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Kugluktuk

Bathurst Inlet
Kingaok

Bay Chimo
Umingmaktok

Cambridge Bay
Ikaluktutiak

Gjoa Haven
Okhoktok

Taloyoak

Kugaaruk

Richard Dwyer

Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut
X0B 1J0

June 30th, 2020

Re: Review of TMAC's 2019 Annual report for Hope Bay Project.

Dear Richard Dwyer, the KIA has reviewed TMAC's 2019 Annual Report for the Hope Bay project to the NWB.

1) Compliance Monitoring:

The KIA's Framework Agreement (FA) and Inuit Impact and Benefits Agreement (IIBA) with TMAC Resources Inc. the cover terms and conditions of NIRB Project Certificate 009 and the NWB Type A water licenses.

The Framework Agreement is a confidential agreement between KIA and TMAC that supersedes and replaces all previous contractual arrangements between both parties. Section 3.1 of the FA covers Terms and conditions of land use license and reporting.

Appendix A of Section 3.1 of the Framework Agreement specifies the details of annual reporting by Sabina to the KIA, which is summarized as follows:

TMAC is to provide an annual report to KIA providing details of its operations under any land use License, Advanced Exploration Lease and/or Commercial Lease covering the location and operations area of lands affected, and the nature of facilities and equipment at these sites. In addition, TMAC is to provide details of progressive reclamation or closure activities undertaken during the year and details of all permits, licenses, and authorizations from other regulatory bodies or agencies that are required for operations.

This annual report is to provide information on:

- Ground disturbances including land use activities for camps, infrastructure, equipment, winter roads and trails.
- Fuel and Chemical storage including Chemicals of Potential Concern inventory (COPC), fuel and chemical usage, and spill records.
- Drilling programs, locations, and methods.
- Water use and effects on water.

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- Wildlife interaction, data logs, and summaries.
- Waste disposal, waste management practices, inventory of waste on site, and inventory of hazardous materials or non-combustible waste removed from site.
- Closure and reclamation progress associated with waste management, drilling, and ground disturbance along with associated costs.
- General information on annual inspection activities by staff and other agencies and their results, community consultations, future exploration work plans, submissions to NIRB, NWB, or NPC or other regulators related to mining activity, archaeological sites and burial grounds, and any incidents of storage or possession of alcohol and drugs on site.

TMAC has provided the KIA with the **Hope Bay Project 2019 Annual Report for KIA Framework Agreement** in accordance with Appendix A to Schedule 3.1 of the Framework Agreement. This report is separate from the **Hope Bay Project 2019 Annual Report to the NWB**.

Compliance Status

2) Effects of Monitoring:

a) **Whether the conclusions reached by TMAC in the Hope Bay 2019 Annual Report to the NWB are Valid.**

KIA's consultants in the areas of wildlife, aquatic sciences, fish sciences, and geotechnical engineering reviewed the Hope Bay 2019 Annual Report to the NWB and the following documents:

- Hope Bay Project 2019 Nunavut Water Board Annual Report
- Appendix A. Concordance Table
- Appendix B. NWB Forms
- Appendix C. Site Layouts
- Appendix D. Water Licence(s) Monitoring Data
    - Appendix D.1. 2AM-DOH1335
    - Appendix D.2. 2BE-HOP1222
    - Appendix D.3. 2BB-MAE1727
    - Appendix D.4. 2BB-BOS1727
    - Appendix D.5. 2AM-BOS1835
- Appendix E. Doris Mine Annual Water and Load Balance Assessment – 2019 Calendar Year
- Appendix F. 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid Mines, Hope Bay Project

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- Appendix G. 2019 Waste Rock and Ore Monitoring Report, Boston Camp, Hope Bay Project
- Appendix H. Hope Bay Project Spill Contingency Plan (TMAC, March 2020)
- Appendix I. Hope Bay Project Incinerator Source Emissions Testing 2019.

Overall, our consultants find Sabina's conclusions in the 2019 Annual Report are valid. TMAC has generally presented adequate information to demonstrate that the Hope Bay Belt projects have not adversely affected the aquatic environment.

In general, KIA finds the presentation of the relevant geochemical data, material testing, quality assurance and quality control (QA/QC) and interpretation of the results to be satisfactory and complete.

However, there are several identified issues in KIA's review of the 2019 Annual Report and appendices relating to missing data, elevated parameter concentrations, implementation of spill corrective action, and follow-up to issues identified in KIA annual inspections. These concerns should be addressed in the coming year to ensure that any trending changes in the aquatic environment from mine related impacts are managed and mitigated in a timely manner.

b) **Any areas of significance requiring further supporting information or changes to the monitoring program, which may be required.**

1.0 Hope Bay Project 2019 Annual Report to NWB

1.1 KIA-NWB-01

Review Comment Number	KIA-NWB-01
Subject/Topic	Flotation tailings levels
References	HOPE BAY PROJECT 2019 Nunavut Water Board Annual Report • Section 8.1.2.2
Summary	Elevated trace elements content in flotation tailings that were deposited in the Doris TIA.
Detailed Review Comment	In Section 8.1.2.2, Flotation Tailings (TL-6), TMAC makes the following statement regarding the flotation tailings deposited in the Doris TIA; *"Trace element content was elevated compared to the screening criteria*

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	for arsenic, sulphur, gold and one high bismuth sample." Further, *"Ten times the average crustal abundance for basalt (Prince 1997)"* was used as an indicator of enrichment for the flotation tailings deposited in the Doris TIA. The reference list for the document does not include the Prince 1997 reference, making review of the element comparison not possible.
Recommendation/Request	The KIA requests more clarity surrounding the screening criteria for trace element content, and inclusion of the reference used (Prince 1997).
Importance	Medium

1.2 KIA-NWB-02

Review Comment Number	KIA-NWB-02
Subject/Topic	Spill report #19-240 Turbid Water Unknown Volume
References	HOPE BAY PROJECT 2019 Nunavut Water Board Annual Report • Section 11, table 11-1, spill number 19-240.
Summary	*"Surface runoff containing sediment … migrates overland through the active layer of tundra to the shoreline of Patch Lake."* Samples of both flows were collected to quantify potential impacts to Patch Lake. Results and methods used for testing were not present or referenced in the report.
Detailed Review Comment	Four hours after the initial observation of the runoff event, runoff samples were collected to test for acute lethality. TMAC states that "A review of the analytical results showed both streams entering Patch Lake to be non-acutely lethal with a 100% survival rate for both Rainbow trout (96-hour LC50 test) and Daphnia magna (48-hour LC50 test)". TMAC does not supply the references for the 96-h and 48-h LC50 tests, which would be helpful. The relevance of LC50-test results on rainbow trout, a temperate fish species, to resident Arctic species such as arctic char must be extrapolated carefully. Although some research

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	has been done that supports the applicability of toxicology research on marine temperate fish species (turbot (Scophthalmus maximus) and European bass (Dicentrarchus labrax)) for Arctic marine fish species (polar cod (Boreogadus saida) and daubed shanny (Leptoclinus maculatus)) (Camus et al., 2015; Olsen et al., 2011), care must be taken when assuming how temperature modifies toxicity within a species, and potential differences in toxicity sensitivity between temperate and Arctic species (Gewurtz et al., 2006). Generally, Arctic organisms differ from temperate species in life span, developmental time, surface-to-volume ratios, metabolic rates, total energy usage, and lipid content for energy storage. Compared to temperate species, the onset and tolerance of toxic effects can be delayed and different in Arctic species due to metabolic differences. Chapman (2016) reviewed the evidence of delayed toxicity in Arctic species, highlighting the need for research to be conducted specifically on Arctic species. Zamora et al. (2015) found that exposure periods of 48-96 hours which is commonly used for temperate species, are too short for responses in polar organisms, urging the need for longer exposure periods in toxicity tests for polar biota to generate relevant sensitivity data. Chapman (2016) further states that when using current methodologies where exposure period is not accounted for, sensitivity to toxicants may not be adequately estimated in Arctic species, with an underestimation of toxicity and an overestimation of predicted concentrations though to have no effect.
Recommendation/Request	Please include LC50 references and/or results. In future instances of spills that require LC50 tests please provide necessary caveats when extrapolating results from temperate species, re-evaluate lab methods for LC50 test to adequately reflect Arctic species.
Importance	High

1.3 **KIA-NWB-03**

Review Comment Number	KIA-NWB-03
Subject/Topic	Water discharge from the Landfarm (ST-4).

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References	HOPE BAY PROJECT 2019 Nunavut Water Board - Annual Report
Summary	*"Water quality samples were collected on June 17 from the Land farm (ST-4) prior to discharge of…….second sample was collected on June 24 and exceeded the discharge criteria for Oil & Grease and Visible Sheen."* Water discharge from Landfarm presents visible oil sheen and the second sample collected on June 24 shows exceedance for Oil & Grease criteria.
Detailed Review Comment	Same as above.
Recommendation/Request	The source of Oil & Grease should be identified to prevent future contamination of the water discharged from the Landfarm sump.
Importance	Low

1.4 KIA-NWB-04

Review Comment Number	KIA-NWB-04
Subject/Topic	TL-1 TIA Monitoring Station
References	HOPE BAY PROJECT 2019 Nunavut Water Board - Annual Report
Summary	*"This section presents the results of monitoring of the Tailings Impoundment Area (TIA) as per the applicable sections of Part F….."* Table D1-24 and D1-25 present a summary of the results of the annual monitoring. Water samples were collected at the TIA Reclaim Pipeline monitoring station TL-1 from a sample port on the reclaim pump. A total of 12 samples had been collected from January 2019 to December 2019 (monthly sampling).
Detailed Review Comment	Some parameters seem to present upward trends in the concentration at the tailing impoundment area (water quality station TL-1). Three Histograms were prepared for some PCOCs; the upward trend is clear for the parameters Total Magnesium and Total Dissolved Solids. The parameter Total Ammonia, as well, indicates a slightly upward trend.

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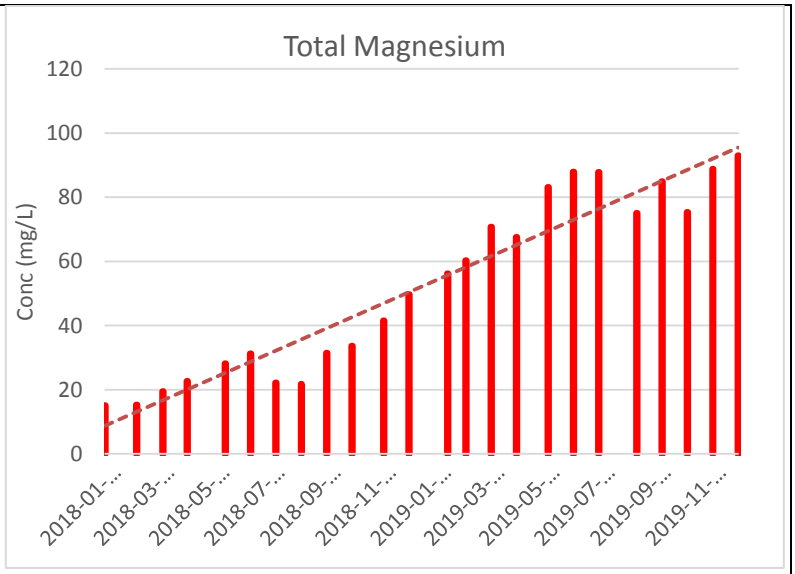

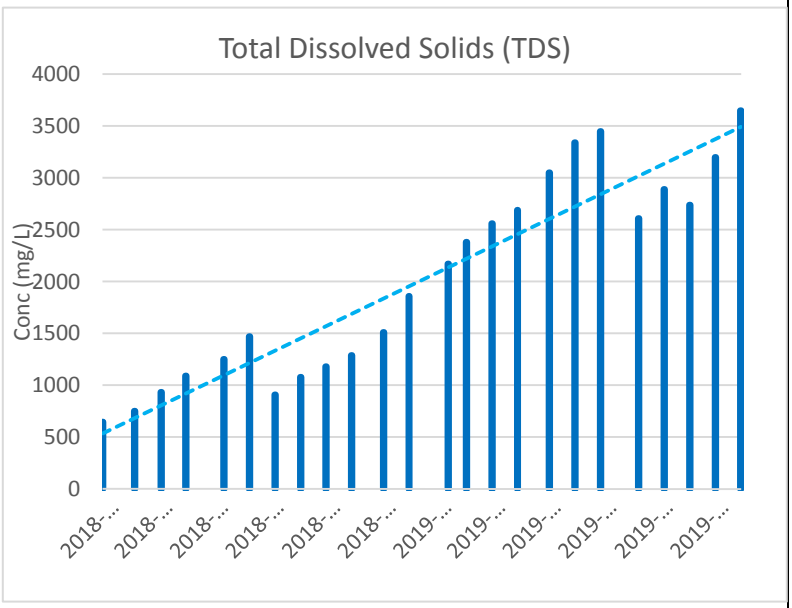

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	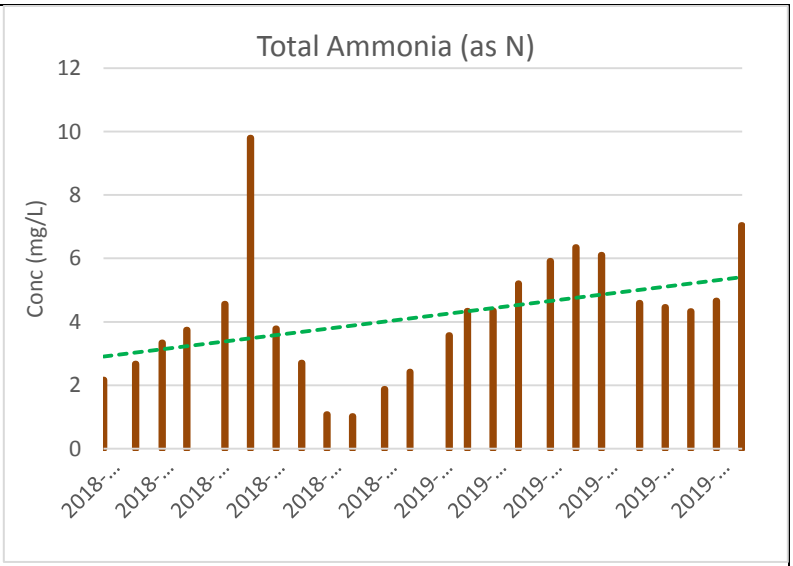
Recommendation/Request	A trend analysis for each contaminant of potential concern should be performed. This includes the identification of significant and sustained upward trends in the concentration of pollutants in the Tailings Impoundment Area (TIA) identified as being at risk of creating potential unconformities with respect to existing licenses.
Importance	Medium/High

1.5 KIA-NWB-05

Review Comment Number	KIA-NWB-05
Subject/Topic	TL12 Monitoring of Underground Dewatering
References	HOPE BAY PROJECT 2019 Nunavut Water Board - Annual Report
Summary	*"In December 2019, underground pumping rates periodically exceeded 2000m3/day and TMAC provided notice to the Inspector on January 8, 2020 as outlined in Module A of the Hope Bay Groundwater Management Plan."* The monthly volume of Doris dewatering for December 2019 was 72,904 m3, approximately 2352 m3/day. The average dewatering rate for December is above the 2000m3/day for dewatering activities.
Detailed Review Comment	The increase of the dewatering rate above the 2000

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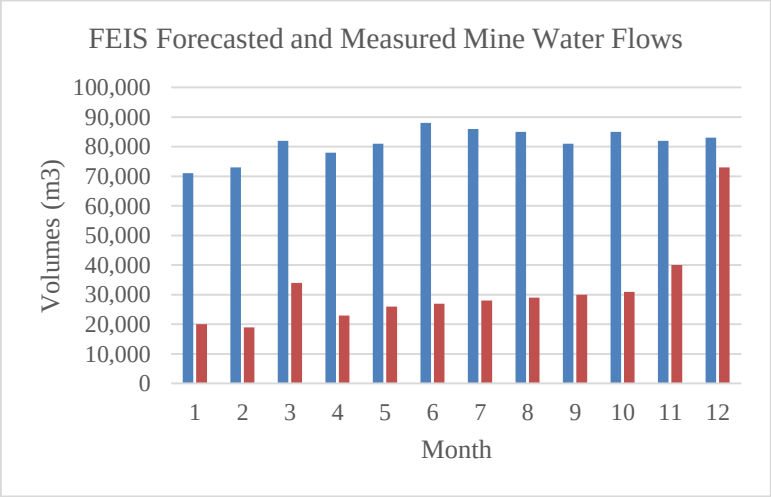
	m^3/day threshold might require amending Type A Water Licence No. 2AM-DOH1335. During 2019, approximately 430,000 tonnes of waste rock were produced at Doris underground works, approximately 265,000 tonnes were used for immediate backfilling operations and approximately 90,000 tonnes of waste rock from surface stockpiles was placed as backfill in underground stope. A correlation between underground works and increase in the dewatering rate should be investigated. The 2019 December dewatering flow volume (approximately 72,904 m^3) is below the FEIS forecasted value, nevertheless the trend in the measured value indicates the potential to exceed the FEIS values. 
Recommendation/Request	Monthly dewatering volumes should be analyzed and commented in relation to the ongoing underground works.
Importance	Low

1.6 KIA-NWB-06

Review Comment Number	KIA-NWB-06
Subject/Topic	Waste rock used in road construction
References	Hope Bay 2019 Annual Report, 8. Geochemical Studies, 8.1.1.4 Naartok East CPR

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Summary	Some of the waste rock used for road construction had potentially higher risk of ML/ARD.
Detailed Review Comment	TMAC states that mining at Naartok East CPR started in "month 2019 with waste rock production starting in month". The missing month information should be provided. TMAC states that "all waste rock used for construction was determined to have a low risk of ML/ARD except 7,650 t of waste rock that was strategically placed in areas where waste rock seepage will be managed, specifically in pit of NE CPR (7,300 t) and a lined area adjacent to the Madrid North portal (350 t)" (p. 8-3). Details on how seepage will be managed in these areas (beyond lining storage areas) should be provided to avoid metal leaching and acid rock drainage. TMAC states that 4 composite samples of waste rock used for construction were analyzed and that results showed that they were non-PAG with arsenic levels below screening criteria. Did these samples include the 7,650 t waste rock mentioned above?
Recommendation/Request	Please add missing month information. Please provide details on how seepage of the 7,650 t waste rock with potentially high risk of ML/ARD will be managed. Please clarify whether composite samples of waste rock used in construction included samples from the 7,650 t waste rock with potentially high risk of ML/ARD.
Importance	Low

1.7 KIA-NWB-07

Review Comment Number	KIA-NWB-07
Subject/Topic	Increased concentrations of tailings parameters
References	Hope Bay 2019 Annual Report, 8. Geochemical Studies, 8.1.2 Tailings, 8.1.2.1 Effluent from Process Plant Tailings (TL-5), Appendix F – 2019 Waste Rock, Quarry and Tailings Monitoring Report
Summary	Several parameters showed increasing trends in the process plant tailings water discharge to the TIA in

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	2019, including spikes in concentrations in August or October.
Detailed Review Comment	TMAC states that, for effluent from process plant tailings, *"trends for major ions and trace elements were stable in 2019 with ranges equivalent to 2018. Exceptions included magnesium, molybdenum, antimony and selenium, all of which exhibited increasing trends in 2019"* (p. 8-4). It is unclear why concentrations of magnesium, molybdenum, antimony and selenium increased in 2019. Appendix F shows the time series of the constituent loads for the process plant tailings water discharge at TL-5 to the TIA. Many parameters show a spike in concentration in August or October 2019 compared to the rest of the year (e.g., for antimony, barium, beryllium, bismuth, cadmium, chromium, copper, lead, lithium, magnesium manganese, mercury, molybdenum, nickel, phosphorus, selenium, thallium, tin, titanium, vanadium, zinc, zirconium). This pattern for these parameters is not discussed in the Annual Report. What was the cause?

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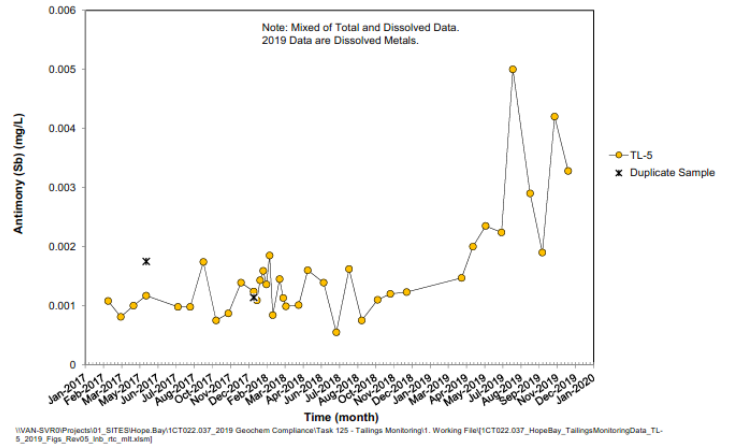

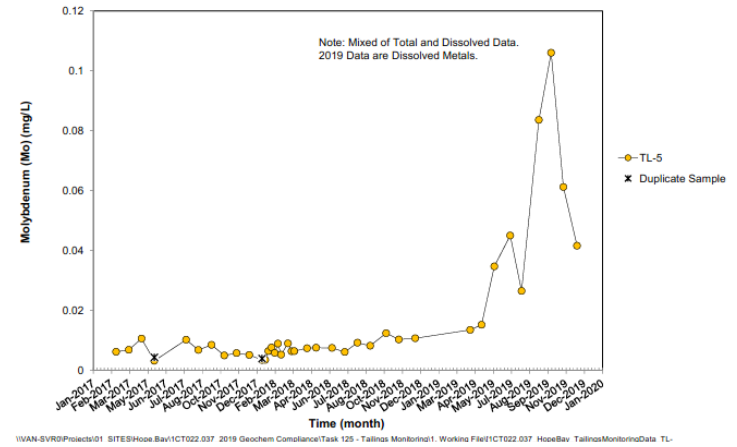

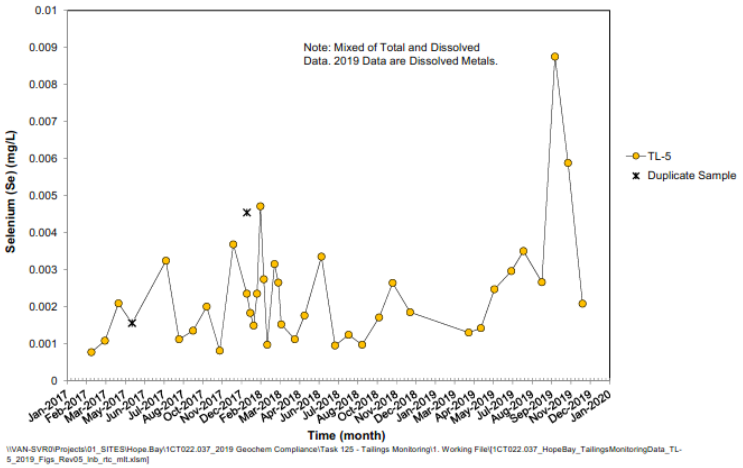

Recommendation/Request	Please explain why concentrations of magnesium,

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	molybdenum, antimony and selenium increased in the process plant tailings in 2019. Please explain why many parameters exhibited a spike in concentration in August or October in the process plant tailings. We acknowledge that although the TIA did not discharge to the environment in 2019. However, ongoing increases in tailings process water concentrations may affect the ability to meet TIA discharge limits in future.
Importance	Medium

1.8 KIA-NWB-08

Review Comment Number	KIA-NWB-08
Subject/Topic	Water quality parameter exceedances in tailings
References	Hope Bay 2019 Annual Report, 8. Geochemical Studies, 8.1.2 Tailings, 8.1.2.2 Flotation Tailings (TL-6) and 8.1.2.3 Detoxified Tailings Solids (TL-7a), Appendix D Table D1-28 to Table D1-31
Summary	Parameter exceedances are not summarized in tables in comparison to screening criteria limits, making it difficult to assess their significance.
Detailed Review Comment	In the Main Report, TMAC indicates that some parameters were elevated above screening criteria in flotation tailings (arsenic, sulphur, gold and bismuth) and detoxified tailings solids (arsenic, bismuth, copper, selenium, gold, silver, sulphur, copper, lead and zinc). Sample results are shown in Tables D1-28 through D1-31 in Appendix D. It would be helpful to include the screening criteria concentrations for all parameters in these tables so that the magnitude of exceedances can be easily evaluated.
Recommendation/Request	Please add screening criteria to water quality data tables.
Importance	Medium

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1.9 KIA-NWB-09

Review Comment Number	KIA-NWB-09
Subject/Topic	Seepage survey results
References	Hope Bay 2019 Annual Report, 9. Geochemical Seepage Surveys, 9.1 Doris and Madrid Mines, 9.1.1 Construction (Quarry) Rock and Waste Rock Seepage Survey, 9.2.1 Seepage Monitoring
Summary	Seepage surveys were conducted at Doris North and Madrid sites, as well as references sites, but no field data were collected at the reference sites. The results of seepage surveys from Doris North, Madrid and Boston sites are missing from the Annual Report.
Detailed Review Comment	Seepage surveys were conducted in June 2019 at Doris North and Madrid sites through visual inspection and opportunistic sampling of downstream seepage from

Table 9.1-1. Median Values for Field Conductivity and pH Measurements

Mine Area	Material Source	Site Area	No. of Samples	Conductivity (µS/cm)	pH
Reference	-	Reference (Windy Road)	3	-	-
Doris	Waste Rock	WRIA	6	2300	8.1
	Quarry 2	South Dam	1	300	7.9
		Access Road to Doris CPR	2	270	8.0
		MOFB Access Road	13	190	7.7
Madrid	Quarry D	Access Road to Madrid North CWP	11	79	7.5

areas. Three reference sites were also sampled, but no field data were collected at the reference sites. Why no field data were collected at the reference sites?

TMAC reports that no major issues were found relating to metal leaching and acid rock drainage in seepage at Doris North and Madrid associated with infrastructure. However, waste rock seepage showed elevated levels of chloride, nitrate and ammonia and increasing concentration trends for sulphate, copper and cobalt.

TMAC reports that results from seepage monitoring at the Boston Camp were consistent with historical results and no long-term trends were identified. However, the Northeast camp pad had order of magnitude higher concentrations of nitrate, chloride, dissolved arsenic, nickel, selenium and sulphate compared with seepage from the toe of the road (19-BOS-02).

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	Where are the data from the seepage surveys presented? They do not appear in Appendix D.
Recommendation/Request	Please explain why no field data were collected at the reference sites. Please provide the results of the Doris North/Madrid and Boston seepage surveys in tabular and/or graphical form.
Importance	Medium

1.10 **KIA-NWB-10**

Review Comment Number	KIA-NWB-10
Subject/Topic	Ephemeral streams monitoring
References	Hope Bay 2019 Annual Report, 9. Geochemical Seepage Surveys, 9.2.2 Ephemeral Streams Monitoring
Summary	Ephemeral stream monitoring is summarized but the monitoring data is not presented.
Detailed Review Comment	Monitoring of five ephemeral streams in the Boston Camp area is conducted annually to track drainage from the ore stockpiles and camp pad before it enters Aimaokatalok Lake and attenuation by the tundra. TMAC reports that sulphate and chloride are not attenuated but that "overall, the water quality of the ephemeral streams is stable and results validate the findings of the water and load balance and that there are therefore no projected impacts to the receiving environment" (p. 9-3). Where is the ephemeral stream monitoring presented?
Recommendation/Request	Please provide the results of the ephemeral streams monitoring in tabular and/or graphical form.
Importance	Medium

1.11 **KIA-NWB-11**

Review Comment Number	KIA-NWB-11
Subject/Topic	Corrective actions for tailings/process water spill at Doris North and sewage spill at Boston Camp

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References	Hope Bay 2019 Annual Report, 11. Spill Reports, Table 11-1 Summary of Reportable Spills in 2019
Summary	Information on the implementation and schedules of recommended corrective action is missing.
Detailed Review Comment	On March 11 2019, tailings/process water spilled onto the tundra from the TIA reclaim pipeline because bolts connecting sections of the pipe loosened. TMAC conducted an internal review and identified two corrective actions: The Annual Report does not indicate what the schedule will be for the routine preventative maintenance • Implement routine preventative maintenance program for reclaim water pipeline, including checks of flange bolts and pipe connections; and • Place delineators at flange locations along reclaim pipeline in summer of 2019 to identify flange locations during winter months and allow effective snow removal at these locations to facilitate inspections. program, nor how often flange bolts and pipe • Use Victaulic fittings for pipe connections that are appropriate for the pipe material; • Conduct assessment of pipe connections along entire length of the grey water pipeline at Boston Camp and replace if necessary; and • Replace current pipe support with robust materials that are less susceptible to weathering and failure. connections will be checked. On June 23 2019, sewage spilled onto the tundra at Boston Camp. TMAC identified three corrective actions: The Annual Report does not indicate when these actions will be implemented.
Recommendation/Request	Please provide details on the schedule for routine preventative maintenance for the reclaim water pipeline at Doris North, including how often bolts and connections will be checked. Please explain whether the corrective actions to prevent future sewage spills at the Boston Camp have been implemented, and if not, when they will be.
Importance	Medium

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1.12 **KIA-NWB-12**

Review Comment Number	KIA-NWB-12
Subject/Topic	Annual inspections
References	Hope Bay 2019 Annual Report, 15. Annual Inspection Activities, Table 15-1
Summary	The KIA identified two problems in their inspections which TMAC states will be monitored. Details on the monitoring strategy are missing.
Detailed Review Comment	The KIA made two inspections of the Doris Mine in 2019, in June and August. Among the issues identified were the observations that "the berm is cracking at the Tank Farm in main camp, which needs to be repaired" (June 18-20 inspection) and "the Roberts Bay tank farm containment area will be adding another 5 ml tank that is currently being built. The rock face wall behind is not reinforced; this is a big safety concern" (June 18-20 and August 13-15 inspections). TMAC's response on both dates to these issues was "All areas identified will continue to be monitored by TMAC". No information is provided on how TMAC will monitor the cracking berm and the unreinforced rock face (e.g., what kind of monitoring will be done, its frequency, what changes will trigger action, and what the action will be).
Recommendation/Request	Please provide details on monitoring of the cracking berm and unreinforced rock face identified by the KIA in its annual inspections, including what kind of monitoring, when it will be implemented, its frequency, what changes in the structures will trigger action, and what that action will be.
Importance	Medium

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2.0 Appendix D. Water Licence(s) Monitoring Data

2.1 KIA-NWB-13

Review Comment Number	KIA-NWB-13
Subject/Topic	Water quality monitoring at ST-1 Doris Sedimentation Pond
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.1 2AM-DOH1335, Table D1-3
Summary	Water quality was not monitored at ST-1 throughout the period water was transferred to the Tailings Impoundment Area (TIA).
Detailed Review Comment	Water was transferred from the ST-1 Doris Sedimentation Pond to the TIA from June through September 2019. However, Table D1-3 shows that water quality monitoring at ST-1 only occurred in June, July and September.
Recommendation/Request	Please explain why water quality was not monitored at ST-1 in August 2019.
Importance	Low

2.2 KIA-NWB-14

Review Comment Number	KIA-NWB-14
Subject/Topic	Location of runoff monitoring
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.1 2AM-DOH1335, MMS-9 Site Runoff from Sediment Controls, Table D1-44
Summary	The location of runoff monitoring sites is not shown on a figure.
Detailed Review Comment	Water quality monitoring of runoff was conducted at the Madrid site in 2019. Table D1-44 gives the coordinates of sampling locations, but these sites are not indicated on Figures D1-1 to D1-3.
Recommendation/Request	Please indicate the location of runoff sampling sites on a figure.
Importance	Medium

