

TECHNICAL MEMORANDUM

Date: May 28, 2026

To: Joseph B. Fobister, Lead Negotiator (Grassy Narrows Land Protection Team), David Sone (ANA Advisor), Jackie Esmonde (Legal Counsel) and Sydney Lang (Legal Counsel) of the ANA Advisory Team

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Subject: Review of the Great Bear Project Impact Statement – Preliminary Technical Review Comments

Introduction

Source Environmental Associates Inc. (Source) was retained by Asubpeeschoseewagong Netum Anishinabek (ANA) to review the Great Bear Project Impact Statement submitted in support of the proposed Great Bear Gold Project.

The Great Bear Project herein represents a transition from the previously reviewed Advanced Exploration (AEX) Program to a proposed full-scale mining operation. The project includes both underground mine and open pit development, mine water management infrastructure, waste rock and ore handling facilities, water treatment systems, closure and reclamation components, and associated infrastructure with the potential to affect groundwater, surface water, aquatic ecosystems, and downstream receiving environments.

This memorandum provides Source's preliminary technical review comments on the Impact Statement and associated supporting documents. The review focuses on technical deficiencies, information gaps, uncertainties, and environmental risks, particularly with respect to:

- Water quality and contaminant loading;
- Groundwater and surface water interactions;
- Mine water management and treatment;
- Hydrogeological and hydrological modelling; and
- Monitoring, mitigation, and adaptive management.

Where the proponent's conclusions depend on future design, future permitting, future monitoring, or adaptive management, this review also identifies whether additional detail is

needed at the Impact Statement stage to understand potential effects and evaluate the adequacy of proposed mitigation.

Primary materials reviewed included the Impact Statement sections addressing alternatives, effects assessment methodology, groundwater, surface water flows and levels, water quality, cumulative effects, accidents and malfunctions, and key appendices including Appendix H (Groundwater), Appendix I (Hydrology and Water Balance), Appendix J (Geochemistry), and Appendix K (Water Quality).

Where relevant, this review also considers issues previously identified during Source's review of the Great Bear Advanced Exploration Program Environmental Compliance Approval and Permit to Take Water applications. Several concerns identified during the AEX review remain relevant to the full-scale mining proposal where the current Impact Statement relies on similar assumptions and modelling approaches.

Technical Comments on Water Quality

1. Range in Flows for Water Quality Modelling

Appendix K-3 provides sensitivity cases for 1:100 dry year, 1:100 wet year, climate change, and upper baseline conditions; however, the water quality model appears to rely on monthly average or median baseline water quality data and monthly water balance/source term inputs. This approach may be reasonable for estimating long-term average trends, but it does not adequately represent the upper range of water quality conditions relevant to effects assessment and receiving environment protection. The average water flow approach consistently underestimates exceedances of water quality parameters substantially. For parameters with highly variable concentrations, such as ammonia, nitrate, nitrite, cyanide, sulphate, arsenic, selenium, mercury, and other metals, median inputs are not sufficiently conservative for assessing environmental risk. A variable water quality and flow model is needed to represent the range in expected values for key model parameters. The base case for the water quality model should be a realization representing the full range in historic flows or a stochastic representation of the expected range in flows. This is because groundwater, seepages and underground dewatering tend to be fairly constant with time as sources of contaminants while lower than average flows in receivers occur reasonably frequently and are not represented adequately by average monthly flow models.

2. Source Term Inputs for Water Quality Modelling

The proponent should clarify how monthly baseline values and monthly source terms were selected, including whether monthly medians, averages, upperpercentiles (75th, 90th, or 95th), or other statistics were used for each model input. The proponent should also clarify whether upper-percentile water quality conditions were evaluated for key source terms, including WTP influent, treated effluent, TMF seepage, MWP seepage, VMF water, LP Central pit water, construction

runoff, nitrogen species, and cyanide-related parameters. These sensitivity cases are needed to demonstrate that predicted water quality remains protective when elevated source concentrations coincide with reduced assimilative capacity in small unnamed watercourses, Dixie Creek, and the Chukuni River.

3. Need for a Dedicated Brine (Reject Solution) Management Plan

The Mine Site Water Balance Report (Appendix I-2) provides a conceptual reject solution management approach: membrane filtration is expected to produce reject solution equal to approximately 10% of the treated volume; reject solution would be used in paste backfill where possible, with excess stored in the west VMF, later potentially pumped to a sequestered area of the LP Central pit, and then pumped underground at closure.

The Mine Site Water Quality Estimate (Appendix K-2) provides predicted membrane filtration reject solution chemistry. While the inclusion of reject solution water quality in the WQM is helpful, it does not replace the need for a dedicated brine/reject solution management plan. Additional information is required to assess whether the proposed approach is environmentally protective and well-managed over operations, closure, and post-closure. The proponent should develop a dedicated brine/reject solution management plan that includes predicted reject solution chemistry, annual and cumulative volumes, seepage and groundwater contaminant transport risks, compatibility with paste backfill, closure/post-closure fate, treatment feasibility, monitoring requirements, and contingency measures. The plan should also clarify whether reject solution stored in the west VMF, LP Central pit, paste backfill, or underground workings could affect closure reflooding water quality.

Without a dedicated brine/reject solution management plan, the long-term implications of storing or relocating concentrated reject solution remain uncertain, particularly from a water quality and closure risk perspective.

A better solution is to treat the brine generated so that it does not need to be managed long term as a contaminant source. This is a common approach used in water treatment as membrane systems simply separate contaminants and are more useful if followed by destruction of contaminants through treatment such as metals removal and anoxic biological treatment (i.e. MBBR or FBR).

4. Need for a Dedicated Nitrogen Management Plan

The Project is expected to use substantial quantities of explosives, estimated at up to approximately 10,500 tonnes per year when LP Central pit and underground mining occur concurrently, decreasing to approximately 5,000 tonnes per year during the later underground-only mining phase. The Mine Site Water Quality Estimate (Appendix K-2) indicates that ammonium nitrate fuel oil emulsion and emulsion blend explosives are planned, and that

ammonia, nitrate, and nitrite will be the primary blasting-residue constituents available to load mine dewatering waters.

Appendix K-2 provides nitrogen source terms and estimates that appear lower than realistic based on additional information included in Appendix K and professional experience. While the source term in the model used for nitrate-N is 3.3 mg/L, concentrations included in Table 1 are 8.3 mg/L, 3.7, mg/L and 8.3 mg/L. Nitrate is a common problem at open pit mines with blasting and cyanide gold mines, and robust water quality influent predictions are important for assessing the need for nitrate removal by water treatment. Additional mines similar to the proposed Great Bear project often have nitrate concentrations much higher than 3.3 mg/L, often orders of magnitude higher.

The ANFO loss factor used in the water quality model was not provided. The loss factor is the estimated mass of blasting-related nitrogen that reports to mine contact water as ammonia, nitrate, and nitrite. Without this information, reviewers cannot verify whether the nitrogen source terms are realistic or conservative. Please provide this key metric used in water quality modelling for nitrate and other nitrogen species.

In Appendix K the statement is made that water quality modelling of nitrate and cyanide is not common; however, this is not the case for many mines in Canada as empirical data exists and can be used for modelling as well as ANFO loss factor, etc. Nitrate and cyanide are often key issues at mines site and an accurate range of predictions of influent are critical to successful mitigations planning. It is possible that additional treatment is needed (such as MBBR or FBR) to remove nitrogen species (and this was missed by the use of unrealistically low influent predictions).

These estimates rely on assumed explosives use, average annual monthly water balance flows, literature-based nitrogen species distribution, and analogue data. As a result, the water quality model does not replace the need for a dedicated operational plan to minimize nitrogen loading at source and manage nitrogen species before discharge.

The proponent should develop a dedicated Nitrogen Management Plan that includes explosives selection, storage, handling, loading practices, spill prevention, blast design, misfire prevention, residual explosives cleanup, tracking of annual and monthly explosive use, nitrogen load estimates, monitoring of ammonia, nitrate, nitrite, and un-ionized ammonia in mine dewatering water, WTP influent, treated effluent, seepage, and receiving waters, and clear trigger/action levels. The plan should also identify treatment capability and contingency measures for ammonia, nitrate, and nitrite, including measures if nitrogen concentrations exceed model predictions or if WTP performance is insufficient during high-blasting, freshet, low-flow, or winter conditions.

5. Need for Protective Cyanide Targets and a Comprehensive Cyanide Management Plan

The Cyanide and Nitrogen Contact Water Quality Estimates (Appendix A of Appendix K-2) states that cyanide destruction is planned for the tailings slurry, and that the final target concentrations

for total and WAD cyanide following the cyanide destruction circuit will comply with limits intended to be protective of wildlife and avian species. The International Cyanide Management Code commonly uses 50 mg/L WAD cyanide as the tailings facility wildlife-protection threshold. However, this threshold is not appropriate as a water quality management target for the receiving environment. It is 10,000 times higher than the 0.005 mg/L WAD cyanide water quality guideline for protection of aquatic life.

The water quality model uses substantially lower process water source terms of 0.1 mg/L WAD compared with the TMF pond target of 50 mg/L WAD-CN. This is potentially a large error that is often caused by unrealistically low post-cyanide destruction laboratory testing. Actual data from analogue sites is much higher (e.g., 2.3 mg/L WAD CN). Also, the Worley study looked at the feasibility of cyanide destruct achieving 1 mg/L WAD-CN, which is typically a substantive cost associated with milling. Because of the challenges and costs associated with cyanide destruct and poor industry track record, it is important that a range of TMF WAD-CN concentrations be considered in the water quality model such as 1-50 mg/L, depending on the commitment of the proponent and regulators to ensure the TMF does not exceed the value used in the water quality model for the TMF.

The defined protective cyanide target in the TMF following the cyanide destruction circuit, must match the source term used in the water quality modelling. Otherwise, the water quality modelling will be significantly under-representing the risk of cyanide to downstream receptors. It is important to understand the risks associated with cyanide-metal complexes such as CN-cobalt complexes and the lack of ability for RO membranes to achieve target concentrations. This is documented in BQE (2025) – see attached¹. This raises significant concerns regarding the lack of cyanide management presented in the application and warrants additional work.

there is no assurance that cyanide concentrations will consistently be reduced to the levels assumed in the water quality model. If no operational target substantially lower than 50 mg/L WAD cyanide is established for TSF/VMF water and post-destruction tailings slurry, there is limited assurance that the cyanide destruction circuit will be operated to achieve the low cyanide concentrations assumed in the effects assessment.

