EAGLE GOLD PROJECT

HEAP LEACH FACILITY CONTINGENCY WATER MANAGEMENT PLAN

Version 2020-01

JANUARY 2020

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1 INTRODUCTION

1.1 PROJECT SUMMARY

Victoria Gold (Yukon) Corp. (VGC), a directly held wholly owned subsidiary of Victoria Gold Corp., operates a gold mine in central Yukon. The Eagle Gold Project (the Project) is located 85 km from Mayo, Yukon using existing highway and access roads. The Project involves open pit mining and gold extraction using a three-stage crushing process, heap leaching, and a carbon adsorption, desorption and recovery system over the mine life.

1.2 SCOPE AND OBJECTIVES

This Heap Leach Facility Contingency Water Management Plan (HCWMP) describes the management of leach solution, both pregnant and barren, and precipitation within the Heap Leach Facility (HLF). The HCWMP is intended to inform relevant site personnel of the mitigation measures available to manage the solution inventory within the HLF to minimize the risk of an unplanned release of solution to the environment.

The HCWMP is intended to act as a framework for future revisions and should be considered a living document that evolves over the life of the facility to incorporate operational experience. To the extent possible, the HCWMP presents a complete management structure to mitigate potential environmental impacts associated with water and solution management. It is supported by complementary management plans and Standard Operating Procedures (SOPs) developed by the VGC Process Department and the Environmental Department.

1.3 PLAN REVIEW AND UPDATE REQUIREMENTS

The HCWMP is one of the Project's environmental, health, and safety (EHS) management plans. The HCWMP will be updated, as necessary, to reflect relevant optimizations to operational practices or regulatory requirements, and will be kept current with specific facility or process changes that may occur over the life of the mine. All revisions to the HCWMP and the supporting management plans and SOPs cited herein will be reviewed and approved by VGC management. Further, this plan will be updated as required based on operational experience to ensure it meets its primary objective.

2 PLAN REQUIREMENTS

VGC has developed this HCWMP to describe management strategies that address the potential build-up of excess water within the HLF throughout the life of the Project to ensure that the potential for release of water is minimized.

2.1 HLF WATER BALANCE MODEL OVERVIEW

HLF water balance models have been developed (and will be continually updated) for the Project, with the primary objectives of evaluating HLF performance in terms of predicting and tracking: 1) makeup water demands, 2) tracking water volumes in the HLF system, and 3) the potential for maintaining an adequate level of emergency pond storage volume.

Three different types of water balance models have been used to date: a weekly timestep deterministic model (using a chain of single valued input parameters to produce a series of single valued results), a weekly timestep stochastic model (probability based) and an operational model focused more on daily inputs and outputs. The models are discussed briefly herein; however, the outputs of these models have been integrated into facility design and operational considerations relied upon for the HCWMP and thus results are not provided. The model reports (The Mines Group 2018a and 2018b) provide detailed discussion on all model inputs and outputs.

2.1.1 Deterministic Model

For the deterministic model, a 68-year site synthetic meteoric record (Lorax 2017) is used for the modeling of the facility operational life, which includes active ore stacking, a period of gold extraction after the cessation of ore stacking, and an additional period that represents the initiation of draindown and closure.

A three (3) year dry period and a three (3) year wet period, taken from the 68-year synthetic record was included within the mine life. Inclusion of these wet and dry periods in the deterministic record assure that the potential impact of historically observed variations in precipitation are represented by the model and included in the expected operating range.

Air temperature was also included in the site synthetic meteoric record, as it is a major factor in the climate of the site influencing the fluctuations and phases of meteoric water. The water balance model controls the accumulation of snow water equivalent (SWE) in the snowpack as a function of precipitation and temperature using a monthly series of snowpack factors. Similarly, the evaporation data provided in the Lorax (2017) site synthetic record was included; for the coldest months with mean monthly temperatures below freezing, the potential evaporative loss was replaced with a sublimation loss assumed to be 20% of the monthly precipitation (Lorax 2017).

The deterministic model uses the synthetic precipitation record, number of days of precipitation, temperature, and the synthetic evaporation time history for the same time period to track system storage and makeup water demand on a monthly basis, compute a single value for all variables and provide results for each month in the record. System storage and makeup water demand is also analyzed.

2.1.2 Stochastic Model

For use in stochastic modeling, descriptive statistics were developed for the compiled monthly values from the 68-year synthetic meteoric record. Rather than singular climate inputs (i.e., the synthetic record), the stochastic model substitutes probability distributions for the discrete monthly rainfall, temperature, and evaporation values and samples the distributions based on the observed statistical parameters (monthly mean and standard deviation). Then the model compiles new probability distributions for the results of interest.

Stochastic modeling results can be used to inform operators on the suitable volumes of water that can be stored within the pond system and the ability to maintain an adequate level of emergency storage. The available emergency storage volume is defined as the total pond capacity minus the volume of water in storage within the pond system at any given point in time.

2.1.3 Operational Model

The HLF operational model is built on a GoldSim® platform with similar principals to the other two HLF water balance models in terms of tracking meteoric variability, but is computed on a 6-hour basis to track in more detail water inputs, stacking sequence, lift volumes, ore properties (e.g., moisture, density, gold grade, etc.), contained gold, solution flow rates and in-heap pond water levels. This model will be used to output data on a weekly or monthly basis, to feed into the site-wide water balance model and also conduct stochastic analyses (as required by QZ14-041-1).

2.1.4 Heap Draindown

Once all gold production has ceased and cyanide neutralization and rinsing of the HLF is finished, the post closure heap will be allowed to dewater and drain. The draindown process is an unsaturated flow process that is controlled by the soil water retention characteristics of the ore. The rate of flow during draindown is a function of the unsaturated hydraulic conductivity which is in turn a function of the moisture content of the ore. As the ore drains, the moisture content decreases, and the effective unsaturated hydraulic conductivity declines as well leading to an exponentially declining flow rate curve.

It is not practical nor advantageous to simply turn off the pumps and allow the heap to just drain as a very large volume of water would report quickly to the ponds, filling and overtopping them. Therefore, the HLF model assumes that pumping of process solution will continue at a declining rate until such time as the water content in the active leach column approaches the water content in the unirrigated ore, or the potential draindown volume remaining would not fill the ponds but would be captured in the pond system and still provide sufficient capacity to capture and store the design events (i.e., 1% probability (100 yr) 24 hr storm and a short-term drain-down). At that point the pumps could be turned off while allowing the heap to continue to drain until it reaches a meta-stable equilibrium with the level of meteoric water that continues to enter the pad year after year.

2.2 DESIRED AVAIALBLE STORAGE CRITERIA

While the Events Pond is sized to accommodate the Probable Maximum Flood (PMF) volume that is calculated based on the entire catchment above the HLF and the Events Pond, the desired level of available storage during normal operations varies as a function of the lined footprint of the HLF (and therefore varies by phase) and is dictated by the Type A Water Use Licence (WUL) QZ14-041-1.

Table 2-1 shows the desired available storage volume to be maintained at a minimum in the Events Pond by phase.

Table 2-1: Desired Available Storage Volume by HLF Phase

Phase	100 Year 24 Hr (1%) Storm Volume (m^3)[1]	72 Hr Draindown Volume (m^3)[2]	Freeboard (m^3)[3]	Desired Available Storage Volume (m^3)
1	Not considered as per QZ14-041-1			198,340
2	42,000	149,040	19,600	210,640
3 - 5	58,700	149,040	19,600	227,340

Notes:
1- Based on a 100 Yr 24 Hr (1%) storm rainfall depth of 54 mm. Event volume includes runoff from Events Pond Sub-catchment assuming no losses to infiltration (i.e., CN = 100), direct precipitation on the Events Pond, and event volume considered in HLF design for plan area of pad.
2- 72-hour draindown has been calculated based on a draindown rate of 2,070 m^3/hr as mandated by the Yukon Water Board.
3- Based on a pond depth freeboard of 0.5 m in the Events Pond.

3 DESIGNED CONTINGENCIES FOR HEAP LEACH FACILITY

The HLF valley fill design incorporates an earthfill/rockfill embankment (dam) that provides stability to the base of the heap and the stacked ore. The dam also creates solution storage associated with the In-Heap Pond, which is a leaching configuration that provides storage of pregnant solution within the pore spaces of the ore. The major design components for the HLF include the following:

- an earthfill/rockfill embankment (dam) and the In-Heap Pond;
- a composite liner system;
- solution recovery wells;
- a leak detection and recovery system (LDRS);
- associated piping network for solution collection and distribution;
- ditches and diversions at various stages of the HLF development; and
- a downstream Events Pond.