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2.3 KIA-NWB-15

Review Comment Number	KIA-NWB-15
Subject/Topic	Location of drilling and hydrology monitoring sites
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.2 2BE-HOP1222, Summary of Monitoring Information and Hydrology Monitoring – Windy Lake Water Level.
Summary	The location of monitoring sites for on-ice exploration drilling on Patch Lake, as well as on-land exploration drilling are not shown on a figure.
Detailed Review Comment	Sampling was conducted before and after on-ice drilling on Patch Lake, but sampling locations are not shown. In addition, on-land exploration drilling was conducted, but the drill locations are not shown. It is not possible to assess potential impacts of these mine activities on the environment without knowing where they occurred in the project area.
Recommendation/Request	Please indicate the location of on-ice and on-land drilling sites on a figure.
Importance of Issue	Medium

2.4 KIA-NWB-16

Review Comment Number	KIA-NWB-16
Subject/Topic	Monitoring parameters for drilling at Windy Lake Camp
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.2 2BE-HOP1222, Tables D2-2, D2-3
Summary	Strontium is identified in the water license as a parameter to be measured under ice, but it is not listed in the water quality sampling results and thus appears not to have been sampled as part of the 2019 monitoring program.
Detailed Review Comment	Part J Item 7 of Water License No. 2BE-HOP1222 indicates that strontium is one of the trace metals to be measured in the under-ice sampling before and after drilling. However, strontium is not listed in the water quality sampling results in Tables D2-2 and D2-3.
Recommendation/Request	Please add strontium to the suite of parameters

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	measured under-ice before and after drilling as per the water license requirements.
Importance	Medium

2.5 KIA-NWB-17

Review Comment Number	KIA-NWB-17
Subject/Topic	Water license conditions for drilling at Windy Lake Camp.
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.2 2BE-HOP1222, Tables D2-2, D2-3.
Summary	Information is missing on drill waste disposal for land and on-ice drilling, as well as use of additives or mud, and release of return water for on-ice drilling.
Detailed Review Comment	Part F Item 2 of Water License No. 2BE-HOP1222 details the disposal requirements for drill waste from land and on-ice drilling, including the requirement that waste is disposed of at least 31 m from any water body and away from direct flow into any water body. Neither the Main Report nor Appendix D discusses how drill waste was managed in 2019. Part F Items 5 and 6 of the Water License set out additional conditions for on-ice drilling, relating to the 5. Drilling additives or mud shall not be used in connection with holes drilled through lake ice unless they are re-circulated or contained such that they do not enter the water, or are demonstrated to be non-toxic. 6. For "on-ice" drilling where drill additives are not being used, return water released must be nontoxic, and not result in an increase in total suspended solids in the immediate receiving waters above the Canadian Council of Ministers for the Environment, Guidelines for the Protection of Freshwater Aquatic Life (i.e. 10mg/L for lakes with background levels under 100 mg/L, or 10% for those above 100mg/L). use of additives or mud, and the release of return water: TMAC does not report whether drilling additives or mud were used for on-ice drilling. If they were used, TMAC should indicate how condition #5 was met. If neither was used, then condition #6 of the Water License applies. The water quality data for pre and post on-ice drilling is presented in Tables D2-2 and D2-3. The results show that TSS increased by >10 mg/L at the PLA and PLC sites post-drilling compared to background

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	levels, which exceeds the CCME guideline and thus does not meet the Water License requirement. Table D2-2. Water Quality Sampling Patch Lake Prior to On-Ice Drilling, January 2019 In addition, it is not clear why location PLG was only sampled in the post on-ice drilling monitoring.
Recommendation/Request	Please discuss how drill waste for land and on-ice drilling was managed in 2019. Please clarify whether drilling additives or mud was used for on-ice drilling. If they were used, please explain how Part F Item 5 of the Water License was met. If neither were used, please explain how Part F Item 6 of the Water License was met. Please explain why sampling at PLG was only conducted post drilling.
Importance	High

Table D2-2. Water Quality Sampling Patch Lake Prior to On-Ice Drilling, January 2019

Sample ID		PLA	PLB	PLC	PLC ^	PLD	PLE
ALS ID		L2217538-1	L2217538-2	L2217538-3	L2217538-6	L2217538-4	L2217538-5
Date Sampled		2019-01-06 12:00	2019-01-06 12:45	2019-01-06 13:30	2019-01-06 13:30	2019-01-06 14:20	2019-01-06 14:40
Parameter	Units	Results					
Conductivity	µS/cm	385	383	380	392	375	446
Hardness (as $CaCO_3$)	mg/L	69.4	73.3	73.2	72.5	71.6	83.6
pH	pH	7.74	7.6	7.68	7.7	7.69	7.73
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

Table D2-3. Water Quality Sampling Patch Lake Post On-Ice Drilling, May 2019

Sample ID		PLA	PLB	PLC	PLD	PLE	PLF	PLG	PLG ^
ALS ID		L2272441-1	L2272441-2	L2272441-3	L2272441-4	L2272441-5	L2272441-6	L2272441-7	L2272441-8
Date Sampled		2019-05-12 15:00	2019-05-12 15:30	2019-05-12 15:45	2019-05-12 17:00	2019-05-12 17:15	2019-05-12 16:00	2019-05-12 16:15	2019-05-12 16:15
Parameter	Units	Results							
Conductivity	µS/cm	457	473	452	450	487	405	392	391
Hardness (as $CaCO_3$)	mg/L	91.3	93.1	87.7	87.8	95.6	77.7	76.2	74.8
pH	pH	7.77	7.72	7.74	7.73	7.76	7.72	7.65	7.72
Total Suspended Solids	mg/L	19.6	8.2	17.4	<3.0	<3.0	<3.0	<3.0	<3.0

2.6 KIA-NWB-18

Review Comment Number	KIA-NWB-18
Subject/Topic	Monitoring parameters for effluent, seepage and runoff for the Boston Advance Exploration Project
References	Appendix D Water Licence(s) Monitoring Data, Appendix D.4 2BB-BOS1727, Tables D4-4, D4-7 and D4-8
Summary	Chloride is identified in the water license as a parameter

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	to be measured at BOS-2 and BOS-5, but it is not listed in their respective water quality sampling results. Strontium is identified in the water license as a parameter to be measured at BOS-8 but is not listed in the water quality sampling results. It thus appears that these parameters were not sampled at these sites as part of the 2019 monitoring program.
Detailed Review Comment	Part J Item 10 of Water License No. 2BB-BOS1727 indicates that sulphate and chloride are to be monitored at BOS-2 (Containment Pond discharge) and BOS-5 (Effluent from the Bulk Fuel Storage Facility) stations. Part J Item 14 of 2BB-BOS1727 indicates that strontium is one of the trace metals to be measured at BOS-8 (the Waste Rock and Ore Storage Pad). However, chloride and strontium are not listed in the respective water quality sampling results for these sampling stations in Tables D4-4, D4-7 and D4-8. In addition, Part D Item 19 of the water license shows effluent water quality limits for benzene, toluene and ethylbenzene. These limits should be included on Table D4-7.
Recommendation/Request	Please add chloride to the suite of parameters measured at BOS-2 and BOS-5, and strontium to the suite of parameters measured at BOS-8 as per the water license requirements. Please add effluent limits for benzene, toluene and ethylbenzene as per the water license requirements.
Importance	Medium

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3.0 Appendix E. Doris Mine Annual Water and Load Balance Assessment – 2019 Calendar Year

3.1 KIA-NWB-19

Review Comment Number	KIA-NWB-19
Subject/Topic	Meteorological data used to update water balance model.
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 2.1.1 Hydrology Update.
Summary	There were several gaps in the Doris meteorological data collected in 2019 and ECCC Cambridge Bay weather station data were used to replace the missing data. It is not clear why there were gaps in the Doris dataset, nor whether ECCC data from the entire year were used to update the water balance model.
Detailed Review Comment	TMAC used 2019 Doris meteorological data to update the water balance model. However, because there were several gaps in the monitoring data (Oct 15-29 and Nov 15-24 for average daily temperature, and Oct 15-30 and Nov 15-24 for total precipitation and daily rainfall), data from the four ECCC Cambridge Bay weather stations was substituted for the missing data. TMAC states that the ECCC data "were compiled and updated in the model until the end of 2019" (p. 3). TMAC states that "patching in Cambridge Bay data was previously found to be an acceptable method for filling in the gaps" (p. 3). Since the mine is more than 150 km away from Cambridge Bay it would be helpful for TMAC to provide details on validation of patching in these data for mine data. The reason for the gaps in 2019 Doris meteorological data is not given. It is not clear whether the ECCC data from the entire year were added to the model, or just during the October and November missing data periods.
Recommendation/Request	Please provide details on the validity of substituting Cambridge Bay meteorological data for local data collected at the mine. Please explain why meteorological data were not available during the October and November periods. Please clarify whether ECCC weather station data from the entire year was used to supplement mine data in the

