Information Request 48

Responses to Information Request 48

IR 48 – Accidents and Malfunctions

References:

EIS Guidelines, Section 2.7.6
EIS, Section 2.7.6
2009 EIS, Section 6.2.7

Related Comments:

CEAR # 290 (Tsilhqot'in National Government)
CEAR # 257 (Denny Wagg)
CEAR # 295 (MiningWatch Canada)
CEAR # 276 (BC Environmental Assessment Office)

Rationale:

In the EIS (Section 2.7.6, p. 1325), the Proponent indicates that "the EIS describes potential accidents and malfunctions that might occur during the life of the Project. The primary objectives of this section are to determine the potential range of environmental effects that might occur in the unlikely event of an accident or malfunction."

In Section 2.7.6 (p. 60), the EIS Guidelines require the Proponent to "identify the probability of potential accidents and malfunctions related to the Project, including an explanation of how those events were identified, potential consequences (including the potential environmental effects), the worst case scenarios and impacts". The EIS has examined several lower risk scenarios, but fails to examine some notable worst case scenarios. The EIS Guidelines (p.60) also state that the accidents and malfunctions assessment EIS shall include an "evaluation of worst case scenarios (e.g. tailings impoundment structural failure, accidental explosion, earthquake, or landslide into the tailings impoundment)".

In the 2009 EIS (Section 6.2.7, p. 6-15), Taseko identified several failures that had a higher likelihood of occurrence relative to the previous option for the Prosperity Project. These failures are: seepage through foundations; embankment instability; insufficient PAG waste rock submergence; excessive sedimentation in the TSF during construction and operation; release of ARD from PAG outside the TSF; instability; excessive sedimentation in waste rock storage areas (construction and operation); water pipeline rupture; water pump station failure; tailings pipeline rupture; tailings distribution failure; and excessive make-up water requirements.

Several participants stated concerns with dam failure. The BC Environmental Assessment Office (p.6) mentions that while the "failure of the tailings embankment dams is considered remote based on good engineering design, construction practices and monitoring, the consequence of a failure would be *Very High.* Worst case scenarios need to be identified for accidents and malfunctions in the EIS. Thus embankment failure needs to be fully considered and discussed..." The Tsilhqot'in National Government (p.64) state that "embankment failure should be described in a 'worst case' scenario in sufficient detail that downstream impacts and risks are properly understood." In addition, Denny Wagg (p.2) states that he is "very concerned about the impact on Fish Lake and downstream salmon habitat in the event of a tailings dam failure… if that embankment gave way in the event of an earthquake etc. it would result in a catastrophic pollution event that would have a significant adverse environmental impact on fish and fish habitat in Fish Lake".

MiningWatch Canada (p.10) comments that the "likely scenarios should include more than a general statement of probability but an analysis of the frequency of these types of events and or the conditions that contribute to these events".

Information Requested:

With regards to failures identified above (seepage through foundations; embankment instability; insufficient PAG waste rock submergence; excessive sedimentation in the TSF during construction and operation; release of ARD from PAG outside the TSF; instability; excessive sedimentation in waste rock storage areas (construction and operation); water pipeline rupture; water pump station failure; tailings pipeline rupture; tailings distribution failure; and excessive make-up water requirements, tailings embankment failure, abrupt escape of water into the open pit from Fish Lake, and failure of the water control dams), the Panel requests that Taseko:

a. Provide a risk assessment in light of changes made to the project design in the New Prosperity Project

b. Conduct an assessment of these failures as potential accidents or malfunctions. In the response, include:
   i. an identification of the probability of these failures;
   ii. a description of the sensitivity of receptors in the project area to these failures;
   iii. an explanation of the magnitude of these failures, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials likely to be released into the environment during the malfunction and/or accidental event;
   iv. an identification of the capabilities, resources and equipment available to safely respond to these failures;
   v. a description of the planned response to these failures;
   vi. a description of the environmental effects, contingency plans, clean-up or restoration work that would be required should these failures occur; and
   vii. an identification of the notification and rescue communication plan and process to be used if it were required.

