Red Chris Block Cave Project - Production Phase

Application for an Amendment to Environmental Assessment Certificate #M05-02

Chapter 13.0 Accidents and Malfunctions

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Acronyms and Abbreviations

AAIR	Amendment Application Information Requirements
Amendment Application	Application for an Amendment to Environmental Assessment Certificate #M05-02
BC	British Columbia
BGC	BGC Engineering Inc.
CMP	Cave Management Plan
EAO	Environmental Assessment Office
EoR	Engineer of Record
EPRP	Emergency Preparedness and Response Plan
ESRP	Emergency and Spill Response Plan
FMEA	Failure Mode Effects Analysis
GCMP	Ground Control Management Plan
HSRC	Health, Safety and Reclamation Code for Mines in British Columbia
IFC	Issue for Construction
ITRB	Independent Tailings Review Board
KLLC	Kluea Lake Landslide Complex
kV	kilovolt
MHS	Material Handling System
Mine/the Mine (also Red Chris	Red Chris Porphyry Copper-Gold Mine
Mt	million tonnes
Newmont	Newmont Corporation.
NRCML	Newcrest Red Chris Mining Limited
OMS	Operation, Maintenance, and Surveillance

Original Application	Red Chris Copper-Gold Porphyry Project Environmental Assessment Certificate Application
Project	Production Phase of the Block Cave Project
RAM	Risk Assessment Matrix
Red Chris (also Mine/the Mine)	Red Chris Porphyry Copper-Gold Mine
TARP	Trigger Action Response Plan *(formerly referred to as Trigger Response Plan or TRP)*
TIA	Tailings Impoundment Area
VC	Valued Component

13.0 Accidents and Malfunctions

13.1 Introduction

Newcrest Red Chris Mining Limited (NRCML) proposes to change the mining method at the Red Chris Porphyry Copper-Gold Mine (Red Chris/Mine/the Mine) from the current surficial Open Pit to an underground mining technique known as block cave mining. The change in mining method will allow NRCML to access higher grade ore known to exist below the permitted Open Pit shell. As described in this document, the Production Phase of the Block Cave Project (the Project) will support continued operation of the Mine for approximately 15 years, by which time the existing Tailings Impoundment Area (TIA) will reach its currently permitted capacity.

Red Chris is an existing mine that has been in operation since early 2015; NRCML has developed an Emergency and Spill Response Plan (ESRP; Document 400-0000-EN-PLA-001) outlining suitable responses to unexpected events that pose a risk to human health and safety, property, and/or the environment. The assessment of Accidents and Malfunctions (as defined in Section 13.2 below) presented in this section will be focussed on risks associated with new activities proposed by the Project for which new and/or updated risk mitigation measures may be warranted. While risks associated with current activities that will support the Project are also discussed, they are outside the scope of assessment.

13.2 Scope

This section presents an assessment of Accidents and Malfunctions associated with the proposed Project components and activities, which could affect the Valued Components (VC) identified in Chapter 5.0 Valued Component Selection. While outside the scope of the assessment, this section will also present an overview of existing failure modes and the procedures currently in place to address potential Accidents and Malfunctions associated with current operations.

This assessment of Accidents and Malfunctions has been conducted in accordance with Section 13.0 of the Amendment Application Information Requirements (AAIR). For the purposes of this assessment, the definitions of Accidents and Malfunctions are consistent with what is presented by the Impact Assessment Agency of Canada in its Policy and Guidance, Section 22 – Factors to be Considered Descriptions (Government of Canada 2024), as follows:

- An accident is an unexpected and unintended interaction of a project component or activity with environmental, health-related, social, or economic conditions.
- A malfunction in the context of impact assessment is a failure of a piece of equipment, a device, or a system to operate as intended.

This assessment considers the identification and characterization of credible failure modes, and the formulation of worst-case scenarios associated with each failure mode. Failure modes for which existing risk mitigation measures are considered sufficient are not subject to further analysis and reference to the existing control measures is provided. Failure modes for which new risk mitigation measures are warranted are subject to further assessment, as described in Section 13.3.

13.3 Method

In alignment with the British Columbia (BC) Environmental Assessment Office (EAO) Effects Assessment Policy (EAO 2020) and the AAIR, a Failure Mode and Effects Analysis (FMEA) was used to identify failure modes and credible scenarios. FMEA is a method to evaluate risks that involves the identification of potential failure modes, the mechanisms that could cause these failures, and their consequences. Note that risks that are associated with the existing Mine components and activities were removed from further evaluation; only the additional risks associated with the Project were carried forward to the next stage.

13.3.1 Identification of Failure Modes Associated with the Project

A detailed review of the Project components and activities, as described in Chapter 1.0 Project Overview, was conducted by a multidisciplinary team of environmental and mining specialists to identify failure modes that could affect VCs. Due to the nature of the Project, most of the failure modes were associated with underground mining activities.

Table 13-1 presents the credible failure modes that are solely associated with the proposed Project, which will be assessed in detail in Section 13.5. The failure modes that are already present in the operation of Red Chris, along with the mitigation measures that are currently in place to control the risks, are discussed briefly in Section 13.4.

Table 13-1: Credible Failure Modes

Failure Mode		Scenario		Worst-Case Consequences
1	Uncontrolled Ingress of Water and/or Solids into Underground Workings	1.1	Mud rush	• Multiple fatalities • Damage to underground equipment and infrastructure • Production disruption
		1.2	Underground flooding	• Multiple fatalities • Damage to underground equipment and infrastructure • Production disruption
2	Underground Instability	2.1	Air blast induced by collapse within cave [1]	• Multiple fatalities • Damage to underground equipment and infrastructure • Production disruption • Uncontrolled air emissions (i.e., dust)
		2.2	Fall of ground in work area	• Fatality or permanently disabling injury • Damage to underground equipment and infrastructure • Production disruption

[1] Air blast induced by massive fall of ground within the cave - The movement of massive amounts of rock simultaneously into a void displacing air into the connected tunnels and openings. This is a risk during cave development before full connection to surface and is managed by preventing the creation of a large airgap through production compliance.