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	model.
Importance	Low

3.2 KIA-NWB-20

Review Comment Number	KIA-NWB-20
Subject/Topic	Modelled vs. Measured Mine Processing Rates
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 2.1.2 Processing Rate, Table 2, Figure 1.
Summary	There are discrepancies in the forecasted and measured mine processing rates presented.
Detailed Review Comment	TMAC updated the monthly processing rates in the water balance model based on measured values in 2019, which are presented in Table 2 for Doris and Madrid mines. The column totals do not match the sums of the monthly rates for each column (i.e., Doris Mine FEIS total = 24,000, Doris Mine Measured total = 19,500, Madrid Mine FEIS = 828, Madrid Mine Measured = 1350, Total Processed FEIS = 24,000, Total Processed Measured = 20,850). It is not clear why the annual forecasted processed rate for Madrid Mine (828) underestimated the measured processing rate (1350) by about 40%; this value seems outside an acceptable margin of error. Figure 1 also compares the forecasted and measured processing rates:

Table 2: Summary of FEIS Forecasted and Measured Processing Rates

Date	Ore Processed in the Doris Process Plant (tpd)					
	Doris Mine		Madrid Mine		Total Processed	
	FEIS	Measured	FEIS	Measured	FEIS	Measured
January	2,000	1,500	69	-	2,000	1,500
February	2,000	1,700	69	-	2,000	1,700
March	2,000	1,700	69	-	2,000	1,700
April	2,000	1,300	69	-	2,000	1,300
May	2,000	2,000	69	-	2,000	2,000
June	2,000	1,900	69	-	2,000	1,900
July	2,000	1,400	69	-	2,000	1,400
August	2,000	1,800	69	-	2,000	1,800
September	2,000	1,900	69	-	2,000	1,900
October	2,000	1,800	69	170	2,000	2,000
November	2,000	1,400	69	430	2,000	1,800
December	2,000	1,100	69	750	2,000	1,900
Total	720,000	590,000	25,000	41,000	750,000	630,000

Source: \\ark.ad\dfs\nalvan\Projects\01_SITES\Hope Bay\1CT022.066_2020 Site Wide Water Mgmt\1_2019_Annual\WLB\Inputs\HopeBay_2019Inputs_1CT022.045_R00_ajb.xlsx

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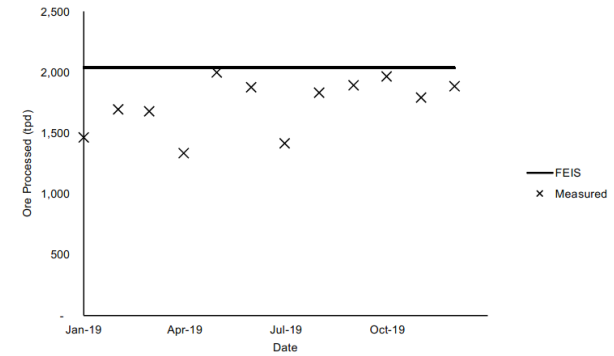
	The measured values for May and October should be plotted on the FEIS line, according to the rates listed in Table 2.  Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\1_2019_AnnualWLB\Inputs\HopeBay_2019Inputs_1CT022.045_R00_ajb.xlsx **Figure 1: FEIS Forecasted and Measured Processing Rates**
Recommendation/Request	Please explain what the column totals represent. Please explain why the measured processing rate for Madrid Mine greatly exceeded the forecasted rate in 2019 (by 163%). Please correct the May and October rates in Figure 1 to show that they are the same as the predicted rate.
Importance	Medium

3.3 KIA-NWB-21

Review Comment Number	KIA-NWB-21
Subject/Topic	Modelled vs. Measured Flow Rates for Site Contact Water.
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 2.1.3 Site Contact Water, Table 3.
Summary	Predicted flow rates from the sediment control pond to the Doris TIA are not presented for comparison with measured flow rates.
Detailed Review Comment	The monthly measured flows from the sediment control pond to the Doris TIA for 2017 through 2019 were added to the model to update transfer rates. The predicted monthly flow rates were not presented for comparison.
Recommendation/Request	Please provide the monthly predicted flow rates from

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	the sediment control pond to the Doris TIA.
Importance	Medium

3.4 KIA-NWB-22

Review Comment Number	KIA-NWB-22
Subject/Topic	Modelled vs. Measured Flow Rates for Underground Mine Water.
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 2.1.4 Mine Water and Robert's Bay Discharge Line, Table 4.
Summary	There is a discrepancy in the total measured mine water flow reported for 2019.
Detailed Review Comment	TMAC states that *the "measured mine water encountered to date totaled 510,000 m³, representing about 9% of total volume of water held in the Doris TIA…and 40% of the FEIS predicted flow for 2019"* (p. 5). It is not clear where the 510,000 m³ value comes from; since the total measured mine water flow shown in Table 4 is 380,000 m³. Furthermore, 510,000 m³ equals 52% of the FEIS predicted flow for 2019 shown in Table 4 (980,000 m³), while 380,000 m³ equals 40% of the FEIS predicted flow for 2019.
Recommendation/Request	Please clarify whether the 510,000 m3 reported measured mine water flow represents the total for 2019

Table 4: Summary of FEIS Forecasted and Measured Mine Water Flows

Month	Mine Water (m³/month)			
	Doris Mine		Madrid North Mine	
	FEIS	Measured	FEIS	Measured
1	71,000	20,000	-	-
2	73,000	19,000	-	-
3	82,000	34,000	-	-
4	78,000	23,000	-	-
5	81,000	26,000	-	-
6	88,000	27,000	-	-
7	86,000	28,000	-	-
8	85,000	29,000	-	-
9	81,000	30,000	-	-
10	85,000	31,000	-	-
11	82,000	40,000	-	-
12	83,000	73,000	-	-
Total	980,000	380,000	-	-

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.066_2020 Site Wide Water Mgmt\1_2019_Annual\WLB\Inputs\HopeBay_2019Inputs_1CT022.045_R00_ajb.xlsx

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	or for all years of operation, and how it relates to the data provided in Table 4.
Importance	Medium

3.5 KIA-NWB-23

Review Comment Number	KIA-NWB-23
Subject/Topic	Elevated total cyanide
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 2.2.1 Total Cyanide and Degradation Products.
Summary	Total cyanide concentration at TL-5 (effluent from the Doris Process Plant) was elevated in February 2019, but the reason for this spike is not discussed.
Detailed Review Comment	TMAC states that "the process source term for total cyanide was adjusted to 3.8 mg/L based on the average of the TL-5 data, with omission of the February 3, 2019 sample due to an elevated concentration nine times higher than the 2017 to 2019 observed range" (p. 8). The increase in total cyanide concentration at TL-5 on February 3, 2019 does not appear to be discussed in the annual report. Why was there a spike in total cyanide at this location in February? What was the previous cyanide source term? What was the elevated concentration?
Recommendation/Request	Please provide the data showing the actual concentration of total cyanide at TL-5 on February 3, 2019 in relation to the historic range and explain why it was nine times higher than the 2017 to 2019 observed range.
Importance	High

3.6 KIA-NWB-24

Review Comment Number	KIA-NWB-24
Subject/Topic	TSS Predictions for the TIA
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 4.2 Predicted TIA Water Quality, 4.2.3

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	Metals and TSS Evaluation, 5.1. Measured Values.
Summary	The model is unable to accurately predict TSS concentrations in the TIA.
Detailed Review Comment	TMAC states that "the model is set up as a conservative mass balance and is unable to accurately predict TSS in model reservoirs" (p. 14) but that "the Doris TIA is a large facility that has previously demonstrated capacity to settle TSS from both the tailings slurry and the Doris mine water in 2018" (p. 14). However, TSS was the only parameter that exceeded MDMER limits in 2019 (for the maximum monthly mean concentration) in the TIA (although no discharge from the TIA occurred). Given that TSS is a parameter of concern in 2019 it should be a functional component of the load balance model.
Recommendation/Request	Please calibrate the model to measured results such that it is able to accurately predict TSS concentrations in the TIA.
Importance	Medium

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3.7 KIA-NWB-25

Review Comment Number	KIA-NWB-25
Subject/Topic	Elevated unionized ammonia in the TIA
References	Appendix E Doris Mine Annual Water and Load Balance Assessment, 5 Comparison to MDMER, 5.1 Measured Values.
Summary	Information on the unionized ammonia exceedance in late summer at TL-1 is missing in the report.
Detailed Review Comment	TMAC states that *"updated water quality projections for the Doris TIA were compared to the MDMER limits…in Attachment 2"* (p. 15). Unionized ammonia concentrations were reported to increase to almost three times the future MDMER limit in August and September 2019, coinciding with an algal bloom that increased TSS and pH concentrations in the TIA. The maximum average monthly concentration for unionized ammonia at TL-1 is presented in Tables 13 and 14, but measured and predicted concentrations are not compared to MDMER limits in these tables nor in Attachment 2.

Parameter	Units	MDMER Maximum Authorized Concentration in a Grab Sample	Maximum Concentration Measured in the Doris TIA in 2019 (TL-1)	Date of Maximum Concentration	Percent of MDMER Limit
TSS	mg/L	30	23.8	9/2/2019	79%
Total Arsenic	mg/L	1	0.00157	12/2/2019	0.2%
Total Copper	mg/L	0.6	0.0938	12/2/2019	16%
Cyanide – Total	mg/L	2	0.338	12/9/2019	17%
Total Lead	mg/L	0.4	0.00031	1/28/2019	0.1%
Total Nickel	mg/L	1	0.0137	6/17/2019	1.4%
Total Zinc	mg/L	1	0.017	11/18/2019	1.7%
Unionized Ammonia (as N)	mg/L	-	0.331	9/9/2019	-

Source: \\ark.ad.dfs\nalvan\Projects\01_SITES\Hope Bay\1CT022.026_2018 General Compliance\Annual_Review_2018\HopeBay_WLBReview_1CT022.026_R05_ajb.xlsm

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	Table 13: Comparison of Maximum Monthly Mean Measured Concentrations in the Doris TIA to the Proposed MDMER Parameter / Units / MDMER Maximum Authorized Monthly Mean Concentration / Maximum of 2019 Doris TIA Average Monthly Concentrations (TL-1) / Month of Maximum Concentration / Percent of MDMER Limit TSS / mg/L / 15 / 21 / September / 138% Total Arsenic / mg/L / 0.5 / 0.0014 / December / 0.3% Total Copper / mg/L / 0.3 / 0.092 / December / 31% Cyanide – Total / mg/L / 1 / 0.33 / December / 33% Total Lead / mg/L / 0.2 / 0.00027 / January / 0.1% Total Nickel / mg/L / 0.5 / 0.013 / June / 3% Total Zinc / mg/L / 0.5 / 0.012 / December / 2% Unionized Ammonia (as N) / mg/L / - / 0.18 / August / - Source: \\ark.adlds\nalvan\Projects\01_SITES\Hope Bay\1CT022.026_2018 General Compliance\Annual_Review_2018\HopeBay_WLBReview_1CT022.026_R05_ajb.xlsm Table 14: Comparison of Maximum Grab Sample Concentration Measured in the Doris TIA Compared to the Proposed MDMER TMAC states that it *"is actively working towards a TSS solution that would allow for a pH adjustment, if required, for any subsequent algae blooms during planned active discharge" (p. 15).*
Recommendation/Request	Please provide a graph in Attachment 2 of measured and predicted unionized ammonia concentrations at TL-1 in relation to MDMER limits. Please explain what mitigation measures are being considered to manage elevated TSS in the TIA during discharge periods.
Importance	Medium

3.8 KIA-NWB-26

Review Comment Number	KIA-NWB-26
Subject/Topic	Total Suspended Solids (TSS) Management
References	Appendix E, Section 5.1
Summary	Further discussion on TSS management.
Detailed Review Comment	TSS was the only parameter to exceed Metal and Diamond Mining Effluent Regulations (MDMER, 2019), following the revisions to the water and load balance for the Doris TIA and updates to the water quality projections. TSS exceeded the maximum monthly mean concentration in the Doris TIA, but not the maximum authorized, and no discharge from the TIA took place in 2019 during these elevated TSS periods. BGC understands the higher TSS values were associated with an algae bloom in the TIA coinciding with higher

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	unionized ammonia concentrations. Unionized ammonia is dependent on pH and temperature, both of which increase during the open water season at the Hope Bay Project. Similar algal blooms are expected for the future.
Recommendation/Request	BGC understands unionized ammonia is not included in the Doris TIA Water and Load Balance model. However, if unionized ammonia concentrations are the main contributor to TSS exceedances, can TMAC comment as to whether this parameter should be considered as part of future modeling efforts to improve assessment of the fraction of unionized versus ionized ammonia (NH3 vs. NH4+, respectively) and predict the potential for algal blooms and elevated TSS concentrations? BGC requests that TMAC provides some commentary on the steps being (or to be) taken to actively manage TSS associated with the Doris TIA.
Importance	Medium

4.0 Appendix F. 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid Mines, Hope Bay Project

4.1 KIA-NWB-27

Review Comment Number	KIA-NWB-27
Subject/Topic	Selenium Assessment
References	Appendix F, Sections 3.1.3., 3.2.5, 3.3.4.
Summary	Selenium method detection limit (MDL) is equivalent to screening criterion.
Detailed Review Comment	Trace elemental results are compared to ten times the average crustal (solid phase) abundance for basalt (from Price, 1997) as an indicator of enrichment. The selenium laboratory MDL is 0.5 mg/kg, which is equivalent as the applied selenium screening criterion. Therefore, selenium results are generally not assessed due to measured values below detection or within the range of analytical error.

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Recommendation/Request	Several laboratories can provide a lower solid-phase selenium analysis (i.e., to 0.003 mg/kg). Can TMAC comment on whether a lower MDL should be considered to improve the assessment of selenium enrichment?
Importance	Low

4.2 KIA-NWB-28

Review Comment Number	KIA-NWB-28
Subject/Topic	Underground Waste Rock
References	Appendix F, Section 5.3.2
Summary	Underground waste rock used in construction
Detailed Review Comment	The Doris CPR cover was primarily constructed of waste rock, with selected areas using ROQ rock from Quarry 2. Waste rock was geochemically characterized prior to use according to the WROMP (TMAC, March 2019); however, elevated chloride and nitrate results from shake flask extraction (SFE) tests suggest waste rock from the underground may be present in the CPR cover material. The document states "TMAC suspects some underground waste rock may have been mixed with the surface layer when the CPR was being backfilled in stages resulting in waste rock placement in the cover", which is not consistent with the CPR cover design (i.e., underground waste rock to be placed below the active layer). As a result of this likelihood, the Doris CPR cover will be included in subsequent seepage surveys to assess the potential for contaminant leaching from the Doris CPR. BGC agrees this response is appropriate to monitor and manage the risk of metal leaching and/or acid rock drainage from the Doris CPR cover. The likelihood that underground waste rock was used in construction in 2019 is not fully consistent with information provided in Table 2-2 (Section 2.1.2) that states underground waste rock was not a source of construction rock in 2019.