This issue is also relevant to accidents and malfunctions. Section 16 identifies several potential accident/malfunction scenarios involving cyanide release, including TMF or TMF pond dam failure involving cyanide-laden tailings and water, tailings pipeline failure involving cyanide-laden slurry, and chemical release from an accident or reagent spill. Cyanide-laden contact water, tailings slurry, reagent, seepage, or spill releases to groundwater or surface water could adversely affect

¹ Following the experience of the Eagle Gold membrane water treatment approach, it was surprising to learn that following the breakdown of WAD CN, free cyanide was not rejected by the membrane and needed further treatment (see BQE 2025 presentation, e.g. page 9,11). Available at: <https://bc-mlard.ca/files/presentations/2025-6-JACOBSON-ETAL-emergency-response-water-treatment.pdf>

aquatic life, particularly if cyanide concentrations are managed only to a wildlife-protection threshold rather than a more conservative aquatic-life-protective target.

The proponent should develop a comprehensive Cyanide Management Plan that identifies protective operational targets and trigger/action levels for total cyanide and WAD cyanide following the cyanide destruction circuit, in the TMF/east VMF, seepage, reclaim water, WTP influent, treated effluent, and relevant receiving environment monitoring locations. The plan should include monitoring frequency, process controls, trigger mechanisms, response actions, discharge restrictions, contingency treatment, spill response, pipeline failure response, and adaptive management requirements.

In addition, the feasibility of cyanide treatment for effluent discharge to the receiving environment should be reassessed using the proposed TSF/VMF supernatant and post-cyanide destruction targets as influent assumptions. This reassessment should include cyanide-related species and degradation products, including but not limited to total cyanide, WAD cyanide, thiocyanate, cyanate, nitrate, nitrite, and ammonia.

6. First-Flush and Reflooding Water Quality

The Receiver Water Quality Modelling Report (Appendix K-3) states that during closure, freshwater from the Chukuni River will be used to actively fill the LP Central pit, VMF, and underground workings, and that filling is expected to be completed by the end of Year 30. The document includes pit lake water quality predictions for the LP Central pit and VMF. However, it is unclear whether the assessment fully captures flushing and reflooding risks for the underground workings.

Reflooding may mobilize oxidation products and dissolved constituents from exposed underground walls, tailings, paste backfill, PAG/ML materials, and stored reject solution. The proponent should provide underground reflooding water quality predictions, including expected peak concentrations, timing of peak loading, treatment requirements, monitoring triggers, and contingency measures before passive discharge is allowed. The proponent should clarify how first-flush and reflooding water quality were assessed for the underground workings during closure. During the transition from operations to initial closure, typically mitigation is required such as additional treatment of underground spaces until flooded volumes approach baseline groundwater conditions.

7. Pre-Project Disturbance Data

The Great Bear Project Water Quality Baseline Report (Appendix K-1) presents the results of surface water and groundwater baseline monitoring conducted within the Project area. According to the report, surface water quality data used to characterize baseline conditions were collected beginning in 2020. Section 1.2 defines baseline as representing “pre-Project, existing environmental conditions.”

However, there is concern that the monitoring data presented in Appendix K-1 may not represent pre-disturbance conditions within the Project area. Section C.3.2 of the Detailed Project Description for the Advanced Exploration (AEX) program states that substantial surface exploration activities associated with the Great Bear Project began in 2017. These activities included, but were not limited to:

- tree clearing;
- approximately 550,000 metres of diamond drilling; and
- the operation of mobile equipment and associated exploration infrastructure.

Because the water quality monitoring program described in Appendix K-1 began after several years of intensive exploration activity had already occurred, the dataset may reflect conditions that were already influenced by Project-related disturbance rather than undisturbed baseline conditions. This distinction is important because baseline datasets are used to establish reference conditions against which future Project effects, regulatory thresholds, and cumulative environmental changes are evaluated. Appendix K-1 should therefore acknowledge that the monitoring data reflect site conditions following the commencement of exploration activities in 2017.

In addition, if water quality or hydrogeological data exist from before the initiation of exploration activities, those data should be reviewed and compared against post-2017 monitoring results to evaluate whether exploration activities have already altered surface water or groundwater quality within the Project area.

8. Surface Water Quality Monitoring

Table 3-1 of Appendix K-1 lists the stations monitored as part of the surface water quality program. Stations selected downgradient of the proposed Project footprint (far-field sites) include SW-03, SW-04, and SW-08. These sites are essential for determining baseline water quality conditions in Dixie Creek prior to Project disturbance. SW-03 and SW-08 also serve as predictive nodes (DIX-2 and DIX-3, respectively) in Appendix K-3, Receiver Water Quality Modelling Report.

However, it appears that these monitoring points do not capture all Project-related activities. The Viggo Pit, later referred to as the VMF, is located downgradient of Station SW-08. The Viggo Pit will serve as a source of ore during construction, and it will store PAG concentrate tailings beginning in operations. The closest surface water monitoring station that could potentially capture impacts from the Viggo Pit/VMF is SW-09, which is located approximately 3–4 km downstream.

Future surface water quality monitoring should therefore be revised to include a monitoring station capable of capturing potential impacts from the Viggo Pit/VMF prior to significant downstream dilution or mixing. This would allow the monitoring program to better capture the majority of

Project-related effects on surface water quality and provide early warning of potential seepage or contaminant migration from PAG tailings stored within the VMF into Dixie Creek.

9. WAD Cyanide in Receiving Environment

Figure F-13 of Appendix K-3 indicates that weak acid dissociable (WAD) cyanide concentrations in Unnamed Watercourse 1 are predicted to exceed applicable Provincial Water Quality Guidelines beginning in Year 6 of Operations. These exceedances are predicted to persist throughout the Operations phase and decline below guideline values only by approximately Year 34. Unnamed Watercourse 1 is located immediately downstream of the TMF and has been identified in the Application as fish-bearing habitat. In addition, predictions are expected to underestimate water quality because 1) lack of variable flow water quality model, and 2) higher WAD-CN in the TMF, i.e. based on the TMF target level defined, 50 mg/L WAD CN.

Despite these predicted exceedances in the receiving environment, the assessment does not appear to adequately evaluate the potential effects of elevated WAD cyanide concentrations on aquatic life. For example, Section 5.6.2 of Appendix L-2 (Fisheries Act Paragraph 35(2)(b) Authorization, Offset Plan, and MDMER Schedule 2 Fish Habitat Compensation Plan) does not identify cyanide contamination in downstream watercourses as a potential indirect effect on fish populations or fish habitat.

Given that WAD cyanide is toxic to aquatic organisms and that exceedances are predicted in fish-bearing waters over an extended period, the Impact Statement should be revised to assess the potential effects of elevated WAD cyanide concentrations on fish and aquatic life in Unnamed Watercourse 1. We also expect worse than predicted water quality (and the effects assessment / models should be updated to take into account increased concentrations as described above). In addition, the Proponent should consider protective measures (e.g., defined and regulated cyanide target for the cyanide destruction circuit and a liner for seepage) to prevent the exceedance of cyanide water quality guidelines in the receiving environment.

10. Monitoring Downgradient of Tailings Management Facility

Section 2.2 of Appendix K-1 indicates that glaciolacustrine sand deposits within the Project Area are expected to act as conduits for groundwater flow. Review of Figure 5-2 in the Hydrogeology Baseline Report (Appendix H-1) suggests that a substantial glaciolacustrine sand deposit is located downgradient of the TMF footprint. Based on the figure provided, this deposit appears to be approximately 33–34 m thick.

The application does not clearly confirm whether the TMF basin, TMF pond, or seepage collection ditches are lined. Appendix K-2 states that desulphurized tailings will be deposited in the TMF, that runoff and process water will be collected in the TMF pond, and that seepage from the TMF and runoff from the dams will be collected in a seepage collection ditch and pumped back to the TMF/TMF pond. Appendix K-2 also acknowledges that some seepage may bypass the seepage

collection system as fugitive seepage, including seepage reporting to the receiving environment. Appendix K-3 similarly treats fugitive groundwater seepage as a Project pathway and identifies the TMF as the greatest seepage source to model nodes, including seepage to UN-1 during post-closure.

Although Appendix K-1 identifies glaciolacustrine sand as a preferential groundwater flow pathway, the potential role of this unit in transporting TMF seepage or contaminants to Unnamed Watercourse 1, potentially Unnamed Watercourse 11, and downstream receiving waters, including Dixie Creek, does not appear to be fully evaluated. This uncertainty is important because the water quality model already assumes that TMF fugitive seepage may reach the receiving environment, regardless of whether a seepage collection system is present.

Baseline surface water quality monitoring in this area also appears limited. Monitoring on Unnamed Watercourse 1 was conducted only at station SW-01 near the outlet of Unnamed Waterbody 1, and it does not appear that continued surface water quality monitoring is proposed for Unnamed Watercourse 1 following the overprinting of Unnamed Waterbody 1 by the TMF. In addition, only one groundwater monitoring well, MW23-14, appears to be located within the downgradient sand deposit at the time of writing.

Given the identified groundwater flow conduit, the unclear liner status of the TMF and seepage collection system, and its potential to facilitate contaminant migration from the TMF, additional monitoring and assessment are warranted. It is recommended that surface water quality monitoring be conducted on Unnamed Watercourse 1 and Watercourse 11 throughout the life of mine following placement of the TMF. Additional groundwater monitoring wells should also be installed within the downgradient glaciolacustrine sand deposit to better characterize groundwater flow and monitor potential seepage migration from the TMF.

11. TMF Tailings Deposition Method and Beach Development

The application describes the TMF as receiving desulphurized tailings and states that runoff and process water will be collected in the TMF pond. However, it is unclear whether the tailings would be in the form of dry-stack or conventional slurry tailings. A conventional slurry tailings facility would typically include tailings beaches and evolving tailings-water contact conditions, whereas dry-stack or filtered tailings would have different seepage, stability, water management, and closure implications.

If the TMF is a conventional slurry tailings facility rather than a dry-stack facility, the assessment should clearly describe the expected tailings deposition approach, beach development, pond location, and supernatant water management over time. These conditions can affect oxygen exposure, seepage quality, seepage rates, dam contact water, and the timing and chemistry of water reporting to the seepage collection system or receiving environment.

The proponent should also develop a tailings storage Best Available Technology assessment, including the alternatives considered, screening criteria, assessment matrix, technical feasibility, seepage and water quality implications, closure performance, stability considerations, and rationale for selecting the proposed TMF design. Without this information, it is difficult to assess whether the proposed TMF configuration represents a protective tailings management approach or whether alternatives such as filtered tailings/dry stack were adequately considered.

12. Insufficient Groundwater Baseline Data

Table 3-4 of Appendix K-1 presents the groundwater quality monitoring locations and associated sampling frequencies used to characterize baseline groundwater conditions. While the number of monitoring locations appears extensive, the number of samples collected at most stations does not appear sufficient to adequately characterize baseline groundwater quality conditions or natural temporal variability across the site.

Relevant guidance for groundwater baseline characterization, including the British Columbia Field Sampling Manual, Part E2 – Groundwater, recommends a minimum of quarterly groundwater quality sampling over at least two years to establish representative baseline conditions. Based on the information provided in Table 3-4, this level of temporal coverage was not achieved for any groundwater monitoring location during the Great Bear baseline program. Most monitoring wells used to establish baseline conditions were installed in 2023, and no well appears to have more than seven sampling events completed at the time of reporting

The limited duration and frequency of groundwater quality monitoring introduce uncertainty into the characterization of baseline conditions and may reduce confidence in subsequent impact predictions, seepage assessments, and water quality modelling results. At this time, it does not appear that baseline groundwater conditions have been sufficiently characterized to support the level of certainty implied in the effects assessment. This limitation and associated uncertainty should be clearly acknowledged and reflected in the impact assessment, including in the evaluation of potential effects to groundwater and connected surface water systems.

13. Incomplete Presentation of Surface Water Quality Data

Appendix C of Appendix K-1 provides graphs of surface water quality data collected for the Project baseline. However, only select surface water quality parameters are graphed, and no rationale for this selection is provided. Several key parameters important for understanding baseline conditions, including dissolved oxygen, conductivity, and total suspended solids, are not included in the graphical summaries. This makes evaluation of baseline water quality more challenging and shifts the burden of reviewing tabulated data onto the reviewer. In addition, method detection limits are not shown, which further complicates the evaluation of censored data.

The Application should be revised to include graphs for all monitored parameters, consistent with industry standard practice. Detection limits should also be included to clearly identify which parameters were non-detects for a given sample.

14. Water Treatment Performance

Section 3.4.3 of the Receiver Water Quality Modelling Report (Appendix K-3) states that best available technologies that are economically achievable are being considered for the WTP to meet the protection requirements of local Indigenous Nations. The water quality model provides estimated treated water quality based on projected treatment performance for the WTP and membrane filtration system. However, the Impact Statement should also provide the supporting treatment feasibility, design basis, and best available technology assessment documentation demonstrating that the assumed treatment performance is technically achievable under the range of predicted influent conditions for all relevant parameters of potential concern.

The proponent should provide the best available technology assessment and treatment feasibility/design document used to support the selected WTP and membrane filtration treatment approach. This should include, at minimum, the treatment technology options considered, screening criteria, assessment matrix, technical feasibility evaluation, predicted influent chemistry ranges, design-basis flow rates, target effluent concentrations, treatment technology selection rationale, bench-scale or pilot-scale testing results where available, expected removal efficiencies, membrane fouling/scaling risks, sludge and brine/reject management, contingency treatment measures, and rationale for rejecting alternative treatment technologies.

This information is needed to confirm that the treated effluent quality assumed in the WQM can be achieved consistently and that the proposed treatment system represents an appropriate and protective technology selection. Without the supporting best available technology assessment and treatment feasibility/design basis, there remains uncertainty regarding whether the WQM predictions are achievable in practice rather than only modelled outcomes.

15. Adaptive Management Triggers

The water quality and receiver models identify predicted concentrations and compare them to WQG PAL and baseline conditions; however, the application does not clearly translate model predictions into monitoring triggers, action levels, and response timelines. This is important because many conclusions rely on future treatment performance, cyanide destruction, seepage collection, passive discharge decisions, and closure water quality verification.

The proponent should provide a parameter-specific monitoring and adaptive management framework for construction, operations, closure, and post-closure, including early-warning triggers, action levels, discharge restrictions, treatment adjustment requirements, contingency storage, and reporting requirements.

16. Construction-Phase Mine Site Water Quality Predictions

Appendix K-2, the Mine Site Water Quality Estimate, does not appear to provide a clear construction-phase mine site water quality assessment or construction-phase source terms for contact water. Appendix K-3 (Receiver Water Quality Estimate) provides discussion and modelling of construction-phase; however, the mine site water quality assumptions that support the construction-phase receiving environment predictions are not clearly presented.

This creates uncertainty because construction is not limited to general site preparation. Project components, including the Viggo pit, are expected to be actively advanced during the construction phase, and other areas may be disturbed through excavation, road construction, stockpiling, water management infrastructure development, and AEX-related activities. These activities may generate contact water affected by exposed rock, disturbed soils, blasting residues, temporary stockpiles, sediment, nitrogen species, metals, hydrocarbons, and other potential contaminants.

The receiving environment assessment in Appendix K-3 is important, but it is not sufficient on its own without a clear mine site water quality basis for the construction phase. The proponent should provide construction-phase mine site water quality predictions and source terms for key construction activities and facilities, including the Viggo pit, disturbed areas, excavation areas, temporary stockpiles, construction water management ponds, AEX-related facilities, and any areas where potentially deleterious materials may be exposed. Without clear construction-phase mine site water quality predictions, it is difficult to assess whether the construction-phase receiver water quality predictions in Appendix K-3 are adequately supported.

17. Appendix K-3 References

The Receiver Water Quality Modelling Report (Appendix K-3) includes a “References” section in the table of contents; however, the document does not appear to provide a reference list. Please provide a complete reference list for Appendix K-3.

Technical Comments on Water Quantity

18. Need for Transient Groundwater Modeling

The Hydrogeological Modelling Report (Appendix H-2) states that the groundwater model was developed using FEFLOW 7.2 and simulates 3D steady-state flow conditions. The report also acknowledges that steady-state conditions represent long-term dewatering after initial drawdown, and that short-term dewatering rates and seasonal inflows following freshet may be greater than the long-term rate.

The use of a steady-state 3D groundwater model may be reasonable for estimating long-term average groundwater inflows and general zones of influence. However, it is not sufficient on its own to assess time-dependent effects that are important for this Project, including seasonal

baseflow reductions, low-flow impacts to small tributaries, initial dewatering rates, drought response, closure reflooding, and recovery of groundwater levels after mining. Because the model does not simulate seasonal or transient conditions, the application may understate risks to groundwater-dependent surface water features, particularly small unnamed watercourses and low-flow periods. The proponent should provide transient modelling or, at minimum, robust sensitivity analyses for seasonal low-flow, freshet, drought, initial drawdown, closure reflooding, and post-closure recovery conditions.

19. Need for Fault and Shear Zone Sensitivity Analysis

The Hydrogeological Modelling Report (Appendix H-2) identifies the LP Shear Zone, Yauro Shear Zone, and Auro Fault, and states that these structures intersect the underground workings and LP Central pit, while none intersect the Viggo pit. Appendix H-2 also includes sensitivity analysis for different hydraulic conductivity assumptions; however, these broader hydraulic conductivity sensitivity cases do not appear to specifically test the hydraulic behaviour of the identified faults and shear zones. This is a key uncertainty because faults and shear zones may behave differently from the surrounding bedrock. They can act as preferential groundwater pathways or lower-permeability barriers.

Because these structures intersect the main mine workings, their hydraulic behaviour is directly relevant to predicted groundwater inflows, drawdown, baseflow reductions, and closure seepage pathways. The proponent should provide sensitivity cases where the LP Shear Zone, Yauro Shear Zone, and Auro Fault are represented as higher-conductivity pathways and, where appropriate, lower-conductivity barriers. These cases should assess effects on underground inflow, LP Central pit inflow, zone of influence, groundwater-surface water interaction, and closure/post-closure seepage pathways.

20. Exploration Boreholes and Need for Sealing Verification

The Hydrogeological Modelling Report (Appendix H-2) notes that hydraulic test results near open exploration drillholes were removed from the dataset because open drillholes could create artificially high hydraulic connections. The report also notes that remaining ungrouted boreholes near the proposed underground mine could act as conduits for groundwater inflow into the pit and underground workings.

This creates uncertainty because open or poorly sealed boreholes could increase groundwater inflows, alter drawdown patterns, and create preferential pathways between surface water, and shallow groundwater. The proponent should provide a complete and clear borehole inventory, sealing status, grouting method, and verification monitoring. If the sealing is incomplete, the groundwater model should also include sensitivity cases for unsealed or partially sealed boreholes acting as preferential pathways, particularly near the LP Central pit, underground workings, faults/shear zones, Dixie Creek, and unnamed watercourses.

21. Calibration Dataset is Limited

The Hydrogeological Modelling Report (Appendix H-2) states that the pre-mining baseline model was calibrated to measured groundwater levels from Fall/Winter 2023, including 106 water-level measurements from monitoring wells and vibrating wire piezometers, excluding dry wells. It also states that simulated groundwater inflows were compared to interpreted baseflow rates, but those baseflow rates were not used as critical calibration targets.

Calibration to Fall/Winter 2023 data does not demonstrate that the model reliably represents the full seasonal and interannual range of groundwater conditions, including spring freshet, summer low-flow/drought, and winter low-recharge periods. This is important because the model is used to predict groundwater inflows, baseflow changes, and groundwater-surface water interactions. The proponent should provide calibration or validation using multi-season and multi-year groundwater and surface-water data, or provide sensitivity analyses showing that predicted drawdown, baseflow reductions, seepage, and groundwater inflows remain protective under seasonal high- and low-flow conditions.

22. Absence of Seepage Analysis for LP Central Pit and Underground Workings

Section 4.2.3 of the Hydrogeological Modelling Report (Appendix H-2) provides the predicted seepage impacts from the TMF, MWP, stockpiles, and VMF. However, it appears that the seepage analysis does not identify seepage from the LP Central pit or underground workings.

This omission should be clarified because the LP Central pit and underground workings will be key features during operations and will be refilled at closure, becoming long-term mine-water features. Appendix H-2 states that the underground mine, LP Central pit, and VMF will be actively filled at the end of mine life, with the underground mine managed to allow gravity flow to the LP Central pit. The proponent should clarify whether outward seepage from the LP Central pit and underground workings was modelled. If it was not, the proponent should explain the rationale for such exclusion.

23. Water-Taking from Chukuni River during Closure filling

The Project indicates that freshwater from the Chukuni River would be used during closure to accelerate filling of the underground workings, LP Central pit, and VMF. While accelerated filling may reduce the duration of active closure, the proposed closure water-taking requires further assessment to demonstrate that withdrawals would not adversely affect Chukuni River flows, aquatic habitat, downstream users, or receiving environment conditions, particularly during seasonal low-flow periods, drought conditions, and climate-change-affected flow regimes.

The proponent should provide a detailed closure water-taking assessment that includes proposed withdrawal rates, timing, seasonal restrictions, low-flow protection thresholds, drought contingencies, effects on Chukuni River flow and aquatic habitat, and an alternative closure scenario where freshwater withdrawal is reduced or unavailable. The assessment should also

explain how water-taking would be adaptively managed if river flows are lower than predicted or if closure water quality requires a longer filling or treatment period.

24. Need for Higher-Percentile Climate Change Scenario in Water Balance

Mine Site Water Balance Report (Appendix I-2) uses 2071–2100 climate projections for the climate change scenario. While use of the later-century period is appropriate for evaluating long-term closure conditions, the selected 50th percentile projection represents the median and does not adequately test the range of plausible climate-related water management risks. Detailed Climate Change Dataset (Appendix W-3) confirms that the 50th percentile represents the median and may be used as a starting point for initial closure design or risk assessment, while higher percentiles may be considered for critical closure infrastructure or high-risk applications.

Given that the water balance supports critical closure-phase decisions, including pit filling, underground reflooding, water-taking from the Chukuni River, treatment requirements, storage capacity, and passive discharge to the receiving environment, reliance on only the median climate change scenario may not be sufficiently conservative. The proponent should provide additional sensitivity assessments using higher-percentile climate projections, such as the 75th, 90th, or 95th percentile and demonstrate that closure water management remains protective under these conditions.

25. Effluent Discharge Rate During Low-Flow Conditions

Section 4.1 of the Receiver Water Quality Modelling Report (Appendix K-3) states that the design discharge rate for peak conditions is 1,330 m³/h and that, under the MECP Policy B-1-5 theoretical worst-case scenario, this discharge rate would represent approximately 20.5% of the Chukuni River 7Q20 low-flow condition. The report states that this scenario is “highly unlikely” because the peak discharge rate is intended for wet conditions and contingency planning and would be unlikely to coincide with an extreme drought event.

This rationale is not sufficient on its own. A discharge representing approximately one-fifth of the 7Q20 flow is large from a mixing and assimilative capacity perspective. Under low-flow conditions, the effluent would make up a substantial fraction of the receiving flow, reducing dilution capacity and increasing the sensitivity of the receiving environment to treatment performance, effluent chemistry, diffuser performance, and incomplete mixing. Appendix K-3 also indicates that the CORMIX low-flow scenario predicts the effluent plume would extend approximately 300 m downstream.

From an environmental protection perspective, the scenario should not be discounted solely because it is considered unlikely. Low-probability but high-consequence conditions are relevant to assessing potential effects, particularly where reduced river flow, elevated discharge rates, and limited assimilative capacity could coincide. As a result, uncertainty remains regarding whether the receiving environment would remain protected during low-flow conditions if high discharge

rates were required. A variable flow water quality model is essential as the base case for the impact assessment (as discussed earlier).

Other Technical Comments

26. Management of PAG Mine Rock from Underground Workings

The Application indicates that the PAG/ML portion of the MRS will be progressively reclaimed with a low-permeability compacted clay cover, starting in Year 7 and completed by the end of Year 10. Underground mining is expected to continue well beyond Year 10, and underground workings may continue to generate PAG and/or ML waste rock until Year 26.

This creates uncertainty regarding where PAG/ML waste rock generated from underground mining after Year 10 would be placed, if the PAG/ML portion of the MRS has already been covered and reclaimed. It is unclear whether this material would be placed underground as backfill, stored in a separate active area of the MRS, placed on top of the reclaimed cover, or managed through another facility. If PAG/ML mine rock is to be rehandled and used as underground backfill, the application should clarify where this rehandling would occur and whether the material would be temporarily stored on surface before placement underground.

The proponent should clarify the expected quantities and management pathway for PAG/ML mine rock generated from underground workings after Year 10. The proponent should also explain how progressive MRS reclamation will remain effective if additional PAG/ML material continues to be generated after the cover is placed, and how runoff, seepage, and contact water from any post-Year 10 PAG/ML material will be collected, treated, monitored, and incorporated into the water balance and water quality model.

27. Consideration of the Mine Water Pond in TMF Failure Scenarios

In Section 16: Effects of Potential Accidents and Malfunctions, several scenarios are considered for a breach of the Tailings Management Facility (TMF) north, west, and south dams as well as a breach of the TMF pond that will contain contact water from the TMF. In the failure mode whereby the TMF and TMF Pond breach releasing both desulphurized tailings and contact water to the environment, a breach of the contingency mine water pond is not considered. Because it is considered a contingency storage facility, it is not assessed in the breach scenarios, but this facility is mentioned throughout the report and design documents. All potential scenarios should be considered including contingency facilities, such as the WMP, to fully assess potential environmental effects of a TMF and TMF Pond dam breach since they are located directly upstream of the WMP.