Failure Mode		Scenario		Worst-Case Consequences
3	Surface Instability	3.1	Surface subsidence exceeds predictions	• Damage to equipment and infrastructure • Impacts to terrestrial environment • Impacts to aquatic environment (e.g., Camp Creek)
		3.2	Caving induced landslide	• Fatality or permanent disabling injury • Environmental degradation • Fish habitat loses • Destruction of cultural heritage sites
4	Power Failure for Underground Workings	4.1	Powerline failure due to storm	• Damage to underground equipment and infrastructure • Production disruption
		4.2	Powerline failure due to forest fire	• Damage to underground equipment and infrastructure • Production disruption
5	Fires and Explosions within Underground Workings	5.1	Electrical fire / Circuit overload	• Multiple fatalities • Damage to underground equipment and infrastructure • Production disruption • Uncontrolled air emissions (i.e., combustion gases)
		5.2	Uncontrolled combustion of flammable materials	• Multiple fatalities • Damage to underground equipment and infrastructure • Production disruption • Uncontrolled air emissions (i.e., combustion gases)

13.3.2 Identification of Interactions with Valued Components

Table 13-2 identifies and ranks potential interactions between the failure modes presented in Section 13.3.1 and the VCs, and classifies these interactions as follows:

- Little to no interaction expected with the VC. No further consideration warranted.
- Interaction with the potential to generate an impact on the VC; for which likelihood and consequence could result in a low, medium, or high risk.
- Interaction with the potential to generate an impact on the VC; for which likelihood and consequence could result in a high, extreme, or material risk.

Interactions with the potential to generate impacts on VCs were carried forward and considered in the risk assessment.

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Table 13-2: Failure Modes and Valued Components Interaction Matrix

Failure Mode		Scenario		Air Quality	Acoustics	Surface Water	Groundwater	Soil, Landscape, and Terrain	Vegetation and Terrestrial Ecosystems	Wildlife and Wildlife Habitat	Fisheries and Aquatic Resources	Employment and Economy	Infrastructure and Services	Human Health	Archaeological and Heritage Resources	Culture
1	Uncontrolled Ingress of Water and Solids into Underground Workings	1.1	Mud rush	—	—	○	—	—	—	—	—	●	●	●	—	—
		1.2	Underground flooding	—	—	○	○	—	—	—	—	●	●	●	—	—
2	Underground Instability	2.1	Air blast induced by collapse of the cave	○	○	—	—	—	—	—	—	●	●	●	—	—
		2.2	Fall of ground in work area	—	—	—	—	—	—	—	—	●	●	●	—	—
3	Surface Instability	3.1	Surface subsidence exceeds predictions	○	○	●	●	●	●	●	●	○	○	○	○	○
		3.2	Caving induced landslide	○	○	●	●	●	●	●	●	●	●	●	●	●
4	Power Failure	4.1	Powerline failure due to storm	—	—	—	—	—	—	—	—	●	●	○	—	—
		4.2	Powerline failure due to forest fire	—	—	—	—	—	—	—	—	●	●	○	—	—
5	Fires and Explosions	5.1	Overloaded circuits	●	○	○	—	—	—	—	—	●	●	●	—	—
		5.2	Uncontrolled combustion of flammable materials	●	○	○	—	—	—	—	—	●	●	●	—	—

Notes

Blank Failure mode scenario has little to no interaction expected with the VC. No further consideration warranted.

○ Failure mode scenario has an interaction with the potential to generate an impact on the VC; for which likelihood and consequence could result in a low or medium risk.

● Failure mode scenario has an interaction with the potential to generate an impact on the VC; for which likelihood and consequence could result in a high, extreme, or material risk.

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13.3.3 Risk Assessment

A risk-based approach was used for the assessment of Accidents and Malfunctions that could impact the VCs and Indigenous interests identified for the Project. The following steps were followed for each of the failure modes identified in Section 13.2.

- Characterization of credible worst-case scenarios;
- Formulation of mitigation measures that are assumed to apply to potential incidents;
- Use of risk rating and ranking criteria; and
- Assessment of risks on Indigenous interests.

13.3.3.1 Characterization of Credible Worst-Case Scenarios

A credible worst-case scenario considers the most serious or severe outcome that may happen under a failure mode. Credible worst-case scenarios were formulated using professional mining knowledge and supported by a review of historic Accidents and Malfunctions that have occurred in block cave mining operations elsewhere.

All credible worst-case scenarios were carried forward into the risk assessment except for the ones associated with permitted activities that would continue during Project execution and discussed in Section 13.4. The characterization of worst-case scenarios was also informed by knowledge of existing environmental conditions that could influence the failure modes, such as extreme precipitation events or the presence of natural hazards in proximity to the Project.

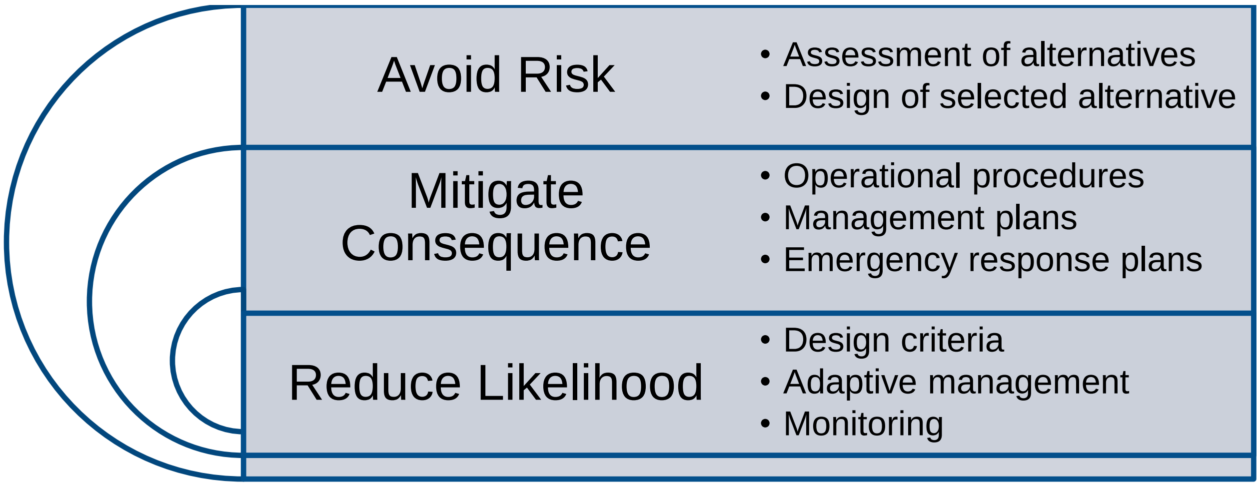
Block caving is a mining method that has been used in the mining industry for decades and there are lessons learned from tragic events, such as underground fires, mud rushes, and air blasts. The following case studies were reviewed to inform the characterization of credible worst-case scenarios:

- Underground Fire at Musselwhite Mine (Goldcorp 2019);
- Cadia Rideway Inrush, 2015 (Simtars 2015); and
- Northparkes Air Blast, 1999 (Government of NSW n.d.).

