EAGLE GOLD PROJECT

HEAP LEACH FACILITY OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL

Version 2020-01

JANUARY 2020

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1 INTRODUCTION

This Operation, Maintenance and Surveillance (OMS) Manual for the Heap Leach Facility (HLF) was prepared by Victoria Gold (Yukon) Corp. (VGC) for the Eagle Gold Project (the Project), which is located approximately 85 km from Mayo Yukon. The OMS Manual will be used in the development of training material and guidance for key operators and maintenance personnel with responsibilities related to the HLF. It also includes guidance on emergency response procedures but should be reviewed in conjunction with the following documents:

- The Heap Leach and Process Facilities Plan;
- The Heap Leach Facility Contingency Water Management Plan;
- The Cyanide Management Plan; and,
- The Heap Leach and Process Facilities Emergency Response Plan.

The OMS Manual provides a framework for actions and a basis for measuring performance for the HLF operations. Key items and activities covered in this Manual include the following:

- Roles and responsibilities of personnel assigned to OMS activities for the HLF;
- Description of the HLF including site conditions, key components, regulatory requirements, and design criteria;
- Facility operations including ore stacking, leaching, in-heap solution management, solution processing, environmental protection, and documentation and reporting;
- Facility maintenance including routine and event-driven maintenance, and documentation and reporting;
- Facility surveillance including routine, event-driven and annual inspections and documentation and reporting.

This OMS Manual presents procedures that will be considered by appropriate mine personnel for the operation, maintenance, and surveillance of the HLF to ensure that it is functioning as designed; meets regulatory and company environmental policy obligations.

2 MANAGING CHANGE

The HLF OMS Manual will be reviewed and updated as required by the Process Manager or in accordance with Eagle Gold Operating Procedure VGC-CMP-SOP-001 “Preparation, Review, Approval, Update, Controlled Distribution of Eagle Project Management Plans and Standard Operating Procedures”.

Manual revisions may incorporate changes in facility performance, capacity, operational requirements, closure requirements, site management, roles and responsibilities, or regulations or reporting procedures.

Previous versions of the Manual are accessible to all relevant persons operating the facility, the Engineer of Record (EoR) and regulatory authorities. Tables 2.1-1 summarize the Manual revision history.

Version 2020-01 of the HLF OMS Manual for the Project has been revised in January 2020 to update Version 2019-03 as per Conditions 103 and 104 of QZ041-14-1. Table 2.1-2 identifies modifications made to the Manual compared to the previous Version 2019-03 and provides a summary and rationale for such modifications.

The list of Manual holders for the HLF is provided in Table 2.1-3. VGC will maintain a record of the location of each copy of the Manual and will ensure that all copies are updated when required.

Table 2.1-1: OMS Manual Revisions History

Revision Number	Details	Issue Date
Version 2014-01	Initial OMS for HLF. Presents the proposed facility design; operation, maintenance and surveillance activities; from construction through reclamation and closure.	April 2014
Version 2019-01	Revised to reflect HLF design improvements, and addresses conditions of QML-0011 and Water Use Licence (WUL) QZ14-041.	February 2019
Version 2019-02	Revised in response to a technical information request from the Yukon Water Board Secretariat	April 2019
Version 2019-03	Revised in response to another technical information request from the Yukon Water Board Secretariat	June 2019
Version 2020-01	Revised in response to Conditions 103 and 104 of QZ014-041-1.	January 2020

Table 2.1-2: Version 2019-03 Revisions

Section	Revision/Rationale
All	▪ Revision to description of Project based on regulatory, construction and operational status for various facilities and equipment. ▪ Updated company information. ▪ Revision to certain position titles to reflect personnel responsibility based on current VGC organizational chart.
2 Managing Change	▪ Updated revision history information. ▪ Updated list of manual holders.
3.1 Assignment of Responsibilities	▪ Minor update to positions within VGC and reassignment of responsibilities as necessary.
4.3 HLF Overview	▪ Update to acknowledge that fluid may remain within the Events Pond for use as process solution. ▪ Inclusion of test to specify that the available storage volume that can be assumed within the In-heap Pond is at values mandated by the Yukon Water Board.

Section	Revision/Rationale
	▪ Inclusion of text to recognize that verification testing of available storage volume within the In-heap Pond is required as per the WUL. ▪ Update to embankment integrity monitoring equipment.
5 Regulatory Requirements	▪ Revision to location of relevant electronic documentation.
6.2 Design Basis	▪ Minor text revision for readability.
7.1 Pad Loading	▪ Minor text revision for readability. ▪ Inclusion of text to acknowledge WUL requirement that snow cleared from the surface of the HLF must be placed in locations free of vegetation that include a sediment trap.
7.3.3 Solution Delivery and Leaching - In-Heap Pond	▪ Inclusion of text to specify that the available storage volume within the In-heap Pond is at values mandated by the Yukon Water Board prior to conducting any verification tests. ▪ Revisions to 72-hour draindown volume and Desired Available Storage Volume to values mandated by the Yukon Water Board and updated to show the allowable percentage full of the Events Pond based on those volumes.
7.5 Cold Weather Considerations	▪ Inclusion of text to acknowledge WUL Conditions 89 and 90 that snow cleared from the surface of the HLF must be placed in locations free of vegetation that include a sediment trap. ▪ Inclusion of text to acknowledge WUL Condition 117 that snow water equivalent must be determined on a monthly basis
7.6 Leachate Solution Collection System	▪ Minor text revisions for readability.
7.8 Events Pond	▪ Update to acknowledge that fluid may remain within the Events Pond for use as process solution.
7.9 Operational Heap Leach Model	▪ Inclusion of text to acknowledge WUL Condition 117 for monthly solution inventory monitoring. ▪ Inclusion of text to acknowledge WUL Condition 57 that no water transfers into the HLF (exclusive of potable water and water for gold elution) are permitted if the Desired Available Storage Volume is unavailable in the Events Pond.
8.1 Routine Maintenance	▪ Minor text revisions for readability.
9.2.1 Solution Head and Temperature	▪ Minor text revisions for readability. ▪ Updated model considerations to specify snow water equivalent. ▪ Included text to acknowledge WUL Condition 89 related to snow removal from the surface of the HLF. ▪ Updated elevation information based on as-built configuration of the In-heap pond and associated infrastructure.
Table 9.2-1 In-Heap Pond Trigger Level Responses	▪ Updated elevation information based on as-built configuration of the In-heap pond and associated infrastructure.
9.2.2 Pond Water Levels	▪ Minor text revisions for readability. ▪ Inclusion of text to acknowledge WUL Condition 57 that no water transfers into the HLF (exclusive of potable water and water for gold elution) are permitted if the Desired Available Storage Volume is unavailable in the Events Pond.

Section	Revision/Rationale
Table 9.2.2 Definitive Events Pond Volume Triggers	▪ Revisions to 72-hour draindown volume and Desired Available Storage Volume to values mandated by the Yukon Water Board and updated to the allowable percentage full and associated solution elevation of the Events Pond based on those volumes.
Table 9.2.3 Events Pond Trigger Level Responses for Phase 1 of the HLF	▪ Table re-named to acknowledge that levels are currently based on Phase 1 operations. ▪ Revisions to action elevations for the Events Pond based on WUL Desired Available Storage Volumes. ▪ Revision to monitoring frequencies for orange condition based on seasonal considerations (i.e., frozen versus non-frozen). ▪ Inclusion of text to acknowledge WUL requirement that no water transfers into the HLF (exclusive of potable water and water for gold elution) are permitted if the Desired Available Storage Volume is unavailable in the Events Pond.
9.2.3.1 HLF LDRS	▪ Inclusion of table and text to satisfy WUL Condition 104 for specific triggers and responses for leakage rates that allow for normal operation, are approaching Alert Level (AL) 1, between AL 1 and AL 2, and above AL2.
9.2.3.2 Events Pond LDRS	▪ Inclusion of table and text to satisfy WUL Condition 104 for specific triggers and responses for leakage rates that allow for normal operation, are approaching Alert Level (AL) 1, between AL 1 and AL 2, and above AL2. ▪ Minor text revision to clarify that solution with the Events Pond is not necessarily process solution.
9.2.5 Seepage and Underdrain Monitoring	▪ Revision to describe as-built and operated condition of the underdrain system (i.e., all fluids returned to lined containment). ▪ Revision to clarify monitoring requirements for the underdrain system based on WUL Condition 105.
9.8 Reporting	▪ Revision to acknowledge all fluid volumes related to heap leaching operations that must be measured and reported on based on WUL Condition 117.

Table 2.1-3: List of Manual Holders and Contact Information

Name	Organization and Title	Email address	Telephone Number
Mark Ayranto	Victoria Gold Corp. Chief Operating Officer	mayranto@vitgoldcorp.com	604-696-6614
David Rouleau	Victoria Gold Corp. Vice President Operations & General Manager	drouleau@vitgoldcorp.com	604-696-6621
Mathew Mock	Victoria Gold Corp. Process Manager	mmock@vitgoldcorp.com	867-334-3369
Barry Carlson P.Eng.	Forte Dynamics Inc. President & CEO, Engineer of Record	bcarlson@fortedynamics.com	720.642.9322
David Crottey	Victoria Gold Corp. Health, Safety and Security Manager	dcrottey@vitgoldcorp.com	867-334-1394
	Yukon Government - Energy, Mines & Resources		867-667-3111
	Yukon Water Board	ywb@yukonwaterboard.ca	867-456-3980

3 ROLES AND RESPONSIBILITIES

This section identifies the individuals having responsibility for the operation, maintenance and surveillance of the HLF. Responsible parties for employee training and managing HLF change procedures are also identified.

3.1 ASSIGNMENT OF RESPONSIBILITIES

The main individuals responsible for the HLF OMS are the Process Manager and the Mine General Manager. Certain VGC Project and corporate personnel will also support the onsite operations. As necessary, additional support will be provided by outside engineering firms, and the Engineer of Record, as appropriate. Communication with key external stakeholders, being the First Nation of Nacho Nyak Dun, Yukon Government Department of Energy, Mines and Resources, the Yukon Water Board and local authorities, will occur as appropriate.

Figure 3.1-1 presents an organization chart that shows reporting links within the organization and communication links to external organizations.

Personnel responsible and accountable for OMS activities and emergency preparedness and response are listed in Table 3.1-1, which describes day-to-day functional relationships between personnel using a responsibility assignment matrix. Contact information for these key individuals is provided in Table 2.1-3 of this Manual.

Table 3.1-1: HLF OMS Personnel and Responsibilities

Title	Corporate	Operations	Maintenance	Surveillance	Emergency Preparedness	Training	Change Management
Chief Operating Officer	R	A	I	I	A	I	C
Vice President of Operations	R	A	A	A	A	A	A
Mine General Manager		R	R	R	R	R	R
Process Manager		R	I	R	R	R	R
Process Operations Superintendent		R	R	R	R	R	R
Process General Foreman		R	R	R	R	R	
Process Supervisor		R	R	R		I	
Chief Metallurgist		R		R		I	
Maintenance Manager			R	I	R	I	R
Maintenance Foreman			R	R		I	R

Title	Corporate	Operations	Maintenance	Surveillance	Emergency Preparedness	Training	Change Management
Maintenance Supervisors			R	R		I	
Senior Maintenance Planner			R	R		I	R
Maintenance Planners			R	R		I	
Environmental Manager				I	I	I	I
Environmental Superintendent				R	C	I	I
Environmental Coordinators				I	I	I	
Health, Safety and Security Manager				I	R	R	R
Health and Safety Coordinator				I	R	R	
Engineer of Record		C	C	C	C	C	A

NOTE: R= Responsible (performing); A = Accountable (managing); C = Consulted; I = Informed

The Process Manager is responsible for all HLF, ADR Plant and crushing operations at the Project, including any decisions regarding the procedures to be carried out during an emergency. Crushing and Conveying General Foreman are responsible for conducting daily inspections and monitoring the placement of the ore on the Heap Leach Pad. The Process General Foreman is responsible for the day-to-day operation of the Process Plant, including regular surveillance and monitoring requirements and coordination with the Maintenance Department for regular maintenance of process related facilities. The Process Operations Superintendent is responsible for ensuring that daily and monthly reports for maintenance (in conjunction with the Maintenance Department), surveillance and monitoring of the HLF are prepared. The Environmental Superintendent is responsible for monitoring and managing the operational aspects of various territorial and federal environmental permits, licenses and regulations. In the event that these individuals are not available, the responsibility is then delegated to a designate.

In addition, all site personnel and visitors on project business are requested to be vigilant of visual indications of faulty performance of all aspects of the facility.

3.2 TRAINING

The Process Department will provide routine training workshops for all personnel with OMS responsibilities for the HLF. The workshops will focus on the operation, surveillance, inspection, monitoring, emergency response, and regulatory reporting requirements for the HLF. Engineering consultants who are familiar with the HLF design and operations may assist with the training program as needed.

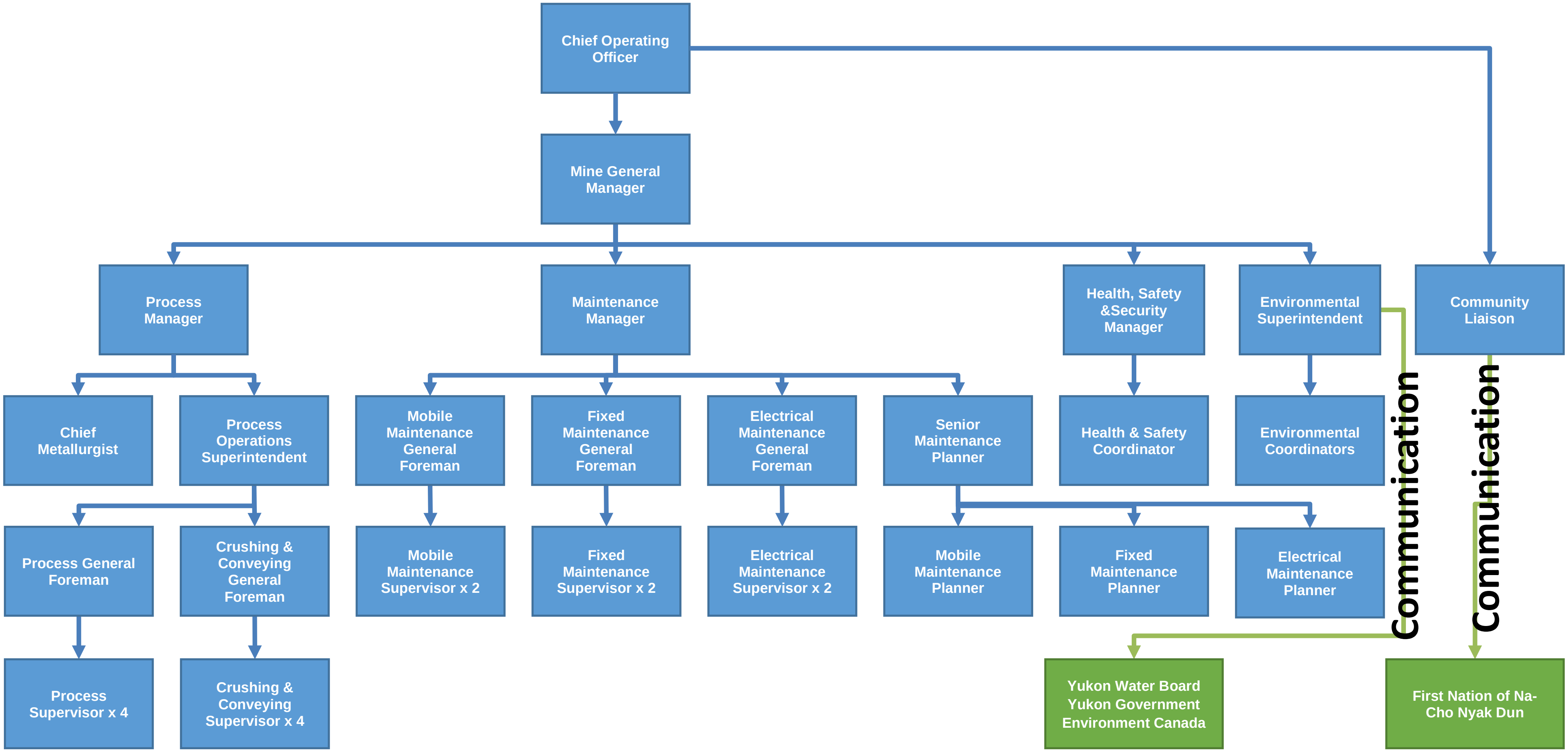


Figure 3.1-1: OMS Responsibility Organizational Chart

4 PROJECT OVERVIEW

4.1 OWNERSHIP

VGC is the owner of the Project. VGC is a directly held-wholly owned subsidiary of Victoria Gold Corp. The company head office is located in Toronto, ON with regional offices in Vancouver, BC and Whitehorse, YT. The Project is located within VGC's 100% owned Dublin Gulch Property. Figure 4.1-1 illustrates the general Project location, while Figure 4.1-2 illustrates the Project site, including all facilities and components.

4.2 SITE OVERVIEW

The Project is an open pit gold mine and heap leach operation. As illustrated by Figure 4.1-1, it is located in the central Yukon Territory, approximately 400 km north of the capital Whitehorse, and 45 km (85 km by road) north-northeast of the Village of Mayo, the closest community with significant commercial services. The Project site is located within the Mayo Mining District.

The Project site can be accessed year-round from Mayo by following Highway 2 for 35 km, then heading along the South McQuesten Road for 21 km. The last 25 km are public but user-maintained, which are generally in good repair and allow passage for cars, trucks, and heavy haul highway truck and trailer units.

This Project focuses on the Eagle Zone portion of the Dublin Gulch Property, which contains a Probable Mineral reserve of 116 Mt, with a diluted grade of 0.66 g/t Au (JDS 2016). The Project is a conventional open pit mine; ore is mined and processed at an average rate of 29,500 t/d over the LOM. Ore is crushed using three stages of conventional crushing, and then heap leached to produce saleable gold doré.

Concurrent reclamation of specific facilities no longer required for operations will be completed during normal mine operations. Final reclamation and closure of the Project site will be initiated after all economic precious metal values have been recovered from the HLF. Post closure monitoring of the Project site, including the HLF, will occur for an estimated 5 years depending on the facility, closure objectives, and when close criteria are met.

A complete site layout drawing is provided by Figure 4.1-2.

4.3 HLF OVERVIEW

The HLF is being progressively developed in three phases that will collectively occupy an area of 106 ha and contain at least 86 MT of ore at the end of the LOM.

The HLF is a valley fill design that incorporates a rock/earth fill embankment that provides stability to the base of the heap and the stacked ore. The embankment also creates an In-Heap Pond leaching configuration that provides storage capacity for pregnant solution within the ore pore spaces and eliminates the need for downstream process solution ponds (Figure 4.3-1). The major design components for the HLF include the following: the embankment; a composite liner system; the In-Heap Pond; solution recovery wells; associated piping network for solution collection and distribution; a leak detection and recovery system (LDRS); and a downstream Events Pond to contain process make-up water or excess solution that results from extreme precipitation or emergency events.

The HLF pad consists of two composite liner systems (Figure 4.3-2), the 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 Pond) is comprised of a double-side textured 80 mil linear low-density, polyethylene (LLDPE) liner over a geosynthetic clay liner (GCL) system. The double composite liner system in the In-Heap Pond is comprised of two discrete layers of LLDPE liner, separated by a layer of geonet material to form the LDRS, over a GCL system.

The In-Heap Pond (essentially a saturated zone within the lower extent of the HLF ore pile) at the spillway invert elevation of 937.5 m asl (i.e., with no freeboard left) allows for containment of solution within the pore spaces of the stacked ore. During operations, the In-heap Pond includes a variable volume of solution to keep the sump full and prevent pump cavitation plus the gradation of moisture content above the operational level that would be expected under normal conditions. Based on current modelling assumptions and regulatory requirements, the In-Heap Pond is assumed to have a maximum available storage capacity of 74,585 m^3 above the volume contained with the sump and gradation zone of moisture content in the ore. Verification tests, as per WUL Conditions 67 through 73 will be undertaken at various times (as specified in the WUL) during the life of the Project to refine the maximum available storage capacity within the In-Heap Pond.

Process (barren) solution containing cyanide is applied to the ore via a drip irrigation system. The resultant pregnant leach solution (PLS) leaches through the ore an is then captured in the solution collection system, which flows to the In-Heap Pond. The PLS is recovered via a well system using pumps and standpipes. The PLS is then transferred to the ADR plant for gold recovery.

The solution collection system is comprised of 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 any infiltrated stormwater to the In-Heap Pond area where it is pumped to the process plant via the solution collection wells. The pipe network was designed to accommodate stormwater volume from a 100-year, 24-hour storm event in addition to 150 percent of the design capacity of the anticipated PLS solution flow (150 percent PLS flow + 100-year, 24-hour storm event).

The downstream Events Pond (Figure 4.3-3) serves as an overflow containment area that provides additional solution storage in the unlikely event that the In-Heap Pond capacity is exceeded. The Events Pond is sized to provide containment storage exceeding the Probable Maximum Flood (PMF) Event assuming the In-Heap Pond solution storage is at maximum capacity. As designed, the Events Pond has an operational storage capacity of approximately 299,900 m^3 (which is greater than the PMF volume of 276,600 m^3) to the spillway invert at elevation 894.5 m. Inspection and monitoring systems are included in the HLF to assess the ongoing performance of the facility. The In-Heap Pond fluid levels are monitored using piezometers. The Events Pond fluid levels are monitored visually with level gauges or survey.

Liner Integrity is monitored by regular inspection of the LDRS monitoring sumps for both the In-Heap Pond and the Events Pond. In addition, the HLF includes an underdrain system for the collection and drainage of subsurface water beneath the lined facility to limit upward pressure on the HLF liner. The underdrain system conveys subsurface flows to a monitoring vault. The underdrain system provides some additional leak monitoring capability (as the underdrain header pipes are situated below the PLS header pipes where flows are concentrated) and the underdrain monitoring vault is regularly checked as an additional method of detection of measurable leakage through the liner system.

Embankment integrity is monitored using survey monuments, inclinometer, VWPs and routine surveys. Monitoring of the HLF also includes regular scheduled visual inspections and reporting programs, in addition to comprehensive third-party inspections in accordance with Canadian Dam Association, Dam Safety Guidelines.

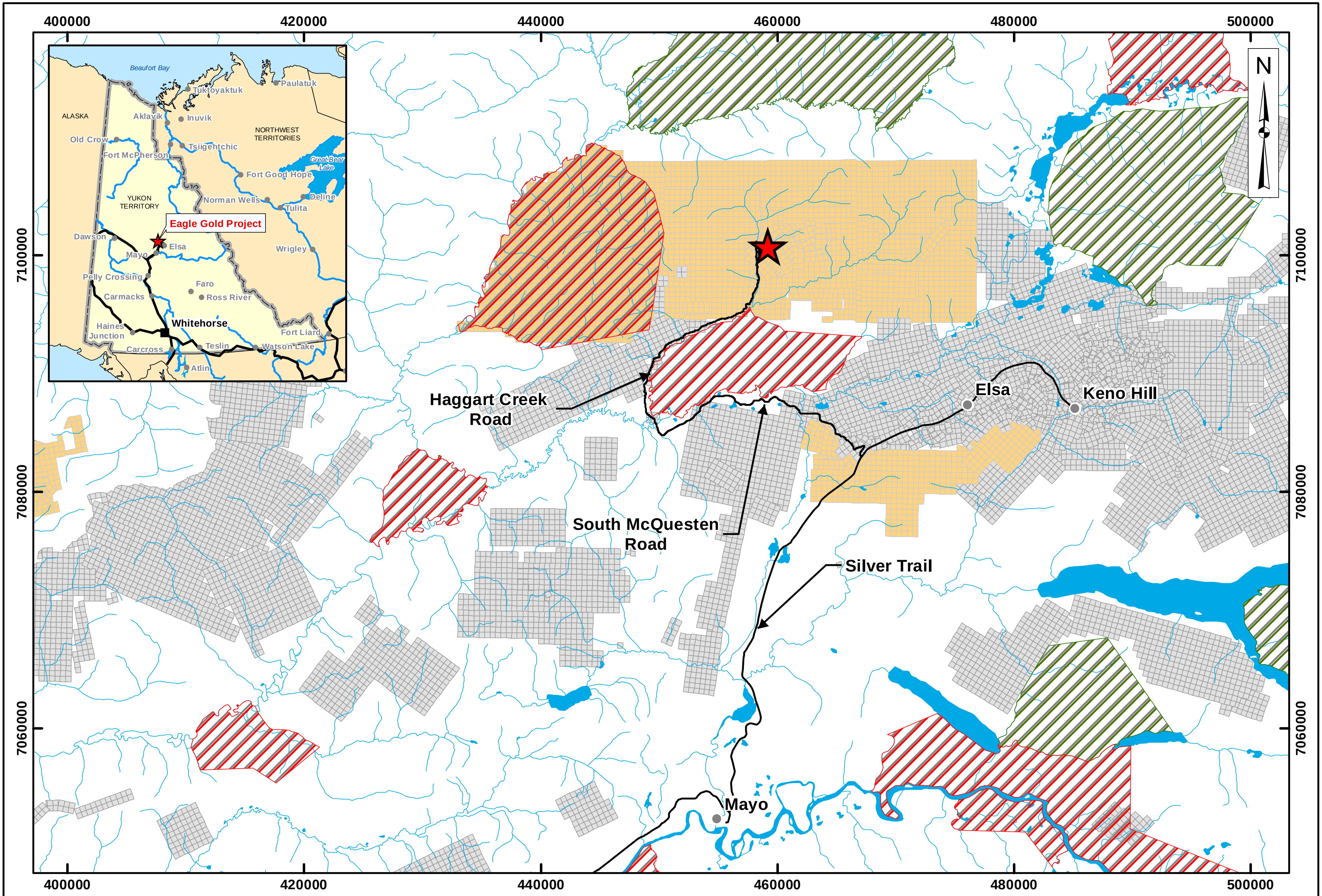
4.4 SITE CONDITIONS

The Project is situated within the Yukon Plateau North Ecoregion, in the Boreal Cordillera Ecozone which encompasses the Stewart, MacMillan and Pelly plateaus and southern part of the Selwyn Mountains.

The Project area topography is characterized by rolling hills and plateaus ranging in elevation from approximately 765 masl near the confluence of Dublin Gulch and Haggart Creek, to 1,525 masl at the base of the Potato Hills which forms the eastern boundary of the Dublin Gulch watershed. The majority of the Project site lies within the Dublin Gulch watershed. The Dublin Gulch stream is a tributary to Haggart Creek which flows to the South McQuesten River within the Stewart River sub-basin of the Yukon River Watershed.

The ground surface within the Project area is covered by residual soil and felsenmeer. Outcrops are rare, generally less than two percent of the surface area, and are limited to ridge tops and creek walls. Lower elevations are vegetated with black spruce, willow, alder and moss, and higher elevations by sub-alpine vegetation. Patchy permafrost occurs on north-facing slopes.

The Project area has a northern continental climate which is characterized by moderate annual precipitation and a large temperature range. Summers are short and can be hot, while winters are long and cold with moderate snowfall. On an annual basis, total precipitation in the region is comprised of roughly 60% rainfall and 40 % snowfall noting proportions vary by elevation. For the component of annual precipitation realized as rainfall, roughly half of annual rainfall may be expected in June and July at the Project site. The mean annual temperature for the area (at the reference elevation of 1,125 m asl) is approximately -3.7°C (Lorax, 2017)



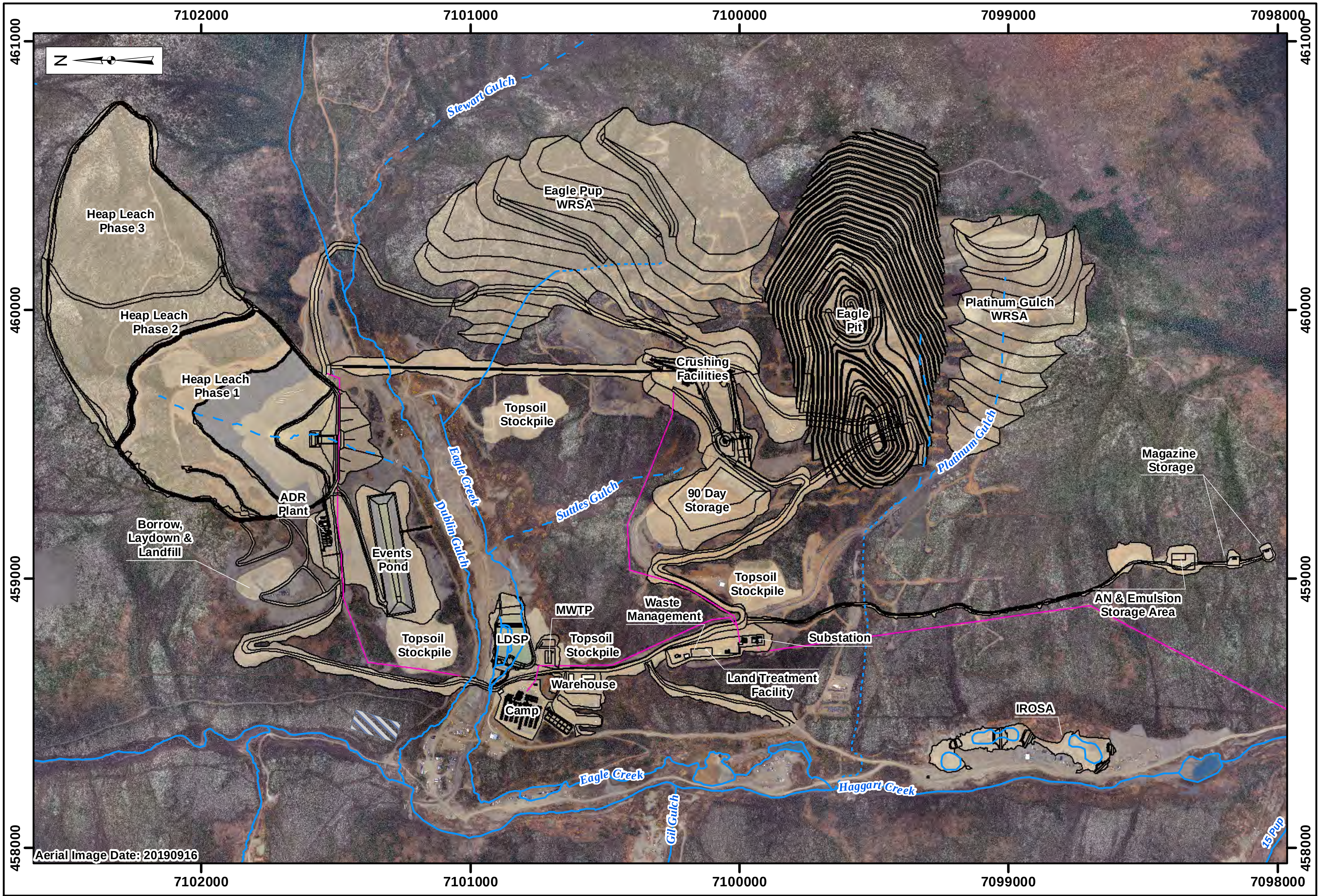
Legend:

- Eagle Gold Project
- StrataGold Claims
- Other Claims
- Town / Village
- Road
- Watercourse
- Category A Settlement Land
- Category B Settlement Land

Victoria GOLD CORP

0 3 6 12 Kilometres

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date: 2020/01/27	Figure: 4.1-1	Project Location



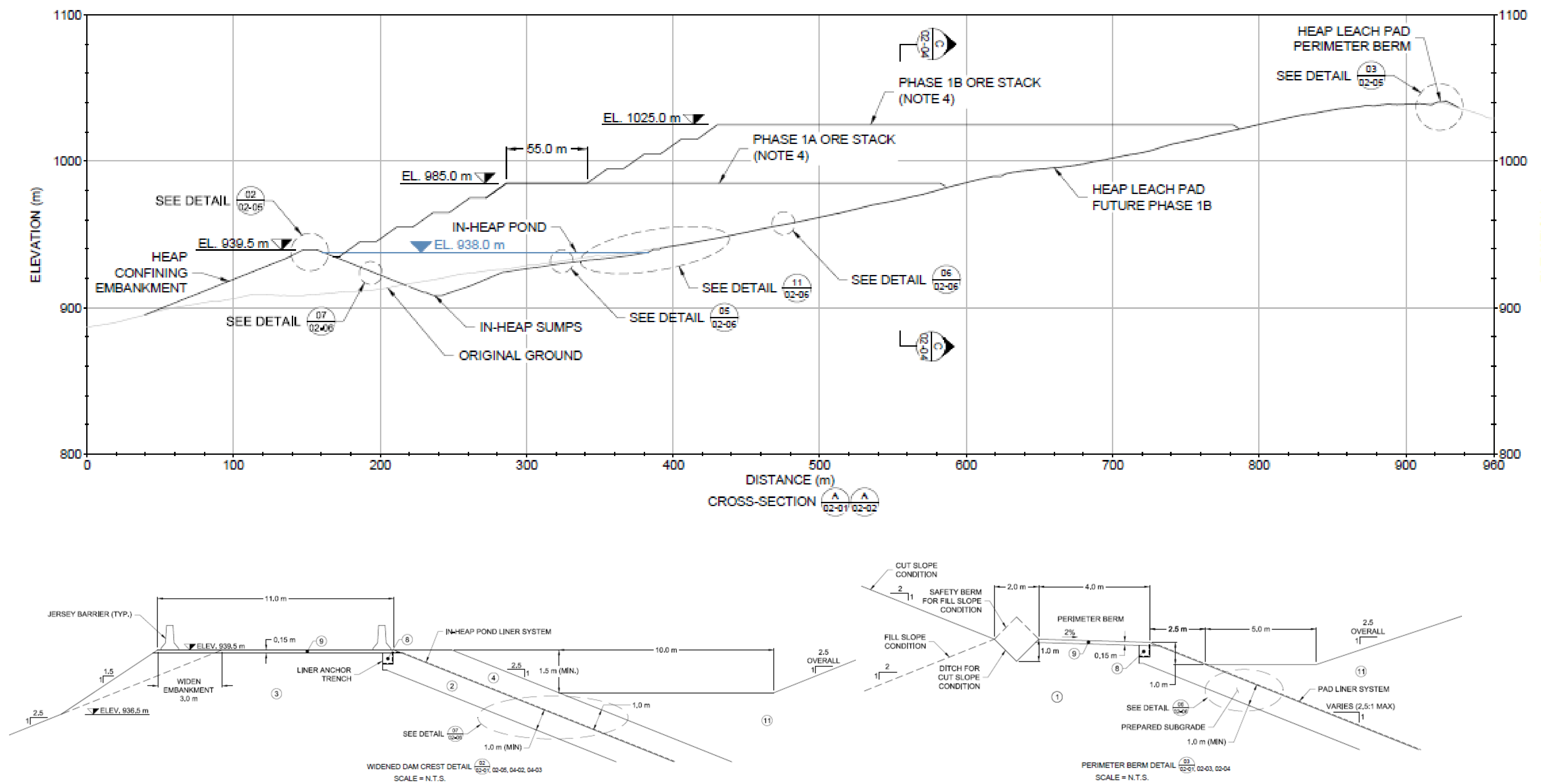
Legend:

- Facility
- Site Power
- Reserved Area
- Perennial
- Ephemeral
- Intermittent

Victoria GOLD CORP

0 125 250 500
Metres

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 UTM Zone 8N	HC	
Date: 2020/01/27	Figure: 4.1-2	Site General Arrangement



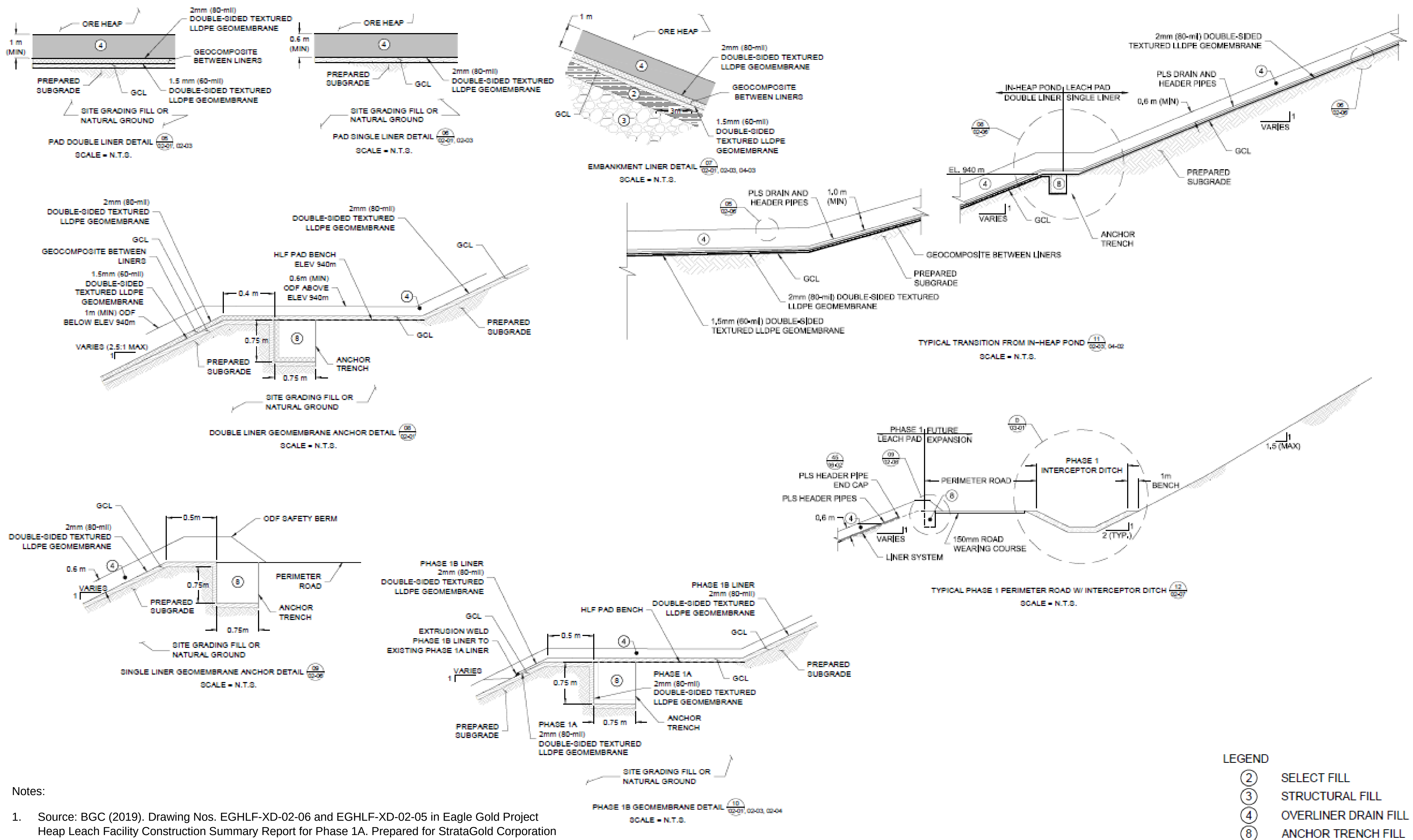
LEGEND

1. SITE GRADING FILL
2. SELECT FILL
3. STRUCTURAL FILL
4. OVERLINER DRAIN FILL
8. ANCHOR TRENCH BACKFILL
9. ROAD WEARING COURSE
11. ORE STOCKPILE

Notes:

1. Source: BGC (2019). Drawing Nos. EGHLF-XD-02-03 and EGHLF-XD-02-05 in Eagle Gold Project Heap Leach Facility Construction Summary Report for Phase 1A. Prepared for StrataGold Corporation September 24, 2019.
2. See Drawing EGHLF-XD-00-02 of BGC 2019 for general notes, abbreviations, legend and fill types.
3. Future phases of the pad and ore stack are not designed.
4. The HLF Pad was constructed to the limits of Phase 1A to approximate elevation 990m. Future phases of the facility are shown for reference only.
5. Ore stacking plan (by others) may results in ore heap stack limits different from shown here. Phases 1A/1B ore stacks are representative of first eight quarters developed by Forte Dynamics, Inc.
6. Required conveyor ramps on ore heap stack not shown.
7. Maximum overall heap ore stack oustlope of 2.5H:1V shown. Ore will be stacked at angle of repose with benches necessary to achieve the overall maximum outslope angle.
8. Drawings may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings.

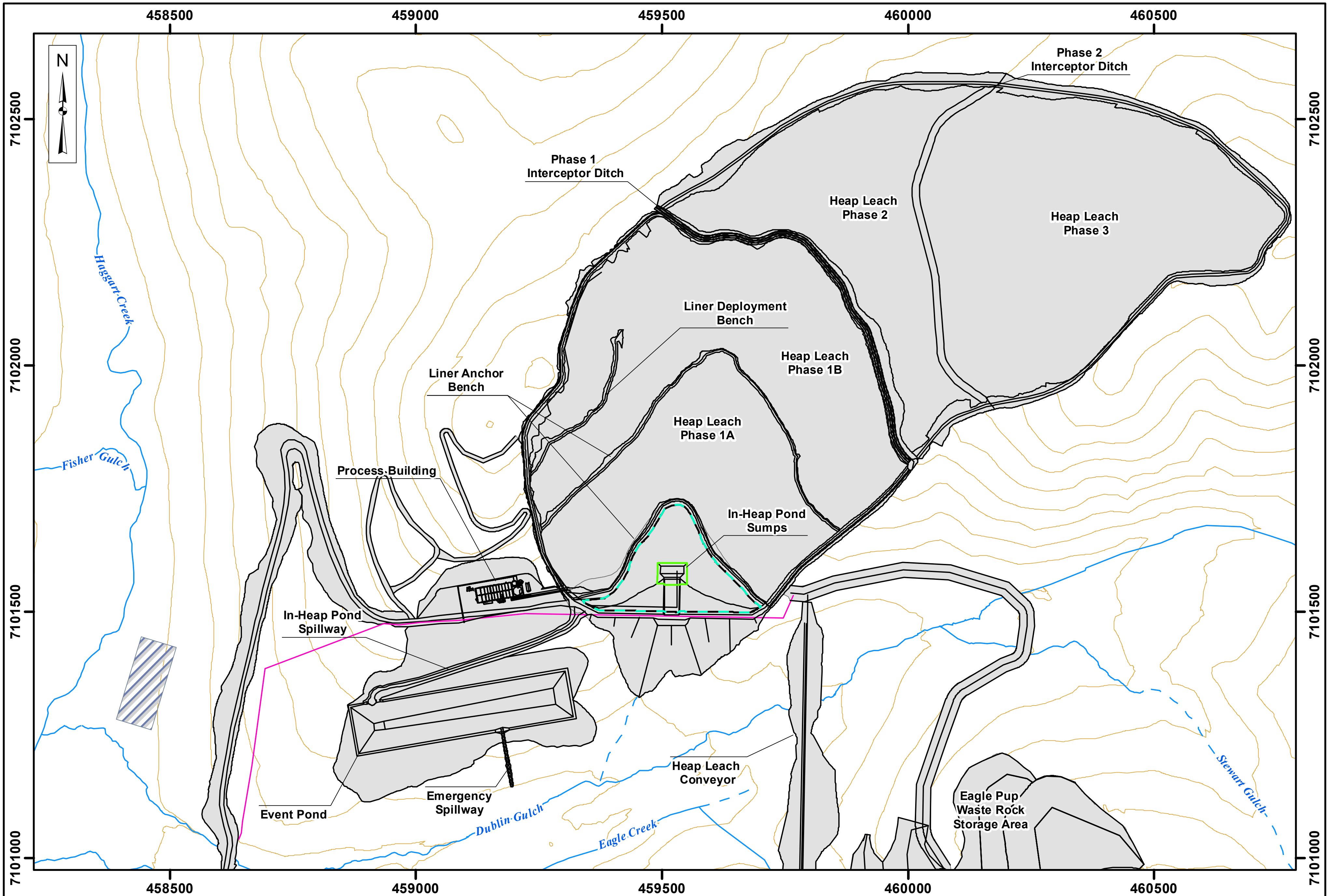
Figure 4.3-1: Heap Leach Facility Cross Section and Corridor Typical Sections



Notes:

1. Source: BGC (2019). Drawing Nos. EGHLF-XD-02-06 and EGHLF-XD-02-05 in Eagle Gold Project Heap Leach Facility Construction Summary Report for Phase 1A. Prepared for StrataGold Corporation
2. See Drawing EGHLF-XD-00-02 of BGC 2019 for general notes, abbreviations, legend and fill types.
3. Drawings may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings

Figure 4.3-2: Liner Details



Legend:

In-Heap Pond	Facility	Perennial	Reserved Area
Sump	Site Power	Ephemeral	Contour (25m)
		Intermittent	

Victoria GOLD CORP

0 75 150 300
Metres

Projection: NAD 83 UTM Zone 8N	Drawn By: HC	EAGLE GOLD PROJECT YUKON TERRITORY	
Date: 2020/01/27	Figure: 4.3-3	Heap Leach Facility Phases	

5 REGULATORY REQUIREMENTS

Regulations and permitting requirements for heap leach facilities in the Yukon Territory are not expressly stated; but rather, they have historically relied on regulations from other regions and on precedence established from other successful projects. Permitting considerations for the HLF either remain consistent with those proposed during the regulatory approvals process or, in some cases, have been revised to meet the conditions imposed by the Type A WUL QZ14-041-1 and to address stakeholder input received during the regulatory approvals process.

The Heap Leach Facility design standards adopted for the project include:

- The regulatory requirements of Yukon and Canada;
- The YWB Licensing Guidelines (2009). The referenced guidelines were considered during the initial assessment and licensing of the Project and have subsequently been revised by the YWB to acknowledge industry standards. The revisions to the YWB Licensing Guidelines (2012) allow for reliance on Canadian Dam Association Guidelines rather than specific hazard criteria imposed by the YWB. The criteria considered to date for the Project are more stringent than would be considered for a new project in Yukon;
- The requirements specified in the WUL issued for the Project;
- The requirements specified in the Quartz Mining Licence issued for the Project;
- Guidelines from the Canadian Dam Association (2013, 2014); and
- Permitting requirements of the State of Nevada. These are not regulatory requirements in the Yukon, but are considered as standards for best practice.

These documents are available on the mine operations network drive.

6 BASIS OF HLF DESIGN AND DESIGN CRITERIA

6.1 DESIGN REQUIREMENTS

There are currently no published international standards for the design and construction of the HLF. Guidelines from the State of Nevada State, where there is a preponderance of heap leach facilities, provide minimum standards for heap leach facilities and have been adopted for the Project. North American standards for the design of embankment dams were used where applicable, specifically the Canadian Dam Association (CDA 2014) guidelines. Table 6.1-1 summarizes the main technical and permitting requirements for the State of Nevada for the key elements of the HLF design.

Table 6.1-1: Summary of HLF Design and Permitting Requirements

Heap Leach Feature	Description
Leach Pad	System must have containment capability equal to or greater than that of a composite liner consisting of a synthetic liner over one foot of compacted soil at a permeability of 1 x 10^{-6} cm/s or 1 x 10^{-5} cm/s if a leak detection system is used beneath portions of the liner with the greatest potential for leakage Synthetic liners must be rated as having resistance to fluid passage equal to a permeability of less than or equal to 1 x 10^{-11} cm/s.
Solution Ponds	System must have a primary synthetic liner and a secondary liner that meet the above-described liner specifications. The synthetic liners must be separated by a fluid transmission layer which is capable of transmitting leaked fluids at a rate that will ensure that excessive head will not develop on the secondary liner.
Solution Management and Containment	Process components must be demonstrated to have the capacity to “withstand” the runoff from a 100-year, 24-hour precipitation event. In addition, facility fluid management systems must demonstrate the capability of remaining “fully functional and fully contain all process fluids including all accumulation resulting from a 25-year, 24-hour precipitation event. The foregoing standards are minimal and additional containment capacity may be required if surface water bodies or human populations are in close proximity to the facility, or if groundwater is shallow.
Foundations	Consider static / dynamic loads and differential movement or shifting.
Construction QA/QC	Regulations require that each applicant develop and carry out a quality assurance and quality control program for liner construction. A summary of the QA/QC program must be submitted with as-built drawings after construction has been completed.
Neutralization of Spent Ore	Spent ore, whether it is to be left on pads or removed from a pad, must be rinsed until it can be demonstrated either the remaining solid material, when representatively sampled does not contain levels of contaminants that are likely to become mobile and degrade the waters of the state under the conditions that will exist at the site, or, the spent ore is stabilized in such a manner as to inhibit meteoric waters from migrating through the material and transporting contaminants that have the potential to degrade the waters of the state.

6.2 DESIGN BASIS

As the Project has been subject to numerous regulatory reviews (commencing in 2010 and are ongoing to satisfy various regulatory requirements), the YWB Licensing Guidelines for Type A Quartz Mining Undertakings that were available when the Project was introduced, is still considered for the design basis to ensure that regulatory decisions throughout the design development life are based on a consistent framework and followed. The specific guidance for selected mine site earthworks facilities at that time (which have since been revised to rely more on industry standard practices rather than specific directives that do not relate to consequence categories as determined under Canadian Dam Safety Guidelines), were as follows:

"General: Type A quartz mining undertakings may vary significantly in their magnitude and in the potential environmental effects associated with them. The guidelines contained in this document assume the development of a mine with significant potential environmental impacts such as those resulting from acid rock drainage or the failure of a large tailings impoundment. Projects such as this are considered to fall into the Very High Consequence of Failure category described in the Canadian Dam Safety Guidelines (January 1999). In situations where this category is not appropriate for some reason, the Board is prepared to consider well developed and documented justification for the use of alternative consequences of failure criteria developed in accordance with the Canadian Dam Safety Guidelines."

The latest version of the CDA guidelines (2013), including the Application of Dam Safety Guidelines to Mining Dams Technical Bulletin, were used for the Project. Further, specific design guidance, which references older guidelines, is included as follows:

- The design, construction, operation, maintenance and surveillance of dams and associated water management structures should be carried out in a manner which is consistent with the recommendations contained in the Canadian Dam Safety Guidelines (January 1999) for the Very High Consequence Category, unless compelling reasons consistent with the Canadian Dam Safety Guidelines for a lower consequence category are provided.
- Long-term dams and associated water management structures should be designed to withstand the Maximum Credible Earthquake (MCE) and pass the Probable Maximum Flood (PMF). Shorter term structures may be built to lesser standards but a compelling rationale for the selected criteria must be provided.
- Heaps should be designed to have a minimum factor of safety under static loading of 1.3 for short term cases (i.e. within the mine life) and 1.5 for long term cases (i.e. abandonment) as described in the Investigation and Design of Mine Dumps (British Columbia Mine Dump Committee, 1991). The factor of safety for dams should be as recommended in the Canadian Dam Safety Guidelines (January 1999).
- Designs for dams and associated water management structures, rock dumps, and heaps should recognize the probable presence of permafrost and should include appropriate measures to manage permafrost and maximize the stability of the structures consistent with recommendations contained in the Canadian Dam Safety Guidelines (January 1999).

BGC (2017b) performed a dam breach analysis to provide input into evaluating the HLF embankment hazard classification, per Canadian Dam Association (2013) guidelines. The results confirm that the confining embankment can be classified as a Significant dam (i.e., there is no permanent population or infrastructure at risk in the inundation path, and restoration of fish and wildlife habitat is highly possible). Nevertheless, the environmental assessment, and subsequently the WUL, for the Project imposes an Extreme dam classification (the most stringent possible) for hydrologic and storage criteria. Thus, the Extreme hydrologic and storage criteria were used for the HLF design. A requirement to impose more conservative geotechnical criteria beyond those specified in the CDA guidelines were not included in the Yukon regulatory process; nevertheless, geotechnical criteria applied here assume a High hazard dam classification. The dam classifications used here also consider the input from the Application of Dam Safety Guidelines to Mining Dams (CDA 2014), and have been vetted during consideration and consultation between owner and regulators.

6.3 ENGINEERING DESIGN CRITERIA

The parameters and criteria presented in Table 6.3-1 below form the basis of design for the HLF. Geotechnical design criteria were developed by BGC while ore parameters were provided by VGC or other consultants working on the Project.

Table 6.3-1: Summary of HLF Design and Permitting Requirements

General	Quantity/Criteria
Heap ore capacity	86 Mt
Ore processing	Estimated 10.8 Mt/a of crushed ore p.a. Three-stage crushing to 6.5 mm (P_{80}) - primary crushing 365 days (29,500 tpd), secondary/tertiary 275 days per year (39,154 tpd)
Leach pad type	Permanent, multiple lift
Stacking Rate	Approximately 40,000-45,000 tpd
Stacking method	Conveyor-stacker or alternate
Stacked dry density of ore	Initial - 1.7 t/m^3
Stack / lift height	Nominal 10 m lifts
Overall slope angle of stacked ore	2.5:1 (H:V), 22 degrees
Ore Setback	5 m from perimeter road 10 m from dam
Leach schedule	365 days per year
Solution application method	Drip emitters (buried during cold weather)
Solution application rate	10 L/hr/m^2 (7 L/hr/m^2 nominal operations application rate)
Total leach cycle time	90-day primary leach (45-day primary leach planned for operations)
Solution application flow	1,500 m^3/hour nominal operations rate, additional capacity available for additional dynamic storage purposes
Geotechnical Stability	**Quantity/Criteria**
Design Basis Earthquake (DBE)	PGA = 0.25g (1 in 2475-year return period; applies to the operational condition of the HLF only; does not apply to the confining embankment
Maximum Design Earthquake (MDE)	PGA = 0.35g (corresponds to the Maximum Credible Earthquake or MCE event); applies to the confining embankment and long-term stability of the post-closure heap pile
Minimum embankment Factor of Safety	Static Loading - 1.5 (impounding), 1.3 (non-impounding), Seismic Loading - 1.0 (use pseudo-static methods)
Permafrost	Ice-rich materials encountered in the embankment foundation will be removed; ice-rich material in the pad or pond foundations, if thaw unstable, will be removed.
Confining Embankment	**Quantity/Criteria**
General	To provide stable confinement of the ore and create a In-Heap Pond

Overflow spillway	Sized to pass the PMF peak flow with 0.5 m of freeboard assuming heap storage is at capacity at the start of the event.
Groundwater	**Quantity/Criteria**
General	A drainage system is required beneath the liner system to control groundwater pressures. The system is to collect and monitor groundwater in a controlled manner before discharge downslope of the containment embankment if discharge criteria from QZ14-041 are met.
Pad Liner System	**Quantity/Criteria**
Overliner Drain Fill (ODF)	Crushed clean rock to provide a free draining layer under the placed ore and to protect the lining system from damage by ore placement while not impacting the conveyance of solution to the recovery wells. ODF will consist of a minimum 1.0 meter thickness (within the In-Heap Pond, minimum of 0.6 m otherwise) of minus 38 mm clean durable rock with less than 20 percent passing the No. 4 ASTM sieve size, and less than 5 percent fines passing the No. 200 ASTM sieve size and minimum in place hydraulic conductivity of $2x10^{-4}$ m/s.
Geosynthetic (geomembrane) Liner	Suitable liner material to provide required puncture resistance, elastic strain range and resistance to solution attack and chemical breakdown along with cold weather performance for the Project's climate conditions (refer to LLDPE project standard specifications).
Geosynthetic Clay Liner (GCL)	Geosynthetic clay liner below the geosynthetic liner to provide a composite liner to minimize leakage. Objective maximum permeability 1×10^{-5} cm/s or 1×10^{-6} cm/s in the absence of a leachate detection and removal system.
Leachate collection and recovery system	A system to collect leachate and convey it to solution recovery wells. System to comprise ODF and a network of collection pipes to convey solution to the In-Heap Pond area while limiting solution head on liner.
Leak detection and recovery system (LDRS)	A system within the In-Heap Pond and Events Pond to collect leakage through the composite liner and convey it to monitoring points. The system to comprise geonet or similar synthetic drainage product to collect and convey any leaked solution to a gravel filled sump and pumping system.
LDRS monitoring	Monitoring of the flow into the LDRS to ensure that allowable rates (determined by permitting authorities) are not exceeded.
Solution Recovery Wells	**Quantity/Criteria**
General	Solution is to be recovered from the heap through inclined well casings equipped with submersible pumps installed in the In-Heap Pond solution storage area along the upstream dam slope. Adequate access for installing and recovering pumps from well casings will be provided on the dam crest.
Events Pond	**Quantity/Criteria**
General	The purpose of the Events Pond (constructed downstream of the embankment) is to temporarily store excess inflows that cannot be stored in the In-Heap Pond. Any overflow into the events pond will be evacuated, and used as make-up water, as fresh ore is added to the HLF. During the initial heap operation, the Events Pond may also be used as temporary storage for make-up water. Otherwise, the Events Pond will be kept dry.
Overflow spillways	Sized for routed PMF peak flow with 0.5 m of freeboard.
Storage Capacity	Sized to contain the runoff volume from PMF event assuming the In-Heap Pond is full.
Liner system	Lining to comprise a double composite geosynthetic liner system with LDRS

7 HEAP LEACH FACILITY OPERATIONS

The HLF will be progressively developed over the life of the Project (Figures 7.1-1 to 7.1-3). Ore will be mined and delivered to the primary crusher at a rate of 29,500 t/d (10.76 Mt/a). The secondary and tertiary crushing system, conveyors and portable stacking system are designed to crush and place ore at a rate of 39,200 t/d. The operation of the heap leach pad involves loading the pad at a rate of approximately 29,500 tonnes/day during Year 1 then 39,154 tonnes/day thereafter (for 275 loading days/year) with 10 m lifts, and distributing leach solution at a nominal rate of 1,500 m^3/hr or a unit rate of 7 L/hr/m^2.

7.1 PAD LOADING

The HLF conveyor system is operated during an approximately 275 day per year period (i.e., approximately March to November) using a conveyor stacking system in combination with trucks and dozers as needed. The 90-day primary crushed ore stockpile is fed to the secondary and tertiary crushing- system once stacking operations resume during the 275-day period. This no staking period is an operational cold weather buffer and it is likely the operation will convert to year-round stacking if deemed technically prudent. The planned heap stacking system will include:

- A series of overland conveyors;
- Grasshopper-type portable transfer conveyors;
- A mobile bridge conveyor;
- A radial stacking conveyor; and/or
- A combination of small trucks and a dozer.

The HLF feed conveyors are installed adjacent to the heap leach pad, and then extend as needed around the eastern circumference pad. The grasshopper conveyors transport ore from the overland conveyors to the bridge conveyor.

Lime is added to the ore following tertiary crushing during conveyance to the HLF at a target rate of approximately 1-2 kg/tonne to control pH in the solution.

Ore is placed in lifts using the radial stacker and/or some combination of small tucks and a dozer.

Bench widths of 10 m have generally been included between each successive lift of ore placed on the heap, such that an overall 2.5H:1V maximum heap slope results. Ore will be placed such that:

- Ore is not placed outside limits of liner;
- Ore loading will occur in an up-slope direction where possible;
- The maximum slope must not exceed the general design slope of the middle section of the heap of 2.5:1;
- Ore placement on the overliner is not damaging the ODF or underlying solution collection pipework or liner system;
- Ore being placed generally meets the characteristics used as a basis for design; and
- New ore is not placed on snow with accumulations of greater than 100 cm in thickness; excess snow will be pushed to designated snow collection areas (that are free of vegetation and include a sediment trap

to capture any ore entrained in the snow) to allow continuation of ore placement. Alternately ore with snow will be ripped with dozer prior to stacking on top.

- Deviations from the above criteria will be reviewed for appropriateness and when required the Engineer of Record will be consulted for review.

For areas of the heap that are under leach in the winter months, the leach lines will be "ripped in" to the ore and covered to prevent freezing. To insulate larger piping, an additional insulation cover and crushed ore may be placed in stockpiles on the heap and spread by dozers to facilitate rapid placement and spreading of the ore.

7.2 ORE STACKING PLAN

The heap leach stacking plan was designed in coordination with the mining plan to efficiently schedule ore stacking and leaching over the LOM. The stacking plan is based on a loading rate of approximately 29,500 tonnes/day during Year 1 then 39,154 tonnes/day thereafter for 275 loading days, or more, per year.

Figures 7.1-1, 7.1-2 and 7.1-3 illustrate the leach pad development plan through the LOM.

7.3 SOLUTION DELIVERY AND LEACHING

Barren cyanide solution is applied to the ore stacked on the HLF to extract the gold. After passing through the stacked ore, the gold-bearing PLS drains to the In-Heap Pond where it is recovered by the PLS pumps and pumped to the ADR facility for processing.

7.3.1 Barren Solution Delivery

A series of barren solution pumps located at the ADR facility pump solution to the heap leach pad. Pressure piping is dual contained at all times. Fresh sodium cyanide solution is added at a rate of approximately 0.42 kg/tonne NaCN and adjusted as required (see Cyanide Management Plan). Anti-scalants are also added as needed following the barren solution tank at the ADR plant, prior to the barren solution pumps. The primary supply line tracks along the west side of the HLF and is located a safe distance from the service roads and conveyors. All pipe crossings are to be maintained to prevent crushing of the double lined pipes or damage to the liner.

7.3.2 Leaching

A series of pipe headers distribute the solution to secondary and tertiary headers, and ultimately to drip emitters within the ore stack. During the summer months, barren solution is applied to the heap with drip emitters laid on top of the ore. During the cold winter months, the solution is applied with drip emitters buried to a depth of approximately 1 m. Leaching operations are to be conducted such that:

- All pipe crossings are operated to prevent crushing of the pipes;
- Solution distribution lines are working properly;
- There is no or minimal ponding of leach solution on the heap surface;
- Alkalinity of the leachate solution will be maintained at a target of 10.5 pH, with an acceptable range of 10.0 to 11.2; and
- Any major leaks in the pipes will be repaired.

7.3.3 In-Heap Pond

The In-Heap Pond, created by the embankment, is designed to be a saturated zone within the lower extent of the HLF ore pile, with a currently assumed available storage capacity up to 74,565 m^3 of solution above the typical occupied operational volume. Typically, the In-heap Pond occupied operational volume will be about 52,200 m^3 (this volume is calculated to include a sufficient amount to keep the sump full and prevent pump cavitation plus the volume of moisture held in pore spaces above the operational level that would be expected under normal conditions). In general, the water level in the In-Heap Pond will be maintained as low as practical to maximize available capacity for storm events and to ensure that solution is constantly available for the ADR process and the subsequent production of gold. Up to three vertical turbine pumps (plus backup capacity) will be used to advance the PLS to the ADR plant at a nominal rate of 1,500 m^3/h.

If the solution storage capacity of the In-Heap Pond is exceeded due to an extreme climatic event, the overflow is directed to the Events Pond. The capacity of the Events Pond is 299,900 m^3 to the spillway invert at elevation 894.5m with a total capacity of 340,400 m^3 to the crest elevation of 895.5m. The combined storage volumes of the In-Heap Pond and Events Pond (to the spillway inverts) for solution management above the occupied operational volume of the In-heap Pond is a total of 374,465 m^3.

In the event of an emergency, or other unforeseen circumstance, in which pumping of solution ceases, or in the event of excessive surface runoff from the heap leach pad, discharge of excess water or solution will be directed in a controlled manner through the lined spillway to the Events Pond. Solution levels within the In-Heap Pond are expected to be kept low during normal operations. However, during emergency situations, the HLF spillway will prevent overtopping of the embankment, and will maintain containment of solution. The HLF spillway is designed to safely convey the flow from the Probable Maximum Flood (PMF) event to the Events Pond.

The HLF Contingency Water Management Plan (HLF CWMP) describes water management methods such as the use of in-heap dynamic storage, the use of excess solution evaporation and sublimation, snowpack management, solution treatment and release to safely control water levels in the HLF. The HLF CWMP includes specific triggers for implementing management strategies to address excess water in the HLF that could result in a potential release to the environment.

The WUL for the Project mandates specific volumes that must be available for the management of upset events (i.e., the Desired Available Storage). The specific triggers, which are based on maintaining solution storage capacity of concurrent extreme events whilst retaining freeboard volume within the Events Pond, which are phase dependent, have been developed based on the WUL conditions as shown in Table 7.3-1.

Table 7.3-1: 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)	Allowable 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%

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)	Allowable Percentage Full of Events Pond
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.

The percentage full levels for the Events Pond will be clearly marked on the Events Pond Liner so that basic visual inspection will inform all personnel that contingency actions, as considered in the HLF CWMP (Contingency Water Management Plan), need to be taken.

The measure considered in the HLF CWMP provide flexibility and management of solution options for operators.

7.4 HEAP LEACHING CYCLE

Table 7.4-1 illustrates a heap leaching cycle from initiation through the LOM.

Table 7.4-1: Heap Leaching Plan

Lift No.	Elevation (m)	Mine Year	Primary Leach (days from start of stacking)	Days Leached	Secondary Leach (days from start of stacking)
High Perm Area	930	1	212.00	19	231
Intermediate Liner	935	1	212.00	19	231
Lift 1	945	1	273.00	19	292
Lift 2	955	1	304.00	9	313
Lift 3	965	1	344.00	19	363
Lift 4	975	1	396.00	39	435
Lift 5	985	1	548.00	19	567
Lift 6	995	1	597.00	30	627
Lift 7	1005	1	658.00	40	698
Lift 8	1015	2	731.00	42	773
Lift 9	1025	2	811.00	45	856
Lift 10	1035	2	993.00	45	1038
Lift 11	1045	3	1105.00	45	1150
Lift 12	1055	3	1317.00	45	1362
Lift 13	1065	3	1461.00	45	1506
Lift 14	1075	4	1673.00	45	1718
Lift 15	1085	4	1805.00	45	1850
Lift 16	1095	5	2009.00	45	2054
Lift 17	1105	5	2131.00	45	2176

Lift No.	Elevation (m)	Mine Year	Primary Leach (days from start of stacking)	Days Leached	Secondary Leach (days from start of stacking)
Lift 18	1115	6	2242.00	45	2287
Lift 19	1125	6	2435.00	45	2480
Lift 20	1135	7	2536.00	40	2576
Lift 21	1145	7	2637.00	45	2682
Lift 22	1155	7	2800.00	30	2830
Lift 23	1165	7	2892.00	19	2911
Lift 24	1175	8	2962.00	30	2992
Lift 25	1185	8	3104.00	30	3134
Lift 26	1195	8	3165.00	19	3184
Lift 27	1205	8	3214.00	12	3226
Lift 28	1215	9	3266.00	30	3296
Lift 29	1225	9	3306.00	30	3296

Based on the current leaching plan, the majority of the lifts will be leached for the design leaching cycle (45 d). The first several lifts will experience a reduced leach cycle time, as additional lifts are progressively stacked on top before the full leaching cycle is complete. These lifts will have reduced leaching cycle times and consequently have some impairment in gold recovery. The shortened leaching cycle for these lifts will result in some leachable gold remaining in the ore and will simply take longer to leach out of the heap. The remaining gold will continue to complex and will be recovered when the heap leach pad is rinsed.

7.5 COLD WEATHER CONSIDERATIONS

The following parameters have been incorporated and built into the HLF to provide for year-round heap leaching activities:

- selected an in-valley heap configuration to create a heat sink
- selected a south facing valley
- use of an In-Heap Pond for PLS storage
- sizing of the fine ore crushing operation to allow increased production rate during warm months
- ore stacking on the heap leach pad during the warm season (275 d)
- storing ore on the ore storage pad during the winter season

The process pumping and solution delivery system includes pumps, pipelines, valves, and associated controls to move solution between the ADR plant and the HLF. The system includes the following provisions for year-round operation:

- buried emitters (ripped in by dozer) to an approximate 1 m depth
- barren solution tank located within the ADR plant
- heat traced and insulated (or buried) pipelines as needed

- heating of barren solution is not anticipated for winter operations, but will be further evaluated as operations advance, with measures in place to heat solution if needed.
- barren and PLS solution temperature monitoring
- generators for backup power supply to pumps and emergency process equipment as described in the HLF Contingency Water Management Plan and HLF Emergency Response Plan.

As an additional cold weather consideration, throughout the winter, the snow water equivalent (SWE) on the HLF will be measured on a monthly basis to establish the volume of water that may enter the HLF during a melt event. In accordance with the HLF CWMP, this volume of water may be actively managed if the solution levels within the HLF indicate that the definitive Events Pond triggers would be reached. This management strategy is discussed further in the HLF CWMP and will benefit both the water balance for the facility and enhancing leaching efficiency. During excess snow accumulation years, and prior to melting or freshet conditions, snowpack accumulated on the flat surfaces will be pushed via dozer off to the sides and ends of the facility into larger piles that cover less area, which will delay the melt due to thermal process in larger snowpacks. Also, and as determined by the Process Manager based on snow management of the heap pad and trigger levels discussed in Section 9.2 with the In-Heap Pond and Events Pond, snow may be pushed via dozer off the facility out of the HLF catchment to adjacent designated snow storage locations that are free of vegetation. The designated snow storage locations much include a sediment trap to capture any ore entrained in the snow. In some cases, and depending on the volume of snowpack, temporary interceptor ditches could be developed that report to exfiltration sumps or exfiltration areas as necessary to minimize effects from runoff.

7.6 LEACHATE SOLUTION COLLECTION SYSTEM

The heap leach pad consists of two liner systems (see Figure 4.3-2), the up-gradient liner system and the lower, in-heap pond liner system. The lower section of the heap leach pad acts as an In-Heap Pond for the primary storage of PLS. Located above this liner system is a layer of drainage rock which has been designed to transmit the PLS to a collection system. This overliner drainage fill serves to efficiently transmit the PLS and protect the primary liner from damage by rocks and/or equipment which might come in contact with the liner.

The HLF drain pipes consist of corrugated dual-wall, perforated ADS N-12 PE pipes. A series of primary collector pipes are spaced approximately 25 m apart and arranged in a “herringbone” pattern to convey flows for collection in larger header pipes. Where slope lengths dictate, secondary collector pipes are installed to convey flows from the primary pipes to the header pipes.

Within the In-Heap Pond there will be five vertical turbine pumps, with up to three operating at any one time. The redundancy in installed pumps is based on the need for back up pumps during a maintenance event or an unplanned upset event. The inclined arrangement consists of five thick-walled, steel pipes, to allow for raising and lowering of a submersible pump. Each well has an outer casing connected to the collection lines, mechanical pump, and related electrical and control components. These wells and pumps serve to convey the pregnant solution to the process plant.

The Leachate Collection System pumping rates for ADR plant feed are operated such that appropriate solution depths in the HLF are maintained to prevent pump cavitation and to maintain storage volumes in the In-Heap Pond so that solution is maintained within the In-Heap Pond for all conditions other than upset events. Piezometers monitor these levels and are used confirm the low phreatic conditions during operations as described in section 9.2 Instrumentation and Monitoring below.

To maximize the efficiency of the ore's drainage and to minimize the potential for leakage through the pads' liner system, the hydraulic head above the liner was designed to be less than a maximum height of 0.6 m resulting in a minimum secondary pipe spacing ranging from 12 m to 17 m depending on the slope of the leach pad. The effects of the maximum load on the pipes were analyzed to verify acceptable deflections are not exceeded to ensure integrity of the pipes under operational conditions. Figure 7.6-1 provides an overview of the system.

7.7 LEAK DETECTION AND RECOVERY SYSTEM

A leak detection and recovery system (LDRS) is installed between the upper and lower geomembrane liners of the Events Pond and the In-Heap Pond. Any fluids that report to the LDRS drain to a monitoring sump equipped with an automatic, fluid level activated pump. The pump is sized to sufficiently remove fluids to minimize head on the secondary liner (Figure 7.7-1).

This LDRS allows for the detection, containment and pump back of any leakage resulting from a possible liner failure. The sump monitoring instruments provide early alerts to the presence of flow. Collected solution will then be pumped back to the HLF. Additional information on the monitoring of solution levels in the monitoring sump, as well as response to the presence of solutions, is included in section 9.2.3 LDRS Levels below.

7.8 EVENTS POND

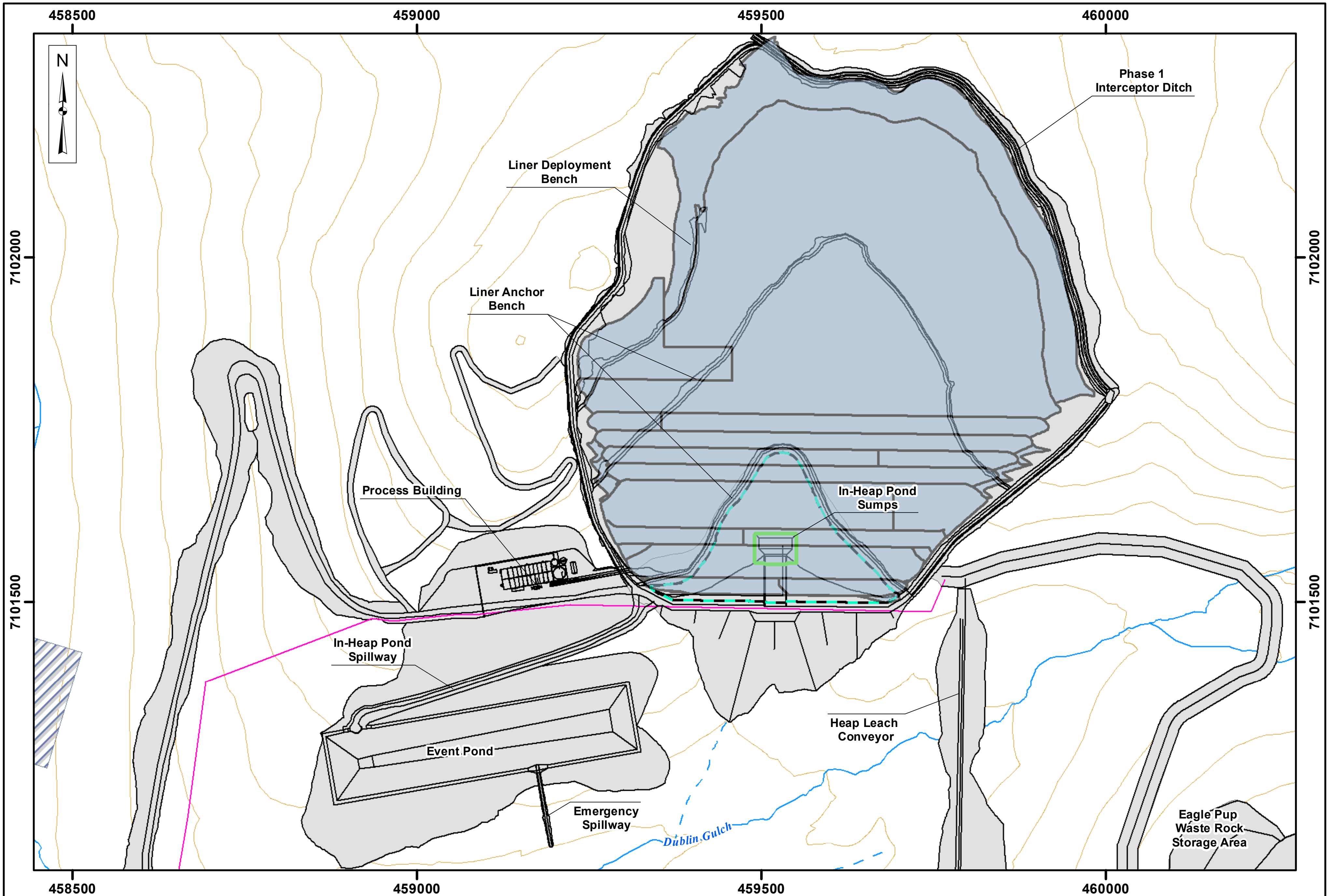
A lined Events Pond located downstream of the HLF (Figure 4.3-3) is constructed to temporarily store direct precipitation, process make-up water or excess process solution that may occur during upset conditions. The water or solution contained in this pond will be recycled back into the heap leach circuit as required to meet process make-up demands, when normal operation resumes or as dictated by the HLF CWMP (i.e., if the definitive Events Pond trigger indicate that the excess water/solution should either be placed in dynamic storage or treated and released). The pond has been sized to accommodate the PMF storm event from the ultimate HLF (all phases). The Events Pond includes leak detection and recovery within the liner system (see section 7.7).

7.9 OPERATIONAL HEAP LEACH MODEL

An operational heap leach water balance model will be used to help manage solution storage and operation of the ADR and HLF. The model will be used to evaluate HLF pad performance by tracking and predicting makeup water demands, and ensuring that an adequate volume of emergency pond storage (i.e., the phase dependent desired available storage) remains available.

The Process Manager is responsible for the operational heap leach water balance model, determining makeup water demand, ensuring a safe allocation of storage within the Events Pond and In-Heap Pond and for allocating water transfers from outside the system (i.e., from groundwater or the LDSP) to meet makeup water demand and to allow for determination of the monthly volume of solution within the HLF (including the Events Pond).Water transfers into the HLF (exclusive of potable water and water for gold elution) are not permitted when the Desired Available Storage volume is not available in the Events Pond (as per Table 7.3-1).

To ensure the Desired Available Storage is retained in the Events Pond, protocols or event pond triggers are set as described in Section 4.0 and listed in Table 4-1 of the HLF CWMP. To prevent exceeding the triggers, any meteoric water from the Events Pond that exceeds these triggers will be the first source utilized in the ADR Plant as makeup water. Use of the Events Pond for temporary storage of makeup water will be a tool available to the Process Manager, while following the appropriate protocols for each Phase of operations.



Legend:

Phase 1 (Lift 1-11)	Facility	Perennial
In-Heap Pond	Site Power	Ephemeral
Sump	Reserved Area	Intermittent

Contour (25m)

Victoria GOLD CORP

0 50 100 200
Metres

Projection: NAD 83 UTM Zone 8N

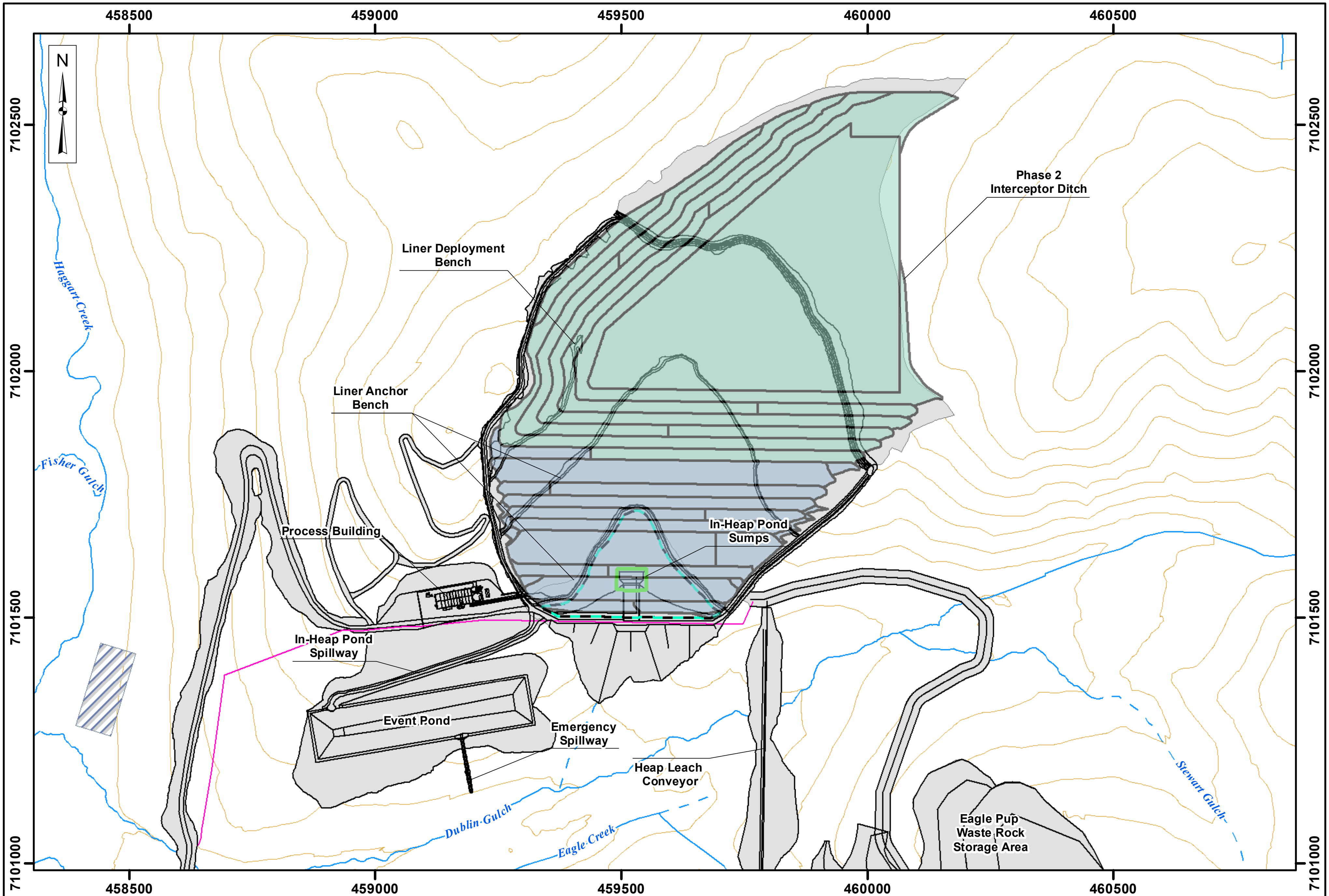
Drawn By: HC

Date: 2018/01/03

Figure: 7.1-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Heap Leach Facility
Phase 1



Legend:

Phase 1 (Lift 1-11)	Sump	Reserved Area	Ephemeral
Phase 2 (Lift 12-17)	Facility	Perennial	Intermittent
In-Heap Pond	Site Power		Contour (25m)

Victoria GOLD CORP

0 75 150 300
Metres

Projection: NAD 83 UTM Zone 8N

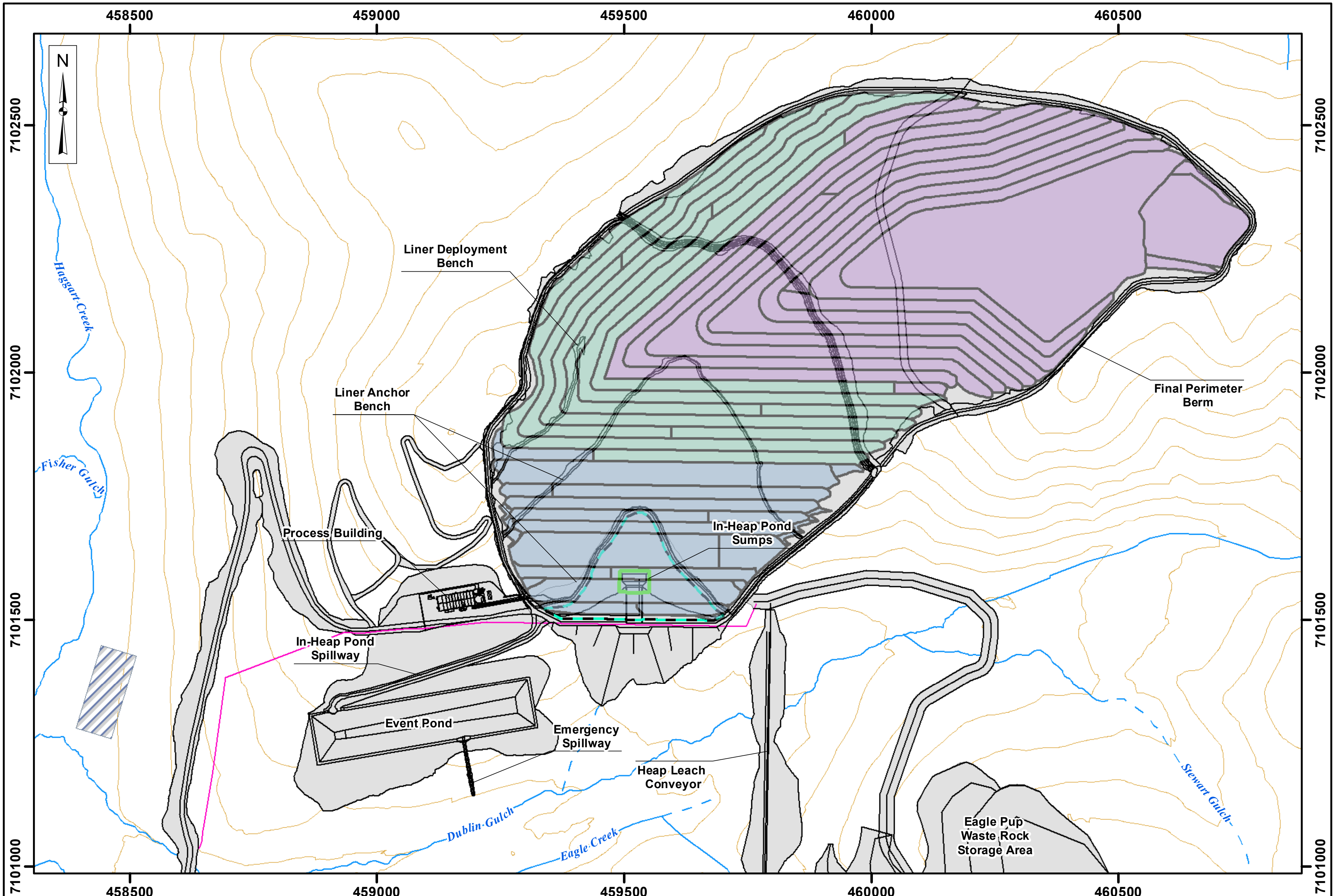
Drawn By: HC

Date: 2020/01/27

Figure: 7.1-2

EAGLE GOLD PROJECT
YUKON TERRITORY

Heap Leach Facility
Phase 2



Legend:

Phase 1 (Lift 1-11)	In-Heap Pond	Site Power	Ephemeral
Phase 2 (Lift 12-17)	Sump	Reserved Area	Intermittent
Phase 3 (Lift 18-29)	Facility	Perennial	Contour (25m)

Victoria GOLD CORP

0 75 150 300
Metres

Projection: NAD 83 UTM Zone 8N

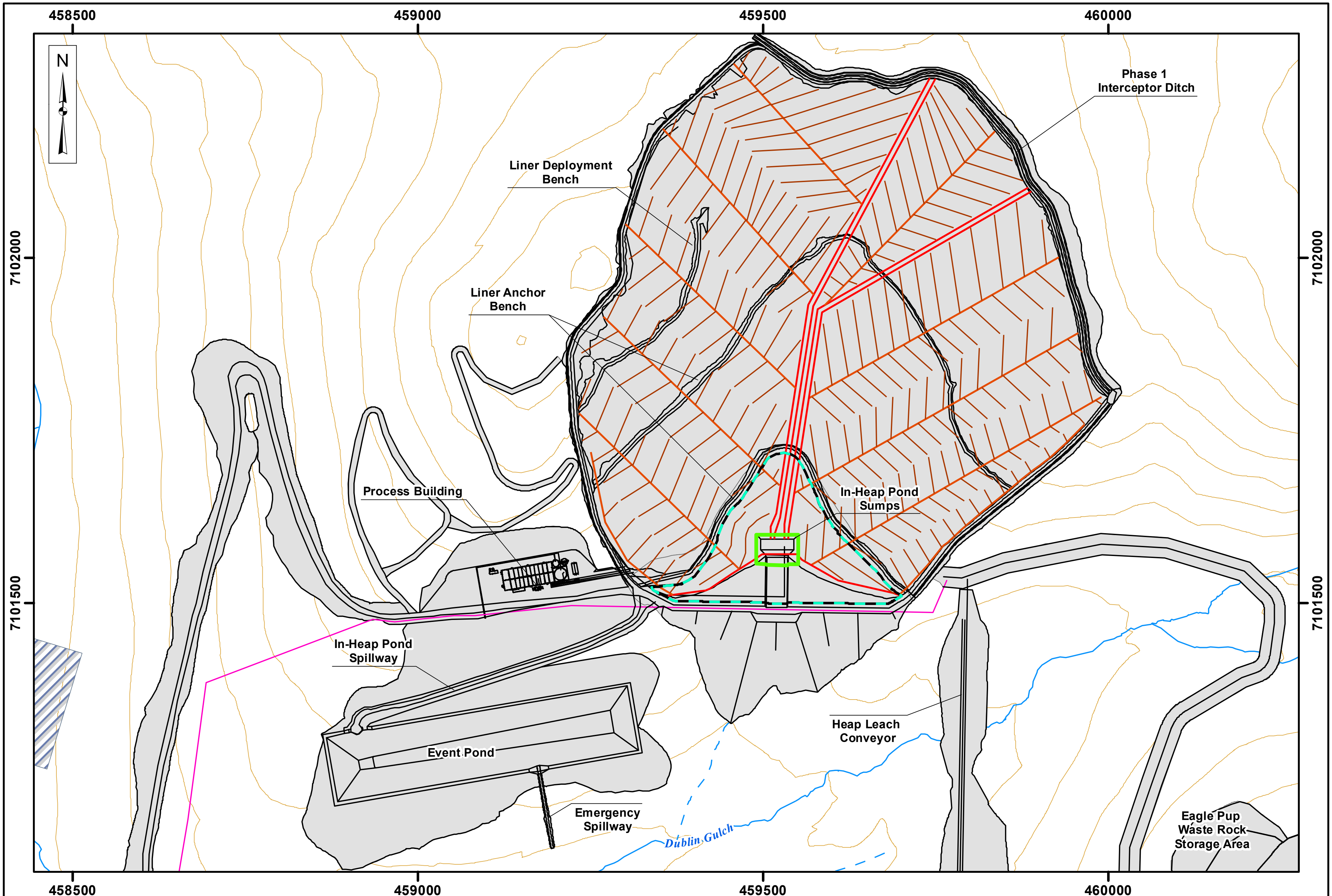
Drawn By: HC

Date: 2020/01/27

Figure: 7.1-3

EAGLE GOLD PROJECT
YUKON TERRITORY

Heap Leach Facility Phase 3 (LOM)



Legend:

Facility	PLS Drain Pipe 100 mm	Perennial
Site Power	PLS Header Pipe 250 mm	Ephemeral
In-Heap Pond	PLS Header Pipe 450 mm	Intermittent
Sump	Reserved Area	Contour (25m)

Victoria GOLD CORP

0 50 100 200
Metres

Projection: NAD 83 UTM Zone 8N

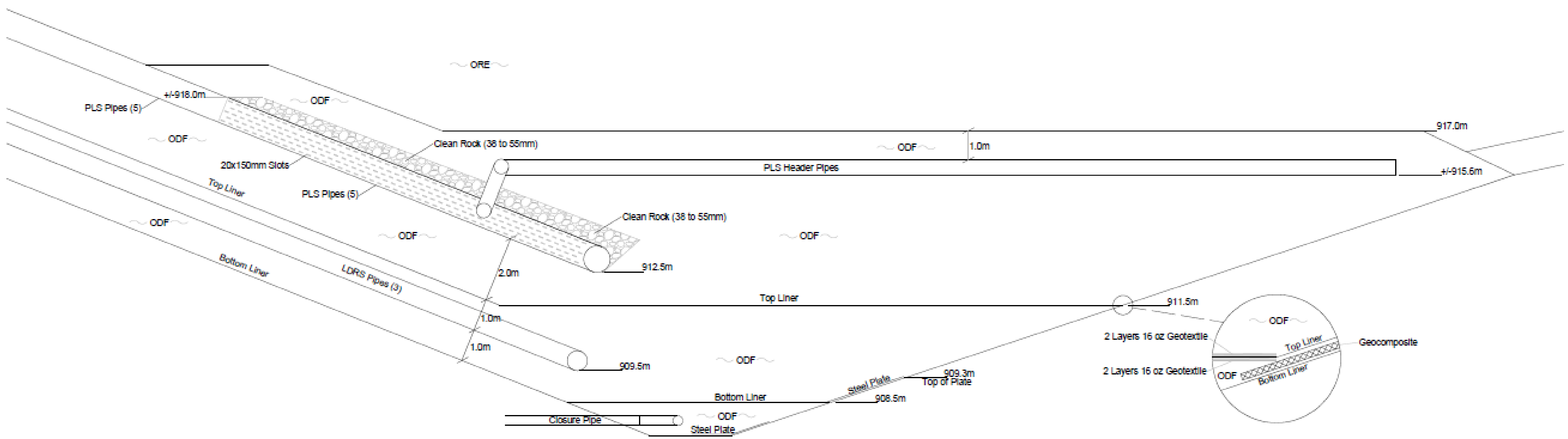
Drawn By: HC

Date: 2018/01/03

Figure: 7.6-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Heap Leach Facility
Phase 1 Solution
Collection System



Notes:

1. Source: BGC (2019). Drawing Nos. EGHLF-XD-02-06 and EGHLF-XD-02-05 in Eagle Gold Project Heap Leach Facility Construction Summary Report for Phase 1A. Prepared for StrataGold Corporation
2. See Drawing EGHLF-XD-00-02 of BGC 2019 for general notes, abbreviations, legend and fill types.
3. Rub sheet shall be installed under each steel casing with direct contact to the liner. Rub sheet shall consist of a 16 oz. non-woven geotextile and an additional layer of 2 mm (80-mil) double-side textured LLDPE geomembrane placed beneath each pump casing for liner protection. Temporarily secure rub sheet with sand bags as needed.
4. 2 m long concrete filled steel pipe anchor posts (each side of pump casing) embedded 0.9 m into concrete anchor to inhibit lateral movement and vertical settlement of riser.
5. All solid pipe fittings and connections to conform to AWWA C-906 standards.
6. Install 12.5 mm (0.5") thick steel plates on top of liner to protect during closure drilling. Steel plates are to be underlain with conveyor belt material or 16 oz. non-woven geotextile and the edges beveled to prevent puncturing or liner. Steel plate installed in closure sump to include an angle at the bottom to identify termination point for drilling. Steel plates are to be spaced 0.2 m apart to allow room for liner system between them.
7. Free-floating (low friction) pipe support to be installed at top of riser to allow for thermal expansion/contraction while inhibiting lateral movement and vertical settlement.
8. All connections between PE and steel pipe (and other connections as identified by the field engineer) shall be completely and securely wrapped with geocomposite to at least 500 mm on both sides of the connections.
9. Drawings may have been reduced or enlarged. All fractional scale notations indicated are based on original format drawings

Figure 7.7-1: Heap Leach Facility PLS Sump and LDRS Detail

8 HEAP LEACH FACILITY MAINTENANCE

The purpose of the HLF Maintenance Program is to ensure the individual facility components, and the entire facility as a whole, are operating as designed. Proper HLF maintenance will provide a safe working environment for employees; maximize precious metals recovery; and minimize the potential for events that would contribute to the requirement for the institution of contingency water management measures as considered in the HLF CMWP.

Maintenance of the HLF is the responsibility of the Maintenance Manager or designate with support from the Process Manager or designate. The Process and Maintenance Department includes personnel with the required qualifications to understand operating and maintenance manuals, assess conformance with HLF design or performance standards, complete routine or predictive maintenance tasks, and to adequately respond to event-driven maintenance requirements.

Figure 8.1-1 presents a general maintenance flowchart for the HLF. This flowchart presents a maintenance review process that will be applied to individual components to ensure the facility is operating as designed.

8.1 ROUTINE MAINTENANCE

HLF components that require routine assessment to determine if maintenance activities are required include:

- HLF embankment;
- Stacked ore pile;
- PLS recovery pumps;
- Accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, tanks, pipeline corridors, and other support facilities;
- Conveyors and radial stacker facilities;
- Instrumentation as appropriate; and
- Events Pond.

Regular maintenance procedures for the HLF components include the following:

- Regular inspection of the interceptor ditches and solution channels for accumulation of debris or sediment, and remove as appropriate.
- Pipeline corridors monitored for flows indicating leaks from pipes. Pipes will be repaired, as needed.
- Visually inspect the embankment for signs of erosion, leaks or slope movement. Repair erosion gullies, local slumps or slides in the embankment face. Report all signs of erosion, leakage or slope movement to a qualified geotechnical engineer as appropriate.
- Visually inspect the heap ore pile for signs of sliding, tension cracks, erosion or other signs of instability. Repair as appropriate. Slope maintenance includes any activities required to maintain the slope of the ore and preserve the integrity of structure along the toe of the slope. Report all signs of heap instability to a qualified geotechnical engineer as appropriate.
- Conduct routine inspections and maintenance of all pumps per manufacturer guidelines.

- Conduct routine inspections and maintenance of all instrumentation per manufacturer guidelines.
- Conduct routine inspections and maintenance of the conveyor systems and radial stacker per manufacturer guidelines.
- Visually inspect the visible portions of the HLF and Events Pond liners and make repairs to damaged sections as appropriate.
- Conduct routine inspections of the Events Pond. Remove any accumulated debris as appropriate. Make repairs to pond liners as appropriate. Remove any accumulated solutions, including stormwater runoff, within the specified timeframes as specified in the HLF CWMP to maintain required pond storage capacities.
- Conduct routine inspections of accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, and tanks.
- Perform regular non-destructive testing appropriate for components of the system including periodic measurement of pipeline thickness to identify areas of wear and to schedule pipeline replacement if necessary. Replace pipe work, bends and fitting components as required. Remove accumulated debris from valves, reducers and off takes. Carry out maintenance as recommended by fitting and valve suppliers, and regularly inspect major wear components.

8.2 EVENT DRIVEN MAINTENANCE

Potential event-driven maintenance items arising from pipeline leaks or breaks, earthquakes and floods are listed below.

8.2.1 Solution Collection and Delivery System Pipeline Leaks or Breaks

- Inspect entire pipeline;
- Repair or replace affected components;
- Perform opportune and scheduled maintenance;
- Repair any collateral damage caused by a leak or break;
- Collect any released or spilled solutions and return them to the HLF fluid management system; and
- Reclaim any disturbed areas as appropriate.

8.2.2 Earthquake Occurrence

- Inspect embankment for sign of distress due to deformation;
- Inspect embankment for signs of liquefaction (e.g. local sand boils, etc.);
- Inspect ore pile for signs of movement;
- Check LDRS leakage rates to determine if liner integrity has been compromised; and,
- Check underdrain flow rates and water quality to determine if liner integrity has been compromised.

8.2.3 Flood Event

- Monitor In-Heap Pond and Events Pond fluid levels.
- Measure freeboard in both the In-Heap Pond and Events Pond for compliance with design requirements and the HLF CWMP.
- Inspect embankment, solution and diversion ditches for signs of excessive erosion and repair if required; and,
- Inspect solution collection and delivery system for operational adequacy.

8.3 MAINTENANCE SCHEDULE AND SPARE PARTS

All electrical and mechanical components will be inspected and maintained as per manufacturer’s recommendation. A spare parts inventory will be maintained as recommended by equipment manufacturers and as required by the Owner.

8.4 DOCUMENTATION

Maintenance records of each component will be kept by the Process Manager or designate and will include:

- Up-to-date logs of in-service equipment and facilities;
- Maintenance schedules;
- Maintenance history;
- Inspection logs;
- Repair reports including cost;
- Quality control records;
- Photographs, videos of repair issues;
- Inventory of spares, materials, tools and equipment; and
- Critical spares list.

8.5 REPORTING

A Maintenance Report will be prepared monthly, or as required, by the Maintenance Manager or designate and will include:

- Completed work;
- Updated maintenance log and schedule;
- Progress on partially completed work that has been halted for some reason;
- Items not requiring maintenance and why;
- New items or conditions requiring maintenance; and,
- Cause of any neglected or late maintenance.

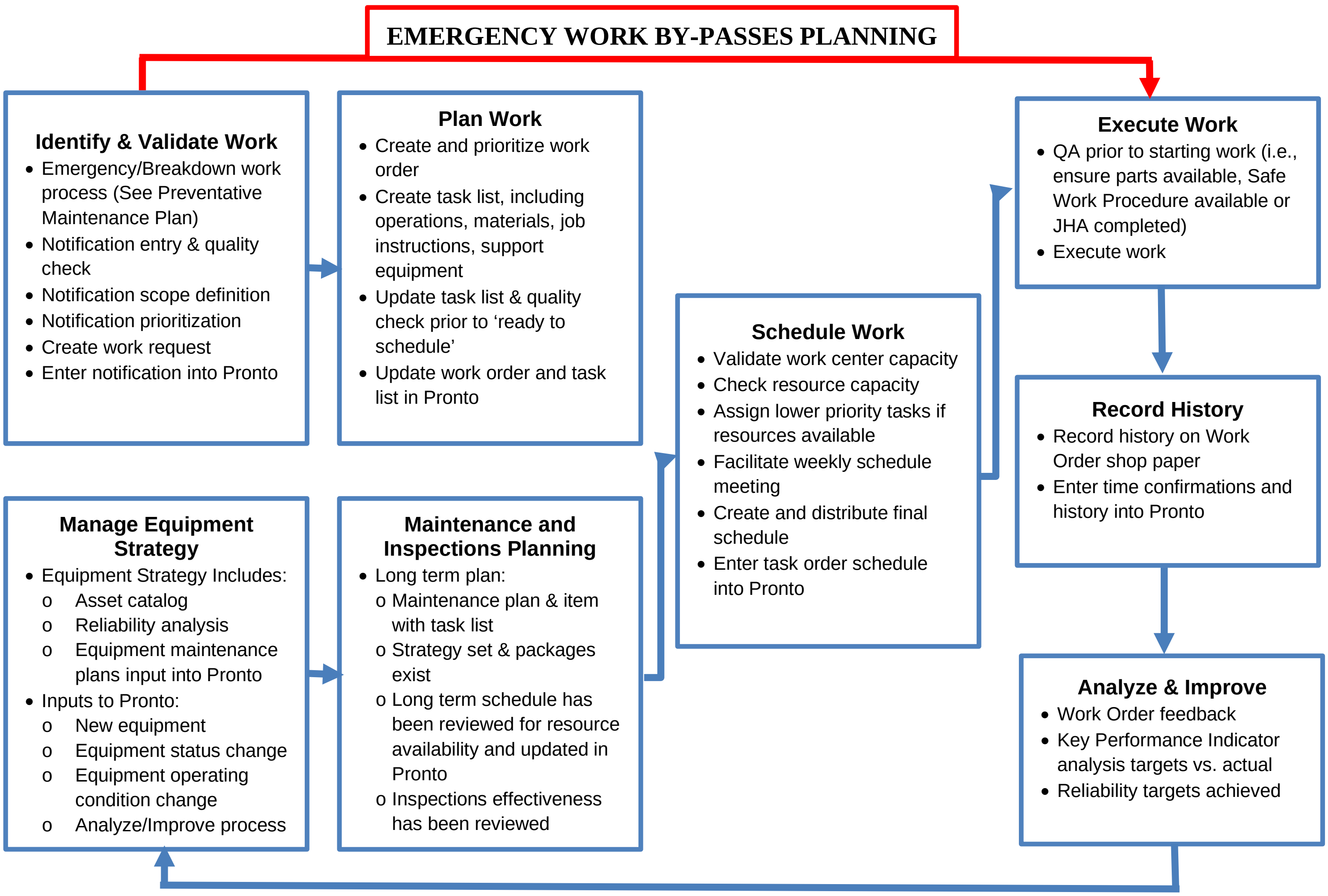


Figure 8.1-1: Heap Leach Facility Basic Maintenance Work Management Process

9 HEAP LEACH FACILITY SUVEILLANCE AND RESPONSE

Surveillance of the HLF is required to determine if the facilities are operating within expected parameters. Deviations from expected performance may require adjustments to operation, maintenance or design to facilitate ongoing safe and efficient operation of the facilities. Regular surveillance is essential to ensure ongoing safety of the HLF and to identify areas requiring maintenance before problems and safety concerns develop. Behavior and performance of the facility are assessed visually and through monitoring of instrumentation.

A flow chart of the Surveillance process is shown in Figure 9.1-1. The flowchart describes a surveillance review procedure, including an inspection program, to help ensure safe and continued operation of the HLF.

Surveillance is undertaken in two primary methods – visual inspection and reading of instruments. Results of these qualitative and quantitative observations are compared to the expected performance of the HLF. If observations are within the expected range or performance, the results of the surveillance are simply recorded. If observations are outside the expected range, further evaluation is completed to determine if remedial action is necessary. If necessary, this action is taken and may range from a minor adjustment, implementing the HLF CWMP operational procedures, or potentially the initiation of HLF Emergency Response Plan procedures, depending on the severity and nature of the deviation from expected performance.

Signs of potential or actual hazards can generally be observed by a combination of visual inspection and instrumentation readings before hazards become significant. Mine personal can identify the need for maintenance based on observations of changes to the HLF such as erosion, cracking, bulging, seeps or changes in vegetation. Additionally, changes in instrumentation readings can also indicate potential hazards.

The purpose of an inspection program is to identify problems and/or unsafe conditions that are visually evident. Visual inspections are an integral part of proper maintenance and performance of monitoring programs for the HLF. Failure to correct identified maintenance and repair items, or potential adverse behavior, could result in unsafe conditions or lead to a failure of operating systems or cause an adverse environmental effect. Table 9.1-1 summarizes the routine surveillance requirements for the HLF.

Table 9.1-1: Surveillance Requirements for the HLF

Surveillance	Frequency	Responsibility
Routine Inspection		
Embankment	Weekly by staff (Annually by Engineer)	Process General Foreman or alternate
Embankment Geotechnical Instrumentation (piezometers and inclinometer)	Continuous using wireless relays to office	Process General Foreman Process General Foreman
Pad Liner	Weekly	Process General Foreman or alternate
Stacked leach ore for stability	Weekly	Process General Foreman or alternate
In-Heap Pond Piezometers	Continuous using wireless relays to office	Process General Foreman
Solution collection and recovery system	Weekly	Process General Foreman or alternate
Leak Detection and Recovery System Monitoring Ports	Daily	Environmental Superintendent
Heap leach pad vibrating wire piezometers	Daily during freshet or when solution inflow and outflow rates are not equalized (i.e., application and withdrawal rates	Environmental Superintendent

Surveillance	Frequency	Responsibility
	altered for operational purposes or equipment malfunction/upset event) weekly during the remainder of the year.	
Monitoring Vault	Weekly	Environmental Superintendent
Events Pond fluid levels	Daily if the desired available storage has been reached and weekly otherwise.	Environmental Superintendent
Events Pond liners	Weekly	Environmental Superintendent
Conveyors and radial stacker	Monthly	Crushing & Conveying Supervisor
Geochemical sampling of pregnant and barren process solution	Quarterly	Metallurgist
HLF and Dam Inspection by Engineer	Annually	Engineering of Record
Independent third-party physical stability inspection	Annually	Engineering Consultant
Event Driven Inspection	Following unusual event (e.g., heavy precipitation, freshet, earthquake)	Managers - Process, Maintenance, Health & Safety and Environmental
Comprehensive Review (Dam Safety Review)	No later than 5 years after construction and prior to decommissioning	Engineering Consultant
Instrumentation	Monthly and per Manufacturer Guidelines	Instrumentation Technician
General Visual Inspection of HLF Components and the Events Pond	Daily during the completion of standard work procedures	Environmental Superintendent and Coordinators and Health, Safety and Security Manager and Coordinator

If any unusual occurrences are observed during the completion of the routine surveillance activities, they will be immediately reported to the Process Manager and the Process General Foreman for assessment and development of an appropriate course of action. The Process Manager will immediately notify the Engineer of Record of any observation that has the potential to impact the stability of the HLF. If deemed necessary, appropriate procedures will be implemented as outlined in the HLF CWMP, HLF Emergency Response Plan or as directed by the Engineer of Record.

9.1 ROUTINE INSPECTIONS

Routine and/or regular visual inspections of the HLF components listed in Table 9.1-1 are completed in accordance with required frequencies. During high water times (e.g., spring freshet, high rainfall, and flood events), daily or more frequent surveillance is undertaken to ensure the safe operation of pumping systems and/or spillway operations. Ideally the inspections are performed and recorded by the same person(s) to ensure that relevant incremental changes are observed between each inspection. The visual inspections are done for all components of the HLF, including the visible portions of the leach pad liner; leach pad embankment; stacked ore pile; accessible portions of the solution delivery and collection system including pipelines, drip emitters, pumps, tanks and other support facilities; conveyors, radial stacker; the Events Pond, and instrumentation as appropriate. Records are kept of all dam inspections and copies will be maintained on site for review during annual inspections.

Representative samples of the pregnant and barren solution are sampled on a quarterly basis and analyzed for constituents as determined by the Process Manager and the Environmental Manager.

The LDRS monitoring sumps are checked daily for the presence of solution. If solutions are present, they are sampled and analyzed for the presence of constituents as determined by the Process Manager and Environmental Superintendent. Contained solutions in any of the monitoring ports will be evacuated and measured for volume. All information is recorded for comparison with follow-up measurements, and for comparison with the alert levels for the In-Heap Pond and Events Pond.

Emphasis is placed on visual inspections of the HLF embankment. The following are items are examined during these inspections:

- evidence of settlement or subsidence on the embankment crest or slope;
- evidence of cracks or erosion on the embankment slope;
- bulging on the downstream slope which could indicate leakage; and,
- evidence of animal burrows or unusual vegetation patterns on the dam.

Monthly snowpack measurements are made on approximately five flat and sloped surfaces (or benches/lifts) of the heap leach facility, and by aspect. Each snow survey consists of a flat (leaching) surface and the adjacent slope, and each bench/slope is measured at a minimum of ten locations evenly spaced across each bench, with an average snowpack calculated for each area. The on-site weather stations at Camp and Potato Hills are used to measure any and all rainfall, including snowfall with respective density (water content).

All observations will be documented.

9.2 INSTRUMENTATION, MONITORING AND RESPONSE

Construction and operational monitoring requirements for the HLF includes instrumentation for measuring phreatic levels and pore pressures within the heap, foundation and embankment; fluid levels within the in-heap pond; and movement of the embankment. Monitoring is used to verify the facility components are performing as expected and to provide early warning of problematic conditions. Observations on the performance of the initial stages may provide useful information for optimizing subsequent stages of development.

9.2.1 Solution Head and Temperature

Vibrating Wire Piezometers are installed in the embankment and will also be installed in the Phase 1B HLF overliner.

Two pairs of vibrating wire piezometers will be located within the In-Heap Pond, one pair in the LDRS sump and one pair in the overliner layer at the base of the In-Heap Pond sump to monitor the fluid levels. The piezometers will be installed in inclined riser pipes to contain instrument lead wires for access at the dam crest.

The instrumentation will allow remote reading in the ADR by the Process General Foreman or their alternate (see Table 9.1-1, above). Based on the levels recorded by the piezometers and the estimated porosity, the volume of fluid within the system (or pore moisture) can be readily calculated. This will be done continually and routinely by the operational heap leach water balance model.

The model will be updated with current HLF system and monitoring information as a function of time (e.g., irrigation rate, active leaching area, length of irrigation line, evaporation estimates, rainfall, snow water equivalent, etc.) on a weekly basis, and will produce respective solution/water volumes in the saturated and unsaturated zones (including active and inactive leaching areas) on a regular basis. The model will also be calibrated regularly to confirm porosity assumptions and to establish mass balance. Snow removal during spring, in accordance with the requirements of the WUL, will be conducted as needed based on the model results and/or operational needs, and updates to the model will be made accordingly.

Three pairs of vibrating wire piezometers will be located within the Phase 1B leach pad overliner layer upgradient of the In-Heap Pond. The piezometers will provide pressure and temperature data and will be read daily during freshet and weekly during the remainder of the year to provide the water levels within the dam and ore pile.

Trigger levels and required actions have been established for the In-Heap pond to protect the pumping system from cavitation to ensure that the Process Manager can institute mitigative measures to ensure that the Desired Available Storage (as further described in the HLF CWMP) is maintained at all times. The trigger levels will be programmed into an automatic alarm system in the process control center for continuous monitoring. The trigger levels will be verified by field measurement utilizing the schedule provided in Table 9.1-1:

- Condition Green: Solution level is between 918 and 933 m asl.
- Condition Orange: Solution level is between 914 and 918 m asl or between 933 and 937 m asl.
- Condition Red: Solution level is less than 914 m asl or greater than 937 m asl.

9.2.1.1 In-Heap Pond Trigger Level Response

To ensure that normal operating conditions are maintained, appropriate mitigative responses to solution level fluctuations have been developed, based on the as-built configuration of the HLF, as shown in Table 9.2-1. The Process Manager or designate is ultimately responsible for the institution of these responses.

Table 9.2-1: In-Heap Pond Trigger Level Responses

Condition	Solution Level (m asl)	Potential Response Actions
Green	918 to 933	• No response required. • Continue normal instrumentation monitoring. • Continue normal leaching operations.
Orange	914 to 918	• Confirm that solution application rate and solution withdrawal rates are in equilibrium. • Reduce In-heap Pond pump out rate as necessary and as directed by Process Manager. • Increase solution application rate as necessary and as directed by Process Manager. • Increase field monitoring frequency to daily until solution level rises to normal operating level.
	933 to 937	• Confirm that solution application rate and solution withdrawal rates are in equilibrium. • Increase In-heap Pond pump out rate as necessary and as directed by Process Manager. • Maintain normal solution applicate rate at current leach area. • Inspect solution application pumping system (both operational and redundant) to ensure that increased pumping can be utilized to put solution into dynamic storage as necessary.

Condition	Solution Level (m asl)	Potential Response Actions
		• Consider solution application to inactive areas as necessary and as directed by Process Manager (i.e., confirm dynamic storage capability is available and utilize as necessary). • Increase field monitoring frequency to daily until solution level reduces to normal operating level (918 to 933 m asl). • Inspect HLF spillway on a daily basis to confirm that there are no blockages. • Measure Events Pond solution levels on daily basis to ensure that the desired available storage is available at a minimum. • Consult with the Environmental Superintendent regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary.
Red	<914	• Cease In-Heap Pond pump out. • Increase solution application rate as necessary and as directed by Process Manager. • