8	2023-07-20
PWREF	BSB	--	--	4.6	0.9	2023-07-20
PWREF	BSB	--	--	4.2	0.8	2023-07-20
PWREF	BSB	--	--	4.4	0.9	2023-07-20
PWREF	BSB	--	--	4.6	0.9	2023-07-20
PWREF	BSB	--	--	4.2	1	2023-07-20
PWREF	BSB	--	--	4.4	0.9	2023-07-20
PWREF	BSB	--	--	4.3	0.7	2023-07-20
PWREF	BSB	--	--	4.5	0.7	2023-07-20
PWREF	BSB	--	--	4.7	1	2023-07-20
PWREF	BSB	--	--	4.5	1.1	2023-07-20
PWREF	BSB	--	--	4.3	0.7	2023-07-20
PWREF	BSB	--	--	4.5	1	2023-07-20
PWREF	BSB	--	--	4.4	0.8	2023-07-20
PWREF	BSB	--	--	4.1	0.7	2023-07-20
PWREF	BSB	--	--	4.8	0.8	2023-07-20
PWREF	BSB	--	--	5.1	1.2	2023-07-20
PWREF	BSB	--	--	4.2	0.8	2023-07-20
PWREF	BSB	--	--	4.4	0.7	2023-07-20
PWREF	BSB	--	--	4.6	0.8	2023-07-20
PWREF	BSB	--	--	4.4	9	2023-07-20
PWREF	BSB	--	--	4.8	1.1	2023-07-20
PWREF	BSB	--	--	5	1.4	2023-07-20
PWREF	BSB	--	--	4.6	1.1	2023-07-20
PWREF	BSB	--	--	4.6	1	2023-07-20
PWREF	BSB	--	--	4.7	1.1	2023-07-20
PWREF	BSB	--	--	4.3	0.9	2023-07-20
PWREF	BSB	--	--	4	0.8	2023-07-20

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	BSB	--	--	4.8	1.1	2023-07-20
PWREF	BSB	--	--	4.7	1	2023-07-20
PWREF	BSB	--	--	4.1	0.8	2023-07-20
PWREF	BSB	--	--	4.8	1	2023-07-21
PWREF	BSB	--	--	3.9	0.6	2023-07-21
PWREF	BSB	--	--	3.2	0.3	2023-07-21
PWREF	BSB	--	--	4.4	1.1	2023-07-21
PWREF	BSB	--	--	4.5	0.9	2023-07-21
PWREF	BSB	--	--	4.4	0.9	2023-07-21
PWREF	BSB	--	--	4.6	1	2023-07-21
PWREF	BSB	--	--	5.1	1.3	2023-07-21
PWREF	BSB	--	--	4.5	0.8	2023-07-21
PWREF	BSB	--	--	4.3	0.7	2023-07-21
PWREF	BSB	--	--	4.8	0.9	2023-07-21
PWREF	BSB	--	--	4.9	1.2	2023-07-21
PWREF	BSB	--	--	5	1.6	2023-07-21
PWREF	BSB	--	--	4.7	1.3	2023-07-21
PWREF	BSB	--	--	4.3	0.7	2023-07-21
PWREF	BSB	--	--	4.2	0.9	2023-07-21
PWREF	BSB	--	--	4.9	1.1	2023-07-21
PWREF	BSB	--	--	4.8	0.9	2023-07-21
PWREF	BSB	--	--	4.4	1	2023-07-21
PWREF	BSB	--	--	53	1.3	2023-07-21
PWREF	BSB	--	--	4.5	0.9	2023-07-21
PWREF	BSB	--	--	3.7	0.5	2023-07-21
PWREF	BSB	--	--	4.3	0.9	2023-07-21
PWREF	BSB	--	--	5.6	1.3	2023-07-21
PWREF	BSB	--	--	4.7	2	2023-07-21
PWREF	BSB	--	--	4.7	0.6	2023-07-21
PWREF	BSB	--	--	5.2	1.3	2023-07-21
PWREF	BSB	--	--	3	0.3	2023-07-21
PWREF	BSB	--	--	4.7	1.2	2023-07-21
PWREF	BSB	--	--	4.5	1	2023-07-21
PWREF	BSB	--	--	4.6	1	2023-07-21
PWREF	BSB	--	--	4.4	0.9	2023-07-21
PWREF	BSB	--	--	4.6	1.2	2023-07-21
PWREF	BSB	--	--	3.4	0.5	2023-07-21
PWREF	BSB	--	--	4.4	1	2023-07-21
PWREF	BSB	--	--	3.1	0.4	2023-07-21
PWREF	BSB	--	--	4.3	0.9	2023-07-21
PWREF	BSB	--	--	4.4	0.9	2023-07-21
PWREF	BSB	--	--	4.6	1.1	2023-07-21
PWREF	BSB	--	--	4.4	0.7	2023-07-21
PWREF	BSB	--	--	4.7	0.9	2023-07-21
PWREF	BSB	--	--	4.1	0.7	2023-07-21
PWREF	BSB	--	--	4.3	0.8	2023-07-21
PWREF	BSB	--	--	4.8	0.9	2023-07-21
PWREF	BSB	--	--	4.3	0.9	2023-07-21
PWREF	BSB	--	--	4.6	0.9	2023-07-21
PWREF	BSB	--	--	4.7	0.8	2023-07-21
PWREF	BSB	--	--	3.6	0.6	2023-07-21
PWREF	BSB	--	--	5	1.3	2023-07-21
PWREF	BSB	--	--	2.6	0.1	2023-07-21
PWREF	BSD	--	--	6.8	3.1	2023-07-23
PWREF	BSD	--	--	3.8	0.3	2023-07-23
PWREF	BSD	--	--	2.9	0.3	2023-07-21
PWREF	CC	--	11.3	11.9	16.1	2023-07-21
PWREF	CC	--	6.1	6.6	2.5	2023-07-20
PWREF	CC	--	6.6	7.2	3.6	2023-07-20
PWREF	CC	--	6.4	7.1	3	2023-07-20
PWREF	CC	--	6.1	6.5	2.3	2023-07-20
PWREF	CC	--	6.4	6.7	2.8	2023-07-20
PWREF	CC	--	5.9	6.5	2.4	2023-07-20
PWREF	CC	--	4.7	5	1.2	2023-07-20
PWREF	CC	--	4.9	5.3	1.6	2023-07-20
PWREF	CC	--	6.6	7.2	2.9	2023-07-20
PWREF	CC	--	6.7	7.1	3.2	2023-07-20
PWREF	CC	--	5.7	5.6	1.6	2023-07-20
PWREF	CC	--	4.4	4.9	1	2023-07-20
PWREF	CC	--	6.3	6.7	2.6	2023-07-20

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	CC	--	7.1	7.7	3.9	2023-07-20
PWREF	CC	--	8.3	8.7	6.1	2023-07-20
PWREF	CC	--	6.4	6.7	2.5	2023-07-20
PWREF	CC	--	6.8	7.1	4.3	2023-07-20
PWREF	CC	--	6.1	6.6	2.1	2023-07-20
PWREF	CC	--	6.4	6.9	2.8	2023-07-20
PWREF	CC	--	8.4	9	7.4	2023-07-20
PWREF	CC	--	5.8	6.3	2.1	2023-07-20
PWREF	CC	--	5.8	6.2	--	2023-07-20
PWREF	CC	--	5.5	5.9	1.7	2023-07-20
PWREF	CC	--	4.5	4.9	1	2023-07-20
PWREF	CC	--	7.7	8.2	4.5	2023-07-20
PWREF	CC	--	5.2	5.6	1.5	2023-07-20
PWREF	CC	--	3.9	4.2	0.8	2023-07-21
PWREF	CC	--	3.7	4	0.6	2023-07-21
PWREF	CC	--	3.8	4.1	0.6	2023-07-21
PWREF	CC	--	2.9	3.2	0.4	2023-07-21
PWREF	CC	--	3.4	3.6	0.5	2023-07-21
PWREF	CC	--	3.3	3.5	0.5	2023-07-21
PWREF	CC	--	3.4	3.7	0.5	2023-07-21
PWREF	CC	--	3.6	3.9	0.6	2023-07-21
PWREF	CC	--	4.4	4.8	1.1	2023-07-21
PWREF	CC	--	3.5	3.7	0.4	2023-07-21
PWREF	CC	--	4.2	4.5	0.8	2023-07-21
PWREF	CC	--	3.4	3.7	0.6	2023-07-21
PWREF	CC	--	--	3.7	0.7	2023-07-21
PWREF	CC	--	3.4	3.6	0.4	2023-07-21
PWREF	CC	--	4.2	4.5	0.7	2023-07-21
PWREF	CC	--	4.3	4.6	0.9	2023-07-21
PWREF	CC	--	3.5	3.7	0.6	2023-07-21
PWREF	CC	--	3.4	3.6	0.5	2023-07-21
PWREF	CC	--	2.5	--	0.2	2023-07-21
PWREF	CC	--	2.8	3.1	0.2	2023-07-21
PWREF	CC	--	2.7	3	0.2	2023-07-21
PWREF	CC	--	2.6	2.9	0.2	2023-07-21
PWREF	CC	--	2.8	3.1	0.8	2023-07-21
PWREF	CC	--	2.7	2.9	0.2	2023-07-21
PWREF	CC	--	2.4	2.6	0.2	2023-07-21
PWREF	CC	--	2.6	2.8	0.1	2023-07-21
PWREF	CC	--	2.4	2.6	0.2	2023-07-21
PWREF	CC	--	2.5	2.7	0.2	2023-07-21
PWREF	CC	--	2.8	3	0.1	2023-07-21
PWREF	CC	--	2.4	2.6	0.1	2023-07-21
PWREF	CC	--	2.6	2.8	0.2	2023-07-21
PWREF	CC	--	2.6	3	0.2	2023-07-21
PWREF	CC	--	2.3	2.5	0.1	2023-07-21
PWREF	CC	--	2.6	2.9	0.2	2023-07-21
PWREF	CC	--	2.6	2.9	0.2	2023-07-21
PWREF	CC	--	2.2	2.4	0.1	2023-07-21
PWREF	CC	--	2.7	2.9	0.2	2023-07-21
PWREF	CC	--	2.6	2.8	0.3	2023-07-21
PWREF	CC	--	2.7	2.9	0.2	2023-07-21
PWREF	CC	--	2.6	2.9	0.3	2023-07-21
PWREF	CC	--	2.3	2.5	0.1	2023-07-21
PWREF	CC	--	2.2	2.5	0.2	2023-07-21
PWREF	CC	--	2.4	2.7	0.3	2023-07-21
PWREF	CC	--	2.4	2.7	0.2	2023-07-21
PWREF	CC	--	2.6	2.9	0.3	2023-07-21
PWREF	CC	--	2.4	2.6	0.2	2023-07-21
PWREF	CC	--	2.7	2.9	0.3	2023-07-21
PWREF	CC	--	2.5	2.7	0.2	2023-07-21
PWREF	CC	--	2.4	2.6	0.2	2023-07-21
PWREF	CMM	CMM-6	--	7.8	4.948	2023-07-21
PWREF	CMM	CMM-7	--	8.6	8.452	2023-07-22
PWREF	CMM	CMM-8	--	7.3	4.756	2023-07-22
PWREF	CMM	CMM-9	--	6.4	3.42	2023-07-22
PWREF	CMM	CMM-10	--	5.7	2.743	2023-07-22
PWREF	CMM	CMM-11	--	9.4	9.843	2023-07-23
PWREF	CMM	CMM-12	--	7.8	5.187	2023-07-23
PWREF	CMM	CMM-13	--	9.6	9.141	2023-07-23

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	CMM	CMM-14	--	8.1	5.733	2023-07-23
PWREF	CMM	CMM-1	--	8.1	5.273	2023-07-20
PWREF	CMM	CMM-2	--	6.2	2.598	2023-07-20
PWREF	CMM	CMM-3	--	8.5	6.885	2023-07-20
PWREF	CMM	CMM-4	--	6.3	2.485	2023-07-20
PWREF	CMM	CMM-5	--	5.9	2.558	2023-07-20
PWREF	CMM	--	--	7.7	5.1	2023-07-23
PWREF	CMM	--	--	4.9	1.5	2023-07-23
PWREF	CMM	--	--	6.7	3	2023-07-23
PWREF	CMM	--	--	6.8	2.9	2023-07-23
PWREF	CMM	--	--	6.4	2.7	2023-07-23
PWREF	CMM	--	--	4.6	1.2	2023-07-23
PWREF	CMM	--	--	5.2	1.6	2023-07-23
PWREF	CMM	--	--	5.4	1.9	2023-07-23
PWREF	CMM	--	--	5.4	2	2023-07-23
PWREF	CMM	--	--	5.7	1.9	2023-07-23
PWREF	CMM	--	--	4.8	1.4	2023-07-23
PWREF	CMM	--	--	5.3	1.8	2023-07-23
PWREF	CMM	--	--	6.7	3.1	2023-07-23
PWREF	CMM	--	--	4.9	1.3	2023-07-23
PWREF	CMM	--	--	6.6	3.3	2023-07-23
PWREF	CMM	--	--	5.4	1.6	2023-07-23
PWREF	CMM	--	--	4.9	1.4	2023-07-23
PWREF	CMM	--	--	5.8	2.3	2023-07-23
PWREF	CMM	--	--	6.5	3.1	2023-07-23
PWREF	CMM	--	--	6.1	2.4	2023-07-23
PWREF	CMM	--	--	6.9	3.9	2023-07-23
PWREF	CMM	--	--	4.3	0.9	2023-07-23
PWREF	CMM	--	--	6.1	2.9	2023-07-23
PWREF	CMM	--	--	7	3.5	2023-07-23
PWREF	CMM	--	--	7.4	4.4	2023-07-23
PWREF	CMM	--	--	6.7	3.5	2023-07-23
PWREF	CMM	--	--	4.4	0.9	2023-07-23
PWREF	CMM	--	--	5	1.4	2023-07-23
PWREF	CMM	--	--	4.5	1.2	2023-07-23
PWREF	CMM	--	--	6.9	3.2	2023-07-23
PWREF	CMM	--	--	5.1	1.6	2023-07-23
PWREF	CMM	--	--	4.8	1.3	2023-07-23
PWREF	CMM	--	--	4.9	1.4	2023-07-23
PWREF	CMM	--	--	6.3	2.8	2023-07-23
PWREF	CMM	--	--	6.7	3.4	2023-07-23
PWREF	CMM	--	--	4.6	1.3	2023-07-23
PWREF	CMM	--	--	4.9	1.2	2023-07-23
PWREF	CMM	--	--	4.8	3.6	2023-07-23
PWREF	CMM	--	--	4.8	1.1	2023-07-20
PWREF	CMM	--	--	4.5	1	2023-07-20
PWREF	CMM	--	--	5.5	1.9	2023-07-20
PWREF	CMM	--	--	4.9	1.4	2023-07-20
PWREF	CMM	--	--	4.6	1	2023-07-22
PWREF	CMM	--	--	4.7	1.5	2023-07-22
PWREF	CMM	--	--	4.4	0.9	2023-07-22
PWREF	CMM	--	--	4.2	0.9	2023-07-22
PWREF	CMM	--	--	4.5	0.8	2023-07-22
PWREF	CMM	--	--	4.6	1.1	2023-07-22
PWREF	CMM	--	--	4.4	0.8	2023-07-22
PWREF	CMM	--	--	4.3	0.8	2023-07-22
PWREF	CS	CS-31	5.6	--	2.342	2023-07-21
PWREF	CS	CS-32	5.7	--	2.277	2023-07-21
PWREF	CS	CS-33	5.7	--	2.938	2023-07-21
PWREF	CS	CS-34	5.5	--	2.061	2023-07-21
PWREF	CS	CS-35	6.2	--	3.308	2023-07-21
PWREF	CS	CS-36	6	--	2.649	2023-07-21
PWREF	CS	CS-37	9.4	--	17.575	2023-07-21
PWREF	CS	CS-38	5.4	--	1.92	2023-07-21
PWREF	CS	CS-39	5.2	--	1.651	2023-07-21
PWREF	CS	CS-40	5.3	--	1.755	2023-07-21
PWREF	CS	CS-41	5.3	--	1.873	2023-07-21
PWREF	CS	CS-42	5.2	--	1.898	2023-07-21
PWREF	CS	CS-43	5.1	--	1.738	2023-07-21
PWREF	CS	CS-44	5.4	--	2.238	2023-07-21

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	CS	CS-45	5	--	1.772	2023-07-21
PWREF	CS	CS-46	5.6	--	2.191	2023-07-21
PWREF	CS	CS-47	6.9	--	4.488	2023-07-21
PWREF	CS	CS-48	5.6	--	2.222	2023-07-21
PWREF	CS	CS-49	5.4	--	1.978	2023-07-21
PWREF	CS	CS-50	5.3	--	--	2023-07-21
PWREF	CS	CS-51	5.4	--	1.974	2023-07-21
PWREF	CS	CS-52	12.8	--	27.965	2023-07-22
PWREF	CS	CS-53	11	--	18.436	2023-07-22
PWREF	CS	CS-54	11.4	--	19.622	2023-07-22
PWREF	CS	CS-55	12.5	--	26.792	2023-07-22
PWREF	CS	CS-56	12.7	--	28.194	2023-07-22
PWREF	CS	CS-1	9.6	--	13.85	2023-07-20
PWREF	CS	CS-2	5.1	--	1.66	2023-07-20
PWREF	CS	CS-3	9.1	--	11.231	2023-07-20
PWREF	CS	CS-4	5.4	--	2.061	2023-07-20
PWREF	CS	CS-5	5.4	--	1.9	2023-07-20
PWREF	CS	CS-6	7.2	--	4.343	2023-07-20
PWREF	CS	CS-7	5.9	--	2.33	2023-07-20
PWREF	CS	CS-8	9.2	--	9.226	2023-07-20
PWREF	CS	CS-9	9.8	--	12.083	2023-07-20
PWREF	CS	CS-10	6.2	--	2.52	2023-07-20
PWREF	CS	CS-11	9.7	--	11.158	2023-07-20
PWREF	CS	CS-12	5.2	--	1.824	2023-07-20
PWREF	CS	CS-13	9.7	--	11.526	2023-07-20
PWREF	CS	CS-14	10.4	--	14.806	2023-07-20
PWREF	CS	CS-15	6.8	--	3.273	2023-07-20
PWREF	CS	CS-16	6.1	--	2.968	2023-07-20
PWREF	CS	CS-17	5.8	--	2.143	2023-07-20
PWREF	CS	CS-18	5.5	--	2.413	2023-07-20
PWREF	CS	CS-19	6.8	--	4.03	2023-07-20
PWREF	CS	CS-20	4.9	--	1.367	2023-07-20
PWREF	CS	CS-21	5.3	--	2	2023-07-20
PWREF	CS	CS-22	10.9	--	16.644	2023-07-20
PWREF	CS	CS-23	6.2	--	2.565	2023-07-20
PWREF	CS	CS-24	6.1	--	2.953	2023-07-20
PWREF	CS	CS-25	4.9	--	1.346	2023-07-20
PWREF	CS	CS-26	6	--	1.79	2023-07-20
PWREF	CS	CS-27	6.4	--	3.075	2023-07-20
PWREF	CS	CS-28	10.4	--	19.228	2023-07-21
PWREF	CS	CS-29	5.2	--	1.879	2023-07-21
PWREF	CS	CS-30	6.5	--	3.941	2023-07-21
PWREF	CS	--	5.1	5.5	1.4	2023-07-20
PWREF	CS	--	4.6	4.9	0.7	2023-07-20
PWREF	CS	--	4.9	5.4	0.9	2023-07-20
PWREF	CS	--	4.6	5.2	1.1	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	4.8	5.1	1.1	2023-07-20
PWREF	CS	--	4.8	5.2	1.1	2023-07-20
PWREF	CS	--	5.7	6.1	1.9	2023-07-20
PWREF	CS	--	4.9	5.4	1.4	2023-07-20
PWREF	CS	--	4.4	4.9	0.8	2023-07-20
PWREF	CS	--	4.3	5.1	1.1	2023-07-20
PWREF	CS	--	4.8	5.2	1	2023-07-20
PWREF	CS	--	5	8.6	1.1	2023-07-20
PWREF	CS	--	4.7	5.2	1.1	2023-07-20
PWREF	CS	--	4.6	5.2	1.2	2023-07-20
PWREF	CS	--	4.4	4.9	1	2023-07-20
PWREF	CS	--	4.7	5.1	1.3	2023-07-20
PWREF	CS	--	5.1	5.6	1.4	2023-07-20
PWREF	CS	--	4.6	5.1	0.9	2023-07-20
PWREF	CS	--	4.4	4.9	0.9	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	5	5.6	1.4	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	4.5	4.9	0.8	2023-07-20
PWREF	CS	--	4.8	5.3	1.3	2023-07-20
PWREF	CS	--	4.9	5.4	1.1	2023-07-20

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	CS	--	4.6	5.1	0.9	2023-07-20
PWREF	CS	--	4.9	5.4	1.2	2023-07-20
PWREF	CS	--	4.7	5.1	0.9	2023-07-20
PWREF	CS	--	4.6	5.1	0.9	2023-07-20
PWREF	CS	--	4.7	5.4	1.2	2023-07-20
PWREF	CS	--	4.9	5.3	1.2	2023-07-20
PWREF	CS	--	4.5	4.9	0.8	2023-07-21
PWREF	CS	--	4.5	4.9	1.1	2023-07-21
PWREF	CS	--	4.4	4.9	0.9	2023-07-21
PWREF	CS	--	4.4	4.9	1.2	2023-07-21
PWREF	CS	--	5	5.4	--	2023-07-21
PWREF	CS	--	4.5	5	1.1	2023-07-21
PWREF	CS	--	4.7	5.1	1.1	2023-07-21
PWREF	CS	--	4.9	5.4	1.3	2023-07-21
PWREF	CS	--	4.8	5.3	1.1	2023-07-21
PWREF	CS	--	4.7	5	1.2	2023-07-21
PWREF	CS	--	4.6	5	1.1	2023-07-21
PWREF	CS	--	4.3	4.7	1.1	2023-07-21
PWREF	CS	--	4.5	4.9	0.9	2023-07-21
PWREF	CS	--	4.4	4.7	0.9	2023-07-21
PWREF	CS	--	4.4	4.7	0.8	2023-07-21
PWREF	CS	--	4.9	5.3	1.4	2023-07-21
PWREF	CS	--	4.2	4.5	0.7	2023-07-21
PWREF	CS	--	4.4	4.9	1	2023-07-21
PWREF	CS	--	4.7	5.1	1.1	2023-07-21
PWREF	CS	--	4.6	5.1	1.1	2023-07-21
PWREF	CS	--	4.9	5.4	1.1	2023-07-21
PWREF	CS	--	4.5	5.1	1	2023-07-21
PWREF	CS	--	4.7	5.1	1.1	2023-07-21
PWREF	CS	--	4.7	5.1	1.2	2023-07-21
PWREF	CS	--	4.8	5.3	1.2	2023-07-21
PWREF	CS	--	4.8	5.4	1.3	2023-07-21
PWREF	CS	--	4.7	5.2	1.2	2023-07-21
PWREF	CS	--	4.6	5.1	1.2	2023-07-21
PWREF	CS	--	4.7	5.1	1	2023-07-21
PWREF	CS	--	4.7	5.2	1	2023-07-21
PWREF	CS	--	4.3	4.6	0.6	2023-07-21
PWREF	CS	--	4.9	5.4	1.3	2023-07-21
PWREF	CS	--	4.7	5.2	1.2	2023-07-21
PWREF	CS	--	4.5	4.9	0.9	2023-07-21
PWREF	CS	--	4.8	5.1	1.2	2023-07-21
PWREF	CS	--	4.6	4.9	1.1	2023-07-21
PWREF	CS	--	4.7	5.2	1.3	2023-07-21
PWREF	CS	--	4.9	5.4	1.2	2023-07-21
PWREF	CS	--	4.6	4.9	1	2023-07-21
PWREF	CS	--	4.5	4.9	1	2023-07-21
PWREF	CS	--	4.8	5.2	1.2	2023-07-21
PWREF	CS	--	4.9	5.4	1.4	2023-07-21
PWREF	CS	--	4.4	4.9	0.9	2023-07-21
PWREF	CS	--	4.5	4.9	1.1	2023-07-21
PWREF	CS	--	4.8	5.2	1.2	2023-07-21
PWREF	CS	--	4.8	5.3	1.2	2023-07-21
PWREF	CS	--	4.3	4.7	0.9	2023-07-21
PWREF	FSD	--	2.8	3	0.2	2023-07-23
PWREF	FSD	--	2.4	2.6	0.1	2023-07-23
PWREF	FSD	--	4.6	4.9	0.9	2023-07-20
PWREF	FSD	--	4.3	4.6	0.9	2023-07-20
PWREF	FSD	--	4.8	5.2	1.4	2023-07-20
PWREF	FSD	--	3.4	3.6	0.6	2023-07-21
PWREF	FSD	--	3.3	3.5	0.4	2023-07-21
PWREF	FSD	--	4	4.4	0.7	2023-07-21
PWREF	FSD	--	4	4.4	0.7	2023-07-21
PWREF	FSD	--	4.4	4.6	1.1	2023-07-21
PWREF	FSD	--	3.9	4.3	--	2023-07-21
PWREF	FSD	--	3.9	4.1	0.8	2023-07-21
PWREF	FSD	--	4.3	4.6	1	2023-07-22
PWREF	FSD	--	4.8	5.1	1.3	2023-07-22
PWREF	FSD	--	4.1	4.4	0.7	2023-07-22
PWREF	FSD	--	2.7	2.9	5.7	2023-07-22
PWREF	FSD	--	4.1	4.4	0.6	2023-07-22

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	FSD	--	3.5	3.7	0.3	2023-07-22
PWREF	FSD	--	3.6	3.9	6.5	2023-07-22
PWREF	GS	--	9.6	10.6	11.3	2023-07-21
PWREF	GS	--	6.3	6.9	2.8	2023-07-20
PWREF	GS	--	6.3	6.9	3	2023-07-20
PWREF	JD	--	--	5.5	1.4	2023-07-23
PWREF	JD	--	--	5.2	1.3	2023-07-22
PWREF	JD	--	--	6.5	2.4	2023-07-22
PWREF	JD	--	--	5.8	1.7	2023-07-22
PWREF	JD	--	--	5.1	1.4	2023-07-22
PWREF	JD	--	--	5.9	1.7	2023-07-22
PWREF	JD	--	--	5.9	1.6	2023-07-22
PWREF	NP	--	32.5	34.4	245	2023-07-21
PWREF	NP	--	37.4	39.3	440	2023-07-21
PWREF	NP	--	34.6	38.4	365	2023-07-21
PWREF	NP	--	33.6	36	325	2023-07-21
PWREF	NP	--	32.6	34.2	295	2023-07-21
PWREF	NP	--	33.7	36	295	2023-07-21
PWREF	NP	--	35.2	37.9	370	2023-07-21
PWREF	NP	--	36.2	38.2	401	2023-07-21
PWREF	NP	--	38.3	42.6	510	2023-07-21
PWREF	NP	--	32.4	36.1	311	2023-07-21
PWREF	NP	--	31.4	35.2	281	2023-07-21
PWREF	NP	--	36.8	39.1	382	2023-07-21
PWREF	NPD	--	6	6.4	2.4	2023-07-20
PWREF	NRBD	--	4.9	5.3	1.2	2023-07-23
PWREF	NRBD	--	4.1	4.4	--	2023-07-23
PWREF	NRBD	--	5	5.4	1.3	2023-07-20
PWREF	NRBD	--	5.3	5.5	1.8	2023-07-20
PWREF	NRBD	--	5.1	5.4	1.9	2023-07-20
PWREF	NRBD	--	5.2	5.5	1.5	2023-07-20
PWREF	NRBD	--	4.3	4.5	0.9	2023-07-20
PWREF	NRBD	--	5.1	5.5	1.5	2023-07-20
PWREF	NRBD	--	4	4.4	0.9	2023-07-20
PWREF	NRBD	--	4.4	4.6	1.1	2023-07-20
PWREF	NRBD	--	4.9	5.3	1.5	2023-07-20
PWREF	NRBD	--	5.3	5.6	1.4	2023-07-20
PWREF	NRBD	--	5.2	5.5	1.6	2023-07-20
PWREF	NRBD	--	4.4	4.7	1	2023-07-20
PWREF	NRBD	--	5.1	5.4	1.5	2023-07-20
PWREF	NRBD	--	5.5	5.8	1.8	2023-07-20
PWREF	NRBD	--	4.4	4.6	0.8	2023-07-20
PWREF	NRBD	--	4.6	4.8	1	2023-07-20
PWREF	NRBD	--	4.3	4.6	0.9	2023-07-20
PWREF	NRBD	--	5.4	5.6	1.8	2023-07-20
PWREF	NRBD	--	4.2	4.5	0.9	2023-07-20
PWREF	NRBD	--	5.1	5.4	1.3	2023-07-20
PWREF	NRBD	--	5.3	5.6	1.9	2023-07-20
PWREF	NRBD	--	4.3	4.5	1	2023-07-20
PWREF	NRBD	--	4.4	4.7	1.4	2023-07-20
PWREF	NRBD	--	5.2	5.5	1.5	2023-07-20
PWREF	NRBD	--	4.7	5.1	1.2	2023-07-20
PWREF	NRBD	--	4.7	5	1.3	2023-07-20
PWREF	NRBD	--	4.7	5.1	1.2	2023-07-20
PWREF	NRBD	--	4.5	4.9	1	2023-07-20
PWREF	NRBD	--	5.4	5.7	1.9	2023-07-20
PWREF	NRBD	--	5.3	5.6	1.7	2023-07-20
PWREF	NRBD	--	4.1	4.4	0.9	2023-07-20
PWREF	NRBD	--	4.7	5.1	1.7	2023-07-20
PWREF	NRBD	--	4.6	4.9	0.8	2023-07-20
PWREF	NRBD	--	4.9	5.2	1.2	2023-07-20
PWREF	NRBD	--	4.4	4.7	1	2023-07-20
PWREF	NRBD	--	5.4	5.7	2	2023-07-20
PWREF	NRBD	--	5.3	5.6	1.9	2023-07-20
PWREF	NRBD	--	4.2	4.5	0.9	2023-07-20
PWREF	NRBD	--	5.1	5.4	1.4	2023-07-20
PWREF	NRBD	--	4.9	5.2	1.3	2023-07-20
PWREF	NRBD	--	4.7	5	1.3	2023-07-20
PWREF	NRBD	--	4.8	5.1	1.2	2023-07-20
PWREF	NRBD	--	5.2	5.5	1.8	2023-07-20

Area	Species	FishID	ForkLength (cm)	TotalLength (cm)	BodyWeight (g)	Date
PWREF	NRBD	--	4.4	4.7	1.1	2023-07-20
PWREF	NRBD	--	5.1	5.4	1.7	2023-07-20
PWREF	NRBD	--	5	5.3	1.8	2023-07-20
PWREF	NRBD	--	5	5.4	1.4	2023-07-20
PWREF	NRBD	--	4.3	4.6	1	2023-07-20
PWREF	NRBD	--	5.3	5	1.9	2023-07-20
PWREF	NRBD	--	4.6	4.9	1.2	2023-07-20
PWREF	NRBD	--	4.5	4.8	1	2023-07-20
PWREF	NRBD	--	3.8	4.1	0.6	2023-07-21
PWREF	NRBD	--	3.7	3.9	0.6	2023-07-21
PWREF	NRBD	--	3.8	4.1	0.7	2023-07-21
PWREF	NRBD	--	4.1	4.4	0.8	2023-07-21
PWREF	NRBD	--	4.6	4.9	1.2	2023-07-21
PWREF	NRBD	--	3.8	4.1	0.7	2023-07-21
PWREF	NRBD	--	4.4	4.7	0.7	2023-07-21
PWREF	NRBD	--	4.3	4.5	0.9	2023-07-21
PWREF	NRBD	--	4.6	4.9	1.2	2023-07-21
PWREF	NRBD	--	4	4.3	0.8	2023-07-21
PWREF	NRBD	--	4.8	5.1	1.1	2023-07-21
PWREF	NRBD	--	4.1	4.4	0.6	2023-07-21
PWREF	NRBD	--	3.7	4	0.6	2023-07-21
PWREF	NRBD	--	3.8	4.2	0.7	2023-07-21
PWREF	NRBD	--	4.4	4.7	0.3	2023-07-21
PWREF	NRBD	--	3.8	4	--	2023-07-21
PWREF	NRBD	--	3.9	4.2	0.7	2023-07-21
PWREF	NRBD	--	3.5	3.8	0.2	2023-07-21
PWREF	NRBD	--	3.4	3.6	0.2	2023-07-21
PWREF	NRBD	--	3.7	4	0.9	2023-07-21
PWREF	NRBD	--	3.4	3.6	0.8	2023-07-21
PWREF	NRBD	--	3.8	4.2	0.7	2023-07-22
PWREF	NRBD	--	3.9	4.2	--	2023-07-22
PWREF	NRBD	--	3.8	4.1	0.3	2023-07-22
PWREF	NRBD	--	3.7	3.9	0.4	2023-07-22
PWREF	NRBD	--	3.7	3.9	0.5	2023-07-22
PWREF	NRBD	--	4	4.3	0.7	2023-07-22
PWREF	NRBD	--	3.4	3.7	0.5	2023-07-22
PWREF	NRBD	--	4.1	4.4	0.7	2023-07-22
PWREF	NRBD	--	4	4.3	0.8	2023-07-22
PWREF	NRBD	--	4.7	4.9	0.6	2023-07-22
PWREF	NRBD	--	4	4.3	0.7	2023-07-22
PWREF	NRBD	--	3.7	4	0.6	2023-07-22
PWREF	NRBD	--	3.8	4.1	0.6	2023-07-22
PWREF	NRBD	--	4.3	4.5	0.7	2023-07-22
PWREF	NRBD	--	3.9	4.2	0.6	2023-07-22
PWREF	NRBD	--	3.8	4.1	0.5	2023-07-22
PWREF	NRBD	--	4.2	4.5	0.6	2023-07-22
PWREF	NRBD	--	3.7	3.9	0.5	2023-07-22
PWREF	NRBD	--	4.1	4.4	0.5	2023-07-22
PWREF	WS	--	10.3	11	13	2023-07-23
PWREF	WS	--	9.5	10.2	10.7	2023-07-23
PWREF	WS	--	10.9	11.6	15.4	2023-07-21
PWREF	WS	--	20.9	22.2	119.1	2023-07-21
PWREF	WS	--	10.2	10.8	12.3	2023-07-21
PWREF	WS	--	8.9	9	8.1	2023-07-20
PWREF	WS	--	8.6	9	7	2023-07-20
PWREF	WS	--	7.7	8.1	5.1	2023-07-20
PWREF	WS	--	9.1	9.4	8.4	2023-07-21
PWREF	WS	--	7.7	8.2	5.4	2023-07-21
PWREF	WS	--	8.6	9.1	7.4	2023-07-22
PWREF	WS	--	6.6	6.9	3.1	2023-07-22
PWREF	WS	--	7.4	8	4.6	2023-07-22
PWREF	WS	--	7.1	7.5	3.9	2023-07-22
PWREF	WS	--	7.6	8.1	4.9	2023-07-22
PWREF	WS	--	7.4	7.9	4.4	2023-07-22
PWREF	WS	--	7.8	8.2	5.7	2023-07-22
PWREF	WS	--	8.3	8.7	8.1	2023-07-22
PWREF	WS	--	7.7	8	9.4	2023-07-22
PWREF	WS	--	8.7	9.3	7.4	2023-07-22
PWREF	WS	--	9.8	10.3	11	2023-07-22

Table B–7: Fish measurements for PWNF,July 2023

Date	Site	Species	FishID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Notes
7/22/2023	PINRNF	Central Mudminnow	CMM-1	5.8	-	2.296	
7/22/2023	PINRNF	Central Mudminnow	CMM-2	5.8	-	2.159	
7/22/2023	PINRNF	Central Mudminnow	CMM-3	7.3	-	4.564	
7/22/2023	PINRNF	Central Mudminnow	CMM-4	5.7	-	2.175	
7/22/2023	PINRNF	Central Mudminnow	CMM-5	5	-	1.409	
7/22/2023	PINRNF	Central Mudminnow	CMM-6	5.5	-	1.705	
7/22/2023	PINRNF	Central Mudminnow	CMM-7	5.3	-	1.471	
7/22/2023	PINRNF	Central Mudminnow	CMM-8	10.6	-	13.253	
7/23/2023	PINRNF	Central Mudminnow	CMM-9	8.4	-	6.436	
7/23/2023	PINRNF	Central Mudminnow	CMM-10	5.6	-	2.203	
7/23/2023	PINRNF	Central Mudminnow	CMM-11	5	-	1.362	
7/22/2023	PINRNFEF03	Central Mudminnow	CMM	4.6	-	1	
7/18/2023	PINRNF	Common Shiner	CS-1	-	8.6	7.25	
7/18/2023	PINRNF	Common Shiner	CS-2	-	4.8	1.103	
7/18/2023	PINRNF	Common Shiner	CS-3	-	7.1	4.389	
7/18/2023	PINRNF	Common Shiner	CS-4	-	9.4	10.622	
7/18/2023	PINRNF	Common Shiner	CS-5	-	4.8	1.109	
7/18/2023	PINRNF	Common Shiner	CS-6	-	7.3	4.301	Weight taken after dissection but all pieces put back on
7/18/2023	PINRNF	Common Shiner	CS-7	-	6.6	3.482	
7/18/2023	PINRNF	Common Shiner	CS-8	-	8.6	7.505	
7/18/2023	PINRNF	Common Shiner	CS-9	-	9.7	10.539	Gravid Female
7/18/2023	PINRNF	Common Shiner	CS-10	-	11.8	19.975	
7/23/2023	PINRNF	Common Shiner	CS-11	-	5.5	1.877	
7/23/2023	PINRNF	Common Shiner	CS-12	-	5.2	1.392	Weight taken after dissection
7/23/2023	PINRNF	Common Shiner	CS-13	-	12.6	27.238	
7/23/2023	PINRNF	Common Shiner	CS-14	-	10.7	15.56	
7/22/2023	PINRNFEF03	Common Shiner	CS	-	3.1	0.3	
7/18/2023	PINRNFSN03	Common Shiner	CS	3.6	3.3	0.5	
7/18/2023	PINRNFSN03	Common Shiner	CS	3.5	3.2	0.3	
7/18/2023	PINRNFSN03-04	Common Shiner	CS	6.7	5.9	2.3	
7/18/2023	PINRNFSN03-05	Common Shiner	CS	6.2	5.5	2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.8	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.7	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.9	0.3	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.2	

Date	Site	Species	FishID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Notes
7/24/2023	PINRNFSN13	Common Shiner	CS	-	3	0.3	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	3.2	0.4	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	1.9	0.1	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.9	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.7	0.3	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.5	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.5	0.1	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	3.1	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.1	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.6	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.8	0.2	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	3.3	0.4	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.3	0.1	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.3	0.1	
7/24/2023	PINRNFSN13	Common Shiner	CS	-	2.9	0.3	
7/24/2023	PINRNFSN15	Common Shiner	CS	-	3.3	0.4	

Table C–8: Fish measurements for PWFF,July 2023

Date	Site	Species	FishID	Total Length (cm)	Fork Length (cm)	Body Weight (g)	Notes
7/20/2023	PINRFF	Central Mudminnow	CMM-1	6	-	2.333	
7/21/2023	PINRFF	Central Mudminnow	CMM-2	5.7	-	2.08	
7/21/2023	PINRFF	Central Mudminnow	CMM-3	5.7	-	2.101	
7/21/2023	PINRFF	Central Mudminnow	CMM-4	5.1	-	1.453	
7/20/2023	PINRFFSN02	Central Mudminnow	CMM-1	6	-	2.1	
7/20/2023	PINRFF	Common Shiner	CS-1	-	7.6	5.65	
7/20/2023	PINRFF	Common Shiner	CS-2	-	5.2	1.593	Parasites
7/21/2023	PINRFF	Common Shiner	CS-3	-	4.7	1.2	
7/21/2023	PINRFF	Common Shiner	CS-4	-	7.8	5.29	
7/20/2023	PINRFFSN04	Common Shiner	CS-1	-	2.7	0.2	Parasites and black spots

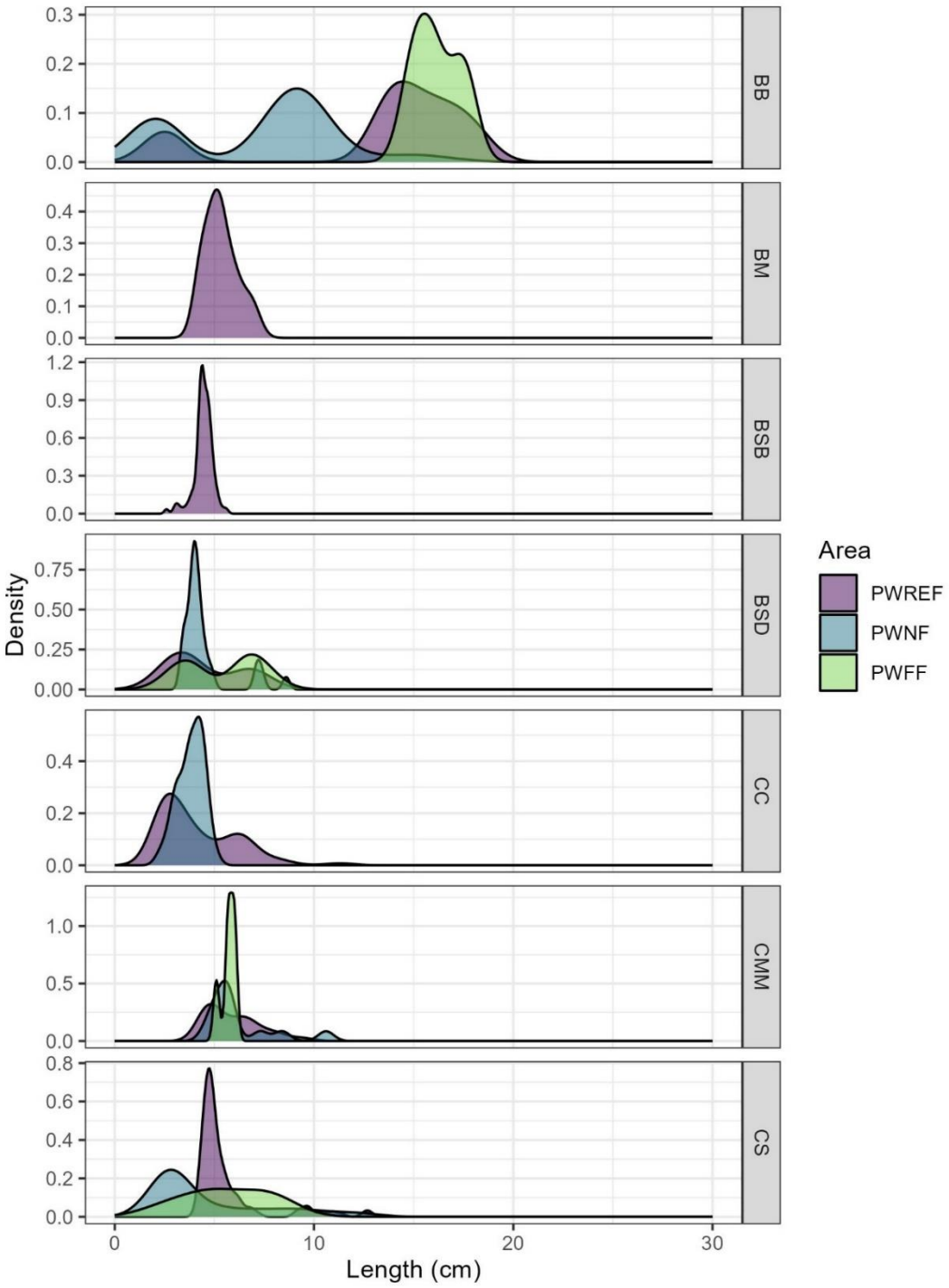

Figure B–1: Density-length plots of species length (total or fork length, species dependent) at PWREF, PWNF, PWFF in 2023. The curve represents the proportion of the data in each range. Fish species are Brown Bullhead (BB), Brassy Minnow (BM), Brook Stickleback (BSB), Blacksided Darter (BSD), Creek Chub (CC), Central Mudminnow (CMM), and Common Shiner (CS).

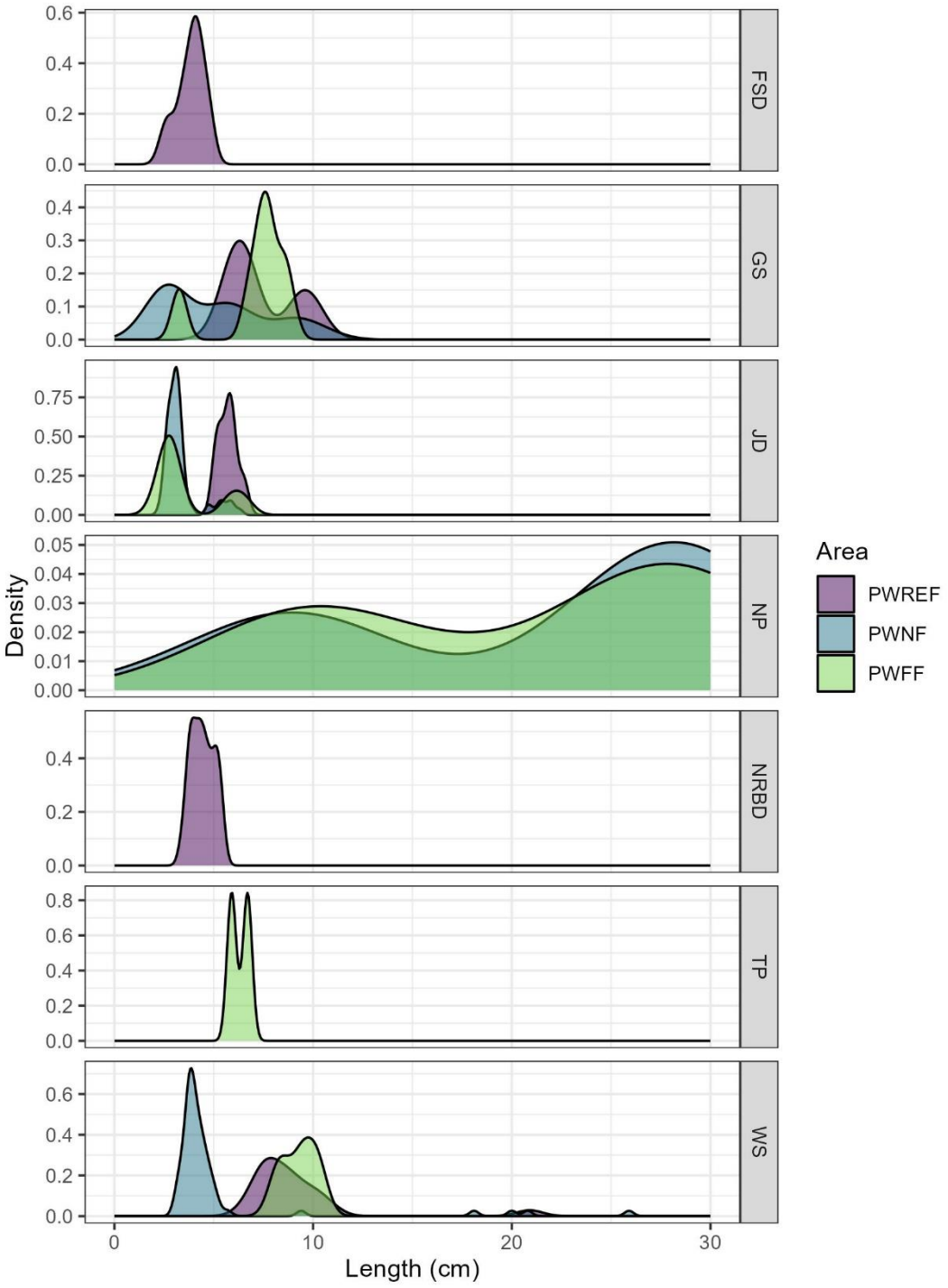

Figure B–2: Density-length plots of species length (total or fork length, species dependent) at PWREF, PWNF, PWFF in 2023. The curve represents the proportion of the data in each range. Species are: Finescale Dace (FSD), Golden Shiner (GS), Johnny Darter (JD), Northern Pike (NP), Northern Redbelly Dace (NRBD) Trout Perch (TP), White Sucker (WS). Species not presented because their sample size were low are Logperch (LP), Northern Pearl Dace (NPD), Rock Bass (RB), Shorthead Redhorse (SHRH) and juvenile Cyprinid YOY (YOY).

Appendix C Detailed Data – Fish Tissue Analysis

Table C–1: Fish measurements for tissue analysis, 2019–2023.

Species	Year	Location	FishID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Tissue Mercury (mg/kg)
CS	2019	PWREF	PW-REF-CS-01	7.5	8.3	5.42	1	--
CS	2019	PWREF	PW-REF-CS-02	6.4	6.8	1.93	1	--
CS	2019	PWREF	PW-REF-CS-03	5.5	5.9	1.84	0	--
CS	2019	PWREF	PW-REF-CS-04	5.7	6.2	1.85	1	--
CS	2019	PWREF	PW-REF-CS-05	3.6	3.9	0.46	0	--
CS	2019	PWREF	PW-REF-CS-06	3.8	4	0.4	0	--
CS	2019	PWREF	PW-REF-CS-07	5.3	5.8	1.53	1	--
CS	2019	PWREF	PW-REF-CS-08	7.1	7.6	3.85	1	--
CS	2019	PWREF	PW-REF-CS-09	7.8	8.2	4.77	1	--
CS	2019	PWREF	PW-REF-CS-10	5.8	6.2	1.67	1	--
CS	2019	PWREF	PW-REF-CS-11	5.8	6.1	1.86	1	--
CS	2019	PWREF	PW-REF-CS-12	7.6	8.2	4.55	2	--
CS	2019	PWREF	PW-REF-CS-13	7	7.6	3.93	1	--
CS	2019	PWREF	PW-REF-CS-14	8	8.6	5.9	2	--
CS	2019	PWREF	PW-REF-CS-15	7.8	8.5	5.96	2	--
CS	2019	PWREF	PW-REF-CS-16	7.4	8	4.3	2	--
CS	2019	PWREF	PW-REF-CS-17	7	7.5	3.79	2	--
CS	2019	PWREF	PW-REF-CS-18	7.2	7.6	4.25	1	--
CS	2019	PWREF	PW-REF-CS-19	7	7.6	3.99	2	--
CS	2019	PWREF	PW-REF-CS-20	6.8	7.2	3.77	2	--
CS	2019	PWREF	PW-REF-CS-21	6.9	7.4	3.57	2	--
CS	2019	PWREF	PW-REF-CS-22	8	8.5	6.04	1	--
CS	2019	PWREF	PW-REF-CS-23	7	7.7	4.36	1	--
CS	2019	PWREF	PW-REF-CS-24	6.8	7.3	3.95	2	--
CS	2019	PWREF	PW-REF-CS-25	7.7	8.2	4.41	2	--
CS	2019	PWREF	PW-REF-CS-26	7.2	7.7	4.29	2	--
CS	2019	PWREF	PW-REF-CS-27	7	7.7	4.14	1	--
CS	2019	PWREF	PW-REF-CS-28	7	7.4	4.13	3	--
CS	2019	PWREF	PW-REF-CS-29	6.9	7.4	3.46	2	--
CS	2019	PWREF	PW-REF-CS-30	7	7.7	3.93	2	--
CS	2019	PWREF	PW-REF-CS-31	6.4	6.8	2.46	2	--
CS	2019	PWREF	PW-REF-CS-32	7.5	8.1	4.88	1	--
CS	2019	PWREF	PW-REF-CS-33	7.1	7.6	3.27	2	--
CS	2019	PWREF	PW-REF-CS-34	7.4	7.9	3.91	2	--
CS	2019	PWREF	PW-REF-CS-35	6.8	7.3	2.97	2	--
CS	2019	PWREF	PW-REF-CS-36	7.4	7.8	4.03	1	--
CS	2019	PWREF	PW-REF-CS-37	7	7.5	3.91	3	--
CS	2019	PWREF	PW-REF-CS-38	7.5	7.9	6.25	1	--
CS	2019	PWREF	PW-REF-CS-39	8	8.5	4.47	2	--
CS	2019	PWREF	PW-REF-CS-40	7	7.4	4.19	2	--
CS	2019	PWREF	PW-REF-CS-41	7.8	8.4	6.09	2	--
CS	2019	PWREF	PW-REF-CS-42	6.3	6.7	2.31	2	--
CS	2019	PWREF	PW-REF-CS-43	7.4	7.8	4.04	1	--
CS	2019	PWREF	PW-REF-CS-44	7.1	7.5	3.62	1	--
CS	2019	PWREF	PW-REF-CS-45	7.9	8.3	5.83	2	--
CS	2019	PWREF	PW-REF-CS-46	7	7.5	3.51	3	--
CS	2019	PWREF	PW-REF-CS-47	6.8	7.3	3.44	1	--
CS	2019	PWREF	PW-REF-CS-48	5	5.3	1.09	1	--
CS	2019	PWREF	PW-REF-CS-49	7	7.8	3.86	2	--
CS	2019	PWREF	PW-REF-CS-50	7.7	8.2	5.14	2	--
CS	2019	PWNF	PW-NF-CS-01	9.3	10.1	8.587	3	0.7
CS	2019	PWNF	PW-NF-CS-02	11.8	12.6	23.534	3	0.28
CS	2019	PWNF	PW-NF-CS-03	9.6	10.3	11.007	2	0.49
CS	2019	PWNF	PW-NF-CS-04	10.6	11.5	16.536	3	0.27
CS	2019	PWNF	PW-NF-CS-05	8.7	9.5	9.148	1	0.37
CS	2019	PWNF	PW-NF-CS-06	9.7	10.5	11.136	1	0.41
CS	2019	PWNF	PW-NF-CS-07	10	10.7	13.476	2	0.48
CS	2019	PWNF	PW-NF-CS-08	7	7.7	3.671	1	0.45
CS	2019	PWNF	PW-NF-CS-09	9.9	10.8	11.175	1	0.47
CS	2019	PWNF	PW-NF-CS-10	8.4	9.2	6.815	1	0.43
CS	2019	PWNF	PW-NF-CS-11	6.5	7.2	3.328	1	0.3
CS	2019	PWNF	PW-NF-CS-12	8.3	9.2	6.993	1	0.3
CS	2019	PWNF	PW-NF-CS-13	10.9	11.7	17.377	2	0.33
CS	2019	PWNF	PW-NF-CS-14	9.9	10.6	11.755	2	0.36
CS	2019	PWNF	PW-NF-CS-15	9.8	10.5	10.293	3	0.59
CS	2019	PWNF	PW-NF-CS-16	6.3	6.7	2.88	1	0.53
CS	2019	PWNF	PW-NF-CS-17	9.3	10.1	11.191	2	0.36

CS	2019	PWNF	PW-NF-CS-18	11	11.8	19	3	0.37
CS	2019	PWNF	PW-NF-CS-19	10.2	11.1	15.072	2	0.32
CS	2019	PWNF	PW-NF-CS-20	10.2	11.1	14.977	3	0.53
CS	2019	PWNF	PW-NF-CS-21	9.8	10.2	12.138	2	0.46
CS	2019	PWNF	PW-NF-CS-22	6.6	7.1	3.69	1	0.56
CS	2019	PWNF	PW-NF-CS-23	12.9	13.5	24.25	4	0.35
CS	2019	PWNF	PW-NF-CS-24	8.8	9.6	8.656	3	0.67
CS	2019	PWNF	PW-NF-CS-25	6.9	7.7	4.241	2	0.32
CS	2019	PWNF	PW-NF-CS-26	11.1	12.1	18.9	3	0.33
CS	2019	PWNF	PW-NF-CS-27	11.6	12.5	21.25	3	0.25
CS	2019	PWNF	PW-NF-CS-28	11.6	12.5	22	3	0.27
CS	2019	PWNF	PW-NF-CS-29	6	6.7	2.608	2	0.6
CS	2019	PWNF	PW-NF-CS-30	11.2	12.1	20.043	3	0.44
CS	2019	PWNF	PW-NF-CS-31	9.5	10.4	11.787	3	0.62
CS	2019	PWNF	PW-NF-CS-32	11.7	12.4	26.96	3	0.37
CS	2019	PWNF	PW-NF-CS-33	9.1	9.7	10.143	3	0.57
CS	2019	PWNF	PW-NF-CS-34	6.3	6.8	2.848	1	0.38
CS	2019	PWNF	PW-NF-CS-35	7.3	8.6	6.148	2	0.41
CS	2019	PWNF	PW-NF-CS-36	6.7	7.4	3.519	2	0.59
CS	2019	PWNF	PW-NF-CS-37	8.7	9	7.261	2	0.63
CS	2019	PWNF	PW-NF-CS-38	8.3	9	7.439	1	0.33
CS	2019	PWNF	PW-NF-CS-39	7.1	7.8	4.099	2	0.5
CS	2019	PWNF	PW-NF-CS-40	10.1	11	14.307	3	0.38
CS	2019	PWNF	PW-NF-CS-41	9.8	10.7	11.835	1	0.41
CS	2019	PWNF	PW-NF-CS-42	10.6	11.5	13.364	3	0.72
CS	2019	PWNF	PW-NF-CS-43	9.7	10.2	12.057	3	0.54
CS	2019	PWNF	PW-NF-CS-44	9.5	10.5	10.469	2	0.62
CS	2019	PWNF	PW-NF-CS-45	11	11.3	16.355	3	0.25
CS	2019	PWNF	PW-NF-CS-46	9.6	10.4	11.143	3	0.48
CS	2019	PWNF	PW-NF-CS-47	9.9	10.9	14.602	2	0.27
CS	2019	PWNF	PW-NF-CS-48	10.6	11.3	20.683	2	0.34
CS	2019	PWNF	PW-NF-CS-49	11.2	12.3	22.442	3	0.29
CS	2019	PWNF	PW-NF-CS-50	7.7	8.3	6.172	2	0.34
CS	2019	PWFF	PW-FF-CS-01	6.9	7.6	3.481	2	0.09
CS	2019	PWFF	PW-FF-CS-02	9	9.9	9.855	3	0.26
CS	2019	PWFF	PW-FF-CS-03	9.6	10.5	11.768	2	0.19
CS	2019	PWFF	PW-FF-CS-04	7.4	8.2	4.953	2	0.22
CS	2019	PWFF	PW-FF-CS-05	9.5	10.5	13.46	3	0.17
CS	2019	PWFF	PW-FF-CS-06	6.9	7.6	3.872	1	0.18
CS	2019	PWFF	PW-FF-CS-07	7.5	8.2	5.159	2	0.34
CS	2019	PWFF	PW-FF-CS-08	9.8	11.2	12.674	3	0.17
CS	2019	PWFF	PW-FF-CS-09	9	9.9	9.07	2	0.23
CS	2019	PWFF	PW-FF-CS-10	6	6.5	2.115	2	0.08
CS	2019	PWFF	PW-FF-CS-11	10.9	11.9	20.305	3	0.21
CS	2019	PWFF	PW-FF-CS-12	8.6	9.4	8.316	2	0.17
CS	2019	PWFF	PW-FF-CS-13	8.4	9.2	7.64	2	0.17
CS	2019	PWFF	PW-FF-CS-14	7.4	8	4.854	2	0.3
CS	2019	PWFF	PW-FF-CS-15	7.6	8.9	6.079	2	0.2
CS	2019	PWFF	PW-FF-CS-16	9.4	10.2	13.036	2	0.15
CS	2019	PWFF	PW-FF-CS-17	8.2	9	3.26	2	0.17
CS	2019	PWFF	PW-FF-CS-18	10.2	11.7	15.954	2	0.2
CS	2019	PWFF	PW-FF-CS-19	9.5	10.2	12.563	1	0.19
CS	2019	PWFF	PW-FF-CS-20	8.2	9.1	7.615	2	0.27
CS	2019	PWFF	PW-FF-CS-21	9	9.7	10.515	2	0.16
CS	2019	PWFF	PW-FF-CS-22	9	9.8	11.084	2	0.2
CS	2019	PWFF	PW-FF-CS-23	5.5	5.8	1.675	2	0.3
CS	2019	PWFF	PW-FF-CS-24	6.1	6.5	2.774	2	0.16
CS	2019	PWFF	PW-FF-CS-25	5.9	6.5	2.275	2	0.38
CS	2019	PWFF	PW-FF-CS-26	6.7	7.4	3.666	2	0.2
CS	2019	PWFF	PW-FF-CS-27	5.3	5.6	1.42	1	0.11
CS	2019	PWFF	PW-FF-CS-28	5.3	5.7	1.625	2	0.19
CS	2019	PWFF	PW-FF-CS-29	5.3	5.9	1.682	1	0.23
CS	2019	PWFF	PW-FF-CS-30	6	6.4	2.127	2	0.21
CS	2019	PWFF	PW-FF-CS-31	11	12	8.821	3	0.2
CS	2019	PWFF	PW-FF-CS-32	10	11.4	6.552	3	0.17
CS	2019	PWFF	PW-FF-CS-33	8.2	9	7.175	2	0.23
CS	2019	PWFF	PW-FF-CS-34	5.8	6.2	2.118	2	0.1
CS	2019	PWFF	PW-FF-CS-35	9	9.7	9.7	2	0.21
CS	2019	PWFF	PW-FF-CS-36	7.8	8.5	5.277	2	0.16
CS	2019	PWFF	PW-FF-CS-37	11.2	11.7	16.245	2	0.22
CS	2019	PWFF	PW-FF-CS-38	10	11	13.869	2	0.19
CS	2019	PWFF	PW-FF-CS-39	5.6	5.9	1.843	1	0.09
CS	2019	PWFF	PW-FF-CS-40	7.3	8.1	4.843	2	0.21
CS	2019	PWFF	PW-FF-CS-41	8.5	9.4	7.972	2	0.18
CS	2019	PWFF	PW-FF-CS-42	7.3	8	4.859	2	0.25
CS	2019	PWFF	PW-FF-CS-43	5.8	6.2	2.066	2	0.18

CS	2019	PWFF	PW-FF-CS-44	9.2	10	9.695	2	0.24
CS	2019	PWFF	PW-FF-CS-45	11	11.7	15.46	3	0.26
CS	2019	PWFF	PW-FF-CS-46	9	9.8	9.572	2	0.18
CS	2019	PWFF	PW-FF-CS-47	7.9	8.6	6.664	2	0.24
CS	2019	PWFF	PW-FF-CS-48	9.1	10	9.711	2	0.16
CS	2019	PWFF	PW-FF-CS-49	8.1	8.9	6.284	2	0.2
CS	2019	PWFF	PW-FF-CS-50	7.2	8.5	4.116	2	0.16
CS	2019	PWFF	PW-FF-CS-51	6.7	7.4	3.669	1	0.21
CS	2020	PWREF	PRREF-CS-01	7.9	8.4	6.37	3	0.0829
CS	2020	PWREF	PRREF-CS-02	8.9	9.6	9.27	2	0.0976
CS	2020	PWREF	PRREF-CS-03	9.9	10.8	12.48	2	0.119
CS	2020	PWREF	PRREF-CS-04	11.4	12.3	21.05	3	0.109
CS	2020	PWREF	PRREF-CS-05	10.5	11.4	14.22	3	0.112
CS	2020	PWREF	PRREF-CS-06	7.1	7.7	3.95	2	0.114
CS	2020	PWREF	PRREF-CS-07	8.6	9.3	6.95	2	0.0634
CS	2020	PWREF	PRREF-CS-08	7.7	8.3	5.92	2	0.115
CS	2020	PWREF	PRREF-CS-09	8	8.9	6.9	3	0.161
CS	2020	PWREF	PRREF-CS-10	10.1	11	13.63	3	0.0725
CS	2020	PWREF	PRREF-CS-11	11	11.8	13.44	3	0.0979
CS	2020	PWREF	PRREF-CS-12	9.1	10	9.97	2	0.0756
CS	2020	PWREF	PRREF-CS-13	7.2	7.9	5.08	2	0.0983
CS	2020	PWREF	PRREF-CS-14	8.9	9.6	8.6	2	0.0913
CS	2020	PWREF	PRREF-CS-15	13.4	14.2	36.65	3	0.104
CS	2020	PWREF	PRREF-CS-16	9.9	10.8	13.01	3	0.104
CS	2020	PWREF	PRREF-CS-17	9.9	10.9	12.62	3	0.118
CS	2020	PWREF	PRREF-CS-18	9.9	10.5	12.56	3	0.0905
CS	2020	PWREF	PRREF-CS-19	9	9.8	8.56	3	0.097
CS	2020	PWREF	PRREF-CS-20	9.2	10.3	8.51	3	0.0673
CS	2020	PWREF	PRREF-CS-21	9.5	10.3	11.12	3	0.0877
CS	2020	PWREF	PRREF-CS-22	8.9	9.8	9.17	2	0.0731
CS	2020	PWREF	PRREF-CS-23	9.8	10.7	11.03	2	0.0795
CS	2020	PWREF	PRREF-CS-24	12.8	13.8	30.54	3	0.167
CS	2020	PWREF	PRREF-CS-25	12.9	14.1	31.03	5	0.143
CS	2020	PWREF	PRREF-CS-26	10.3	11.1	13.82	4	0.1
CS	2020	PWREF	PRREF-CS-27	8.9	9.7	7.64	3	0.0706
CS	2020	PWREF	PRREF-CS-28	--	10.4	10.1	3	0.0833
CS	2020	PWREF	PRREF-CS-29	9.7	10.5	10.83	3	0.0855
CS	2020	PWREF	PRREF-CS-30	4.9	5.7	1.34	2	0.0364
CS	2020	PWREF	PRREF-CS-31	9.7	10.5	11.28	3	0.0824
CS	2020	PWREF	PRREF-CS-32	9.2	9.9	8.99	3	0.0592
CS	2020	PWREF	PRREF-CS-33	11.4	12.4	19.18	4	0.128
CS	2020	PWREF	PRREF-CS-34	11.9	12	16.05	4	0.114
CS	2020	PWREF	PRREF-CS-35	6.1	6.7	2.75	2	0.0396
CS	2020	PWREF	PRREF-CS-36	5.4	5.8	1.76	2	0.0384
CS	2020	PWREF	PRREF-CS-37	5.5	5.9	1.84	1	0.0391
CS	2020	PWREF	PRREF-CS-38	6	6.4	2.23	2	0.0457
CS	2020	PWREF	PRREF-CS-39	5.4	5.8	1.96	1	0.0293
CS	2020	PWREF	PRREF-CS-40	5.8	6.1	2.17	1	0.0449
CS	2020	PWREF	PRREF-CS-41	6.3	6.8	2.96	2	0.0815
CS	2020	PWREF	PRREF-CS-42	5.5	6.1	2.1	1	0.0274
CS	2020	PWREF	PRREF-CS-43	5.7	6.2	1.95	1	0.0401
CS	2020	PWREF	PRREF-CS-44	5.5	5.9	1.83	1	0.039
CS	2020	PWREF	PRREF-CS-45	5.4	5.8	1.61	2	0.0448
CS	2020	PWREF	PRREF-CS-46	4.3	4.8	0.91	1	0.0525
CS	2020	PWREF	PRREF-CS-47	6.5	7.1	2.96	2	0.0451
CS	2020	PWREF	PRREF-CS-48	10.7	11.7	15.44	3	0.133
CS	2020	PWREF	PRREF-CS-49	9.8	10.5	11.48	3	0.102
CS	2020	PWREF	PRREF-CS-50	9.3	9.9	9.1	3	0.1
CS	2020	PWNF	PRNF-CS-01	9.9	10.7	12.224	2	0.075
CS	2020	PWNF	PRNF-CS-02	9.9	10.5	12.668	2	0.055
CS	2020	PWNF	PRNF-CS-03	10.6	11	16.309	2	0.052
CS	2020	PWNF	PRNF-CS-04	5.8	6.3	1.179	2	0.076
CS	2020	PWNF	PRNF-CS-05	8.1	8.8	6.496	2	0.089
CS	2020	PWNF	PRNF-CS-06	4.9	5.3	1.215	1	0.085
CS	2020	PWNF	PRNF-CS-07	4.9	5.3	1.201	2	0.09
CS	2020	PWNF	PRNF-CS-08	6.1	6.6	2.349	2	0.134
CS	2020	PWNF	PRNF-CS-09	8.9	9.8	8.71	3	0.085
CS	2020	PWNF	PRNF-CS-10	5.4	5.6	2.163	1	0.105
CS	2020	PWNF	PRNF-CS-11	8.4	9.2	8.143	2	0.134
CS	2020	PWNF	PRNF-CS-12	9.9	10.4	16.035	2	0.1
CS	2020	PWNF	PRNF-CS-13	10	11.1	13.736	3	0.073
CS	2020	PWNF	PRNF-CS-14	11.6	12.7	22.273	2	0.089
CS	2020	PWNF	PRNF-CS-15	10.6	11.6	17.318	2	0.084
CS	2020	PWNF	PRNF-CS-16	11.1	12.1	20.534	3	0.127
CS	2020	PWNF	PRNF-CS-17	10.8	11.8	17.706	2	0.082
CS	2020	PWNF	PRNF-CS-18	10.2	10.9	13.798	2	0.092

CS	2020	PWNF	PRNF-CS-19	8.1	9	7.829	2	0.119
CS	2020	PWNF	PRNF-CS-20	6.9	7.7	4.718	1	0.09
CS	2020	PWNF	PRNF-CS-21	7.8	8.7	7.423	2	0.099
CS	2020	PWNF	PRNF-CS-22	8	9.1	8.029	2	0.145
CS	2020	PWNF	PRNF-CS-23	7.7	8.6	6.295	1	0.087
CS	2020	PWNF	PRNF-CS-24	8.1	8.9	6.662	2	0.11
CS	2020	PWNF	PRNF-CS-25	7	7.9	4.35	1	0.086
CS	2020	PWNF	PRNF-CS-26	7	1.1	4.206	1	0.125
CS	2020	PWNF	PRNF-CS-27	6.9	7.6	4.128	1	0.117
CS	2020	PWNF	PRNF-CS-28	7.5	8.2	5.425	2	0.089
CS	2020	PWNF	PRNF-CS-29	8.5	9.3	7.087	2	0.093
CS	2020	PWNF	PRNF-CS-30	9	9.9	9.702	3	0.177
CS	2020	PWNF	PRNF-CS-31	9	9.8	9.023	2	0.144
CS	2020	PWNF	PRNF-CS-32	7.3	7.9	4.658	2	0.099
CS	2020	PWNF	PRNF-CS-33	6.1	6.7	2.636	2	0.105
CS	2020	PWNF	PRNF-CS-34	6.5	7	3.424	1	0.123
CS	2020	PWNF	PRNF-CS-35	5.1	5.6	1.354	1	0.049
CS	2020	PWNF	PRNF-CS-36	5.7	6.4	2.246	1	0.111
CS	2020	PWNF	PRNF-CS-37	5.9	6.6	2.558	1	0.104
CS	2020	PWNF	PRNF-CS-38	6.4	7.2	3.027	1	0.094
CS	2020	PWNF	PRNF-CS-39	5.5	6.1	1.797	1	0.107
CS	2020	PWNF	PRNF-CS-40	4.5	5.1	0.988	1	0.098
CS	2020	PWNF	PRNF-CS-41	4.2	4.6	0.896	1	0.132
CS	2020	PWNF	PRNF-CS-42	5.6	6.3	2.144	2	0.144
CS	2020	PWNF	PRNF-CS-43	5.5	6.1	1.927	1	0.164
CS	2020	PWNF	PRNF-CS-44	5.4	6	1.857	1	0.153
CS	2020	PWNF	PRNF-CS-45	5.9	6.6	2.112	2	0.078
CS	2020	PWNF	PRNF-CS-46	4.9	5.5	1.242	1	0.146
CS	2020	PWNF	PRNF-CS-47	4.8	5.2	1.249	1	0.105
CS	2020	PWNF	PRNF-CS-48	4.5	5	0.884	1	0.142
CS	2020	PWNF	PRNF-CS-49	4	4.3	0.585	1	0.159
CS	2020	PWNF	PRNF-CS-50	4.7	5.3	1.008	2	0.154
CS	2020	PWFF	PRFF-CS-01	5.3	5.8	1.526	1	0.0406
CS	2020	PWFF	PRFF-CS-02	5.6	6.2	1.901	2	0.0543
CS	2020	PWFF	PRFF-CS-03	4.7	5.3	1.164	1	0.0476
CS	2020	PWFF	PRFF-CS-04	4.9	5.8	1.487	2	0.058
CS	2020	PWFF	PRFF-CS-05	5.2	5.6	1.4	2	0.0521
CS	2020	PWFF	PRFF-CS-06	5.5	6.2	1.677	2	0.0491
CS	2020	PWFF	PRFF-CS-07	5.8	6.6	1.982	2	0.0444
CS	2020	PWFF	PRFF-CS-08	5	5.5	1.284	1	0.0663
CS	2020	PWFF	PRFF-CS-09	4.9	5.6	1.281	1	0.0576
CS	2020	PWFF	PRFF-CS-10	5.9	6.5	2.245	2	0.0482
CS	2020	PWFF	PRFF-CS-11	4.1	4.6	0.731	1	0.0539
CS	2020	PWFF	PRFF-CS-12	8.3	9	7.808	2	0.0684
CS	2020	PWFF	PRFF-CS-13	8.9	9.7	9.805	2	0.0526
CS	2020	PWFF	PRFF-CS-14	10	10.9	13.91	2	0.054
CS	2020	PWFF	PRFF-CS-15	9.6	10.4	11.905	2	0.0513
CS	2020	PWFF	PRFF-CS-16	7.9	8.4	5.838	2	0.0432
CS	2020	PWFF	PRFF-CS-17	6.2	7	2.335	1	0.048
CS	2020	PWFF	PRFF-CS-18	5.9	6.5	2.145	1	0.0385
CS	2020	PWFF	PRFF-CS-19	--	14	33.96	2	0.0435
CS	2020	PWFF	PRFF-CS-20	--	16.3	53.376	3	0.0594
CS	2020	PWFF	PRFF-CS-21	6.9	7.5	4.028	3	0.139
CS	2020	PWFF	PRFF-CS-22	8.3	9	9.344	2	0.0851
CS	2020	PWFF	PRFF-CS-23	12.1	13.3	26.865	2	0.0655
CS	2020	PWFF	PRFF-CS-24	10.5	11.4	14.876	2	0.0573
CS	2020	PWFF	PRFF-CS-25	9.3	10.1	9.989	3	0.0473
CS	2020	PWFF	PRFF-CS-26	7.9	8.6	5.499	2	0.0478
CS	2020	PWFF	PRFF-CS-27	5	5.4	1.193	1	0.0569
CS	2020	PWFF	PRFF-CS-28	6.6	7.3	3.337	2	0.0469
CS	2020	PWFF	PRFF-CS-29	7.1	8	4.218	2	0.0467
CS	2020	PWFF	PRFF-CS-30	6.4	8.2	2.182	2	0.038
CS	2020	PWFF	PRFF-CS-31	7.5	8.3	5.262	2	0.044
CS	2020	PWFF	PRFF-CS-32	7.8	8.6	5.976	1	0.0494
CS	2020	PWFF	PRFF-CS-33	5.8	6.3	2.2	1	0.0566
CS	2020	PWFF	PRFF-CS-34	6.4	7	2.793	1	0.049
CS	2020	PWFF	PRFF-CS-35	7.5	8.3	4.884	2	0.0477
CS	2020	PWFF	PRFF-CS-36	5.6	6.1	1.963	1	0.0471
CS	2020	PWFF	PRFF-CS-37	5.5	6.3	2.051	1	0.0416
CS	2020	PWFF	PRFF-CS-38	6.1	6.8	2.471	2	0.0627
CS	2020	PWFF	PRFF-CS-39	8.6	9.1	7.217	2	0.112
CS	2020	PWFF	PRFF-CS-40	9.9	10.9	12.935	2	0.0736
CS	2020	PWFF	PRFF-CS-41	7.5	8.1	4.634	2	0.0575
CS	2020	PWFF	PRFF-CS-42	7	7.4	3.715	2	0.0552
CS	2020	PWFF	PRFF-CS-43	9.9	10.6	11.749	3	0.062
CS	2020	PWFF	PRFF-CS-44	5	5.8	1.358	2	0.0501

CS	2020	PWFF	PRFF-CS-45	6.6	7.3	3.315	2	0.0469
CS	2020	PWFF	PRFF-CS-46	9.5	10.4	12.477	2	0.0499
CS	2020	PWFF	PRFF-CS-47	6.4	7.3	2.975	2	0.0498
CS	2020	PWFF	PRFF-CS-48	7.4	8.1	4.567	2	0.0544
CS	2020	PWFF	PRFF-CS-49	5.9	6.4	2.159	2	0.0573
CS	2020	PWFF	PRFF-CS-50	7.4	8.3	5.495	2	0.0469
CS	2021	PWREF	1	10.4	11.3	11.513	5	0.0631
CS	2021	PWREF	2	9.8	10.7	6.747	4	0.0581
CS	2021	PWREF	3	12.2	13.3	23.365	--	0.12
CS	2021	PWREF	4	7.6	8.1	4.696	3	0.0604
CS	2021	PWREF	5	7	7.4	3.789	3	0.0786
CS	2021	PWREF	6	7.3	7.7	4.018	3	0.0624
CS	2021	PWREF	7	6.7	7.3	3.928	3	0.091
CS	2021	PWREF	8	6.8	7.7	4.186	3	0.0724
CS	2021	PWREF	9	6.8	7.2	3.276	3	0.0616
CS	2021	PWREF	10	7.7	8.5	5.653	3	0.203
CS	2021	PWREF	11	6.2	6.5	2.749	2	0.0491
CS	2021	PWREF	12	7.7	8.2	4.952	4	0.0869
CS	2021	PWREF	13	7.3	7.7	4.47	3	0.0853
CS	2021	PWREF	14	7.3	7.7	4.677	3	0.0709
CS	2021	PWREF	15	7	7.4	3.808	3	0.0437
CS	2021	PWREF	16	7	7.4	3.567	3	0.0553
CS	2021	PWREF	17	6.7	7.1	3.241	3	0.0842
CS	2021	PWREF	18	7.2	7.5	3.877	3	0.0868
CS	2021	PWREF	19	7.1	7.6	3.786	3	0.068
CS	2021	PWREF	20	7.2	7.5	4.173	2	0.0691
CS	2021	PWREF	21	7.1	7.5	3.8	4	0.081
CS	2021	PWREF	22	7.5	7.8	4.446	3	0.0672
CS	2021	PWREF	23	6.5	6.9	2.922	2	0.0806
CS	2021	PWREF	24	6.6	6.9	3.038	2	0.0432
CS	2021	PWREF	25	6.6	6.9	3.134	3	0.0505
CS	2021	PWREF	26	6.7	7.1	3.403	3	0.0748
CS	2021	PWREF	27	7	7.4	3.679	4	0.0774
CS	2021	PWREF	28	6.7	7.1	3.004	3	0.0551
CS	2021	PWREF	29	6.6	7	3.137	4	0.0565
CS	2021	PWREF	30	6.8	7.3	3.311	3	0.0497
CS	2021	PWREF	31	7.2	7.6	4.136	4	0.0684
CS	2021	PWREF	32	6.8	7.3	3.622	2	0.0517
CS	2021	PWREF	33	6.8	7.7	4.093	4	0.076
CS	2021	PWREF	34	11.7	12.7	22.309	4	0.143
CS	2021	PWREF	35	7.1	7.5	3.821	3	0.0907
CS	2021	PWREF	36	7.1	7.7	4.016	4	0.0785
CS	2021	PWREF	37	6.6	7	3.373	3	0.0665
CS	2021	PWREF	38	7.7	8.1	4.668	4	0.112
CS	2021	PWREF	39	7.7	8.2	4.942	5	0.0921
CS	2021	PWREF	40	8.1	8.5	5.501	4	0.0669
CS	2021	PWREF	41	7.4	7.8	4.244	3	0.101
CS	2021	PWREF	42	7	7.4	3.847	4	0.0749
CS	2021	PWREF	43	6.6	7	3.448	3	0.0768
CS	2021	PWREF	44	7.6	8.1	4.776	3	0.0755
CS	2021	PWREF	45	7.2	7.5	4.352	3	0.0663
CS	2021	PWREF	46	7.3	7.7	4.555	3	0.0632
CS	2021	PWREF	47	7.2	7.7	3.988	3	0.0746
CS	2021	PWREF	48	7.3	7.7	4.463	3	0.0782
CS	2021	PWREF	49	6.6	6.9	3.602	4	0.0656
CS	2021	PWREF	50	7.5	7.8	4.061	4	0.0825
CS	2021	PWNF	1	10.4	11.2	14.729	4	0.132
CS	2021	PWNF	2	10.8	11.9	18.81	5	0.151
CS	2021	PWNF	3	10.8	11.8	18.299	5	0.133
CS	2021	PWNF	4	10.5	11.4	16.07	4	0.0764
CS	2021	PWNF	5	10	10.9	13.407	3	0.118
CS	2021	PWNF	6	9.8	10.8	12.816	3	0.201
CS	2021	PWNF	7	10.4	11.3	14.597	4	0.136
CS	2021	PWNF	8	10.4	11.4	14.947	4	0.0951
CS	2021	PWNF	9	11.3	12.2	18.041	4	0.138
CS	2021	PWNF	10	7.5	8.2	4	3	0.164
CS	2021	PWNF	11	9	9.9	8.969	3	0.236
CS	2021	PWNF	12	9.1	9.9	9.253	3	0.125
CS	2021	PWNF	13	7.7	8.5	5.489	3	0.135
CS	2021	PWNF	14	7.8	8.6	5.688	3	0.178
CS	2021	PWNF	15	8.3	9	6.086	3	0.215
CS	2021	PWNF	16	7.9	8.6	5.575	3	0.13
CS	2021	PWNF	17	7.9	8.7	5.424	3	0.201
CS	2021	PWNF	18	8.3	9	6.171	4	0.21
CS	2021	PWNF	19	8.9	9.8	8.358	3	0.14
CS	2021	PWNF	20	7.6	8.3	4.57	3	0.126

CS	2021	PWNF	21	8.3	9.1	6.377	3	0.205
CS	2021	PWNF	22	7.5	8.3	4.916	3	0.12
CS	2021	PWNF	23	7.1	7.9	4.08	3	0.157
CS	2021	PWNF	24	7.7	8.5	5.232	4	0.18
CS	2021	PWNF	25	7.4	8.2	4.83	4	0.213
CS	2021	PWNF	26	7.8	8.5	5.145	3	0.176
CS	2021	PWNF	27	7.5	8.2	4.436	3	0.157
CS	2021	PWNF	28	7.1	7.9	4.094	3	0.145
CS	2021	PWNF	29	7.7	8.6	5.16	4	0.166
CS	2021	PWNF	30	7.1	7.7	3.885	3	0.195
CS	2021	PWNF	31	6.9	7.6	3.697	3	0.186
CS	2021	PWNF	32	7.3	8.2	4.347	3	0.156
CS	2021	PWNF	33	7	7.8	3.45	3	0.19
CS	2021	PWNF	34	7.7	8.5	4.904	3	0.175
CS	2021	PWNF	35	7.3	8	4.198	3	0.137
CS	2021	PWNF	36	7.1	7.8	3.848	3	0.154
CS	2021	PWNF	37	7.7	8.5	5.016	3	0.145
CS	2021	PWNF	38	8.8	9.7	7.271	3	0.12
CS	2021	PWNF	39	10.6	11.5	15.297	4	0.14
CS	2021	PWNF	40	10.8	11.7	14.605	4	0.125
CS	2021	PWNF	41	9.2	10	9.505	3	0.0941
CS	2021	PWNF	42	10.5	11.3	13.311	4	0.0962
CS	2021	PWNF	43	10.8	11.8	14.947	5	0.157
CS	2021	PWNF	44	10.3	11.3	13.787	4	0.127
CS	2021	PWNF	45	9	9.9	7.957	3	0.121
CS	2021	PWNF	46	11.1	12	16.641	--	0.144
CS	2021	PWNF	47	9.4	10.3	9.173	3	0.119
CS	2021	PWNF	48	11.4	12.5	18.915	5	0.126
CS	2021	PWNF	49	8.7	9.5	7.892	4	0.161
CS	2021	PWNF	50	11.2	12.2	19.653	4	0.131
CS	2021	PWFF	1	9.8	10.2	10.655	4	0.0854
CS	2021	PWFF	2	11.9	13	24.073	5	0.0767
CS	2021	PWFF	3	11.3	12.2	23.977	5	0.122
CS	2021	PWFF	4	12	13.1	27.474	5	0.084
CS	2021	PWFF	5	12.3	13.2	29.788	5	0.0914
CS	2021	PWFF	6	10.4	11.4	16.464	3	0.113
CS	2021	PWFF	7	11.4	12.4	23.958	3	0.0849
CS	2021	PWFF	8	10.5	11.5	18.567	5	0.0767
CS	2021	PWFF	9	10.6	11.7	16.067	5	0.124
CS	2021	PWFF	10	9.9	10.7	12.451	3	0.15
CS	2021	PWFF	11	12.3	13.5	26.179	5	0.0909
CS	2022	PWREF	PRREF-CS43	6.4	7	3.511	--	0.145
CS	2022	PWREF	PRREF-CS44	6.4	6.9	3.658	3	0.168
CS	2022	PWREF	PRREF-CS41	7	7.8	4.834	2	0.139
CS	2022	PWREF	PRREF-CS37	7.1	7.8	5.693	2	0.0779
CS	2022	PWREF	PRREF-CS38	7.1	7.9	6.023	2	0.113
CS	2022	PWREF	PRREF-CS39	7.1	7.9	5.693	3	0.109
CS	2022	PWREF	PRREF-CS40	7.1	7.8	5.803	2	0.249
CS	2022	PWREF	PRREF-CS31	7.2	7.9	5.494	2	0.114
CS	2022	PWREF	PRREF-CS50	7.2	8.1	5.2	2	0.125
CS	2022	PWREF	PRREF-CS42	7.3	8	5.296	2	0.086
CS	2022	PWREF	PRREF-CS46	7.5	8.3	6.438	2	0.12
CS	2022	PWREF	PRREF-CS20	7.6	8.4	7.098	2	0.107
CS	2022	PWREF	PRREF-CS28	7.6	8.3	5.692	2	0.0981
CS	2022	PWREF	PRREF-CS34	7.8	8.6	6.389	2	0.152
CS	2022	PWREF	PRREF-CS48	7.9	8.6	7.376	2	0.236
CS	2022	PWREF	PRREF-CS32	8	8.9	7.452	2	0.143
CS	2022	PWREF	PRREF-CS36	8	8.7	7.562	2	0.154
CS	2022	PWREF	PRREF-CS11	8.1	8.9	7.982	2	0.0586
CS	2022	PWREF	PRREF-CS13	8.2	9.1	9.018	3	0.122
CS	2022	PWREF	PRREF-CS49	8.2	9.1	8.093	2	0.173
CS	2022	PWREF	PRREF-CS19	8.3	9.1	8.571	2	0.0803
CS	2022	PWREF	PRREF-CS47	8.3	9.1	8.123	4	0.131
CS	2022	PWREF	PRREF-CS08	8.4	9.2	9.2	3	0.102
CS	2022	PWREF	PRREF-CS18	8.4	9.3	8.105	3	0.148
CS	2022	PWREF	PRREF-CS33	8.4	9.3	9.504	2	0.067
CS	2022	PWREF	PRREF-CS35	8.4	9.2	9.767	3	0.151
CS	2022	PWREF	PRREF-CS07	8.6	9.4	8.864	2	0.0848
CS	2022	PWREF	PRREF-CS17	8.6	9.6	9.98	2	0.126
CS	2022	PWREF	PRREF-CS30	8.6	9.3	10.133	2	0.0679
CS	2022	PWREF	PRREF-CS12	8.7	9.8	10.022	2	0.0605
CS	2022	PWREF	PRREF-CS24	8.9	9.8	12.465	2	0.0627
CS	2022	PWREF	PRREF-CS26	8.9	9.7	10.735	2	0.0967
CS	2022	PWREF	PRREF-CS16	9.2	10	11.916	2	0.111
CS	2022	PWREF	PRREF-CS29	9.2	10.1	12.927	2	0.137
CS	2022	PWREF	PRREF-CS27	9.3	10.2	13.291	3	0.0622

CS	2022	PWREF	PRREF-CS04	9.4	10.3	12.777	2	0.0936
CS	2022	PWREF	PRREF-CS45	9.5	10.2	11.838	3	0.0883
CS	2022	PWREF	PRREF-CS23	9.7	10.6	14.769	2	0.0897
CS	2022	PWREF	PRREF-CS05	9.8	10.5	15.153	2	0.0782
CS	2022	PWREF	PRREF-CS25	9.8	10.7	14.484	3	0.0715
CS	2022	PWREF	PRREF-CS21	9.9	10.8	15.645	3	0.0986
CS	2022	PWREF	PRREF-CS22	9.9	10.9	17.157	2	0.0646
CS	2022	PWREF	PRREF-CS06	10	10.9	15.16	3	0.0966
CS	2022	PWREF	PRREF-CS09	10.2	11.2	16.911	3	0.103
CS	2022	PWREF	PRREF-CS14	10.3	11.2	18.076	3	0.053
CS	2022	PWREF	PRREF-CS15	10.3	11.3	17.092	3	0.126
CS	2022	PWREF	PRREF-CS10	10.5	11.3	22.658	3	0.0785
CS	2022	PWREF	PRREF-CS01	11.6	12.4	25.561	3	0.0519
CS	2022	PWREF	PRREF-CS03	12.7	14	35.773	4	0.101
CS	2022	PWREF	PRREF-CS02	12.8	13.7	35.319	3	0.0887
CS	2022	PWNF	PRNF-CS45	4.6	5.2	0.941	1	0.223
CS	2022	PWNF	PRNF-CS36	4.9	5.7	1.339	2	0.185
CS	2022	PWNF	PRNF-CS47	4.9	5.5	1.183	2	0.199
CS	2022	PWNF	PRNF-CS26	5.3	6	1.652	0	0.19
CS	2022	PWNF	PRNF-CS35	5.3	6.4	1.985	1	0.245
CS	2022	PWNF	PRNF-CS43	5.3	5.9	1.709	1	0.218
CS	2022	PWNF	PRNF-CS27	5.4	6	1.769	2	0.126
CS	2022	PWNF	PRNF-CS44	5.4	6	1.68	2	0.215
CS	2022	PWNF	PRNF-CS16	5.5	6.3	1.63	2	0.162
CS	2022	PWNF	PRNF-CS17	5.6	6.3	1.867	1	0.181
CS	2022	PWNF	PRNF-CS03	5.7	5.1	1.189	2	0.181
CS	2022	PWNF	PRNF-CS48	5.7	6.5	1.984	2	0.179
CS	2022	PWNF	PRNF-CS46	5.8	6.5	2.054	1	0.213
CS	2022	PWNF	PRNF-CS04	5.9	6.7	2.241	2	0.208
CS	2022	PWNF	PRNF-CS24	5.9	6.6	2.362	1	0.214
CS	2022	PWNF	PRNF-CS32	5.9	6.6	2.143	1	0.226
CS	2022	PWNF	PRNF-CS31	6	6.8	2.646	1	0.205
CS	2022	PWNF	PRNF-CS38	6	7	2.603	2	0.165
CS	2022	PWNF	PRNF-CS15	6.1	6.8	2.018	--	0.184
CS	2022	PWNF	PRNF-CS23	6.1	6.7	2.446	1	0.15
CS	2022	PWNF	PRNF-CS51	6.1	6.6	2.198	2	0.206
CS	2022	PWNF	PRNF-CS14	6.3	7.1	3.042	2	0.176
CS	2022	PWNF	PRNF-CS29	6.3	7	2.791	3	0.23
CS	2022	PWNF	PRNF-CS37	6.3	7	2.98	2	0.274
CS	2022	PWNF	PRNF-CS05	6.4	7.2	2.89	2	0.199
CS	2022	PWNF	PRNF-CS13	6.4	7.2	2.785	2	0.215
CS	2022	PWNF	PRNF-CS33	6.4	6.8	--	2	0.174
CS	2022	PWNF	PRNF-CS49	6.4	7.4	3.049	3	0.166
CS	2022	PWNF	PRNF-CS28	6.5	7.3	3.057	2	0.208
CS	2022	PWNF	PRNF-CS34	6.6	7.6	3.536	1	0.186
CS	2022	PWNF	PRNF-CS39	6.6	7.3	3.242	1	0.182
CS	2022	PWNF	PRNF-CS07	6.8	7.6	3.248	2	0.179
CS	2022	PWNF	PRNF-CS40	6.8	7.6	3.334	2	0.187
CS	2022	PWNF	PRNF-CS11	6.9	7.6	3.549	1	0.192
CS	2022	PWNF	PRNF-CS12	7.4	8.1	4.196	2	0.167
CS	2022	PWNF	PRNF-CS50	7.4	8.2	4.347	3	0.207
CS	2022	PWNF	PRNF-CS53	7.7	8.6	5.044	--	0.356
CS	2022	PWNF	PRNF-CS54	7.7	8.7	4.734	--	0.21
CS	2022	PWNF	PRNF-CS09	7.8	8.8	6.018	1	0.222
CS	2022	PWNF	PRNF-CS41	7.8	8.6	5.245	3	0.269
CS	2022	PWNF	PRNF-CS06	8.3	9.3	6.43	2	0.427
CS	2022	PWNF	PRNF-CS30	9	9.9	8.256	2	0.493
CS	2022	PWNF	PRNF-CS52	9	10.2	7.996	--	0.283
CS	2022	PWNF	PRNF-CS10	9.5	10.6	9.618	2	0.226
CS	2022	PWNF	PRNF-CS02	9.6	10.5	12.848	--	0.153
CS	2022	PWNF	PRNF-CS01	9.8	10.7	13.635	--	0.455
CS	2022	PWNF	PRNF-CS08	9.9	11.2	12.773	3	0.117
CS	2022	PWNF	PRNF-CS42	10.1	11	10.925	2	0.148
CS	2022	PWFF	PRFF-CS50	4.9	5.4	1.447	1	0.108
CS	2022	PWFF	PRFF-CS26	5	5.5	1.326	1	0.0771
CS	2022	PWFF	PRFF-CS30	5.1	5.6	1.339	1	0.125
CS	2022	PWFF	PRFF-CS38	5.1	5.8	1.36	1	0.118
CS	2022	PWFF	PRFF-CS29	5.2	5.9	1.513	1	0.0964
CS	2022	PWFF	PRFF-CS54	5.2	5.9	1.632	1	0.15
CS	2022	PWFF	PRFF-CS14	5.3	5.8	1.626	1	0.162
CS	2022	PWFF	PRFF-CS18	5.3	6	1.589	1	0.114
CS	2022	PWFF	PRFF-CS36	5.3	5.9	--	1	0.13
CS	2022	PWFF	PRFF-CS48	5.3	6	1.697	1	0.152
CS	2022	PWFF	PRFF-CS28	5.4	5.9	1.776	1	0.143
CS	2022	PWFF	PRFF-CS53	5.4	6.3	1.735	1	0.102
CS	2022	PWFF	PRFF-CS19	5.5	6.1	1.739	1	0.126

CS	2022	PWFF	PRFF-CS65	5.5	6.2	1.646	1	0.164
CS	2022	PWFF	PRFF-CS15	5.6	6.1	1.918	1	0.151
CS	2022	PWFF	PRFF-CS61	5.6	6.4	2.101	1	0.195
CS	2022	PWFF	PRFF-CS17	5.7	6.3	2.226	1	0.109
CS	2022	PWFF	PRFF-CS49	5.8	6.4	2.503	2	0.156
CS	2022	PWFF	PRFF-CS21	5.9	6.6	2.279	1	0.206
CS	2022	PWFF	PRFF-CS42	6.1	6.9	2.529	2	0.173
CS	2022	PWFF	PRFF-CS13	6.2	6.8	2.599	2	0.0945
CS	2022	PWFF	PRFF-CS45	6.2	6.9	2.44	1	0.139
CS	2022	PWFF	PRFF-CS02	6.3	6.9	3.17	2	0.121
CS	2022	PWFF	PRFF-CS31	6.3	7	2.772	2	0.115
CS	2022	PWFF	PRFF-CS52	6.3	7	2.952	1	0.111
CS	2022	PWFF	PRFF-CS20	6.5	7.2	3.405	2	0.0923
CS	2022	PWFF	PRFF-CS34	6.5	7	--	2	0.11
CS	2022	PWFF	PRFF-CS35	6.6	7.1	--	1	0.114
CS	2022	PWFF	PRFF-CS46	6.6	7.3	3.077	1	0.145
CS	2022	PWFF	PRFF-CS44	6.7	7.3	3.463	1	0.0846
CS	2022	PWFF	PRFF-CS16	6.9	7.5	3.653	2	0.252
CS	2022	PWFF	PRFF-CS47	6.9	7.9	3.842	2	0.119
CS	2022	PWFF	PRFF-CS51	6.9	7.7	3.217	1	0.182
CS	2022	PWFF	PRFF-CS23	7	7.7	4.202	2	0.0708
CS	2022	PWFF	PRFF-CS22	7.3	8.1	4.217	1	0.101
CS	2022	PWFF	PRFF-CS58	7.3	8.1	4.236	3	0.137
CS	2022	PWFF	PRFF-CS59	7.3	8.3	4.659	--	0.143
CS	2022	PWFF	PRFF-CS39	7.4	8.2	4.231	2	0.138
CS	2022	PWFF	PRFF-CS24	7.5	8.2	4.839	3	0.135
CS	2022	PWFF	PRFF-CS33	7.6	8.5	--	2	0.147
CS	2022	PWFF	PRFF-CS55	7.6	8.3	4.578	2	0.129
CS	2022	PWFF	PRFF-CS43	7.7	8.3	5.339	3	0.567
CS	2022	PWFF	PRFF-CS57	7.8	8.8	5.211	1	0.119
CS	2022	PWFF	PRFF-CS62	7.9	8.6	5.414	3	0.126
CS	2022	PWFF	PRFF-CS41	8.2	8.9	5.695	2	0.107
CS	2022	PWFF	PRFF-CS63	9.3	10.2	8.544	3	0.109
CS	2022	PWFF	PRFF-CS40	9.5	10.6	11.155	2	0.0751
CS	2022	PWFF	PRFF-CS01	9.6	10.4	5.7	3	0.0721
CS	2022	PWFF	PRFF-CS27	9.7	10.6	10.006	3	0.0658
CS	2022	PWFF	PRFF-CS32	9.9	10.7	10.948	3	0.38
CS	2022	PWFF	PRFF-CS67	10	10.8	10.948	2	0.0997
CS	2022	PWFF	PRFF-CS64	10.6	9.5	9.81	2	0.101
CS	2022	PWFF	PRFF-CS66	10.9	12.1	16.471	3	0.142
CS	2023	PWREF	PINRREF CS-1	9.6	--	13.85	4	0.11
CS	2023	PWREF	PINRREF CS-10	6.2	--	2.52	1	0.104
CS	2023	PWREF	PINRREF CS-11	9.7	--	11.158	2	0.128
CS	2023	PWREF	PINRREF CS-12	5.2	--	1.824	0	0.057
CS	2023	PWREF	PINRREF CS-13	9.7	--	11.526	3	0.111
CS	2023	PWREF	PINRREF CS-14	10.4	--	14.806	2	0.0914
CS	2023	PWREF	PINRREF CS-15	6.8	--	3.273	1	0.174
CS	2023	PWREF	PINRREF CS-16	6.1	--	2.968	1	0.0482
CS	2023	PWREF	PINRREF CS-18	5.5	--	2.413	1	0.0665
CS	2023	PWREF	PINRREF CS-19	6.8	--	4.03	1	0.126
CS	2023	PWREF	PINRREF CS-2	5.1	--	1.66	1	0.071
CS	2023	PWREF	PINRREF CS-20	4.9	--	1.367	1	--
CS	2023	PWREF	PINRREF CS-22	10.9	--	16.644	2	0.104
CS	2023	PWREF	PINRREF CS-23	6.2	--	2.565	1	0.136
CS	2023	PWREF	PINRREF CS-24	6.1	--	2.953	1	0.0696
CS	2023	PWREF	PINRREF CS-25	4.9	--	1.346	1	0.0878
CS	2023	PWREF	PINRREF CS-27	6.4	--	3.075	1	0.194
CS	2023	PWREF	PINRREF CS-28	10.4	--	19.228	3	0.103
CS	2023	PWREF	PINRREF CS-29	5.2	--	1.879	1	0.0593
CS	2023	PWREF	PINRREF CS-3	9.1	--	11.231	2	0.105
CS	2023	PWREF	PINRREF CS-30	6.5	--	3.941	1	0.165
CS	2023	PWREF	PINRREF CS-31	5.6	--	2.342	1	0.0803
CS	2023	PWREF	PINRREF CS-32	5.7	--	2.277	1	0.0864
CS	2023	PWREF	PINRREF CS-33	5.7	--	2.938	1	0.0509
CS	2023	PWREF	PINRREF CS-34	5.5	--	2.061	1	0.0955
CS	2023	PWREF	PINRREF CS-35	6.2	--	3.308	1	0.0911
CS	2023	PWREF	PINRREF CS-36	6	--	2.649	1	0.0249
CS	2023	PWREF	PINRREF CS-37	9.4	--	17.575	2	0.071
CS	2023	PWREF	PINRREF CS-38	5.4	--	1.92	1	0.0976
CS	2023	PWREF	PINRREF CS-39	5.2	--	1.651	1	0.0635
CS	2023	PWREF	PINRREF CS-4	5.4	--	2.061	1	0.0901
CS	2023	PWREF	PINRREF CS-40	5.3	--	1.755	1	0.0575
CS	2023	PWREF	PINRREF CS-41	5.3	--	1.873	1	0.0669
CS	2023	PWREF	PINRREF CS-42	5.2	--	1.898	1	0.0629
CS	2023	PWREF	PINRREF CS-43	5.1	--	1.738	1	0.102
CS	2023	PWREF	PINRREF CS-44	5.4	--	2.238	1	0.053

CS	2023	PWREF	PINRREF CS-45	5	--	1.772	1	0.0977
CS	2023	PWREF	PINRREF CS-46	5.6	--	2.191	1	0.121
CS	2023	PWREF	PINRREF CS-47	6.9	--	4.488	1	0.0646
CS	2023	PWREF	PINRREF CS-48	5.6	--	2.222	1	0.0729
CS	2023	PWREF	PINRREF CS-49	5.4	--	1.978	1	0.0685
CS	2023	PWREF	PINRREF CS-51	5.4	--	1.974	1	0.0938
CS	2023	PWREF	PINRREF CS-52	12.8	--	27.965	3	0.127
CS	2023	PWREF	PINRREF CS-53	11	--	18.436	2	0.0971
CS	2023	PWREF	PINRREF CS-54	11.4	--	19.622	2	0.0985
CS	2023	PWREF	PINRREF CS-55	12.5	--	26.792	3	0.102
CS	2023	PWREF	PINRREF CS-56	12.7	--	28.194	3	0.122
CS	2023	PWREF	PINRREF CS-6	7.2	--	4.343	1	0.101
CS	2023	PWREF	PINRREF CS-7	5.9	--	2.33	1	0.0911
CS	2023	PWREF	PINRREF CS-8	9.2	--	9.226	5	0.0764
CS	2023	PWREF	PINRREF CS-9	9.8	--	12.083	2	0.09
CS	2023	PWNF	PINRNF CS-1	8.6	--	7.25	2	0.0759
CS	2023	PWNF	PINRNF CS-10	11.8	--	19.975	3	0.106
CS	2023	PWNF	PINRNF CS-11	5.5	--	1.877	0	0.131
CS	2023	PWNF	PINRNF CS-12	5.2	--	1.392	1	0.132
CS	2023	PWNF	PINRNF CS-13	12.6	--	27.238	3	0.119
CS	2023	PWNF	PINRNF CS-14	10.7	--	15.56	--	0.267
CS	2023	PWNF	PINRNF CS-2	4.8	--	1.103	1	0.147
CS	2023	PWNF	PINRNF CS-3	7.1	--	4.389	2	0.0996
CS	2023	PWNF	PINRNF CS-4	9.4	--	10.622	3	0.0871
CS	2023	PWNF	PINRNF CS-5	4.8	--	1.109	0	0.127
CS	2023	PWNF	PINRNF CS-6	7.3	--	4.301	1	0.103
CS	2023	PWNF	PINRNF CS-7	6.6	--	3.482	1	0.105
CS	2023	PWNF	PINRNF CS-8	8.6	--	7.505	2	0.213
CS	2023	PWNF	PINRNF CS-9	9.7	--	10.539	3	0.224
CS	2023	PWFF	PINRFF CS-1	7.6	--	5.65	1	0.0618
CS	2023	PWFF	PINRFF CS-2	5.2	--	1.593	1	0.0476
CS	2023	PWFF	PINRFF CS-3	4.7	--	1.2	0	0.0507
CS	2023	PWFF	PINRFF CS-4	7.8	--	5.29	1	0.0587
CMM	2022	PWREF	PRREF-CMM12	--	7.8	5.195	2	0.0517
CMM	2022	PWREF	PRREF-CMM19	--	8	6.719	2	0.0661
CMM	2022	PWREF	PRREF-CMM21	--	8.7	7.309	2	0.066
CMM	2022	PWREF	PRREF-CMM22	--	8.6	6.602	--	0.074
CMM	2022	PWREF	PRREF-CMM31	--	9.1	8.271	--	0.0795
CMM	2022	PWNF	PRNF-CMM2	--	10.3	11.911	1	0.0673
CMM	2022	PWNF	PRNF-CMM6	--	9.9	11.859	1	0.118
CMM	2022	PWNF	PRNF-CMM10	--	8.6	7.85	1	0.0948
CMM	2022	PWNF	PRNF-CMM28	--	8	6.497	2	0.121
CMM	2022	PWNF	PRNF-CMM34	--	--	--	1	0.107
CMM	2022	PWFF	PRFF-CMM01	--	--	--	1	0.0888
CMM	2022	PWFF	PRFF-CMM02	--	2.4	0.1	1	0.0982
CMM	2023	PWREF	PINRREF CMM-10	--	5.7	2.743	0	0.0832
CMM	2023	PWREF	PINRREF CMM-11	--	9.4	9.843	2	0.165
CMM	2023	PWREF	PINRREF CMM-12	--	7.8	5.187	1	0.086
CMM	2023	PWREF	PINRREF CMM-13	--	9.6	9.141	3	0.135
CMM	2023	PWREF	PINRREF CMM-14	--	8.1	5.733	1	0.0587
CMM	2023	PWREF	PINRREF CMM-3	--	8.5	6.885	2	0.0828
CMM	2023	PWREF	PINRREF CMM-5	--	5.9	2.558	0	0.0849
CMM	2023	PWREF	PINRREF CMM-7	--	8.6	8.452	3	0.156
CMM	2023	PWREF	PINRREF CMM-8	--	7.3	4.756	1	0.106
CMM	2023	PWREF	PINRREF CMM-9	--	6.4	3.42	0	0.105
CMM	2023	PWNF	PINRNF CMM-1	--	5.8	2.296	0	0.081
CMM	2023	PWNF	PINRNF CMM-10	--	5.6	2.203	0	0.0893
CMM	2023	PWNF	PINRNF CMM-11	--	5	1.362	0	0.0842
CMM	2023	PWNF	PINRNF CMM-3	--	7.3	4.564	1	0.0897
CMM	2023	PWNF	PINRNF CMM-4	--	5.7	2.175	0	0.0938
CMM	2023	PWNF	PINRNF CMM-5	--	5	1.409	0	0.117
CMM	2023	PWNF	PINRNF CMM-6	--	5.5	1.705	0	0.107
CMM	2023	PWNF	PINRNF CMM-7	--	5.3	1.471	0	0.136
CMM	2023	PWNF	PINRNF CMM-8	--	10.6	13.253	3	0.107
CMM	2023	PWNF	PINRNF CMM-9	--	8.4	6.436	1	0.114
CMM	2023	PWFF	PINRFF CMM-1	--	6	2.333	0	0.0816
CMM	2023	PWFF	PINRFF CMM-2	--	5.7	2.08	0	0.0584
CMM	2023	PWFF	PINRFF CMM-3	--	5.7	2.101	0	0.0744
CMM	2023	PWFF	PINRFF CMM-4	--	5.1	1.453	0	0.0609

Appendix D Comments to MECP

Ecometrix | Environmental INTELLIGENCE

TO:	FROM:
Nathan Baird and Garnet Cornell, New Gold	Joe Tetreault, Brian Kielstra and Jason Dietrich Ecometrix
REF:	**DATE:**
Response to MECP Review of 2021 and 2022 Pinewood Annual TOR and Biological Monitoring Reports	13 October 2023

1.0 Introduction

The comments, clarifications and rework of data provided herein are in response to the review by MECP Surface Water Specialist, Northern Region Technical Support Section of the *Pinewood River Annual Terms of Reference (ToR) and Biological Monitoring Report (2021)* and the *Pinewood River Annual ToR and Biological Monitoring Report (2022)*. Text taken directly from the review provided by MECP are shown in normal font, whereas responses are provided in *italicized font*.

Both reports were submitted and reviewed in the context of meeting the requirements of New Gold's current ECA 2290-CAVKGN which replaced the previous ECA 7004-BC7KQ5 on April 14, 2022. The two specific conditions to be addressed by these reports are:

- 9(3) the Owner shall undertake a long-term study to evaluate the potential effects of flow reductions on the biological communities within the Pinewood River watershed.
- 10(9) The Owner shall undertake a long-erm study to evaluate the potential loadings of sulphate and mercury to the Pinewood River watershed. This study must incorporate the measures within the following Terms of Reference's
    - a "Terms of Reference: Study to assess potential sulphate loadings to the Pinewood River watershed" (August 2016), as amended from time to time with approval from the District Manager
    - b. "Terms of Reference: Study to assess potential mercury loadings to the Pinewood River watershed" (August 2016), as amended from time to time with approval from the District Manager.

DATE: 13 October 2023

TO: Nathan Baird and Garnet Cornell, New Gold

REF: Response to MECP Review of 2021 and 2022 Pinewood Annual TOR and Biological Monitoring Reports

2.0 Response to Comments

2.1 Water Quantity

a) Ensure that there is adequate access to all level loggers for data downloads. Alternative level logger locations should be assessed and proposed to the Ministry. If this is not possible, some formal agreement should be made to guarantee access.

New Gold will undertake and investigation of the accessibility of all the level loggers to ensure the consistency of data downloads. Should a current level logger installation be deemed inadequate for access, an alternative will be communicated to the Ministry.

b) The method being used to correct level logger readings for barometric pressure should be clarified to ensure that accurate readings are being collected.

There is limited elevation change between the various Areas used to assess the water quantity at the site. Additionally, the site is relatively compact removing the need for station-by-station corrections. Therefore, all the level logger data used to assess the water quantity is corrected using a central barologger located at 15U 425249 5411508.

2.2 Water Quality

a) An analytical method with a detection limit that allows for comparison of dissolved and total mercury to relevant water quality criteria should be used for the sampling and analysis of dissolved and total mercury in subsequent reporting.

Acknowledged. A review of the 2023 data indicates that all elevated detection limits for the current calendar year are related to interference in the sample matrix during analysis. This has recently been isolated to effluent samples only. The 2023 data consistently is being reported with detection limits of 5 ng/L 5 ng/L and 0.02 ng/L for total, dissolved and methyl mercury respectively allowing for more meaningful comparisons to the appropriate guidelines.

b) Despite there being detectable mercury concentrations in water quality samples, there is no mercury loading calculation in the 2021 nor 2022 report. This should be included in future reporting as required by condition 10(9)b of the site industrial sewage ECA.

Acknowledged. Future reports will use mercury concentrations in discharge to determine the mercury loadings discharged to the Pinewood River.

c) Despite there being detectable sulphate concentrations in water quality samples, including effluent discharge sampling from the 2021 report (95.8 to 760 mg/L) there is no loading calculation in the 2021 nor 2022 report. This should be included in future reporting as required by condition 10(9)a of the site industrial sewage ECA.

Acknowledged. Future reports will use sulphate concentrations in discharge to determine the sulphate loadings discharged to the Pinewood River.

2.3 Fish Community

a) The addition of a large-bodied fish species to the sampling program would provide a more complete understanding of mercury biomagnification in the Pinewood River. This should be considered in subsequent sampling campaigns when possible.

A large-bodied fish collection program is conducted every three years on the Pinewood River as required as part of New Gold's EA Follow-up Monitoring Plan (FUMP) commitments. This program samples 15 individuals of both Walleye and Northern Pike for muscle, liver and ovarian tissues from a single location further downstream on the Pinewood River. This survey was intended to determine mercury concentrations in edible sized fish and to provide understanding of mercury biomagnification as suggested.

The population of large-bodied fish further upstream in the small-bodied fish areas is relatively small and therefore removal of this number of fish (i.e., 15) via targeted lethal sampling could cause ecological harm. The results of the large-bodied fish metal body burden study are provided under separate cover to MECP and reviewed by the First Nations.

3.0 Closing

The provided responses to the review of the 2021 and 2022 reports will be incorporated into the 2023 report as much as is feasible given that the fieldwork for the small-bodied fish program was completed in July. Additional sampling required to address some of the comments will be incorporated into the sampling plan for the 2024 and onward sampling programs. Please do not hesitate to contact us if further information or discussion is required.