13.3.3.2 Formulation of Risk Mitigation Measures

NRCML’s strategy with respect to the Project risks is to proactively eliminate risks to the most practicable extent possible. A summary of mitigation measures that are assumed to apply to potential incidents and would be considered in the residual risk rankings will be included in the assessment. This includes mitigation measures embedded in the design of the Project and the ones proposed in management or emergency response plans Figure 13-1 shows the general hierarchy of the risk management techniques.

Figure 13-1: Risk Control Strategy



13.3.3.3 Risk Rating and Ranking Criteria

Risk is defined as the potential impact of uncertainty on objectives. For the purposes of this document, risk is assessed using the industry standard methodology of combining consequence severity and likelihood of occurrence of identified failure modes. Table 13-3 (Newcrest 2022) present the likelihood of occurrence and consequence severity definitions used in this analysis and in the Risk Analysis presented in Chapter 10.0 Effects of the Environment on the Project. These definitions are consistent with those employed by NRCML in its internal risk management program and are generally consistent with mining industry practice.

Experience and professional judgement are typically the basis for rating the likelihood and consequence of credible failure modes associated with Project components and activities. The rating of likelihood is based on the probability or frequency of a potential event happening while the consequence severity is informed by factors such as geographic extent affected by the event, the population affected or associated financial losses.

Also, the likelihood of mitigation measures being successful and the lag of time for mitigation measures to become effective are considered in the rating of both likelihood and consequence severity because mitigation measures have the dual objective of reducing the probability and severity of accidents and malfunctions. For instance, measures such as ground support reduce the probability of falls of ground; while the use of automated equipment reduces the exposure of workforce to such an event; therefore, reduces the consequence severity.

In cases where failure modes are associated to natural events such as extreme precipitation and wildfires, the risk rating is also supported by the analysis presented in Chapter 10.0 Effects of the Environment on the Project.

Table 13-3: Likelihood Definitions

Level	Descriptor	Description
6	Almost Certain	• The event is highly likely to occur during the Project timeframe. • More than 90% probability of occurring. • Expected to occur in most circumstances; a history of regular occurrences in similar projects.
5	Likely	• The event is likely to occur during the Project timeframe. • 50-90% probability of occurring. • Expected to occur in most circumstances. • A history of regular occurrences in similar projects.
4	Possible	• The event may occur at some point during the Project timeframe. • 10-50% probability of occurring. • May occur at some time as there is a history of casual occurrence on similar projects.
3	Unlikely	• The event is not likely to occur during the Project. • From 1 in 1,000 to 1 in 10 probability of occurring. • Not expected but there is a slight possibility it may occur at some time during the Project.
2	Rare	• The event will only occur in exceptional circumstances during the Project. • Less than 1 in 1000 probability of occurring. • May occur during the Project but only in exceptional circumstances.
1	Extremely Rare	• The event would occur once every 1,000-10,000 years. • No known occurrences for similar projects.

Table 13-4: Consequence Severity Definitions

Level	Environment	Social	Economic	Health & Safety	Cultural
6	Catastrophic, mass extinction of a species. Extensive impact on ecosystem or threatened species.	Catastrophic impacts/changes in community lifestyles, "loss of community" (social fabric, sense of belonging, and territorial loss) and livelihood impacts, complete breakdown of social order.	Catastrophic, permanent financial impact with long-term restitution orders.	Multiple loss of life. Greater than (>) 5 fatalities. Very serious irreversible injury to >20 people.	Catastrophic threat to cultural heritage over majority of territory, leading to irreparable loss or damage. Cultural extinction, loss of land rights.
5	Extreme, permanent environmental impact. Loss of keystone species, resulting in cumulative effects in the ecosystem.	Extreme, violent social unrest, public outcry. Severe strain on social fabric and well-being of the community members. Breakdown of traditional systems, displacement of adequate support mechanisms. Potential legal challenges, protests, long-term damage to relationships.	Extreme, requiring substantial financial capital and new investments to mitigate.	2–5 fatalities Significant, irreversible human health effects to >10 people. Extreme, irreversible health impacts. Outbreak of infectious disease(s).	Extreme threat to cultural heritage leading to irreparable loss or damage. Loss of critical known or undocumented archaeological/ heritage resources or locations of special interest. Damage to cultural practices and cultural identity and continuity, spiritual beliefs, ancestral territories, cultural knowledge.
4	Major change in regulating, provisioning, and supporting ecosystem services encompassing a larger area or longer term.	Major social tension or conflict (protests). Impact to societal structures, relationships, or access to resources. Loss of community trust.	Major financial impact. Loss of business for a sector of the community. Substantial property loss/ insolvencies/ bankruptcy.	Fatality or permanent partial disability, e.g., loss of limb.	Major loss of known or undocumented archaeological/ heritage resources or locations of special interest.

Level	Environment	Social	Economic	Health & Safety	Cultural
3	Moderate change in regulating, provisioning, and supporting ecosystem services.	Moderate social tension or conflict. Impact to social structures, relationships or access to resources.	Moderate financial impact (loss of employment opportunities, effects on local businesses, and revenue streams within community). Reallocation of resources or adjustment to budget planning for community.	Lost Time Injury or permanent partial disability Moderate, acute exposure, severe but reversible health effects. Widespread outbreak of infectious, treatable (reversible) disease(s).	Moderate alteration to known or undocumented archaeological/ heritage resources or locations of special interest.
2	Minor, reversible impacts that change regulating, provisioning, and supporting ecosystem services. Localized impact.	Minor, temporary disruption to community relationships or events. Limited disruption to cohesion or community.	Minor, temporary impacts. Reallocation of resources or adjustment of budget at community level for a period of time.	Minor, reversible health effects. Minor supportive treatment. Minor medical treatment or illness.	Minor, spatial alteration to known or undocumented archaeological/ heritage resources or locations of special interest.
1	Negligible, undiscernible change in regulating, provisioning, and supporting ecosystem services.	Negligible, perturbation, adjustment of activities such as time delays, brief stoppage.	Negligible, financial impact, affecting only a few individuals/ households in the community. Losses can be absorbed within existing financial or insurance instruments.	Negligible, minimal first aid or temporary illness. Cause discomfort or physical strain for limited time.	Negligible, affect, temporary in nature. No impact to known or undocumented archaeological/ heritage resources.

Using the likelihood and probable consequences of the hypothetical failures, the risks were then plotted on the NRCML Risk Assessment Matrix (RAM), presented in Figure 13-2.

Figure 13-2: Risk Assessment Matrix

Likelihood		Severity Level (Consequence)					
		6	5	4	3	2	1
		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain	M1	M3	1	3	6	10
5	Likely	M2	M5	2	5	9	14
4	Possible	M4	M7	4	8	13	17
3	Unlikely	M6	M9	7	12	16	19
2	Rare	M8	M11	11	15	18	20
1	Extremely Rare	M10	M12	21	22	23	24

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

Source: Project Procedurre PRJ-330-01 Project Risk Management, Newcrest Mining Limited

Note that, by definition, all risks associated with "extreme" and "catastrophic" consequence severity are identified as "material", irrespective of the likelihood of the event.