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Recommendation/Request	Table 2-2 should be updated to document the potential placement of underground waste rock in the CPR cover and the response actions. As well, can TMAC comment on how construction practices, including waste rock QA aspects, could be improved to mitigate a similar scenario in future construction activities.
Importance	High

4.3 KIA-NWB-29

Review Comment Number	KIA-NWB-29
Subject/Topic	Tailings Sampling
References	Appendix F, Section 7.3
Summary	Modifications to tailings solid and/or supernatant sampling schedules.
Detailed Review Comment	Schedule 1 of the Water Licence (NWB 2018) specifies weekly sampling of flotation tailings (TL-6) and (one-time) monthly sampling of the process plant tailings supernatant (TL-5), which are collected from the flotation tailings thickener tank. The weekly TL-6 samples are stored until a composite sample is made each month. In 2019, a substantially lower pH was measured from the August supernatant (TL-5) sample (pH 6.2) relative to the other months (i.e., pH 8.0 – pH 8.4; Figure 4-13 of Appendix E, in Appendix F of the Main Report). This deviation highlights the limitations of sampling the supernatant (TL 5) on a different schedule/method than the tailings solids samples (TL-6) and suggests increased sampling may help to understand similar anomalies as part of future monitoring efforts. For example, a complementary "point" tailings solid sample (TL-6) could be collected at the same time as the monthly supernatant (TL-5), or sampling frequency could be increased following an anomalous result from either tailings solids or supernatant samples. A similar comment was made in Appendix E (Section 4.2.1) that indicates the monthly samples associated with the Doris TIA may be too far apart to assess the peak values and estimate the degradation and removal

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	rates of nitrogen species.
Recommendation/Request	Can TMAC comment on whether changes to the frequency of tailings sampling should be considered to improve the monitoring of tailings deposited in the Doris TIA, as well as the ability to annually refine the Doris Mine Water and Load Balance (Appendix E).
Importance	Medium

4.4 KIA-NWB-30

Review Comment Number	KIA-NWB-30
Subject/Topic	Elevated Nitrogen (N)-Species Concentrations
References	Appendix F, Appendix D (Seepage Survey)
Summary	Spatially elevated nitrate, nitrite and ammonia values – Doris Marine Outfall Berm (MOFB) Access Road.
Detailed Review Comment	Thirteen seep samples were collected along the Doris MOFB Access Road, which was constructed with Quarry 2 material. Section 3.2.2 (of Appendix D in Appendix F of the Main Report) indicates that nitrite and nitrate values from seepage samples collected from Doris infrastructure and roads were similar and ranged from 0.001 to 0.11 mg/L and 0.005 mg/L to 5.4 mg/L, respectively. These provided ranges vary by several orders of magnitude and review of sample results shown in Table 3-2 (of Appendix D in Appendix F of the Main Report) shows samples collected from 19-MOFB-10 to 19-MOFB-13 had substantially elevated nitrate (0.23 mg/L – 5.4 mg/L), nitrite (0.005 mg/L – 0.11 mg/L) and ammonia (0.15 mg/L - 3.5 mg/L) relative to seeps collected at the other nine locations (19-MOFB-01 to 19-MOFB-09; nitrate: <0.005 mg/L, nitrite: <0.001 mg/L; ammonia: 0.006 mg/L – 0.03 mg/L). Reference to Figure 2 (of Appendix D in Appendix F of the Main Report) suggests there may be a spatial relationship to elevated N species that is also aligned with a shift to more alkaline pH values. It is acknowledged that there are no historical seepage samples along the MOFB Access Road for comparison, as noted in Section 4 (of Appendix D of the Appendix F of the Main Report).

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Recommendation/Request	Could TMAC comment on the potential spatial relationship associated with observed nitrogen species concentrations and pH values measured in 2019 from seeps present along the MOFB Access Road? Specifically, are there material or compositional and/or placement timing differences that may promote the observed variability in seepage chemistries between 19-MOFB-01 to 19-MOFB-09 sites versus 19-MOFB-10 to 19-MOFB-13 sites?
Importance	Low

5.0 Appendix G. 2019 Waste Rock and Ore Monitoring Report, Boston Camp, Hope Bay Project

5.1 KIA-NWB-31

Review Comment Number	KIA-NWB-31
Subject/Topic	Loading Calculations
References	Appendix G, Appendix B Section 3.2
Summary	Validation of loading conclusions
Detailed Review Comment	Sampling of ephemeral streams downgradient of the waste rock pile at the Boston Site is conducted to monitor seepage chemistries and provide an indicate of whether contaminants of potential concern from the ore and waste rock pile are reaching the shoreline at Aimaokatalok Lake. Five ephemeral streams are present, A2, B2, C2, D2 and E2; however, flow was observed in 2019 at stations A2, D2 and E2 only. The first bullet of the summary (in Section 3.2, of Appendix B in Appendix G of the Main Report) indicates that "higher sulphate concentrations were observed during periods of low flow resulting in lower sulphate loading rates (e.g., mg SO4/s) compared to samples collected with higher flow rates and lower sulphate concentrations (e.g., D2 in 2011 and 2016, Table 2), suggesting that concentration is related to dilution from surface waters." It is not clear how loading rates can be calculated when

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	flow rates are not consistently collected at the same time as sampling. For example, Table 1 indicates two flow rate measurements have been made at D2; however, the chemistry of 8 samples collected at D2 is shown in Table 2.
Recommendation/Request	Can TMAC outline the stream sampling methodology and comment on the rationale for fewer flow measurements than samples collected as well as the potential uncertainty introduced with these disparities? Further to this request, can TMAC clarify the statement in Section 3.2 on loading rates and concentrations/trends observed in the sampled ephemeral streams in 2019?
Importance	High

5.2 KIA-NWB-32

Review Comment Number	KIA-NWB-32
Subject/Topic	Sulphate from Ephemeral Streams
References	Appendix G, Section 4.2
Summary	Clarification on concluding statements for sulphate trends.
Detailed Review Comment	Section 4.2 states that sulphate is one of the contaminants of concern, as identified by the 2009 water and load balance (Supporting Document B of SRK, July 2009) and measured sulphate at D2 and E2 ephemeral stream stations exceeded the maximum modelled values. Section 4.2 goes on further to state the following: "sulphate levels are not attenuated by the tundra and the concentrations measured in 2019 validate the 2009 water and load balance." And, "concentrations observed in the ephemeral streams indicate that the tundra continues to effectively attenuate contaminants of concern and the breakthrough of the effectiveness of the attenuation process has not occurred." The above statements are contradictory to each other.

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Recommendation/Request	Can TMAC provide clarity on the observed versus predicted sulphate concentrations associated with the ephemeral streams and clarify statements in the document on the potential for attenuation of sulphate by the tundra. As well, if measured sulphate is noted to exceed modelled values, what are the next steps to improve calibration and assessment of potential environmental impacts to downstream receivers?
Importance	Medium

6.0 Appendix H. Hope Bay Project Spill Contingency Plan (TMAC, March 2020)

6.1 KIA-NWB-33

Review Comment Number	KIA-NWB-33
Subject/Topic	Spill Monitoring
References	Appendix H – Hope Bay Project Spill Contingency Plan, 3.4 Monitoring and Restoration, Appendix 4: Responses to Comments on Previous Plan Versions.
Summary	Monitoring of spills to the environment that are not fully or partially recoverable is optional.
Detailed Review Comment	The discretionary language KIA identified in the 2018 Annual Report relating to monitoring of spills remains in the 2019 Annual Report. Under section 3.4 of Appendix H, TMAC states that "monitoring activities may be conducted to assess the impacts of the spill and the effectiveness of associated cleanup/remediation efforts in the event spill material cannot be removed" (p. 20) and "monitoring may be triggered in the event of spills to water of substances that dissolve or sink or where substance recovery is unlikely" (p. 21) and "monitoring may also be triggered in the event of externally reportable spills to land for which recovery of spilled material is unlikely or may be incomplete" (p. 21). In Appendix 4, in response to our previous comments, TMAC indicates that it is not reasonable or necessary to predetermine "every possible scenario, response, follow up monitoring" because such an approach "would result

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	in an extremely voluminous document with thousands of iterations and combinations that account for every possible factor at Hope Bay" (p. 43). We are not suggesting that every possible step for monitoring should be detailed in the Spill Contingency Plan, but we are requesting that monitoring be required for (i) every spill that cannot be removed, (ii) spills to water of substances that dissolve or sink or where substance recovery is unlikely, and (iii) externally reportable spills to land for which recovery is unlikely or incomplete. Specific details on what the required monitoring would entail could then be determined on a case by case basis, depending on the nature of the spill. We do not think such an approach would be unduly time-consuming or cumbersome, but rather, would provide an effective and efficient framework for ensuring monitoring of spills that are not fully or partially recoverable is conducted, so that ultimately no adverse effects to the environment occur, and long-term liabilities on IOL are avoided.
Recommendation/Request	Please remove the discretionary language in section 3.4 and replace with wording that monitoring is required for all spills detailed in (i) to (iii) above.
Importance	Medium

Thank you

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