March 11th, 2022

Richard Dwyer
Manager of Licensing
Nunavut Water Board

Re: Agnico Eagle's response to CIRNAC's comments regarding the Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update

Dear Mr. Dwyer,

The following information is intended to address the CIRNAC'S recommendations regarding the Meadowbank Complex Core Receiving Environment Monitoring Program (CREMP) 2021 Plan:

- CIRNAC – February 14, 2022: Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC's) Review of the Core Receiving Environment Monitoring Program (CREMP) 2021 Plan Update for Water Licences 2AM-MEA1530 and 2AM-WTP1830

Should you have any questions or require further information, please do not hesitate to contact us as indicated below.

Regards,

Agnico Eagle Mines Limited – Meadowbank Complex

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Environment General Supervisor

1.1 Winter Water Sampling Suspension

Comment: AEM recommends in the CREMP Plan 2021, that Winter water sampling (and Limnology profiling) at Third Portage Lake North Basin (TPN) and East Basin (TPE) and Wally Lake (WAL) be suspended now that Third Portage Lake and Wally Lake are no longer receiving environments as of 2014 and 2017, respectively (Page 2; Section 1:1).

This sampling recommendation is concerning to CIRNAC because during winter periods, northern Lakes experience low irradiance as a result of ice and snow cover which cause poor light penetration into the water column of these lakes. The ecological significance of low light penetration in Lakes during winter is that respiration by aquatic organisms, often exceeds primary production leading to low dissolved oxygen (DO) concentrations. Thus, AEM states in Section 2.3.4 of the CREMP 2021 Plan Update that, Limnological parameters include a Secchi depth measurement and vertical profiling for temperature (°C), dissolved oxygen (mg/L), specific conductivity (µS/cm), and pH at every meter from surface to 1 m off the bottom (or up to 20 m).

Despite the suspension/stoppage of discharges into TPN, TPE and WAL, it is very important to CIRNAC that AEM continues monitoring the dissolved oxygen (DO) concentration and other Limnological parameters in TPN, TPE and WAL during winter and ensure that the ongoing mining activities within the vicinity of the Meadowbank project, do not indirectly exacerbate the respiratory conditions of aquatic organisms in lakes within the Meadowbank and Whale Tail project's footprints. The rationale for this is that dissolved oxygen (DO) involved in chemical and biological processes is one of the most important parameters of aquatic ecosystems. A decrease in the oxygen content worsens the quality of water and the habitat of aquatic organisms. The development of hypoxia (low oxygen in the body of organisms) and anoxia (absence of oxygen in the body of organisms) can lead to severe consequences like mass fish die offs. Moreover, under anaerobic conditions, the release and accumulation of greenhouse gases can occur.

During the open water period, oxygen conditions in lakes are largely formed through the gas exchange with the atmosphere and gas redistribution over the water column due to wind-wave mixing and convective movements. In the presence of photosynthesis, oxygen is released and organic matter is formed, which then settles to the bottom and creates the prerequisites for oxygen deficiency in the following winter season.

Continuous ice cover almost completely suppresses the exchange of heat, gas, and momentum between the water mass and the atmosphere. Snow on ice sharply reduces the penetration of photosynthetic radiation into the water column. Inhibited by low illumination, photosynthesis cannot be a significant source of oxygen as long as the snow layer on the ice exceeds 10–20 cm. Thus, in the absence of significant sources of oxygen, its content decreases during the winter, mainly due to bacterial decomposition of organic matter, respiration of organisms, and chemical reactions near the surface of bottom sediments in lakes.

CIRNAC notes AEM's reason for this recommendation is that Third Portage Lake and Wally Lake are no longer receiving environments for effluent discharges as of 2014 and 2017, hence the recommendation to stop winter water sampling at TPN, TPE and WAL respectively.

It is important to note that seven (7) years (2014 to 2021); and four (4) years (2017 to 2021); are still under the specified duration of years suggested for post closure monitoring activities (25 years post-closure monitoring). CIRNAC had consistently recommended and supported a 25-year post closure monitoring as part of the reclamation plan while using this timeline as the benchmark to conclude that a monitoring station has been restored to its baseline data status after all assessment indicators have been considered. CIRNAC views the continuous winter water sampling at TPN, TPE and WAL as a valuable process that would provide insight into how these lakes ecosystems would respond after mining activities have been brought to a close. This information is pivotal for monitoring post-closure implementation plans.

Recommendation 1: CIRNAC recommends that AEM continue Winter water sampling (and Limnology profiling) at Third Portage Lake North Basin (TPN) and East Basin (TPE) and Wally Lake (WAL) as long as mining activities continue to take place within the vicinity of Meadowbank and Whale Tail project's footprints.

Agnico Eagle's Response to Recommendation 1:

CIRNACs rationale to continue winter sampling at TPN, TPE, and WAL was presented in two concerns/observations:

1. That low dissolved oxygen (DO) can occur under ice and "exacerbate the respiratory conditions of aquatic organisms in lakes within the Meadowbank and Whale Tail project's footprints."
2. Reducing the frequency of sampling in the winter is not consistent with the approach for post-closure monitoring.

Their comments are addressed below.

Dissolved Oxygen

CIRNAC correctly pointed out that long periods of ice cover can limit gas exchange between the atmosphere and surface water, which in turn can lead to low DO during winter months in certain situations. Long-term monitoring at the reference area INUG since 2009 has provided a thorough understanding of how variable DO is under ice due to natural conditions. Reference data from INUG are the relevant point of comparison for determining if DO at the Meadowbank study area is impacted by activities at the Mine. It's important to emphasize that the CREMP is designed to

detect changes in lakes close to the mine that are attributed to mining activities, and characterizing conditions in the reference areas is one of the strengths of the CREMP.

Two observations about natural DO conditions are evident when looking at the long-term dataset from the reference area INUG (Figure 1):

1. Dissolved oxygen at INUG is typically above 10 mg/L during the winter months, with most measurements indicating conditions under ice are fully saturated throughout the winter. Recall that cold water has the capacity to hold more oxygen than warm water (CCME, 1999). When water temperatures are approximately 3°C, fully saturated conditions (100% DO) is equal to approximately 13.5 mg/L. The vertical dashed line in Figure 1 shows the theoretical limit of 100% saturated conditions when water is 3°C. As you can see, DO is often measured above the theoretical limit of 100% saturation. DO results > 14 mg/L should be interpreted as *fully saturated* in the plots.

2. Notwithstanding the overall trend of high DO under ice, there have been instances where lower DO reading was recorded at INUG. The number of observations where DO is less than 7.5 mg/L are rare, indicating low DO under ice is not a common occurrence in lakes in the region. Furthermore, conditions of low DO are not persistent from month-to-month when looking at the same line colour (year) across months in Figure 1. For example, at INUG in April 2019, DO was measured as low as 5 mg/L at the 15 m depth interval (see the blue line in Figure 1). By May, DO in two profiles taken at different locations were fully saturated (>13.5 mg/L) and unstratified (similar DO near the surface as the near the sediment).

Based on the results from INUG, we see that DO is typically well saturated under ice and instances of low DO, when they are observed, are transient. Variability in DO is normal for all lakes that experience prolonged periods of ice cover, but *minor variability in DO* is typically associated with climate conditions, lake morphology, and watershed characteristics rather than point source discharges (CCME, 1999).

Long-term trends in under-ice DO for the Project Lakes TPN, TPE, and WAL are shown in Figures 2, 3, and 4, respectively. Monthly profiles at each area clearly show that DO varies according to the range of naturally variability observed at INUG. In short, there is no evidence to suggest that discharge of water from the Portage Attenuation Pond to Third Portage Lake or from the Vault Attenuation Pond to Wally Lake contributed to low DO during the winter.

In addition, in the absence of direct discharge of effluent to the receiving environment, dust deposition would be the most important mining-related input to the near-field lakes. The temporal pattern for these inputs on an annual basis would be accumulation on the ice over the winter (but no contribution to the water) followed by rapid mixing during ice breakup and lake turn-over, then further gradual inputs over the remainder of the open water period. It should be noted that this pathway has never been identified as an important source of contaminants to the receiving environment in the CREMP program. Further, the temporal exposure pattern described above would preclude this pathway from being active under ice cover.

In summary, long-term monitoring of DO during the winter months conducted under the Meadowbank CREMP has demonstrated the prevalence of well-oxygenated water in near-field lakes, even in areas directly receiving mining effluent. Further, any inputs from mining-related dust deposition, which has not been identified as an important source of contaminants to receiving environments at Meadowbank, would not be expected to occur over the winter months.

Reduced Frequency of Sampling in the Post-Closure Period

CIRNACs opinion is that "continuous winter water sampling at TPN, TPE and WAL is a valuable process that would provide insight into how these lakes ecosystems would respond after mining activities have been brought to a close." Based on winter sampling from 2014 to 2021 at TPN and TPE and from 2017 to 2021 at WAL, it's clear that DO in TPN, TPE, and WAL in the post-discharge phase (closure) is similar to baseline and reference conditions.

The CREMP is an adaptive program. The 2005 AEMP (pre-cursor to the CREMP Plan) stated explicitly that monitoring results would be used to make informed decisions about how to improve the program without compromising early detection of changes in the environment:

> *By critically examining the ongoing results of the AEMP over time, those components of low value should be eliminated and additional components (to reflect findings or new activities) should be added if required. This streamlining will ensure that the monitoring program focuses on issues that are relevant to the program objectives.*

It is important to note that Agnico Eagle is not recommending to stop water quality monitoring at TPN, TPE, and WAL under the CREMP. Discontinuing low value winter monitoring at TPN, TPE, and WAL will not affect our ability to detect changes in water quality related to activities at

Meadowbank. Monthly sampling during the open water period in July, August, and September will still occur at TPN, TPE, and WAL to provide insight into how the lakes respond as the intensity of mining activities in each area are reduced. Moreover, winter sampling at Second Portage Lake, Whale Tail study area lakes, and the reference area lakes will continue to provide data to help understand how DO responds to natural vs mining-related factors.

Figure 1. Dissolved oxygen (mg/L) in profiles collected from Inuggugayualik Lake (INUG) since 2009.

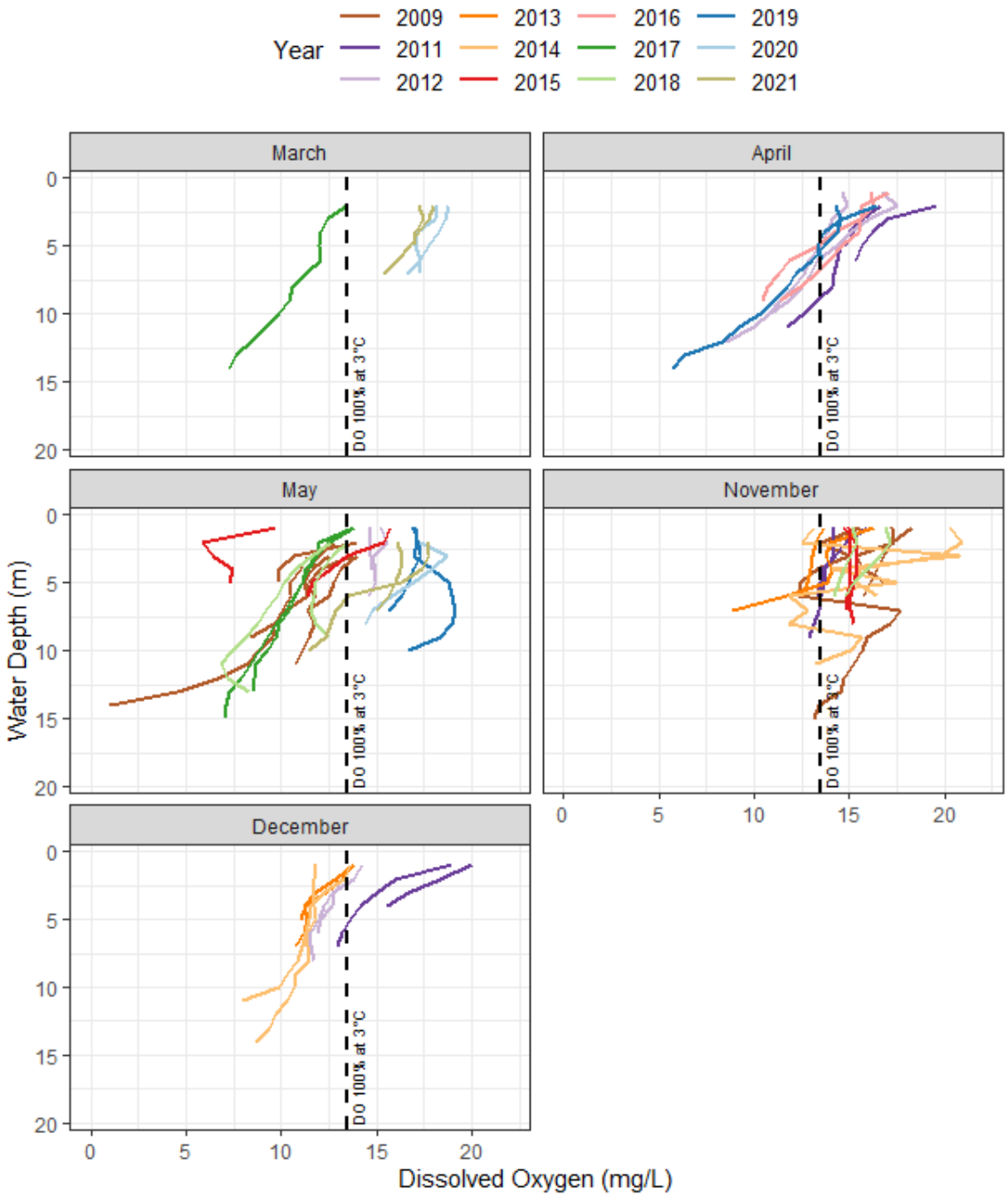


Figure 2. Dissolved oxygen (mg/L) in profiles collected from the north basin of Third Portage Lake (TPN) since 2009.

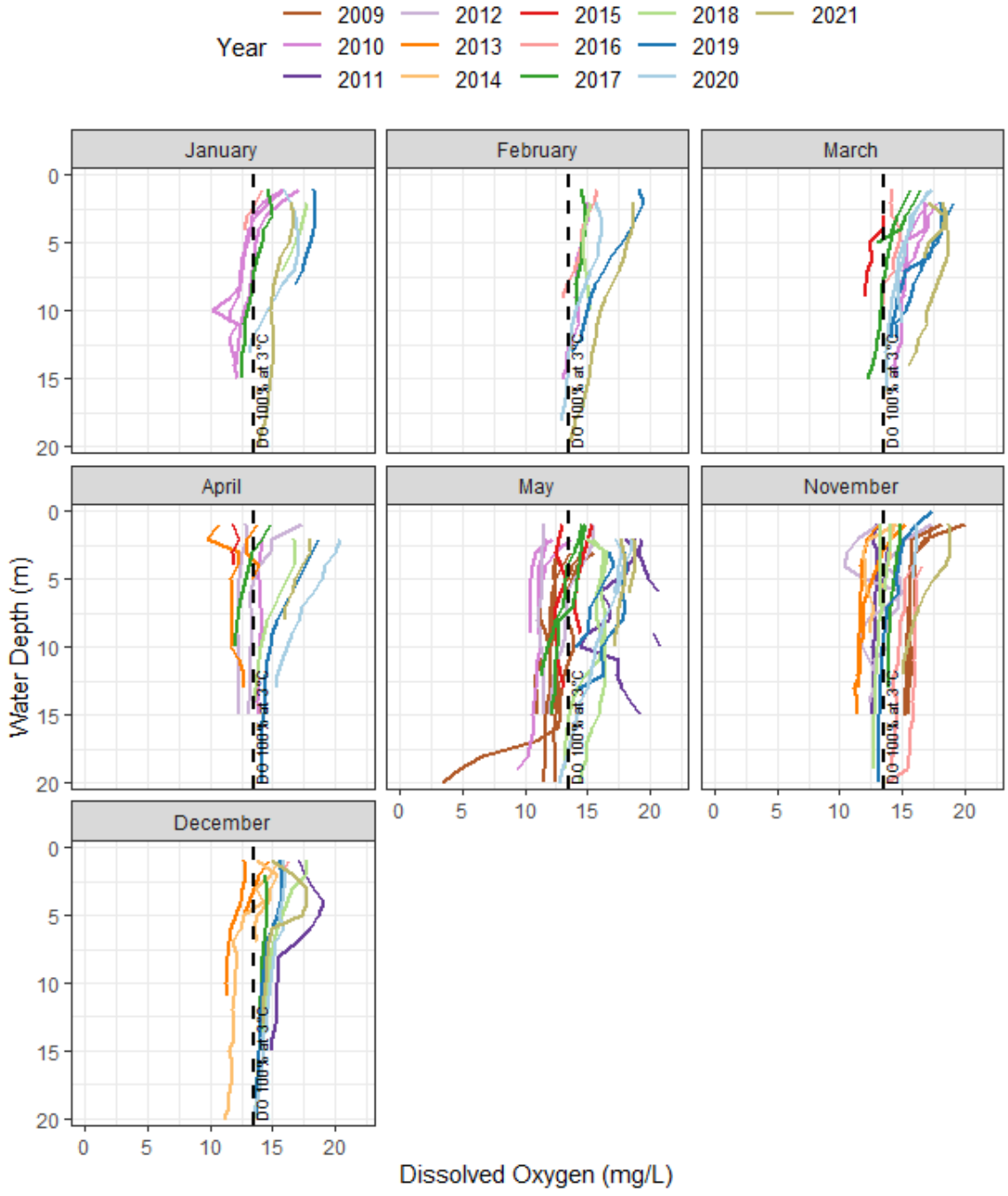


Figure 3. Dissolved oxygen (mg/L) in profiles collected from the east basin of Third Portage Lake (TPE) since 2009.

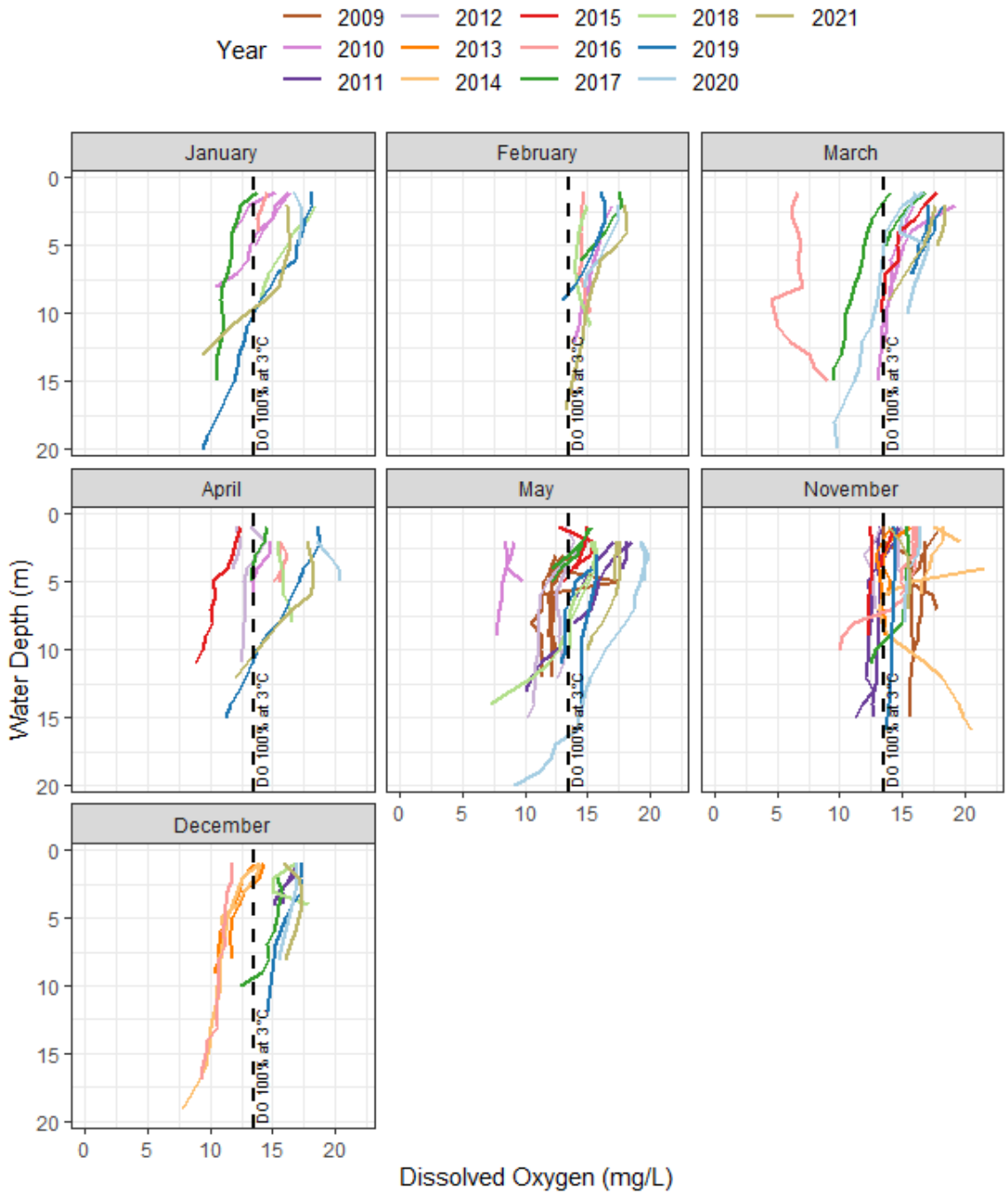
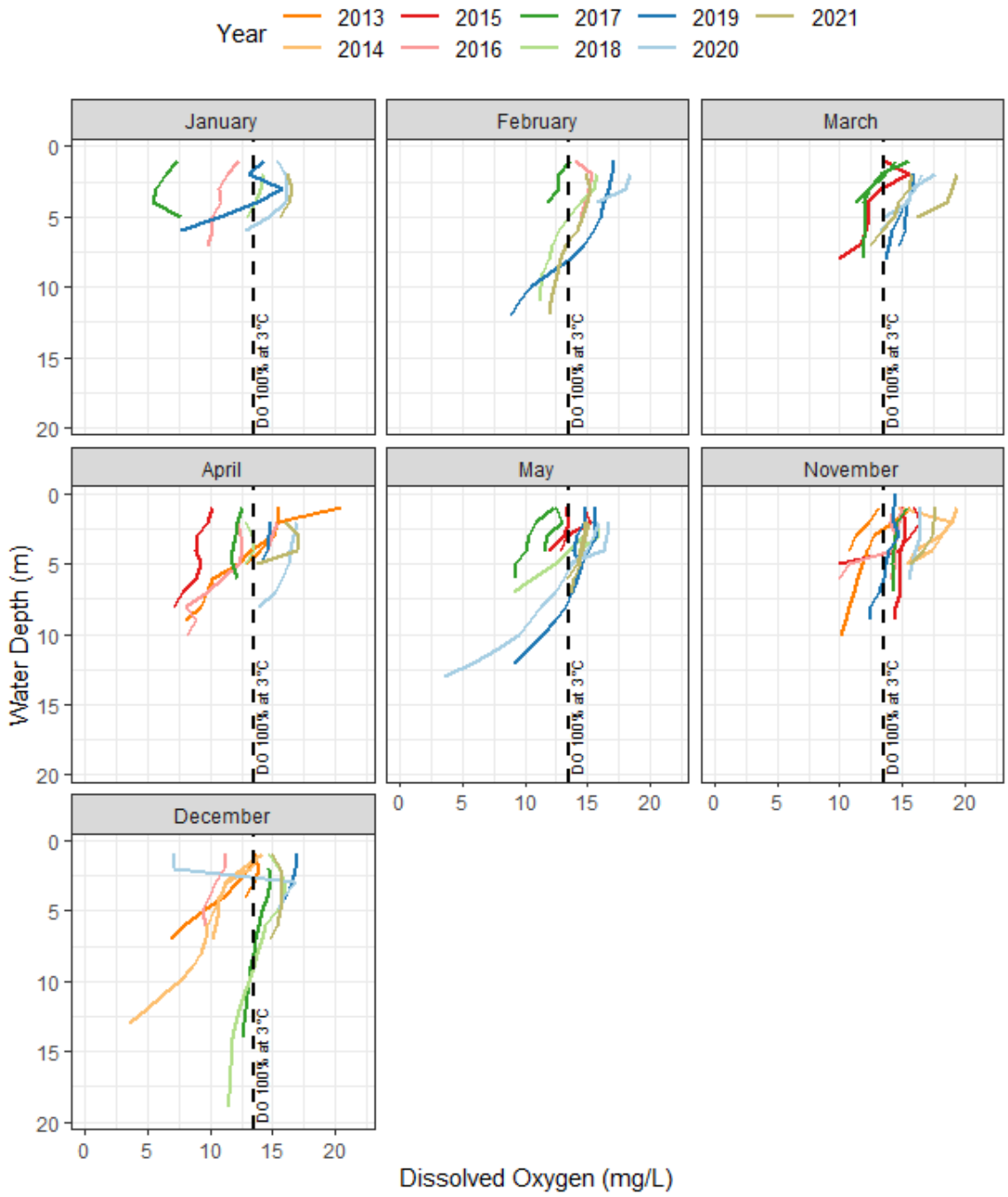


Figure 4. Dissolved oxygen (mg/L) in profiles collected from Wally Lake (WAL) since 2009.



1.2 Benthic invertebrates monitoring frequency

Comment: In the Meadowbank CREMP, AEM recommends an annual monitoring of the invertebrate communities at sampling stations SP and TPE respectively (Page 22; CREMP Plan 2021 Update). For sampling stations TPN and WAL, AEM recommends a reduction in the frequency of benthic invertebrate sampling from annually to a 3-year cycle; given that discharge to both lakes has ceased and the benthic invertebrate communities have remained stable relative to baseline/reference conditions (Pages 22 and 23; CREMP Plan 2021 Update).

CIRNAC is concerned that the inconsistency in the recommended sampling frequencies for Meadowbank's benthic invertebrates monitoring stations, might result in incomparable results that might alter the statistical significance of the data. Thus, CIRNAC is of the opinion that the benthic invertebrates monitoring frequency for all sampling stations at Meadowbank be uniformly performed annually, irrespective of whether discharge has ceased in the sampling location or not. A uniform annually generated data for all Meadowbank's benthic invertebrates monitoring stations, would provide the opportunity for better scientific analysis which would reveal how these invertebrate communities have responded to prolonged years of mining activities within the Meadowbank project's footprint. Furthermore, a uniform annually generated data, would provide the opportunity to perform comparative statistical analyses of the results generated from each of Meadowbank's sampling stations; against the other; to better enable informed decision making as to next steps in the reclamation implementation plan. It would be problematic to compare an annually generated data to a three-yearly generated data and still expect to arrive at a reasonable conclusion that would apply to all, given that the data were not generated at the same frequencies. This is the scenario that AEM's recommendations for Meadowbank's benthic invertebrates monitoring; as in the cases of SP and TPE (annually recommended) and; TPN and WAL (three-yearly recommended); tend to suggest.

CIRNAC reiterates that comparison of results from all Meadowbank's benthic invertebrates monitoring stations, is pivotal to providing insight into how each of these lake ecosystems would respond after mining activities have been brought to a close in the region; as well as ensuring that yearly information is readily available to make an informed decision on monitoring post-closure implementation plans.

As stated in comment #1 above, CIRNAC suggests that AEM assume seven (7) years (2014 to 2021); and four (4) years (2017 to 2021) time horizons after discharges ceased to occur at monitoring stations TPN and WAL respectively. These time horizons are still under the specified duration of years recommended for post closure monitoring activities (25 years post-closure monitoring). CIRNAC had consistently recommended and supported 25-year post closure monitoring as part of the reclamation plan while using this timeline as the benchmark to conclude that a monitoring station has been restored to its baseline data status after all assessment indicators have been considered. More importantly, any halt of direct discharge operations into

these lakes while mining activities are still ongoing in the vicinity does not mean that the lakes are immune to indirect impacts as a result of the ongoing mining activities within the Meadowbank project's footprint.

CIRNAC prefers an annual monitoring frequency recommendation for benthic invertebrates at Meadowbank, to a three-year monitoring cycle recommendation, irrespective of whether or not there has been a halt to direct discharge operations into the monitoring stations. An annual monitoring frequency will ensure the yearly availability of data to make informed decision as long as mining activities continue to take place within the vicinity of Meadowbank and Whale Tail project's footprints. A three-year monitoring frequency might result in missing vital ecosystem signals that would provide insight on how the ecosystems are responding to ongoing mining activities within Meadowbank project's vicinity.

Recommendation 2: CIRNAC recommends that the benthic invertebrates monitoring frequency for all sampling stations at Meadowbank (i.e., SP, TPE, TPN and WAL) be uniformly performed annually as long as mining activities continue to take place within the Meadowbank and Whale Tail project's footprints; (i.e., irrespective of whether or not there had been a halt to direct discharge operations into the monitoring stations).

Agnico Eagle's Response to Recommendation 2:

CIRNAC raised the following concerns regarding benthic invertebrate community monitoring on a 3-year cycle:

1. CIRNAC is concerned that the inconsistency in the recommended sampling frequencies for Meadowbank's benthic invertebrates monitoring stations, might result in incomparable results that might alter the statistical significance of the data.

2. An annual monitoring frequency will ensure the yearly availability of data to make informed decision as long as mining activities continue to take place within the vicinity of Meadowbank and Whale Tail project's footprints. CIRNAC prefers an annual monitoring frequency recommendation for benthic invertebrates at Meadowbank, to a three-year monitoring cycle recommendation, irrespective of whether or not there has been a halt to direct discharge operations into the monitoring stations.

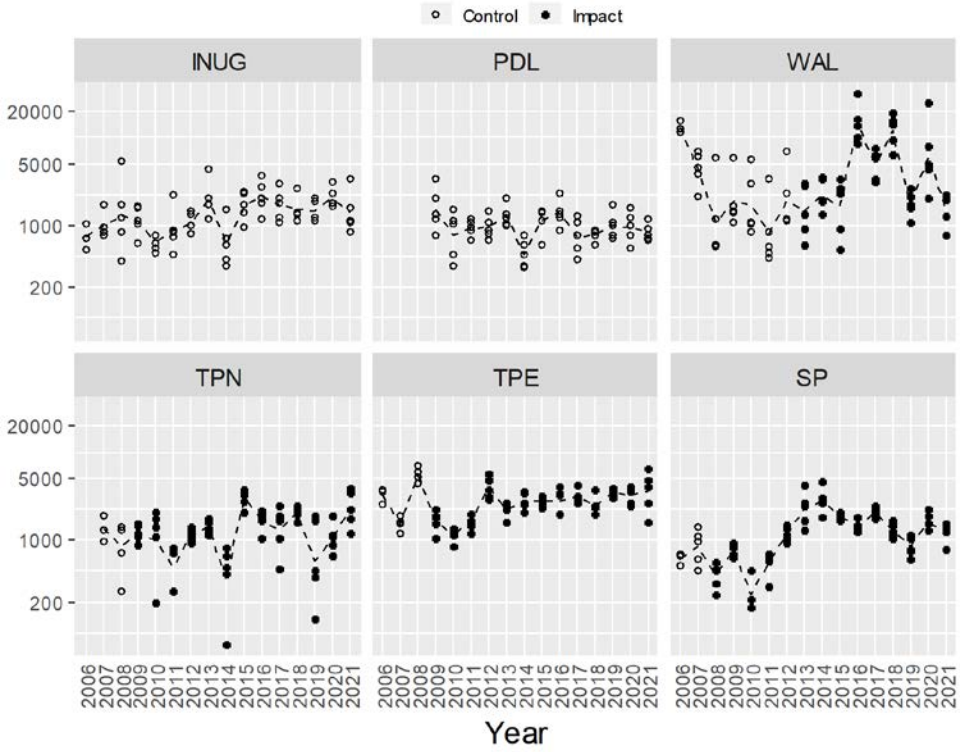
The CREMP has employed the before-after/control-impact (BACI) study design since its inception. BACI designs are robust in that they track changes at control areas (e.g., INUG) and impact areas (e.g., TPN) over time. A big advantage of this model is that it does not assume that control and impact areas are the same at the beginning, nor does it assume that they will be invariable over time. Rather, the target effect that the BACI model tests for is the *proportional change* at the impact area relative to the control area. For simplicity, we refer to this as a comparison to

reference/baseline conditions. The major requirement of using this model is that the control and impact areas need to be sampled in the same years, whether they be "before" or "after" years. Once the "before" (baseline) data are collected, the model has lots of flexibility in how it can be used with "after" data. The Meadowbank CREMP typically compares single "after" years to reference/baseline conditions, but for some metrics looks at longer-term groupings of "after" years to test for chronic changes. This flexibility was leveraged in the *CREMP: 2015 Plan Update* (Azimuth, 2015), which describes a results-driven sampling strategy that potentially reduces monitoring components, including benthic invertebrate sampling, at mid-field and far-field areas depending on the water quality results observed at paired up-gradient areas. The flexibility of the BACI model is critical to the success of this strategy. Should changes in water quality warrant follow-up benthic invertebrate sampling, the BACI model would allow comparisons of that year's results to reference/baseline conditions. Similarly, moving to a 3-yr monitoring cycle for the benthic invertebrate community would not make the data less comparable or alter statistical significance. With "before" (baseline) sampling long since completed for both control (INUG) and impact (TPN, TPE and WAL) areas, the BACI model can be used in the future as long as INUG and any of the impact areas are sampled in the same year.

The recommendation to continue benthic invertebrate community monitoring "irrespective of whether or not there has been a halt to direct discharge" is inconsistent with the evidence-based approach used to make informed decisions about 1) where to sample, 2) what to sample, and 3) how frequently to sample. Focusing our efforts on monitoring changes in areas where effects are more likely to occur is consistent with the existing CREMP monitoring strategy that was developed for Tehek Lake and the south basin of Third Portage Lake in the *CREMP: 2015 Plan Update* (Azimuth, 2015). If mining-related changes in water quality are detected in TPN, TPE, and WAL that have the potential to impact the health of aquatic life, more frequent benthic invertebrate or other targeted studies will be undertaken as per recommendation in the CREMP. Furthermore, annual benthic invertebrate community sampling will still be conducted at Second Portage Lake (SP) as well as the Whale Tail Pit study area lakes where mining-activities have a higher likelihood of causing changes in water quality that *could* affect the benthic invertebrate communities.

Our recommendation to reduce the frequency of monitoring at TPN and WAL start in 2022 is based on multiple years of data that show mining activities have not impacted the health of the benthic invertebrate communities in these lakes. Furthermore, monitoring data from the *Impact* period in each lake over the past several years clearly shows benthic invertebrate community abundance is within the range of values reported during the baseline (Figure 5).

Figure 5. Benthic invertebrate abundance (organisms/m^2) at the Meadowbank Project Lakes since 2006.



References

Azimuth. 2015. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Azimuth. 2005a. Aquatic Effects Management Program (AEMP) – Meadowbank Gold Project. 2005. A report prepared by Azimuth Consulting Group, Vancouver for Cumberland Resources Ltd. October, 2005.

CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life – Dissolved Oxygen (Freshwater).