13.3.3.4 Tahltan Nation Engagement on Consequence Rankings

The Amendment Application, using the currently available information meets the requirements of the AAIR. Newmont's ongoing engagement and collaboration with the Tahltan Nation may produce additional information and knowledge that may be received during the application review process. To the extent information or knowledge is provided within the timelines of the review process in a way that it can be considered and incorporated into the Amendment Application. This information or knowledge will be considered during the review of the single application package. If information is provided outside the timelines, there will be further opportunity for it to be considered during ongoing engagement mechanisms.

13.4 Current Mine Controls

In the context of Accidents and Malfunctions, the Red Chris Copper-Gold Porphyry Project Environmental Assessment Certificate Application (Original Application; AMEC 2004) identified and discussed the following failure scenarios:

- Spills from vehicles transporting materials to or from the Mine site;
- Spills from a tailings delivery and/or reclaim water pipeline;
- Spills from a fuel storage facility;
- Spills of fuel or hydraulic fluid while refueling or servicing mining equipment and service vehicles;
- Spills of process slurry and or milling reagent from the concentrator (mill) due to equipment malfunction;
- Spills in the explosives plant;
- Failure of a tailings embankment; and
- Accident or Malfunction in the explosives plant.

The scenarios mentioned above are linked to activities conducted on surface and remain valid for the Project. Following approval of EAC #M05-02; NRCML developed the ESRP as required by its *Mines Act* Permit M-240. The ESRP addresses failure modes relevant to the current operation and those that could occur at surface during the construction and operation stages of the Project.

The following sections present information about the procedures currently in place to address potential Accidents and Malfunctions associated with current operations.

13.4.1 Emergency and Spill Response

The ESRP has been developed in accordance with the *Health, Safety and Reclamation Code for Mines in British Columbia* (HSRC; BC Gov 2022) and outlines the response procedures and preventive measures implemented for all Mine emergencies. It confirms that advanced preparation and preventive measures for potential emergencies are in place, provides effective and timely response measures for emergencies, and outlines the responsibilities of individual personnel in the event of an emergency.

The ESRP provides information to address the following:

- Accidents in the workplace requiring first aid emergency response;
- Spills of hazardous and non-hazardous materials;
- Vehicle incidents related to transporting mine employees and / or concentrate hauling along the transportation corridor including the Mine access road and the Stewart-Cassiar Provincial Highway (i.e., Highway 37);
- Fire prevention, fire response, and evacuation procedures including forest fires; and
- Weather-related occurrences.

Due to the anticipated increase in offsite traffic related to the Project during the construction (increased transportation of personnel and supplies/equipment) and operations (increased transportation of concentrate), NRCML will be developing an Off-site Traffic Management Plan. The Plan will describe policies and procedures intended to reduce the risk of traffic incidents and accidents; and include requirements for NRCML's major transportation contractors.

Traffic management measures will also be implemented to address the risk of on-site traffic incidents and accidents during the construction stage of the Project, when traffic on site is expected to increase. Traffic control measures will include the following:

- Rules for pedestrian working in high traffic areas;
- Rules to obtain authorization for use of mobile equipment; and
- General driving rules and procedures covering topics such as speed limits, right of way, parking, communications, road design, and traffic control.

13.4.2 Tailings Impoundment Area Emergency Preparedness and Response

The potential for a catastrophic failure of the TIA embankment was identified and assessed as a failure mode in Section 6.15 Accidents and Malfunctions, of the Original Application (AMEC 2004). The assessment presented in the Original Application considered that the likelihood of a catastrophic failure was "Very Unlikely" and that the consequence was "High" because a failure could result in significant adverse impacts on aquatic systems located downstream of the TIA.

A dam breach inundation study was prepared by BGC Engineering (BGC 2014) following the Dam Safety Guidelines by the Canadian Dam Association (CDA 2007) to model the potential consequences of hypothetical dam failures on areas downstream of the TIA. The dam breach and inundation analysis completed for the North, South and Northeast dams was based on hypothetical modes of failure under highly unlikely conditions. The results of the analysis show that the breach of a dam could result in adverse impacts, in some cases significant, along potential flood routes towards the North of the TIA affecting Quarry Creek, Nea Creek, Klappan River and Stikine River; and along potential flood routes towards the South of the TIA affecting Trail Creek, Kluea Lake, Todagin Lake, Tatogga Lake, Eddontenajon Lake, Kinaskan Lake and Iskut River.

The rationale for including the TIA is the specific concern expressed by the Tahltan Central Government regarding the potential catastrophic failure of the TIA; which is also included in the AAIR.

NRCML manages the TIA following best industry practices, which include:

- Retention of a qualified Engineer of Record (EoR) to oversee all key aspects of tailings management (BGC Engineering Inc. [BGC]).
- Establishment of an Independent Tailings Review Board (ITRB) to provide expert technical guidance to all aspects of the design, construction, operation, closure, and post-closure planning for the TIA.
- Management of the TIA in accordance with the HSRC (BC Gov 2022).
- Preparation of a Dam Breach and Inundation Study, which was conducted by BGC (2014) and used to support development the Red Chris Mine Emergency Preparedness and Response Plan (EPRP).
- Submission of Dam Safety Inspection reports annually, which are prepared by the EoR. These reports include the results of annual inspections performed by the EoR and other trained professionals on the various dams and ancillary structures associated with the Red Chris TIA.
- Development of the Red Chris TIA Operation, Maintenance, and Surveillance (OMS) Manual, which is updated annually. The OMS Manual contains the Red Chris Mine EPRP as Appendix O (RCDC 2014).

The configuration of the TIA, as approved in EAC Amendment #2 (Red Chris 2016) and shown in Figure 1-3 of Chapter 1.0 Project Overview, will not be altered by the Project; the final elevation of the TIA dams will remain as permitted at 1,180 metres above sea level to provide a total tailings storage capacity of approximately 300 million tonnes (Mt). Project activities that may alter the operation of the TIA are listed in Section 1.5.5.5 Tailings Management, in the Project Overview and include an increase in the tailings deposition rate and reduced water inflow once the tailings thickener is operating.

The tailings pipelines and distribution system will be upgraded as necessary to accommodate the increase in process plant throughput, and additional cyclones will be installed as required to generate sufficient sand material to raise the embankment at an increased rate. It is noted that the OMS is updated annually.

