ALAMOS GOLD INC.

Lynn Lake Gold Project: Gordon Mine Pit Dewatering Notice of Alteration/Notice of Change

Federal Information Request Responses Round 2

Stantec

Prepared by:

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Introduction

The Impact Assessment Agency of Canada (IAAC) provided a second round (Round 2) of information requests (IRs) on December 11, 2024, for the Lynn Lake Gold Project (LLGP) Notice of Change (NOC) – Dewatering of Historical Pits at the Gordon Site during Project Construction, submitted by Alamos Gold Inc. (Alamos) on February 9, 2024. Upon review of the NOC and Alamos' responses to the Round 1 IRs submitted on October 18, 2024, IAAC has determined that additional information is required to proceed with the analysis of this proposed alteration. This dewatering alteration relates to the construction phase for the Gordon Gold Mine. The Gordon Gold Mine is regulated under the federal Decision Statement issued under Section 54 of the *Canadian Environmental Assessment Act*, 2012 (issued March 5, 2023, and amended July 28, 2024) and the conditions stipulated therein.

Alamos confirms that the single IR provided in Round 2 for this NOC has been fully addressed and answered as clearly and succinctly as possible. A fulsome response to the IR is provided in the following section in reference to the original request. Attachments to the response have been provided in Appendix A.

Alamos has undertaken the following while responding to the IR:

- Considered the context and rationale for the required information for the IR.
- Provided additional information (wherever possible) to address uncertainty and to provide clearly defined, detailed follow-up program measures, including additional proposed mitigation measures.
- Presented complete or summarized information and discussion within the IR response, rather than limited responses referencing applicable reports.

Alamos trusts that this package provides IAAC with all of the required information to conclude the NOC review process.

RESPONSE TO NOC-02-R2-01

ID:	**NOC-02-R2-01**
Expert Department or Group:	Environment and Climate Change Canada
Context and Rationale:	**Context:** Section 3.1 describes the 2022 East Pit Mixing Trial, and Section 4.1 states that the resulting pit water chemistry obtained from the Trial was used in the Hughes River mixing model. The mixing trial was performed exclusively on East Pit and does not include any data from Wendy Pit. Data from the Trial was assumed to be representative of overall pit water quality, including the water stored in Wendy Pit. No discussion has been provided on the quality of water in East Pit versus Wendy Pit to establish if the East Pit is a suitable proxy dataset for Wendy Pit and the overall discharge water quality. **Rationale:** Data from the mixing trial is essential to evaluating environmental impacts. The East Pit Mixing Trial was used to represent discharges from East Pit and Wendy Pit. Additional information is needed to confirm that the mixing trial is representative of Wendy Pit.
Information Request:	ECCC requests that the Proponent provide a comparative analysis with requisite evidence to support the conclusion that water quality is adequately similar in the East and Wendy Pits for the East Pit Mixing Trial results to be used as a proxy for all pit water to be discharged to the Hughes River.
Response:	From the information gathered during baseline studies and as documented in the Hydrogeology Technical Data Report (Stantec 2018a) prepared in support of the Environmental Impact Statement (EIS) Application, it is known that Wendy and East pits are hydraulically connected and connected to the surrounding Gordon and Farley lakes. Hydraulic testing indicates the bedrock around the proposed open pit at the Gordon site is estimated to have a hydraulic conductivity approximately one order of magnitude (i.e., ten times) greater than the surrounding bedrock. This higher hydraulic conductivity of bedrock is associated with the East and Wendy Faults, which extend east-west through Farley and Gordon lakes. Water quality sampling, at depth, was conducted concurrently in Wendy and East pits between May 2015 and March 2017 during preparation of the EIS Application. These data were summarized in the Lynn Lake Gold Project: Water Quality Baseline Technical Data Report (Stantec 2018b) that was submitted as part of the EIS application. The following information about water quality in the pits is taken from the Section 4.1.4 of the TDR: • Specific conductivity and concentrations of total dissolved solids, acidity, bicarbonate, alkalinity, ammonia, chloride, fluoride, hardness, total phosphorus, sulphate, and total suspended solids all increased with increasing depth in both pits. • Dissolved arsenic, dissolved barium, dissolved boron, dissolved calcium, dissolved cesium, dissolved iron, dissolved lithium, dissolved magnesium, dissolved manganese, dissolved molybdenum, dissolved potassium, dissolved rubidium, dissolved selenium, dissolved silicon, dissolved sodium, dissolved strontium, dissolved tungsten, and dissolved uranium concentrations all increased with increasing depth in both pits.

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	• Dissolved cesium and dissolved vanadium concentrations also increased with increasing depth in East Pit but not in Wendy Pit. • Temperature, pH, and concentrations of dissolved oxygen, dissolved copper, and dissolved nickel decreased with increasing depth in both pits. • Concentrations of ammonia, chloride, dissolved iron, and dissolved uranium were at least five times higher at depths >10 m compared to concentrations at depths <10 m in both pits. • Concentrations of sulphate, dissolved boron and dissolved sodium were at least five time higher at depths >10 m compared with concentrations at depths <10 m in Wendy Pit but not East Pit. However, concentrations of these same parameters were between four and five times higher at depths >10 m compared with concentrations at depths <10 m in East Pit. • Concentrations of dissolved manganese were 104 times higher at depths >10 m compared with concentrations at depths <10 m in East Pit but only three times higher at depths >10 m compared with concentrations at depths <10 m in Wendy Pit. • Fluoride concentrations exceeded the CWQG-FAL of 0.12 mg/L in water >10 m deep in Wendy Pit and in water >20 m deep in East Pit. • Total phosphorus concentrations exceeded the CWQG-FAL of 0.025 mg/L in all samples collected in water >10 m deep in Wendy Pit but in <15% of samples collected in water >20 m deep in East Pit. • Dissolved arsenic concentrations exceeded the CWQG-FAL of 0.005 mg/L for total arsenic in water >5 m deep in Wendy Pit and >10 m deep in East Pit. • Dissolved iron concentrations exceeded the CWQG-FAL of 0.3 mg/L for total iron in water >10 m deep in Wendy Pit and >15 m in East Pit. Tables summarizing the differences in average parameter concentrations in Wendy Pit and East Pit in waters greater than and less than 10 m are provided in Table B-13 and Table B-14 of Appendix B of the Water Quality Baseline Technical Data Report (Stantec 2018b), respectively. These are provided here as Attachment NOC-02-R2-01. While water quality in the two pits is not identical, these data indicate that both pits have become meromictic since the previous Farley Mine closed in 1999. Wendy Pit has a maximum depth of 68 m and East Pit has a maximum depth of 85 m and neither pit has a fetch >350 m. These physical characteristics prevent the water column in the pits from fully mixing during spring and fall turnovers. Instead, only the upper 10 m of the water column is mixes (i.e., the mixolimnion). The mixing trial was conducted in East Pit in 2022 because it is the deeper and larger of the two pits volumetrically: 1,655,372 m^3 of water in East Pit compared with 644,846 m^3 in Wendy Pit (the volume of Wendy Pit is reduced by the presence of approximately 465,000 m^3 of submerged waste rock (Golder 2015)). As the trial showed, complete mixing of water in East Pit was attained within 16 hours of aeration (Stantec 2022). Complete mixing of water in Wendy Pit is expected to be quicker because Wendy Pit is smaller than East Pit. The only parameters with substantially higher average concentrations (i.e., >50% higher) in waters >10 m deep in Wendy Pit compared with East Pit are ammonia, dissolved aluminum, dissolved cobalt, dissolved manganese, and dissolved and total iron. Of these parameters, only ammonia and total iron concentrations exceed long-term CWQG-FALs in waters >10 m in Wendy Pit. Ammonia guidelines are temperature and

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	pH dependent and, as shown during the East Pit Mixing Trial, ammonia concentrations in Wendy Pit are expected to fall below the ammonia guideline when fully mixed. However, like East Pit, total iron concentrations in Wendy Pit are expected to exceed the long-term CWQG-FAL of 0.3 mg/L even when fully mixed. Aeration of East Pit did show partial conversion of dissolved iron into the suspended fraction but not enough to reduce total iron concentrations below the guideline. In summary, Alamos considers using the East Pit Mixing Trial as a proxy for water quality in Wendy Pit after mixing to be a conservative approach. This is because, East Pit has a larger volume of water below the 10 m depth contour, water that is generally poorer quality than water below the 10 m depth contour in Wendy Pit. It is important to also note, as committed in the Monitoring Program for Gordon Pit Dewatering to the Hughes River (shared during the first round of IR responses within Attachment NOC-02-02-D) that vertical water quality sampling and laboratory testing will be conducted in both pits following aeration and prior to discharge to the Hughes River. In this regard, there will be confidence that the quality of the water being discharged is suitable to enter the receiving environment. <u>References:</u> Golder. 2015. Marine geophysical survey of the Wendy and East pits. A report prepared for Alamos Gold Inc., Toronto, ON by Golder Associates Limited, Mississauga, ON. Stantec. 2018a. Lynn Lake Gold Project: Hydrogeology Baseline Technical Data Report. A report prepared for Alamos Gold Inc., Toronto, ON by Stantec Consulting Limited, Winnipeg, MB. Stantec. 2018b. Lynn Lake Gold Project: Water Quality Baseline Technical Data Report. A report prepared for Alamos Gold Inc., Toronto, ON by Stantec Consulting Limited, Winnipeg, MB. Stantec. 2022. East Pit Mixing Trial. A report prepared for Alamos Gold Inc., Toronto, ON by Stantec Consulting Limited, Winnipeg, MB.
Attachment:	Appendix A, Attachment NOC-02-R2-01