The Project site will also incorporate other facilities and equipment to support the operation of the HLF including:

- back-up generators;
- pump redundancy; and,
- a mine water treatment plant (MWTP);

The HLF consists of two liner systems: an up-gradient liner system and the In-Heap Pond liner system. The single composite liner system in the upper portion of the pad (above the in-heap solution storage area) is comprised of a double-side textured 60 mil linear low-density, polyethylene (LLDPE) liner over a geosynthetic clay liner (GCL) system. The double composite liner system in the lower portion of the pad (forming the in-heap solution storage area) is composed of two discrete layers of LLDPE liner, separated by a layer of geonet material to form the LDRS, over a GCL system.

Process (barren) solution containing cyanide is applied to the ore via a drip irrigation system (buried during winter). The resultant Pregnant Leachate Solution (PLS) is captured in the solution collection system and flows to the In-Heap Pond. The PLS is recovered via a sump using pumps and standpipes. The PLS is then transferred to the ADR plant for gold recovery.

The heap leach pad contains a network of pipes distributed throughout the limits of the facility at the base of the ore pile. This pipe network collects and conveys PLS and infiltrated storm water and snow melt to the In-Heap Pond where it is pumped to the Adsorption, Desorption and Recovery (ADR) plant via the solution collection system.

The downstream Events Pond serves as an overflow containment area that provides temporary additional solution storage if the In-Heap Pond capacity is exceeded. Within a short period of time, and as new ore is delivered to the pad, water collected in the Events Pond is pumped back to the ADR plant for use as make up water for the barren solution. Prior to construction of the MWTP, the ADR plant is equipped to function as a cyanide destruct circuit in the extreme case that there is excess cyanide solution that needs to be treated.

3.1 DIVERSIONS OF SURFACE WATER

Temporary runoff interceptor ditches have been, and will be, constructed up gradient of each phase of the HLF to collect and divert storm water runoff from the surrounding area so that the runoff will not enter the lined footprint of the HLF (BGC Engineering, 2018). The interceptor ditches are sized for the 100-year, 24-hour event, and armored with riprap and will be constructed and in operation before construction of each pad phase. Prior to the construction of successive phases of the HLF, the next upgradient interceptor ditch will be constructed to allow for construction of the HLF to continue without runoff impacting the work area. Once the successive upgradient interceptor ditch is operational, the downgradient temporary interceptor ditch will be deconstructed, filled and regraded for placement of the liner for the next phase.

A narrow bench (10 m wide) is constructed adjacent to the HLF confining embankment crest for storm water collection and conveyance of flows to the HLF spillway at the base of the pad. In the event of an unforeseen circumstance, in which pumping of solution ceases, or in the event of excessive surface runoff from the HLF, discharge of excess water or solution is directed in a controlled manner through the lined HLF spillway to the Events Pond. The HLF spillway is designed to safely convey the flow from the PMF event to the Events Pond. The Events Pond also incorporates internal and outlet spillways to pass the PMF peak flows after attenuation through the pond.

3.2 EVENTS POND SIZING

The purpose of the external Events Pond is to temporarily store excess inflows and runoff generated from rare events that cannot be stored in the In-Heap Pond. The Events Pond is double-lined and includes a leak detection and recovery system beneath the upper liner system. The Events Pond is sized to provide containment storage for the full PMF volume that would report to the HLF In-Heap Pond assuming that all upgradient interceptor ditches have failed and that the entire HLF catchment is developed regardless of actual Phase in the HLF life. The Events Pond is also able to accommodate the small external basin (with an area of 0.02 km^2) that is located up-gradient of the spillway and Events Pond (and up to the ADR pad[1]). Further, there is some additional capacity designed within the Events Pond for potential seasonal accumulation of water. The PMF event rainfall depth was estimated to be 256 mm (Knight Piesold 2013). The rainfall volume from the PMF, ultimately reporting to the Events Ponds, is summarized in Table 3-1. This table represents the volume from the PMF for each planned phase and assumes no water losses or abstractions during the rainfall event.