NRCML has reviewed these changes and determined that they do not generate any increased risk to TIA embankments. This document does not address embankment failure in the context of Project-related Accidents and Malfunctions, due to the lack of a connection between Project components and activities and the TIA, and the fact that the final configuration of the TIA will remain unchanged from what has already been permitted.

13.5 Project-Related Accidents and Malfunctions

The following sections describe the credible worst-case scenarios for the failure modes directly associated with the Project and the mitigation measures proposed to reduce risk to acceptable levels. An assessment of the residual risk is also presented according to the criteria presented in Section 13.3.3.3.

13.5.1 Uncontrolled Ingress of Water and Solids

Uncontrolled ingress of water and solids into the underground Mine workings could happen because of a mud rush or flooding event. Mud rushes are the sudden release of water and solids through the draw points into the extraction level, while flooding could be generated by an extreme precipitation or snow melting event causing the ingress of water into the underground working through the subsidence zone, declines, or ventilation raises.

The following sections describe credible worst-case scenarios and the mitigation measures to prevent or mitigate the occurrence of these events. They also present the residual risk assessment for each scenario.

13.5.1.1 Credible Worst-Case Scenarios

Table 13-5 describes credible worst-case scenarios for the uncontrolled ingress of water and solids into the underground mine workings.

Table 13-5: Uncontrolled Ingress of Water and Solids Worst-Case Scenarios

Scenario		Characterization of Worst-Case Scenario
1.1	Mud Rush	Water and muck suddenly release from draw points, filling portions of the extraction level and compromising worker health and safety. Equipment damage also likely in this scenario.
1.2	Underground Flooding	Flooding of underground workings due to: • An extreme precipitation event and surface water ingress through subsidence zone, mine openings; and/or • Connection with aquifer resulting in high groundwater ingress.

13.5.1.2 Mitigation Measures

Table 13-6 presents the preventive mitigation measures included in the design and operational controls to mitigate the risk of uncontrolled ingress of water and solids into the underground mine workings.

Table 13-6: Mitigation Measures for Uncontrolled Ingress of Water and Solids

Scenario		Mitigation
1.1	Mud Rush	Mine Design • Cave Management Plan (CMP) will address the risk of mud rush; • Water management plan will be updated to cover surface water and groundwater; • Fragmentation modelling will be completed and integrated into the Mine design and the CMP; and • Automated equipment will be utilized where appropriate. Operational Controls • Operation will adhere to cave management and draw control plans; • Appropriate mining equipment will be available to control draw point hangups; • Miners will be qualified and trained; • Routine inspections will be conducted by qualified supervisors and engineering staff; and • Ongoing instrumentation monitoring and data analysis will be conducted.
1.2	Flooding	• Designs will be developed for water management for box cut/Mine/subsidence zone/vent raise collars/decline; • Execution will be done as per the design for water management for box cut / Mine / subsidence zone/vent raise collars/decline; • Sufficient pumping will be included the design; • Underground Mine water management plan will be prepared, including o Management of mine openings (Subsidence, vent raises, boxcuts, etc.); o Management of underground dewatering infrastructure and pumping; o Monitoring requirements; and o Trigger action response plan (TARP). • Location of vent raise collars will avoid areas vulnerable to flooding; • Sediment control plans and measures will be implemented; and • Design will consider a 1:200-year flooding event.

13.5.1.3 Risk Assessment

When preventive mitigation measures are taken into consideration, the likelihoods of occurrence of the scenarios associated with an uncontrolled ingress of water and solids into the underground mine workings are classified as follows:

- Mud Rush: Unlikely (Level 3)
- Flooding: Rare (Level 2).

Given the likelihood defined above and the consequences as presented in Table 13-4, the residual risks associated with credible worst-case scenarios are classified as follows:

- **Environmental:** The environmental consequence is assigned a Level 1 for both scenarios, as these scenarios are contained to the underground workings and do not affect environmental features located on surface. There is the potential for an indirect effect associated with high concentrations of solids in Mine water potentially discharging into the environment due to the need to rapidly dewater underground workings.
- **Social:** The social consequence is assigned a Level 5 for both scenarios due to the potential for multiple fatalities. These events have the potential to affect NRCML's reputation and could trigger third -party actions in the form or judicial action or public protests.
- **Economic:** The economic consequence of these events would be associated with the damage to underground equipment and infrastructure and the disruption of production, which could represent losses between 1 to $10 million. The economic consequence is assigned a Level 3 for both scenarios.
- **Health:** The consequences on health have been assigned a Level 5 for both scenarios, given the potential for multiple fatalities.
- **Cultural:** The cultural consequences have been assigned a Level 1 because these scenarios are contained to the underground workings and there is negligible potential for impacts on cultural resources located on surface.

The residual risk levels associated with the uncontrolled ingress of water and solids into the underground workings are ranked as presented in Figure 13-3.

Figure 13-3: Uncontrolled Ingress of Water and Solids into Underground Workings Risks Ranking

Uncontrolled Ingress of Water and Solids into Underground Workings		Consequence					
		6	5	4	3	2	1
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible						
3	Unlikely		[1.1S] [1.1H]		[1.1EC]		[1.1EN] [1.1C]
2	Rare		[1.2S] [1.2H]		[1.2EC]		[1.2EN] [1.2C]
1	Extremely Rare						

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.5.2 Underground Instability

Underground instability could generate falls of ground that range in size from local work area events to larger failures within the cave zone, which represent a risk to underground workers. Events within the cave have the potential to occur during the cave initiation (before full connection to the surface), and when a large airgap exists. These events can create an air blast, which is a rapid displacement of air, often under pressure, under these conditions. Underground miners located in high-velocity air pathways are at risk of injury if this event is combined with a lack of sufficient isolation between the cave and the work areas.

13.5.2.1 Credible Worst-Case Scenarios

Table 13-7 describes credible worst-case scenarios for underground instability.

Table 13-7: Underground Instability Worst-Case Scenarios

Scenario		Characterization of Worst-Case Scenario
2.1	Air Blast Induced by Collapse within Cave	A massive caving event occurs that results in an air blast infiltrating work areas and/or seismicity beyond design. This could directly harm workers, and damage equipment, infrastructure, and ground support systems. Energy would most likely be released through draw points on the extraction level but could occur in any workings that are connected to the cave.
2.2	Fall of Ground in Work Area	A fall of ground in a work area of the Mine could bury or trap a portion of the workforce, damage mining equipment or infrastructure, and prevent access to a production area.

13.5.2.2 Mitigation Measures

Table 13-8 describes the proposed mitigation measures to prevent and reduce the risk of air blasts and fall of ground events.