Information Request #48a

With regards to failures identified above (seepage through foundations; embankment instability; insufficient PAG waste rock submergence; excessive sedimentation in the TSF during construction and operation; release of ARD from PAG outside the TSF; instability; excessive sedimentation in waste rock storage areas (construction and operation); water pipeline rupture; water pump station failure; tailings pipeline rupture; tailings distribution failure; and excessive make-up water requirements, tailings embankment failure, abrupt escape of water into the open pit from Fish Lake, and failure of the water control dams), the Panel requests that Taseko:

Provide a risk assessment in light of changes made to the project design in the New Prosperity Project

Response Summary

The Panel requested that Taseko provide a risk assessment of a series of specific potential failure modes.

The risk assessment considers changes made to the project design in the New Prosperity Project and demonstrates that none of the potential failure modes present risks that are high or critical. They all fall in the very low to moderate categories.

Discussion

<u>Risk Assessment Methodology</u>

The environmental risks of the identified potential failure modes were rated according to their significance, firstly evaluating likelihood and consequence as follows:

Likelihood: Likelihood that the proposed safeguard, management or design measure will fail or be ineffective

Consequence: The potential severity or consequences of an impact are reflective of consequences assuming safeguards, designs, or management measures are applied.

In each case the likelihood of occurrence was defined and assigned a numerical value from 1 to 5 and a corresponding rank from rare to almost certain as follows:

1	Rare	Extremely unlikely to occur during period
2	Unlikely	Unlikely to occur during period
3	Possible	May Occur once during period
4	Likely	May occur two to five times during period

5	Almost Certain	Likely to occur repeatedly during period

Consequence definitions considered geographic extent, sensitivity of receptors and reversibility of any impact. Consequence was defined and assigned an alphanumeric score from A to E and a corresponding rank from no affect to major as follows:

A	No Effect	No release of potential contaminants or minor effect on low to moderate value habitat
B	Minor	Impact that is small in geographic extent (<20 ha), or affecting no moderate-high quality or critical habitat, any damage reversible within 5 years
C	Moderate	Impact that is moderate in geographical extent (20-100ha), or affecting moderate-high quality or critical habitat, with damage reversible within 25 years.
D	Serious	Impact that is large in geographical extent (100-500ha), affecting moderate-high quality or critical habitat, with damage reversible within 25 years.
E	Major	Impact that is extensive in geographical extent (>500ha), affecting moderate-high quality or critical habitat, with damage irreversible within 25 years.

Five classes of environmental risk were identified based on a risk matrix of likelihood of occurrence and consequence as shown in Table 48A-1.

Table 48A-1. Risk Matrix

		Likelihood of Occurrence				
		Rare **1**	Unlikely **2**	Possible **3**	Likely **4**	Almost Certain **5**
Consequence	Major **(E)**	1-E	2-E	3-E	4-E	5-E
	Serious **(D)**	1-D	2-D	3-D	4-D	5-D
	Moderate **(C)**	1-C	2-C	3-C	4-C	5-C
	Minor **(B)**	1-B	2-B	3-B	4-B	5-B
	No Effect **(A)**	1-A	2-A	3-A	4-A	5-A

The five classes of environmental risk are defined as:

Critical; Risks that significantly exceed the risk acceptance threshold and need urgent and effective attention in order to reduce risks to acceptable levels.

High; Risks that are at the risk acceptance threshold and require extensive operational controls, proactive monitoring, and ready adaptive management measures. Emergency response measures should be identified, communicated, and practiced. Additional design mitigation and/or operational controls should be investigated.

Moderate; Risks that are below the risk acceptance threshold but require operational controls and active monitoring. Adaptive management measures should be identified. Emergency response measures should be identified and communicated.

Low; risks are unlikely and of low consequence, and require limited active monitoring and/or operational controls. Emergency response measures generally not required.

Very Low; risks are very unlikely and of low consequence, and do not require active management. However some potential for certain risks to occur remains and could require specific monitoring.

Risk Assessment Results

The application of the above methodology results in the likelihood and consequence ratings as shown in Table 48A-2.

The resultant environmental risk and class are shown in Table 48A-3.

Table 48A-2. Likelihood and Consequence Ratings

Project Component	Failure Mode	Likelihood of Occurrence			
			Wildlife	Fish	Vegetation
1. Tailings Storage Facility					
	1.1 Excessive seepage through foundations	3	A	C	C
	1.2 TSF Embankment instability	1	A	A	A
	1.3 Insufficient PAG waste rock submergence	1	A	A	A
	1.4 Excessive sedimentation in TSF	2	B	C	C
	1.5 Release of ARD from PAG outside TSF	1	D	D	D
	1.6 Tailings Embankment Failure	1	E	E	E
2. Waste Rock Storage Areas (WRSA)					
	2.1 Instability	3	C	A	C
	2.2 Excessive sedimentation	2	B	A	B
3. Water and Tailings Management / Distribution					
	3.1 Reclaim water pipeline rupture	5	B	B	B
	3.2 Seepage water pump or pipeline failure	4	A	A	A
	3.3 Tailings pipeline rupture	4	B	B	B
	3.4 Tailings distribution failure - poor pond location	2	A	A	A
	3.5 Excessive make-up water requirements	2	A	A	A
4. Open Pit					
	4.1 Abrupt escape of water from lake to pit	1	E	E	E
	4.2 Failure of water control dams	1	B	B	B

Table 48A-3. Risk Classification

Project Component and Failure Mode	Wildlife	Fish	Vegetation
1. Tailings Storage Facility			
1.1 Excessive seepage through foundations	3 - A	3 - C	3 - C
1.2 Embankment instability	1 - A	1 - A	1 - A
1.3 Insufficient PAG waste rock submergence	1 - A	1 - A	1 - A
1.4 Excessive sedimentation	2 - B	2 - C	2 - C
1.5 Release of ARD from PAG - outside TSF	1 - D	1 - D	1 - D
1.6 Tailings Embankment Failure	1 - E	1 - E	1 - E
2. Waste Rock Storage Areas (WRSA)			
2.1 Instability	3 - C	3 - A	3 - C
2.2 Excessive sedimentation	2 - B	2 - A	2 - B
3. Water and Tailings Management / Distribution			
3.1 Water pipeline rupture	5 - B	5 - B	5 - B
3.2 Seepage water pump or pipeline failure	4 - A	4 - A	4 - A
3.3 Tailings pipeline rupture	4 - B	4 - B	4 - B
3.4 Tailings distribution failure - poor pond location	2 - A	2 - A	2 - A
3.5 Excessive make-up water requirements	2 - A	2 - A	2 - A
4. Open Pit			
4.1 Abrupt escape of water from lake to pit	1 - E	1 - E	1 - E
4.2 Failure of water control dams	1 - B	1 - B	1 - B

Further detail with respect to the probability, magnitude, and failure mechanism of these failures, as well as the sensitivity of receptors and potential environmental effects are provided in the response to IR48b.

Information Request #48b

With regards to failures identified (seepage through foundations; embankment instability; insufficient PAG waste rock submergence; excessive sedimentation in the TSF during construction and operation; release of ARD from PAG outside the TSF; instability; excessive sedimentation in waste rock storage areas (construction and operation); water pipeline rupture; water pump station failure; tailings pipeline rupture; tailings distribution failure; and excessive make-up water requirements, tailings embankment failure, abrupt escape of water into the open pit from Fish Lake, and failure of the water control dams), the Panel requests that Taseko:

Conduct an assessment of these failures as potential accidents or malfunctions. In the response, include:

i. an identification of the probability of these failures;

ii. a description of the sensitivity of receptors in the project area to these failures;

iii. an explanation of the magnitude of these failures, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials likely to be released into the environment during the malfunction and/or accidental event;

iv. an identification of the capabilities, resources and equipment available to safely respond to these failures;

v. a description of the planned response to these failures;

vi. a description of the environmental effects, contingency plans, clean-up or restoration work that would be required should these failures occur; and

vii. an identification of the notification and rescue communication plan and process to be used if it were required.

Discussion

The following mode by mode analysis of potential accidents or malfunctions that might occur during the life of the Project supplements the information provided in the EIS. It is also correlated to the overall risk analysis provided in IR48a.

Seepage Through TSF Embankment Foundation

Description of the Possible Event

Failure modes that could result in excessive seepage through the embankment foundation are:

- inadequate characterization of the overburden and bedrock characteristics at the design phase;
- inadequate QA/QC during construction; and
- failure of the internal drainage systems during operations or closure

i. **Probability –** may occur once during the life of the mine

ii. **Sensitivity of Receptors –** Wildlife; no effect. Fish and vegetation; moderate effect without proper mitigation. No effect on fish and wildlife anticipated with monitoring and mitigation or repair of seepage source.

iii. **Magnitude –** The magnitude of the event would be relatively short term volumes of seepage that would be above design parameters. It is very unlikely that the seepage volume would be high over a short period but more likely a low volume that is detected by monitoring for elevated metals or other elements characteristic of tailings pond chemistry. Mitigation and repair would reduce magnitude.

iv. **Response Capability –** All seepage is directed to seepage ponds so that even above design seepage rates it would be captured prior to release to the receiving environment in most instances. In the event that excess seepage is bypassing the collection system additional capture wells could be installed and commissioned within days or weeks of discovery of the problem. In extreme cases water could be diverted above the source of the excess seepage or blocked at the escape point. The Provincial Ministry of Mines will maintain a reclamation and closure bond that will allow seepage to be monitored and appropriate action taken in the event of any need during a temporary or premature closure.

v. **Planned Response** – Site environmental or operational personnel would inform senior management of any situation of excess seepage. Response action would be taken which would be appropriate to the situation. Possible responses would be: increased monitoring to determine seriousness/duration, placement of additional seepage collection wells, diversion of pond water away from seepage point with spigoted tailings, grout curtain, etc.

vi. **Environmental Effects –** There will be little or no environmental effect with proper monitoring and mitigation repair responses.

vii. **Notification –** Seepage from the TSF will be one of the highest levels of awareness and monitoring in the Environmental Management System (EMS). Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

TSF Embankment Instability

Description of the Possible Event

Failure modes that could result in TSF Embankment Instability are:

- inadequate QA/QC during construction;
- failure of the internal drainage systems during operations or closure; and
- overtopping of the embankment by water.

i. **Probability –** Dam instability is unlikely to occur. Dam failure is extremely unlikely to occur. The process of conducting site investigations, design, review, construction, operations, closure and monitoring of a TSF in Canada, and particularly in British Columbia, is well established and has been for many decades. Qualified third-party engineering firms are required to conduct site investigations and develop designs to meet or exceed the guidelines set out by the Canadian Dam Association (CDA) and the International Commission on Large Dams (ICOLD). The authorization to construct and operate a TSF in BC is provided by the Ministry of Energy and Mines (MEM), which conduct their own review of the site investigations and design of a TSF. Furthermore, the MEM require regular third-party reviews of the design and operation of TSFs; yet another layer of regulatory oversight to review the safety of a TSF. With the design of a TSF by a qualified third-party engineer and strong regulatory oversight, the likelihood of a structural failure of a TSF embankment under these conditions is extremely remote.

ii. **Sensitivity of Receptors –** Instability of the embankment would have no effect on wildlife, fish, or vegetation. A dam failure event would affect all downstream receptors between the TSF and the open pit with inundation with tailings depending on the severity of the failure.

iii. **Magnitude –** Embankment instability would have no magnitude as the cause of the instability would be evidenced early and appropriate action would be immediately taken to restabilize the section of the embankment affected. A partial dam failure would be of significant magnitude in that tailings and dam material would likely be washed down into the area below the dam. A total dam failure of this design would inundate the area between the dam and the open pit but would not escape the open pit.

iv. **Response Capability –** Construction and operation of this type of TSF embankment requires rigorous process controls and monitoring at all times and the mine would provide all resources necessary to successfully carry out their roles. Monitoring of construction material quality and placement and compaction of those materials would be overseen by expert personnel. In the operation phase the dam would be thoroughly inspected and monitored on a regular basis both for signs of unexpected movement or increases in phreatic surfaces which would be pre-indicators of instability of a portion or all of the embankment. Required freeboard levels to ensure the embankment would not be topped even in extreme weather events would be developed during permitting and would be maintained during operations. At closure the embankment will be inspected and operated in much the same level of attention as during operations until the water is deemed suitable to be discharged with no effect on the environment. At that time a spillway of sufficient size would be established to allow the pond to self-discharge while maintaining desired water surface elevation. The Provincial Ministry of Mines will hold a reclamation and closure bond that will provide the ability to maintain the integrity of the TSF embankment in the event of a temporary or premature closure.

v. **Planned Response** – Site environmental or operational personnel would inform senior management and regulators as required. Response action would be taken which would be appropriate to the situation. If signs of instability were to be observed monitoring frequency would increase and appropriate actions such as reducing water pressure through dewatering wells, reducing water level in the pond either by reducing input or by pumping over the dam, or mechanical placement of stabilizing material would immediately be implemented.

vi. **Environmental Effects** – There will be no environmental effect with proper monitoring and mitigation repair responses.

vii. **Notification –** Stability of the TSF embankment will be one of the highest levels of awareness and monitoring in the Environmental Management System (EMS). Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Insufficient PAG Rock Submergence

Description of the Possible Event

Failure modes that could result in insufficient PAG rock submergence are:

- Insufficient water surface level for a period of decades; and
- Excess height of rock pile for a period of decades.

i. **Probability** – Extremely unlikely to occur for a duration that would allow the onset of oxidation

ii. **Sensitivity of Receptors –** There would be no effect on receptors as low water levels that would cause this possible event would also mean that there would be no discharge. Any seepage of low pH water would be collected in the seepage collection system.

iii. **Magnitude –** The magnitude of the event would be limited to the interior of the TSF so there would be no effect.

iv. **Response Capability –** Any response to this possible event would entail moving either rock or water and the mine operation has those capabilities. The Provincial Ministry of Mines would maintain a reclamation and closure bond that would allow them to handle any potential response required in the event of a temporary or premature closure.

v. **Planned Response –** The response to this would be to either raise the water level through increased inflow to the TSF or lower the height of the rock pile mechanically.

vi. **Environmental Effects –** There will be no environmental effect

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Excessive Sedimentation in TSF During Construction and Operations

Description of the Possible Event

Failure modes that could result in excessive sedimentation in the TSF during construction and operations are:

- Insufficient sediment control structures upstream of the TSF; and
- Failure of sediment control structures upstream of the TSF.

i. **Probability –** Unlikely to occur

ii. **Sensitivity of Receptors –** There would be no effect on receptors as any effect would be within the TSF.

iii. **Magnitude –** The magnitude of the event would be limited to the interior of the TSF so there would be no effect.

iv. **Response Capability –** Any response to this possible event would entail mechanical intervention and the mine operation has those capabilities. The Provincial Ministry of Mines would maintain a reclamation and closure bond that would allow them to handle any potential response required in the event of a temporary or premature closure.

v. **Planned Response –** The response to this event would be to improve or repair the upstream sedimentation structures. It is possible but unlikely that sedimentation that enters the TSF would need to be removed to a location where it would not interfere with construction or operations.

vi. **Environmental Effects –** There will be no environmental effect

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Release of ARD from PAG Outside the TSF

Description of the Possible Event

Failure modes that could result in release of ARD from PAG outside the TSF are:

- Incorrect classification of PAG rock as non-PAG; and
- Very long term storage of ore stockpiles.

i. **Probability –** Extremely unlikely to occur

ii. **Sensitivity of Receptors** – There would be serious effect on wildlife, fish, and vegetation in the area where the release occurs if the event is unmitigated as ARD changes water and soil conditions.

iii. **Magnitude –** The magnitude of the event would be limited to the duration of the event, the amount and intensity of the ARD released, and to the area where the release occurs.

iv. **Response Capability –** PAG rock classification errors would be identified before a significant amount of material was placed in non-PAG storage. If the amount involved were deemed significant enough to cause an effect on the environment that material would be removed to that PAG storage area. Very long term storage of ore stockpiles would be extremely unlikely as this material would be processed as a low cost revenue generator in low commodity price periods. The Provincial Ministry of Mines would maintain a reclamation and closure bond that would allow them to handle any potential response required in the event of a temporary or premature closure.

v. **Planned Response –** The response to miss-classification of a block of PAG rock as non-PAG rock would be to determine whether the amount of material is likely to generate ARD which would affect the environment. If the amount were deemed significant it would be removed to the PAG storage area. In the event of low commodity prices which would cause a closure of sufficient duration that oxidation would occur in ore stockpiles, this material would be processed to generate revenue

vi. **Environmental Effects –** There will be no environmental effect given the above mitigation measures

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Instability, excessive sedimentation in waste storage areas during operation and construction

Description of the Possible Event

Failure modes that could result in excessive sedimentation which would cause instability in waste storage areas during construction and operations are:

- Poor foundation materials and preparation;
- Oversteepening of rock piles;
- Insufficient sediment control structures upstream of the waste storage area; and
- Failure of sediment control structures upstream of the area.

i. **Probability –** It is possible that waste rock or ore stockpiles may experience instability during the mine life. The non-PAG stockpile and the ore stockpile will be constructed to meet stability criteria set forth by the BC Ministry of Mines. As part of the design, the material properties of the foundation materials are characterized, and weak materials are removed prior to placement of the rock in the stockpiles. Run-of-mine rock stockpiles are inherently stable, especially when the foundation conditions are understood and prepared appropriately. The final design of the stockpiles will have slopes less than the angle-of-repose, expected to be 2:1. Excessive sedimentation events would be short term and readily mitigated so would not result in instability of the rock piles.

ii. **Sensitivity of Receptors –** There would be no effect on receptors from instability of waste storage or ore storage areas.

iii. **Magnitude –** The magnitude of the event would be limited to clearing personnel and equipment from the area directly below the waste storage area until the instability issue is resolved.

iv. **Response Capability –** Any response to this possible event would entail mechanical intervention and the mine operation has those capabilities. The Provincial Ministry of Mines would maintain a reclamation and closure bond that would allow them to handle any potential response required in the event of a temporary or premature closure.

v. **Planned Response –** The response to this event would be to: stop placing rock on areas of instability, dig out and remove if practical any material that is causing instability, reduce the slope of the instable area by dozing, buttress the area by placing competent material at the toe of the unstable area, or any combination of the above.

Excess sedimentation events would require removal of deposited sediment and improvement or repair of upstream sedimentation control structures.

vi. **Environmental Effects –** There will be no environmental effect

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Reclaim Water or Tailings Pipeline Rupture

Description of the Possible Event

Failure modes that could result in a reclaim water or tailings pipeline rupture are:

- Improper construction and installation;
- Poor pipe or flange quality;
- Contact with a heavy piece of equipment; and
- Material fatigue after years of use;

i. **Probability –** It is likely that the water reclaim or tailings pipelines will rupture or leak during the life of the mine. Likelihood of an event would be reduced by; QA/QC during procurement and construction, locating the pipeline where contact with heavy equipment would be unlikely to occur accidentally, monitoring for pressure to detect ruptures, and regular inspections to detect leaks.

ii. **Sensitivity of Receptors –** there would be no effect on receptors from a water reclaim or tailings pipeline rupture as secondary containment sufficient to redirect or contain all water and tailings from a rupture would be in place and maintained. Pressure sensors and automatic shut-off systems as well as regular visual inspections would be in place to turn the reclaim pumps off in the event of a rupture or leak. The mill would have shutdown protocols in place in the event of a serious tailings pipeline failure.

iii. **Magnitude –** the magnitude of the event would be limited to a maximum of the water or tailings contained in the pipeline in the case of a rupture as pressure sensors would immediately register the event and shutdown of the source would occur. The magnitude of a leak would be limited to the time required to detect it. A major leak would be detected as quickly and in the same manner as a rupture while a minor leak would be detected through visual inspections.

iv. **Response Capability –** the response to a rupture would be the shutdown of the reclaim water line or the mill until it is repaired. A leak would be repaired as required for operational and regulatory oversight. This event would not occur in the situation of a temporary or premature closure.

v. **Planned Response –** the response to this event would be as above. Any water remaining in secondary containment structures would be pumped to the mill or back to the TSF after the pipeline is repaired. Tailings would be mechanically removed from secondary containment in order to maintain adequate containment volumes.

vi. **Environmental Effects –** There will be no environmental effect.

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

<u>Seepage Water Pump or Pipeline Failure</u>

Description of the Possible Event

Failure modes that could result in a seepage water pump or pipeline failure are:

- Improper construction and installation;
- Poor pipe or flange quality;
- Contact with a heavy piece of equipment; and
- Metal fatigue after years of use;

i. **Probability –** It is likely that seepage water pumps and pipelines will fail, rupture, or leak during the life of the mine. Likelihood of an event would be reduced by; QA/QC during procurement and construction, locating pipelines and pump houses where contact with heavy equipment would be difficult to occur by accident, regular maintenance of pumps, monitoring for pressure to detect failures or ruptures, and regular inspections to detect leaks.

ii. **Sensitivity of Receptors –** There would be minor effects on receptors from a seepage water pipeline rupture or leak as only a relatively small volume of water would escape to the receiving environment and the water quality would not be such that short term or small amounts would cause a detectable change to the chemistry of the area. There would be no effect of a seepage water pump failure as the situation would be quickly detected and remedied.

iii. **Magnitude –** The magnitude of a seepage water line failure event would be limited to a maximum of the water contained in the pipeline in the case of a rupture as pressure sensors would immediately register the event and shut down the associated pumps. The magnitude of a leak would be limited to the time required to detect it. A major leak would be detected as quickly and in the same manner as a rupture while a minor leak would be detected through visual inspections.

iv. **Response Capability –** The response to a rupture or leak would be the shutdown of the seepage water line and associated pump until it is repaired. Leaks would be repaired as required for operational and regulatory oversight. The Ministry of Mines would hold a reclamation and closure bond sufficient to maintain the seepage water pump back system in the situation of a temporary or premature closure.

v. **Planned Response –** the response to this event would be as above. No clean up would be required.

vi. **Environmental Effects –** There would be a potential for a minor environmental effect

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

Excessive Make-up Water Requirements

Description of the Possible Event

Failure modes that could result in excessive make-up water requirements are:

- Drought causing lack of surface water to replenish the system; and
- Increased mill requirements due to increased mill capacity.

i. **Probability –** It is extremely unlikely that there would be a significant long term drought condition during the life of the mine that would affect availability of make-up water for the mill. Mill capacity would not be increased unless sufficient make-up water were available.

ii. **Sensitivity of Receptors –** There would be little or no effects on receptors from a shortage of make-up water to operate the mill.

iii. **Magnitude –** The magnitude of a shortage of mill make-up water would affect mill operations, not the receiving environment.

iv. **Response Capability –** The response to a lack of mill make-up water would to either operate the mill accordingly, establish additional groundwater wells, or establish a pumping station on the Taseko River.

v. **Planned Response –** The response to this event would be as above. Additional groundwater wells or pumping from the Taseko River would be subject to permitting which would ensure little or no effects on receptors.

vi. **Environmental Effects –** There would be no environmental effect

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase.

<u>Abrupt Escape of Water from Lake to Pit</u>

Description of the Possible Event

Failure modes that could result in an abrupt escape of water from Fish Lake to the pit are:

- Controlled release of water to maintain the level of Fish Lake in a major storm event;
- Failure of water control dams at the north end of Fish Lake; and
- Wall failure in the pit that would propagate back to the location of the water control dams.

i. **Probability –** It is extremely unlikely that there would be a significant abrupt escape of water from Fish Lake into the pit.

ii. **Sensitivity of Receptors –** There would a significant effect on receptors, rainbow trout especially, from a significant abrupt escape of water from Fish Lake into the pit as the level, depth, and area of the Lake would likely be significantly reduced.

iii. **Magnitude –** The magnitude of any escape of water from the Lake to the pit is expected to be insignificant with the water control structures proposed.

iv. **Response Capability –** Water levels in Fish Lake, construction and operation of water control dams, and conditions of pit walls would be continuously monitored and managed in such a way that the likelihood of an uncontrolled abrupt escape of water is extremely remote. In the event that monitoring begins to indicate that there is a possibility of conditions which could cause this type of failure there would be sufficient time to develop and implement preventative measures.

v. **Planned Response –** The response to this event would be as above. Continuous monitoring and preventative measures such as controlled releases to maintain water levels, repair or replacement to address faulty dam performance, dewatering or other stabilization techniques for wall control such as, rock bolting, buttressing, or reduction of mass at the top of unstable areas would be employed as required. The Ministry of Mines would hold a reclamation and closure bond that would be sufficient to monitor and react preventatively to any condition that would indicate a possibility of an abrupt escape of water from Fish Lake to the pit.

vi. **Environmental Effects –** There would only be an environmental effect in the extremely remote chance that such an event is allowed to occur.

vii. **Notification –** Specific notification protocols within the EMS, both internally and to regulators, will be identified and developed during the permitting phase. These protocols will include notification of any indication of conditions which could lead to an abrupt escape of water from the lake to the pit.