Table 3-1: Event Pond Sizing

HLF Phase	Volume (m^3)
HLF Phase 1 area PMF volume	109,300
HLF Phase 2 area PMF volume	59,900
HLF Phase 3 area PMF volume	79,600
External Basin Plus Events Pond area PMF Volume	27,800
Total PMF Volume	**276,600**

[1] As described in StrataGold 2018 Project Memorandum, runoff from the ADR catchment is collected by an interceptor ditch and conveyed to the west away from the Events Pond catchment)

The Event Pond is sized to provide storage for the PMF storm event from the full build out of the HLF at phase 3. The actual designed capacity of the Events Pond is 299,900 m^3 to the spillway invert. The additional capacity (23,500 m^3) provided in the design above the total volume shown in Table 3-1 allows for seasonal accumulation of fluid and/or additional draindown volume. This additional volume was incorporated in conjunction with the WUL requirement for management of solution seasonally while containing the PMF. The Events Pond has been built to the full capacity of 299,900 m^3. This ensures that during the various phases of HLF development and operation, there is adequate storage in place for management of solution.

As required by the WUL, the Events Pond fluid elevations will be kept below certain levels for each phase of the HLF development during normal operations so that a volume for emergency scenarios (i.e., the Desired Available Storage) remains available. Direct precipitation on the Events Pond or solution routed to the Events Pond via the HLF spillway will be recycled back into the heap leach circuit as necessary and in accordance with the WUL requirements.

3.3 PROCESS SOLUTION VOLUME

The design and operational criteria used for leaching operations include a solution application rate of 10 L/hr/m^2 and 7 L/hr/m^2, respectively using drip emitters with a total flow rate of 2,070 m^3/hr and 1,500 m^3/hr, respectively. These criteria were used to inform the design of the In-Heap Pond (more precisely the in-heap sump where the pumping system is located), the ADR plant, pumps and subsequently backup power generation requirements.

During the ramp up period associated with beginning of stacking and leaching operations in Phase 1 of the HLF, the total application rate will be less than the optimal design rate but will increase over a two-year period as the area available for leaching on the HLF increases until the optimum leach area is available. The optimum area available for leaching, based on the application rate and barren flow rate is approximately 215,000 m^2. Phase 1development will achieve the available area approximately two years into operation. Phase 2 and Phase 3 will operate at the operational capacity (7 L/hr/m^2 and 1,500 m^3/hr), so there is additional capacity for increasing application rate (to 10 L/hr/m^2 and 2,070 m^3/hr) in the design.

During operation, there will be variable requirements for make-up water used to provide process solution to the HLF. This is affected by expected seasonal weather. The HLF water balance accounts for seasonality, the phased development plan, and make up water requirements by phase (Table 3-2).

Table 3-2: Monthly Makeup Water Demands by Phase

Phase	Makeup Water Demands (m^3/week)		
	Approximate Maximum	Computed Average	% Zero
1	32,200	9,600	33.0%
2	29,300	6,300	51.2%
3	39,800	6,100	51.8%

The above information was used to help determine the process solution volume required for the design of the In-Heap Pond. The normal operational volume is the minimum amount of solution required to mitigate the possibility of PLS pump cavitation. The Process Manager is responsible for the operation of the HLF (which includes the Events Pond) to ensure that solution levels are maintained within specific elevations to protect against pump cavitation and for environmental protection.

3.4 STORM EVENT VOLUME

The storm events referred to in the HLF Design and water balance model included the PMF rainfall event and the 100-yr 24-hr storm. The details for the volumes associated with these events are summarized below in Table 3-4.

Table 3-3: Storm Event Volumes

Phase	100-yr 24-Storm (m^3)	Probable Maximum Flood (m^3)
1	29,667	136,900
2	42,029	206,800
3	58,733	276,400

The design for the Events Pond accounts for the maximum total volume of water during a PMF (248,800 m^3 from the HLF footprint + 27,600 m^3 from the additional area draining to the Events Pond = 276,400 m^3) associated with the maximum build out of the HLF. The actual designed and constructed capacity of the Events Pond is 299,900 m^3 to the spillway invert at elevation 894.5 m with a total surge capacity of 340,400 m^3 to the crest elevation of 895.5 m.