Table 13-8: Mitigation Measures for Underground Instability

Cause		Mitigation
2.1	Air Blast Induced by Collapse within Cave	Mine Design: • No engineering level or openings allowed into ore zone to remove potential connection pathways and barriers required. • Cave ramp up / development strictly controlled to prevent airgaps. • Numerical modelling has been completed to study cave initiation, propagation, and draw. • Cave monitoring in place to understand the cave geometry and progression during cave initiation. • TARP based on best industry practises and caving rules. • Preconditioning will be used to reduce rock mass quality / strength to make cave development more predictable. • CMP will incorporate all aspects of cave design, mining sequence, draw control, and instrumentation. • Any air blast barriers required will be engineered. Operational Controls • Operation will adhere to cave management and draw control plans. • Miners will be qualified and trained. • Routine inspections will be conducted by qualified supervisors and engineering staff. • Personnel to be hired for geotechnical work will be Qualified Persons[2] with support in audit and governance. Ongoing instrumentation monitoring and data analysis will be conducted.
2.2	Fall of Ground in Work Area	Mine Design: • A Ground Control Management Plan (GCMP) will be in place. • Mine openings and ground support requirements will be designed using industry best practice. Operational Controls: • Operation will adhere to the GCMP. • Ground support standards will be adapted based on observed conditions. • Miners will be qualified and trained. • Routine inspections will be conducted by qualified supervisors and engineering staff. • Personnel to be hired for geotechnical work will be Qualified Persons with support in audit and governance. • Ongoing instrumentation monitoring and data analysis will be conducted. Quality assurance/quality control process will be in place for ground support materials, which will be tested post-installation.

[2] As defined in the BC *Mines Act.*

13.5.2.3 Risk Assessment

When preventive mitigation measures are taken into consideration, the likelihoods of occurrence of the scenarios associated with an underground instability are classified as follows:

- Air blast induced by collapse within cave: Unlikely (Level 3)
- Fall of ground in work areas: Unlikely (Level 3).

Given the likelihood defined above and the consequences as presented in Table 13-4, the residual risks associated with credible worst-case scenarios are classified as follows:

- Environmental: The environmental consequence under all scenarios is assigned a Level 1, as these scenarios are contained to the underground workings and do not affect environmental features located on surface. There is the potential for an indirect effect associated with dust emissions through the ventilation raises during a short period of time associated with a massive failure of the cave back.
- Social: The social consequence under all scenarios is assigned a Level 5 due to the potential for multiple fatalities. These events have the potential to affect Newmont's reputation and trigger third-party actions in the form or judicial action or public protests.
- Economic: The economic consequence of these events would be associated with the damage to underground equipment and infrastructure and the disruption of production, which could represent losses between higher than $10 million for an air blast caused by massive collapse of the cave back (Level 4); and less than $1 million for a fall of ground in the work area (Level 2).
- Health: The consequences on health have been assigned a Level 5 for both scenarios, given the potential for multiple fatalities.
- Cultural: The cultural consequences have been assigned a Level 1 because these scenarios are contained to the underground workings and there is negligible potential for impacts on cultural resources located on surface.

The residual risk levels associated with the underground instability are ranked as presented in Figure 13-4.

Figure 13-4: Underground Instability Risks Ranking

Underground Instability		Consequence					
		6	5	4	3	2	1
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible						
3	Unlikely		[2.1S] [2.1H]	[2.1EC] [2.2S] [2.2H]		[2.2EC]	[2.1EN] [2.1C] [2.2EN] [2.2C]
2	Rare						
1	Extremely Rare						

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.5.3 Surface Instability

Scenarios associated with surface instability include surface subsidence exceeding what has been predicted by the model, and the reactivation of the Kluea Lake Landslide Complex (KLLC) due to block caving.

13.5.3.1 Credible Worst-Case Scenarios

Table 13-9 describes credible worst-case scenarios associated with surface instability.

Table 13-9: Surface Instability Worst-Case Scenario

Cause		Characterization of Worst-Case Scenario
3.1	Surface Subsidence Exceeds Predictions	Surface subsidence occurs outside of expected/modelled area and timelines, resulting in surface infrastructure instabilities and altered environmental features, such as rerouting drainage of Camp Creek.
3.2	Caving Induced Landslide	Block cave mining remobilizes the KLLC, affecting Kluea Lake, Todagin Lake, and the surrounding environment. This scenario could also affect users of the houses located on the north shore of Todagin Lake, which is located immediately downstream of Kluea Lake.

13.5.3.2 Mitigation Measures

Table 13-10 discusses the mitigation measures to prevent and reduce the risk of surface instability.

Table 13-10: Mitigation Measures for Surface Instability

Cause		Mitigation
3.1	Surface Subsidence Exceeds Predictions	• Subsidence modelling completed as part of mine design. • Appropriate setbacks will be applied to subsidence zone when siting surface infrastructure. • Subsidence criteria will be incorporated into the Mine design and sequence process. • Robust instrumentation program will be developed for ongoing monitoring of surface subsidence with clear TARPs. • Personnel to be hired for geotechnical work will be Qualified Persons with support in audit and governance.
3.2	Caving Induced Landslide	• Subsidence modelling completed as part of Mine design. • Latest subsidence modelling indicates KLLC is outside the cave influence. • Mine seismicity modelling will be completed to test effect on infrastructure and local features. • Routine monitoring of KLLC will be completed. • Holistic structural geology interpretation will be completed. • Seismic sensors will be located based on final Mine design. • Personnel to be hired for geotechnical work will be Qualified Persons with support in audit and governance.

13.5.3.3 Risk Assessment

When preventive mitigation measures are considered, the likelihoods of occurrence of the scenarios associated with surface instability are classified as follows:

- Surface subsidence exceeding predictions: Unlikely (Level 3)
- Caving induced landslide: Unlikely (Level 3).

Given the likelihood defined above and the consequences as presented in Table 13-4, the residual risks associated with credible worst-case scenarios are classified as follows:

- Environmental: The environmental consequence for the surface subsidence exceeding the predictions could affect Camp Creek, which would affect aquatic habitat. Terrestrial environmental features such as vegetation would also be affected if the surface subsidence extends beyond the limits of the Open Pit. This scenario has been assigned a Level 2 because it is fully contained within the Mine site (localized impact). For a caving induced landslide, the worst-case scenario involves the activation of the KLLC, which could potentially affect Kluea Lake itself and the surrounding environment. This scenario has been assigned a Level 3, as it involves environmental damage outside the Mine site, which would require long-term remediation efforts.
- Social: The social consequence of surface subsidence exceeding predictions is classified as Level 1 as it does not compromise the health and safety of workers. However, a caving-induced landslide affecting Kluea Lake has the potential to harm people because the lake and its surrounding area are used seasonally, hence the Level 4 classification.
- Economic: The economic consequence of the surface subsidence exceeding predictions could be between $1 to $10 million, considering the potential need to rehabilitate additional aquatic and terrestrial habitat during the closure phase (Level 3). Under the event of a landslide affecting Kluea Lake; measures to rehabilitate the affected environment could be higher than $10 million (Level 4).
- Health: The consequences on health have been assigned a Level 1 for the scenario of surface subsidence exceeding predictions, and a Level 5 for a caving-induced landslide affecting Kluea Lake.
- Cultural: The cultural consequence has been assigned a Level 2 for the scenario of surface subsidence exceeding predictions due to the potential for it to affect archaeological sites on surface. The consequence of a caving-induced landslide affecting Kluea Lake and its surrounding environment has been assigned a Level 4 because of the potential to affect archaeological and historic sites of high value to the Tahltan Nation.