Appendix A ATTACHMENTS

ATTACHMENT NOC-02-R2-01

Table B-13
Open Pit Parameter Concentrations that Increase with Depth
Lynn Lake Gold Project
Alamos Gold Inc

Parameter	Average Surface Concentration (mg/L)	Average Concentration below 10 m (mg/L)	Percent Difference of Average Surface and >10 m Concentrations
Field Parameters			
Dissolved oxygen, Field	7.3	0.17	-98%
Electrical Conductivity, Field	174	599	244%
Nitrite, Field	0.006	0.004	-42%
pH, Field	7.5	7.3	-3%
Temperature, Field	9.0	3.6	-60%
Total Dissolved Solids, Field	106	388	267%
Turbidity, Field	2.0	1.0	-50%
General Chemistry			
Acidity as $CaCO_3$	5.1	8.1	59%
Alkalinity, Bicarbonate (as $CaCO_3$)	138	280	103%
Alkalinity, Carbonate (as $CaCO_3$)	0.3	0.3	0%
Alkalinity, Hydroxide (as $CaCO_3$)	0.17	0.17	0%
Alkalinity, Total (as $CaCO_3$)	114	230	103%
Ammonia (as N) - Tot	0.017	0.22	1190%
Bromide	0.05	0.05	0%
Chloride	0.39	3.9	901%
Chlorophyll a	2.1	0.24	-89%
Cyanide	0.00050	0.00050	0%
Cyanide (Free)	0.00050	0.00050	0%
Cyanide (Weak Acid Dissociable)	0.00050	0.00050	0%
Dissolved Organic Carbon	12	3.2	-73%
Fluoride	0.083	0.14	71%
Hardness (as $CaCO_3$)	131	370	183%
Nitrate + Nitrite (as N)	0.049	0.030	-39%
Phaeophytin A	1.1	0.37	-66%
Phosphorus, Total	0.013	0.043	227%
Radium-226	0.0050	0.0050	0%
Sulfate	21	195	814%
Total Kjeldahl Nitrogen	0.48	0.37	-23%
Total Organic Carbon	12	3.4	-71%
Total Suspended Solids	2.5	5.4	116%
Metals, Dissolved			
Aluminum-Diss	0.010	0.0025	-75%
Antimony-Diss	0.00010	0.00010	0%
Arsenic-Diss	0.0019	0.0064	238%
Barium-Diss	0.017	0.043	149%
Beryllium-Diss	0.00010	0.00010	0%
Bismuth-Diss	0.00010	0.00010	0%
Boron-Diss	0.010	0.11	1011%
Cadmium-Diss	8.00E-06	5.00E-06	-38%
Calcium-Diss	38	91	141%
Cesium-Diss	0.00019	0.00027	41%
Chromium-Diss	0.000080	0.000050	-38%
Cobalt-Diss	0.00021	0.00010	-52%
Copper-Diss	0.0012	0.00010	-92%
Iron-Diss	0.078	1.9	2327%
Lead-Diss	5.00E-05	4.50E-05	-10%
Lithium-Diss	0.0023	0.010	339%
Magnesium-Diss	8.8	35	295%
Manganese-Diss	0.19	0.56	198%
Mercury-Diss	2.74E-06	6.66E-07	-76%
Molybdenum-Diss	0.00038	0.00084	121%
Nickel-Diss	0.0013	0.00020	-84%
Potassium-Diss	2.7	7.9	188%
Rubidium-Diss	0.0024	0.0055	126%
Selenium-Diss	0.00010	0.00019	94%
Silicon-Diss	3.3	8.2	148%
Silver-Diss	8.00E-06	5.00E-06	-38%
Sodium-Diss	3.6	27	655%
Strontium-Diss	0.074	0.34	353%
Tellurium-Diss	0.00010	0.00010	0%
Thallium-Diss	5.00E-05	5.00E-05	0%
Thorium-Diss	5.00E-05	5.00E-05	0%
Tin-Diss	0.00010	0.00010	0%
Titanium-Diss	0.00048	0.00025	-48%
Tungsten-Diss	5.00E-05	0.00019	274%
Uranium-Diss	4.40E-04	0.0030	591%
Vanadium-Diss	0.00013	0.00010	-23%
Zinc-Diss	0.0020	0.0011	-45%
Zirconium-Diss	0.00020	0.00020	0%