28. Dixie Creek Flood Protection Berm Stability

During a natural flood event or in the event of a TMF south dam and TMF pond breach, water from Dixie Creek may flow into the LP Central Pit. A flood protection berm for Dixie Creek is expected to be required as a contingency measure. Section 16.10.2 of the Effects of Potential Accidents and Malfunctions lists contingency plans and mitigations for the Dixie Creek flood berm which outlines that the berm will be “maintained in good condition” and will be inspected “more frequently” during high rain or flooding events.

Good condition and more frequent inspection are vague and non-quantitative. Further, no specific monitoring, inspection requirements, and design criteria are outlined. Mitigation measures and contingency plans should connect to measurable standards and best practices for mitigating potential accidents and malfunctions for the Dixie Creek flood protection berm.

29. Integrated Water Management System (Pipelines)

Effects of Potential Accidents and Malfunctions (Section 16) outlines that contact water, freshwater, and tailings will be transported within the project area during operations through a pipeline system. There is potential for pipelines to leak or burst, and the concern is primarily with contact water and tailings pipeline failures as they may impact surface or groundwater receptors nearby or downstream. A number of mitigations are included but outstanding questions are outlined below.

Although a leak detection system is anticipated to be installed, additional mitigations should include automatic shutoff valves, an alarm system, a shutdown procedure, and ensuring critical spare parts available at the site in the event of a failure.

One of the mitigation measures listed in Section 16.11.2 is that contact water and tailings pipelines at or near water crossings will likely have secondary containment. Near is not defined and likely is non-committal as a mitigation measure. Secondary containment should be installed for all tailings and contact water pipelines upstream of any water bodies regardless of if they are near water crossing to mitigate potential failures (contaminated pipeline water spilled is expected to flow downhill).

Further, Section 16.11.12 details that tailings pipelines will be placed in a lined ditch, but it is not clear whether contact water, freshwater, and treated effluent pipelines are to be installed above surface or below surface since Section 5 states that some pipelines will be installed in ditches or berms, but further details are not clear. For pipelines above surface, there needs to be mitigations in place to prevent freezing that may lead to potential failure. Similarly, if pipelines are below surface in buried berms, they need to be buried to a sufficient depth to prevent freezing and potential failure.

30. Potential Accidents and Malfunction Consequences – Non-Protective

Section 16.21 of Potential Accidents and Malfunctions (Section 16) outlines the risk assessment completed for the potential accidents and malfunctions discussed. The risk assessment considers

the likelihood of the occurrence and defined consequence rankings. The defined consequences rankings are as follows as it relates to environmental effects:

- **Insignificant:** within project area, negligible to minimal environmental effects, as may be observed within the natural variation of the surrounding PA and anticipated recovery within weeks
- **Minor:** within project area, short-term environmental effects with anticipated recovery less than two years
- **Moderate:** project area and immediate vicinity, medium-term environmental effects with anticipated recovery within the life of the Project between 2 to 26 years
- **High:** regional and recoverable, long-term environmental effects with anticipated recovery greater than the life of the Project (i.e., greater than 26 years)
- **Catastrophic:** regional and unrecoverable, unlikely to be completely remediated with very long-term environmental effects anticipated to be more than the life of the Project (i.e., greater than 26 years)

The consequences assessed for the potential accidents and malfunction failure modes are non-conservative and do not represent a protective approach.

- An environmental effect that takes up to 2 years to recover should not be considered minor;
- An environmental effect that may take the entire mine life to recover should not be considered moderate, and;
- An environmental effect that takes longer than 26 years to recover and may be regional in scale should be considered as catastrophic not high.

Because the consequence definitions are not appropriate, the risks associated with the accidents and malfunctions assessed are underestimated.

31. Passive Discharge During Closure

Receiver Water Quality Modelling Report (Appendix K-3) states that once closure water quality objectives are achieved, the WTP and related infrastructure will be decommissioned and the site will passively discharge to the environment. It also states that treatment and discharge to the Chukuni River is assumed for at least three calendar years after filling of the LP Central pit, VMF, and underground mine, but that the actual duration could be over 100 years and this should be considered in the project planning.

This is a major closure assumption, and the Project should define the water quality objectives, decision criteria, and monitoring duration that would determine when passive discharge is acceptable. The proponent should provide a passive discharge decision framework that includes parameter-specific criteria, monitoring locations, minimum monitoring duration, seasonal sampling requirements, and contingency measures if the LP Central pit lake, Viggo pit lake, TMF seepage, MWP discharge, or other passive flows are not suitable for discharge.

Closing Remarks

Thank you for the opportunity to provide this technical review of the Great Bear Project Impact Statement.

The comments and recommendations presented in this memorandum are intended to support ANA's review of the proposed project and assist in identifying areas where additional technical work, clarification, mitigation, or regulatory consideration may be required.

We remain available to discuss the findings presented herein and to provide additional clarification or technical support as required.

Yours truly,

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per:



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