The residual risk levels associated with the underground instability are ranked as presented in Figure 13-5.

Figure 13-5: Surface Instability Risks Ranking

Surface Instability		Consequence					
		6	5	4	3	2	1
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible						
3	Unlikely			[3.2S][3.2H][3.2EN][3.2EC][3.2C]	[3.1EC]	[3.1EN] [3.1C]	[3.1S] [3.1H]
2	Rare						
1	Extremely Rare						

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.5.4 Power Failure

Storms or forest fires affecting the powerline supplying the Mine with electricity could result in extended power failures at Red Chris, including for the Project. Under these scenarios, the operation of ventilation and dewatering systems required for the operation of the block cave could be compromised and evacuation of the workforce from underground workings would be required. A power failure affects underground ventilation and dewatering, which potentially affects underground workers. The scope of the assessment is limited to the Project.

13.5.4.1 Credible Worst-Case Scenarios

Table 13-11 describes credible worst-case scenarios associated with extended power failures.

Table 13-11: Credible Worst-Case Scenarios for Power Failure

Cause		Characterization of Worst-Case Scenario
4.1	Powerline Failure due to Storms	Power failure due to damage (i.e., cable rupture or collapse of towers) caused by storm(s) forces the evacuation of the workforce from underground working.
4.2	Powerline Failure due to Forest Fires	Power failure due to damage (i.e., destruction of a portion of the powerline) caused by forest fire(s) forces the evacuation of the workforce from underground working.

13.5.4.2 Mitigation Measures

Table 13-12 describes the proposed mitigation measures for extended power failures.

Table 13-12: Mitigation Measures for Power Failure

Cause		Mitigation
4.1	Powerline Failure due to Storms	• Winter stock levels and resupply plan, including a minimum of enough water for five days, will be sufficient to respond to larger-scale, site-wide emergencies. • Deep water well pumps, potable water, and wastewater lines to site camps are winter proof. • Suitably equipped and trained contractors will be used to maintain the site access road and access to camp areas during winter. • Annual assessment of onsite 25 kilovolts (kV) overhead power lines and critical transformers will be conducted, including infrared imaging of cables and connectors, imaging and access to supporting structures and guidewires, and assessing risks from vegetation growth. • Annual assessment of incoming 287 kV powerlines will be conducted, including infrared imaging of cables and connectors, supporting structures and guidewires, and assessing risks from vegetation growth. • Backup generators will provide sufficient power to sustain life and health at camp and control power for other ancillary buildings in the field to support minimal staffing levels for critical functions. • The “Mine Emergency Response Plan” will be updated and practiced annually, including assessment of capacity of Mine rescue and supporting staff. • Workers will adhere to the procedures outlined in the site’s “Working in Extreme Temperatures” guidance. • Weather Monitoring and Notification will be conducted.
4.2	Powerline Failure due to Forest Fires	• Fire suppression system (structure protection) will have increased capacity. • Back-up power generation (diesel generators) will be in place, and assessment of diesel inventory kept at site will be done regularly. • The “Mine Emergency Response Plan” will be updated and practiced annually, including assessment of capacity of Mine rescue and supporting staff. • The Mine Rescue Team will continue to be trained and equipped for forest fires. • Additional firebreaks will be installed around the entire Mine site (including critical infrastructure, offices, and accommodation units). • Selective elimination of fuel sources (e.g., log decks, etc.) has been conducted.

13.5.4.3 Risk Assessment

When preventive mitigation measures are considered, the likelihood of occurrence of the scenarios associated with extended power failure are classified as follows:

- Powerline failure due to storms: Possible (Level 4)
- Powerline failure due to forest fires: Possible (Level 4).

Given the likelihood defined above and the consequences as presented in Table 13-4, the residual risks associated with credible worst-case scenarios are classified as follows:

- Environmental: The environmental consequence of extended power failures under both scenarios is classified as Level 1 because of the minor environmental impacts associated with air emissions generated by back-up generators.
- Social: As it is not expected that loss of life would be a consequence of an extended power failure at the Mine, the social consequences are classified as Level 1.
- Economic: The most relevant consequence of an extended power failure would be the disruption of Mine operation. The consequence has been classified as Level 3, anticipating possible losses between $1 to $10 million.
- Health: The health consequences are classified as Level 1 because it is not expected that the health and safety of the workforce would be compromised as a result of an extended power failure. Evacuation procedures will be in place for the workforce to return to surface in these situations.
- Cultural: The cultural consequence is classified as Level 1 because it is not expected that cultural resources would be lost because of an extended power failure.

The residual risk levels associated with an extended power failure are ranked as presented in Figure 13-6.

Figure 13-6: Power Failure Risks Ranking

Extended Power Failure		**Consequence**					
		6	**5**	**4**	**3**	**2**	**1**
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible				**[4.1EC] [4.2EC]**		**[4.1EN] [4.1S] [4.1H] [4.1C] [4.2EN] [4.2S] [4.2H] [4.2C]**
3	Unlikely						
2	Rare						
1	Extremely Rare						

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.5.5 Fires and Explosion

Fires and explosions could happen as a consequence of electrical fires generated by circuit overloads or the uncontrolled combustion of flammable materials. Electricity is the main source of energy for the Material Handling System (MHS) and an electrical power distribution network connects the underground workings with the sub-station located on surface. Diesel fuel will be stored in a fueling station located in the extraction level to provide fuel to the mobile equipment used in underground mining activities.

13.5.5.1 Credible Worst-Case Scenarios

Table 13-13 presents the worst-case scenarios for Fires and Explosions.