Table B-14
Open Pit Parameter Concentrations that Increase with Depth
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Parameter	Average Surface Concentration (mg/L)	Average Concentration below 10 m (mg/L)	Percent Difference of Average Surface and >10 m Concentrations
Field Parameters			
Dissolved oxygen, Field	9.2	0.49	-95%
Electrical Conductivity, Field	247	624	153%
Nitrite, Field	0.009	0.009	3%
pH, Field	7.7	7.2	-6%
Temperature, Field	8.9	3.25	-64%
Total Dissolved Solids, Field	136	431	217%
Turbidity, Field	3.4	0.99	-71%
General Chemistry			
Acidity as $CaCO_3$	3.7	10.8	191%
Alkalinity, Bicarbonate (as $CaCO_3$)	152	253	66%
Alkalinity, Carbonate (as $CaCO_3$)	0.52	0.30	-42%
Alkalinity, Hydroxide (as $CaCO_3$)	0.17	0.17	0%
Alkalinity, Total (as $CaCO_3$)	125	207	66%
Ammonia (as N) - Tot	0.01	0.12	1072%
Bromide	0.050	0.050	0%
Chloride	0.76	6.6	770%
Chlorophyll a	1.0	0.21	-80%
Cyanide	0.00050	0.00050	0%
Cyanide (Free)	0.00050	0.00050	0%
Cyanide (Weak Acid Dissociable)	0.00050	0.00050	0%
Dissolved Organic Carbon	10	3.7	-64%
Fluoride	0.086	0.14	62%
Hardness (as $CaCO_3$)	158	368	133%
Nitrate + Nitrite (as N)	0.086	0.020	-77%
Phaeophytin A	0.39	0.18	-54%
Phosphorus, Total	0.0080	0.017	109%
Radium-226	0.0050	0.0073	45%
Sulfate	42	202	378%
Total Kjeldahl Nitrogen	0.37	0.32	-13%
Total Organic Carbon	10	3.7	-63%
Total Suspended Solids	1.0	1.7	65%
Metals, Dissolved			
Aluminum-Diss	0.0059	0.0020	-67%
Antimony-Diss	0.00010	0.00010	0%
Arsenic-Diss	0.0022	0.0053	141%
Barium-Diss	0.016	0.037	126%
Beryllium-Diss	0.00010	0.00010	0%
Bismuth-Diss	0.00010	0.00010	0%
Boron-Diss	0.018	0.071	296%
Cadmium-Diss	8.00E-06	5.00E-06	-38%
Calcium-Diss	45	98	116%
Cesium-Diss	0.00017	0.00029	72%
Chromium-Diss	0.000080	0.000050	-38%
Cobalt-Diss	0.00010	0.00031	206%
Copper-Diss	0.0012	0.00010	-92%
Iron-Diss	0.032	0.69	2052%
Lead-Diss	5.70E-05	4.50E-05	-21%
Lithium-Diss	0.0029	0.0073	150%
Magnesium-Diss	11	30	178%
Manganese-Diss	0.0090	0.94	10353%
Mercury-Diss	2.68E-06	9.69E-07	-64%
Molybdenum-Diss	0.00055	0.0015	164%
Nickel-Diss	0.00086	0.00060	-31%
Potassium-Diss	3.7	9.9	169%
Rubidium-Diss	0.0032	0.0068	110%
Selenium-Diss	0.000090	0.00038	322%
Silicon-Diss	3.3	5.7	75%
Silver-Diss	8.00E-06	5.00E-06	-38%
Sodium-Diss	5.6	26	372%
Strontium-Diss	0.096	0.31	219%
Tellurium-Diss	0.00010	0.00010	0%
Thallium-Diss	5.00E-05	5.00E-05	0%
Thorium-Diss	5.00E-05	5.00E-05	0%
Tin-Diss	0.00010	0.00010	0%
Titanium-Diss	0.00028	0.00025	-11%
Tungsten-Diss	7.00E-05	0.00017	136%
Uranium-Diss	9.50E-04	0.0054	467%
Vanadium-Diss	0.00011	0.00012	6%
Zinc-Diss	0.0021	0.00093	-56%
Zirconium-Diss	0.00020	0.00020	0%