3.5 72-HOUR DRAINDOWN VOLUME

The design considered the contingency for an extended draindown duration due to loss of power or failure of pumping facilities. While this scenario is highly unlikely for the Project due to the direct connection to grid power, appropriate backup power generation facilities, and redundancy in pumps for solution management, a 72-hr draindown period has been considered for the HLF as a conservative measure.

A draindown event occurs when the pumps are no longer operational, which includes a pump malfunction (due to direct failure or loss of power) or pump maintenance without using one of the redundant pumps. The combined solution storage volume of the In-Heap and Events Ponds has been sized to accommodate the solution draining down from primarily the irrigated portion of the heap.

The volume (149,040 m^3) associated with the 72-hr draindown was calculated based on the maximum potential solution application rate (i.e., 2,070 m^3/hr) applied over 72 hours. The Events Pond has been built to a capacity of 299,900 m^3 which can easily contain the 72-hr draindown event volume in addition to other upset events (i.e., the 24-hr 100–yr rainfall event).

3.6 BACK-UP POWER

As an additional designed contingency, back-up power will be available for all phases of the project. For Phase 1, along with subsequent phases, generators will be on site to provide back-up power to the pumping system in the event of a power loss or failure from the gridline. Although the configuration of the Project provides sufficient storage, additional contingency tools are in place to further mitigate the risk associated with a power failure. Therefore, the Project incorporates a back-up generator system that is capable of supplying power to the pumping stations. These generators are able to provide sufficient power to all of the pumps so that they can continue to operate in the event of a gridline power failure. This allows for solution to continue to be circulated through the pad so that the Events Pond can continue to function as available emergency storage as necessary.

3.7 PUMP REDUNDANCY

The HLF solution management systems include redundancy in the various pumping systems associated with the HLF. Barren pumps are installed at the barren pumping station that will service the life of the pad, including an installed redundant pump. It is planned by the end of ramp up that there will ultimately be five installed pumps (each with a nominal capacity of ~500 m^3/hr) at the barren pumping station during the life of the facility and during operations; three pumps for operations (1,500 m^3/hr), one pump for maintenance and one pump on standby. The N+1+1 redundancy in the system allows for continuing operation in the event that a pump requires maintenance or if a pump breaks. The redundant pump could also be used while a pump is serviced.

In addition to the redundancy at the barren station, the In-Heap Pond will also have N+1+1 pump redundancy. This allows for continued pumping out of the In-Heap Pond in the event that pump maintenance is required for the other pumps. This provides contingency to minimize operational down time associated with the servicing of any of the pumps in the In-Heap Pond.

Additionally, there is a very high level of pumping capacity available for regular operations of other facilities around the Project. In an unforeseen circumstance, these pumps could be repurposed as necessary to assist with pumping out the Events Pond. The Events Pond is equipped with a dedicated pump for the evacuation of direct precipitation, snowmelt and overflow from the HLF. Additionally, vendors have been approached to determine timelines for the procurement, mobilization and commissioning of another pumping system in the extremely unlikely event that the dedicated Events Pond pump is inoperable and available pumps from other facilities cannot be utilized for any reason and have indicated that a suitable pumping system would be on site and operational within one week.

3.8 WATER TREATMENT PLANT

A MWTP will be built to treat a varying combination of site contact water originating from the open pit and WRSAs as well serving as a back-up to treat excess water from the HLF as necessary. The MWTP will be constructed adjacent to the main site water management pond (LDSP) and just east of the Camp. This site provides good access for chemical delivery trucks and minimizes major pipe runs. The MWTP will be designed to be flexible and expandable to accommodate a wide range in flows.

As required by the WUL, the MWTP will be constructed and commissioned prior to loading ore in Phase 2 of the HLF, will be capable of achieving the effluent quality standards specified in the WUL, and will meet the treatment capacities specified in the WUL.

4 CONTINGENCY WATER MANAGEMENT STRATEGIES

Contingency water management strategies have been developed for the HLF to ensure that solution from the HLF is not released to the environment. The primary strategy for management of excess fluids from an upset event typically involves using dynamic storage within the heap, however, as discussed below a range of other strategies can be utilized.

The HCWMP is not intended to limit the management options available to the HLF operator as any or all of the strategies discussed herein can be used either alone or in combination with other strategies. To provide certainty to regulatory bodies and other interested parties a definitive trigger for the institution of management strategies has been developed. The definitive trigger is HLF phase dependent and is based on retaining solution storage capacity in the Events Pond as mandated by the WUL. For Phase 1 of the HLF, the WUL sets a specific volume criterion. For Phases 2 and 3 of the HLF, the 24-hour 100-yr rainfall event occurring concurrently with a 72-hour draindown event, while maintaining 0.5 m of freeboard in the Events Pond in accordance with the WUL requirements is considered. The Phase 2 and 3 combination of events were chosen as they represent a series of events (albeit extremely unlikely in combination) that could occur simultaneously which the operator of the HLF may not be able to mitigate for in advance. The volumes and triggers are shown in Table 4-1.

Table 4-1: Definitive Events Pond Volume Triggers

Phase	72-hour Draindown Volume (m^3)[1]	0.5 m Freeboard Volume (m^3)	24-hour 100-year Event Volume (m^3)[2]	Desired Available Storage Volume Required (m^3)	Percentage Full of Events Pond
1	Not considered as per QZ14-041-1			198,340	34%
2	149,040	19,600	42,000	210,640	30%
3	149,040	19,600	58,700	227,340	24%
4	149,040	19,600	58,700	227,340	24%
5	149,040	19,600	58,700	227,340	24%

Notes:

1 72-hour draindown has been calculated based on a draindown rate equal to the maximum leaching rate or 2,070 m^3/hr as mandated by the Yukon Water Board.

2 Event volume includes runoff from Events Pond Sub-catchment assuming no losses to infiltration (i.e., CN = 100), direct precipitation on the Events Pond, and event volume considered in HLF design for plan area of pad.

Importantly, the operational philosophy for the HLF is to ensure that solution is withdrawn from the HLF as rapidly as possible so that gold bearing solution can be processed. This normal occupied and operational volume is the practical action threshold for the company (i.e., maintaining significantly more available storage capacity than the definitive Events Pond volume triggers) as it is the primary economic driver for the Project. Allowing solution to accumulate above the normal occupied and operational volume would have impacts on cash flow for the Project that can be entirely mitigated by withdrawing gold bearing solution in a timely manner.

If the percentage full criterion in the Events Pond is reached some combination of the strategies listed below, depending on season and operational appropriateness will be utilized.

4.1 IN HEAP DYNAMIC WATER STORAGE

The stacked ore within the HLF can be used to increase the available solution storage by pumping excess solution to the dry, non-active leaching portions of the pad. Depending on time of year, this could also allow for some evaporation during solution irrigation. To pump excess solution, additional pumping capacity beyond normal operations would be utilized.

A 25% increase in pumping capacity (i.e., less than the maximum 33% increase that is available from using four pumps instead of three) and re-pressurizing previously used emitter lines would temporarily increase the leaching area for use as dynamic storage. With an application rate of 7 liters/hr/m^2 and a design pumping rate of approximately 1,500 m^3/hr, this 25% increase equates to a maximum leaching area of 267,850 m^2 from the normal 214,280 m^2, or approximately 53,570 m^2 of additional area to be used for dynamic storage. With this application rate and area, the additional volumes of dynamic storage produced by phase are shown in Table 4-2. Calculations conservatively assume the 8.6% residual moisture content as a starting condition (i.e., in reality the moisture content would be somewhere between 8.6% and 5.8% (the blended value of fresh ore), depending on the location of the heap chosen) and 13.3% moisture content under operational leaching (a minimum difference of 4.7% moisture content available for storage, by weight).

The solution held in dynamic storage would leach through the ore, be collected in the in-heap pond and then be recirculated. Using dynamic storage over time will deplete excess solution by ore wetting and the normal evaporative process associated with leaching operations. Note for completeness, estimates of dynamic storage available by phase for the full 33% redundancy are also shown in Table 4-2.

Table 4-2: Dynamic Storage Capacities During Operations

Phase	Average Stack Height (m)	Dynamic Storage Available assuming 25% pump increase (m^3)	Dynamic Storage Available Per Pump assuming 33% pump increase (m^3)
1	31.5	136,400	181,900
2	39.2	169,700	226,300
3	37.9	164,100	218,800

It should be noted that as the HLF grows in size during subsequent phases, portions of earlier phases can also be utilized for dynamic storage. This provides additional flexibility and management of solution options for operators. Previously leached areas will remain available for potential use as dynamic storage while actively leaching other areas.

Based on the estimated volumes for the various modelled precipitation events (e.g., 24 hr 100 year) and once the heap has grown sufficiently in size to provide additional irrigation area, there is no single unplanned event (i.e. an event that does not develop over time that the operator can observe and/or measure) that is capable of overwhelming the total available dynamic storage volume of the HLF. Even assuming that In-Heap Pond and Events Pond are at their respective maximum storage capacities and a PMF event were to occur, the HLF has available dynamic storage capacity (i.e., using a fourth pump provides 218,800 m^3 additional storage, and then using the fifth pump provides another 218,800 m^3 of storage). This equates to 33% and 66% increases in irrigation area.

4.2 SNOWPACK MANAGEMENT

The volume of the winter snowpack that would report to the HLF during freshet represents the largest observable water source and predictable volume for the HLF, and thus is the primary driver in the water balance model for most scenarios that require contingency water management. As the snowpack can be accurately measured by VGC during regular operations, it can easily be planned for and mitigated against well in advance of the snowmelt period.

The snowpack will be monitored and managed for purposes of reducing total solution influx into the heap leach system, benefitting both the water balance for the facility and enhancing leaching efficiency. The HLF will be constructed in lifts, with benches every ~10m in lift height. During excess snow accumulation years (> ~1m depth), and prior to melting or freshet conditions, snowpack accumulated on the flat surfaces may be pushed as manageable via dozer off to the sides and ends of the facility into designated snow storage locations that are free of vegetation and constructed with sediment traps to capture any ore entrained in the snow. Further, some of the snowpack can be piled into larger and thicker drifts which would have the effect of reducing the rate of snowmelt, thus spreading the delivery of the influx of water into the heap over a longer time period.

One of the considerations for the design of the HLF was the volume of water that could report to the In-heap Pond as a result of a 24-hour rain-on-snow event followed by 48 hours of melting. Using an empirical equation in the Manual of Operational Hydrology for British Columbia (MOE 1991), and site-specific climate inputs, a 24-hour snowmelt value of 32.3 mm was derived. The amount of snow that melts during the two days following the 100-year 24-hour event was then calculated using the degree-day method (NEH 2007), again using site specific climate inputs, with a result of 17.3 mm/day. Regardless of the SWE for the entire snowpack, these are the maximum predicted snow water equivalent values that could be experienced over a 72-hour period.

For the purposes of HLF contingency water management, the resultant SWE for the initial 24-hour rain-on-snow event followed by 48 hours of melting, is to be considered prior to freshet as an additional volume that must be available within the HLF system. This additional volume does not have to be made available entirely within the Events Pond and can be provided in combination with available storage within the In-heap Pond.

Upon the completion of each monthly snow course survey, the Environmental Superintendent is to verify the available volumes in the In-heap Pond and the Events Pond and if the values provided in Table 4-3 are not available within the system, the snowpack management (or other contingency measures as considered herein) should be instituted.

Table 4-3: Snowpack Management Triggers

Phase	Maximum Predicted SWE from 24-hr rain-on-snow and 48 hr Melt (m^3)	Desired Available Storage Volume Required in the Events Pond (m^3)	Total Available Storage Required within Integrated HLF System for Freshet (m^3)
1	28,566	198,340	226,906
2	47,967	210,640	258,607
3	65,027	227,340	292,367

4.3 SNOWPACK AND RAINFALL MONITORING FOR FRESHET MITIGATION

At a minimum, monthly snowpack measurements will be made on flat and sloped surfaces of the HLF to consider topographic variability and aspect. In general, as part of the Environmental Monitoring, Surveillance and Adaptive Management Plan (EMSAMP), a number of locations (depending on heap size) evenly spaced throughout the pad will be included in the winter time snow surveys (i.e., March 1, April 1 and May 1). Total heap snowpack and average snowpack per certain areas will be calculated.

The on-site weather station will be used to measure temperature, rainfall and snow depth and in combination with snow surveys snow water equivalent data. During winter months, operations will limit leaching operations and will maximize available pond storage in preparation for freshet conditions. Combinations of available total pond storage and dynamic storage (described below) will be utilized for management of freshet. Standard best-management-practices for minimizing erosion will be implemented in preparation each season.

4.4 TOTAL STORAGE VOLUME AVAILABLE TO MANAGE SOLUTION

The primary storage facilities for water management including contingencies comprise the In-Heap Pond, the Events Pond, and dynamic water storage in unirrigated portions of the HLF. The design volumes of the In-Heap Pond and the Events Pond are as follows, and these volumes are in place for all phases of the Project:

- In-Heap Pond:
  - total volume of 126,800 m^3 minus the occupied and operational volume of 52,200 m^3 = 74,600 m^3 (at elevation of spillway invert to the Events Pond, that is, with no freeboard left)
- Event Pond:
  - 299,900 m^3 (at elevation of spillway invert, that is, with no freeboard left)

In addition to the pond system, dynamic storage as described above in Section 4.1 is also available. The ability to pump excess solution to the HLF for storage during a rare event provides incremental storage capacity that varies by Phase, pad loading status, and ore leaching, as well as ore characteristics. The maximum available is dependent on the number of additional pumps. There are two additional pumps, one as a redundant back-up supply and another one for when each pump undergoes routine maintenance. In the event of a true emergency, all five pumps could be deployed to access more dynamic storage.

- Dynamic Storage:
  - 218,800 m^3 (redundant pump increases irrigation area by 33%)
- Additional Dynamic Storage:
  - 218,800 m^3 (extra pump for maintenance increases irrigation area by additional 33%)
- Total Pond plus Dynamic Storage:
  - 812,100 m^3

4.5 SOLUTION TREATMENT AND RELEASE

An excess in solution inventory within the HLF can also be mitigated by treatment in the MWTP and release to the environment.

The preliminary design for the MWTP (which will be refined based on updated climate data and operational data collected during the first couple of years) considers the treatment of mine influenced waters originating from the waste rock storage areas (WRSAs), the open pit, and the HLF. The capacity for treatment of the WRSAs, open pit influenced water, and the HLF influenced water is specified in the WUL.

Solution treatment and release is the least likely strategy to be utilized until the end of the active mining phases for the Project. During the active draindown of the HLF, prior to final closure, the objective is to release water, making treatment the best management strategy.

While solution treatment and release is considered the least likely strategy during normal operations, and in accordance with the WUL, the MWTP will be available to the operator from Phase 2 of the HLF to the end of mine operations.

4.6 RESERVED AREA FOR EMERGENCY POND

The final contingency water management strategy considered in this HCWMP is the construction of a downgradient pond for solution containment. An area upgradient of the confluence of Dublin Gulch and Haggart Creek is available for the excavation of an emergency pond. The emergency pond could, based on the equipment that will be utilized during normal mining operations, be constructed in a short period of time in response to a developing HLF situation requiring additional storage capacity. This pond is not currently planned for construction as there would need to be a combination of improbable circumstances that would require this management strategy. Based on all HLF water balance modelling completed for the Project there is no scenario that would require the institution of this management strategy, however, in accordance with the regulatory requirements for the Project, an area capable of housing a storage pond with a capacity of at least 90,000 m^3 has been reserved.

5 TEMPORARY CLOSURE

During temporary closure, due to the loss from ore wetting and absent any active water management mitigation, one particularly strong freshet year could use a substantial portion of pond capacity. Thus, depending on Phase, at some point, absent any other mitigation measure some level of treatment for discharge to the receiving environment could be used to retain the desired available storage capacity. However, while pumping to treatment is a viable mitigation, in all likelihood, due to the need to find the most efficient and cost-effective measures, some combination of mitigations (e.g., raincoats, snowmelt management, use of evaporators, increasing dynamic storage, etc.) would be employed to maintain the desired available storage capacity during temporary closure.

For example, deploying raincoats (liners) over half of the surface area of the heap would reduce meteoric input by 50%. This option would be considered during the snow free months when the liner is easier to deploy, and if a longer temporary closure is expected. Active snowpack management prior to freshet as described above, would still continue as very viable mitigation. Evaporators could be deployed effectively during the summer months when evaporation rates are higher. Pond system water would be pumped directly to evaporators located on the edges of the heap leach pad.

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