Table 13-13: Worst-Case Scenarios for Fires and Explosions

Cause		Characterization of Worst-Case Scenario
4.2	Electrical Fire / Circuit Overload	Electrical fire in the extraction level caused by overloaded circuits, generating toxic fumes that represent a risk to the workforce. Workforce is potentially trapped inside Mine work areas.
5.1	Uncontrolled Combustion of Flammable Materials	Uncontrolled combustion of diesel in underground fuel station. Fire generates toxic fumes that represent a risk to the workforce. Workforce is potentially trapped inside Mine work areas.

13.5.5.2 Mitigation Measures

Table 13-14 presents mitigation measures for fires and explosions.

Table 13-14: Mitigation Measures for Fires and Explosions

Cause		Mitigation
5.1	Electrical Fire due to Circuit Overload	• Electrical installation design and testing; • Installation will be completed by qualified workforce; • Robust testing and commissioning program will be executed; • Preventative maintenance program will be executed; • Structural fire-fighting equipment and capability will be in place (water truck, sprinkler systems); • Underground fire detections and alarm system will be installed; and Underground fire water system will be installed.
5.2	Uncontrolled Combustion of Flammable Materials	• Structural fire-fighting equipment and capability; • Preventative maintenance program and inspections; • Detailed risk assessments will be conducted for battery charging station, refuelling depot, magazine, MHS, workshop, and flammable materials storage; • Underground fire detection and alarm system will be installed; and Underground fire water system will be installed.

13.5.5.3 Risk Assessment

When preventive mitigation measures are considered, the likelihoods of occurrence of the scenarios associated with extended power failure are classified as follows:

- Electrical fire/Circuit Overload: Rare (Level 2)
- Uncontrolled combustion of flammable materials: Unlikely (Level 3).

Given the likelihood defined above and the consequences as presented in Table 13-4, the residual risks associated with credible worst-case scenarios are classified as follows:

- Environmental: The environmental consequence of fires potentially occurring underground has been classified at Level 2 due to the potential for generation of atmospheric emissions during a short period of time.
- Social: The social consequences are classified as Level 5, due to the possibility of a loss of life as a result of fires happening in the underground workings.
- Economic: The most relevant consequence of an underground fire would be damage to equipment and infrastructure and the disruption of operations. The consequence has been classified as Level 4, anticipating potential losses higher than $10 million.
- Health: The health consequences are classified as Level 5; due to the potential for loss of life as a consequence of underground fires happening in the underground workings.
- Cultural: As it is not expected that cultural resources would be lost because of an underground fire, this is classified as Level 1.

The residual risk levels associated with fires and explosions are ranked as presented in Figure 13-7.

Figure 13-7: Fire and Explosions Risks Ranking

Fires and Explosions		Consequence					
		6	5	4	3	2	1
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible						
3	Unlikely		[5.2S] [5.2H]	[5.2EC]		[5.2EN]	[5.2C]
2	Rare		[5.1S] [5.1H]	[5.1EC]		[5.1EN]	[5.1C]
1	Extremely Rare						

Legend:

- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.6 Summary

The assessment of Accidents and Malfunctions identified 10 credible worst-case scenarios linked to proposed Project activities. The 10 worst-case scenarios represent different levels of risk to the Environmental, Social, Economic, Health, and Cultural VCs. Residual risk levels were assigned, considering mitigation measures embedded in the design of the Project and operational controls to be implemented during project execution. The assessment of the highest ranked residual risks is presented in Figure 13-8 and can be summarized as follows:

- Uncontrolled ingress of water and solids into underground workings resulted in the mud rush (Scenario 1.1) and flooding (Scenario 1.2) with a highest risk level of Material (On-Going Control) on the Social and Health VCs due to an Extreme consequence associated with potential multiple fatalities.
- Underground instability resulted in the air blast induced by collapse within the cave (Scenario 2.1) with a highest risk level of Material (on-Going Control) on the Social and Health VCs due to an extreme consequence associated with multiple fatalities. The highest risk level for the fall of ground in working area (Scenario 2.2) is High on the Social and Health VCs due to a Major consequence associated with a potential single fatality or permanent disabling injury.
- Surface instability resulted in the surface subsidence exceeding predictions (Scenario 3.1) with a highest risk level of Medium on the Economic VCs due to a Moderate consequence associated with potential damage to equipment and infrastructure. The caving induced landslide (Scenario 3.2) resulted in a highest risk level of High on all VCs due to Major consequences associated with a potential single fatality or permanent disabling injury, environmental degradation and potential damages to infrastructure.
- Extended power failure resulted in both scenarios powerline failures due to storms (Scenario 4.1) or due to forest fires (Scenario 4.2) with a highest risk level of High on the Economic VC due to a Moderate consequence associated with production disruption.
- Fires and explosions resulted in both scenarios of fires due to overloaded circuits (Scenario 5.1) or due to uncontrolled combustion of flammable materials (Scenario 5.2) with a highest risk level of Extreme (On-Going Control) due to an Extreme consequence associated with potential multiple fatalities.

Figure 13-8: Summary of Risks Ranking

Environmental (EN) Social (S) Economic (EC) Health (H) Culture (C)		Consequence					
		6	5	4	3	2	1
Likelihood		Catastrophic	Extreme	Major	Moderate	Minor	Negligible
6	Almost Certain						
5	Likely						
4	Possible				[4.1] Power failure due to storm [4.2] Power failure due to forest fire		
3	Unlikely		[1.1] Mud rush [2.1] Air blast in cave [5.2] Fires due to flammable	[2.2] Fall of ground [3.2] Caving induced landslide	[3.1] Subsidence exceeding predictions		
2	Rare		[1.2] Flooding [5.1] Fires due to overloaded circuits				
1	Extremely Rare						

Legend:
- Material Risk (Action Required)
- Material Risk (Ongoing Control)
- Extreme Risk
- High Risk
- Medium Risk
- Low Risk

13.7 Conclusions

Existing controls at Red Chris are considered sufficient to address the failure modes associated with Project activities anticipated to be conducted on surface. New controls in alignment with the HSRC and Newmont global standards are anticipated to be required to avoid or mitigate the risks associated with Project activities anticipated to be performed underground.

For the purposes of assessing the risks of Accidents and Malfunctions related to Project activities to be conducted underground, failure modes associated with the ingress of water and solids, underground and surface instability, extended power failures, fires, and explosions were analyzed, and resulted in the formulation of worst-case scenarios for 10 events.

Residual risks for the Environmental, Social, Economic, Health, and Cultural VCs were assessed and considered mitigation included in the design of the Project and controls to be implemented during Project execution.

Using the information that is currently available, the Project carries some residual risks that were considered material, which are associated with potential loss of life caused by ingress of solids and water, underground instability or underground fires. Advancement in the design of the Project will consider risk management programs, including the safety and sustainability in design and risk management. New risk management measures will be integrated into the existing controls and response systems at the Mine.

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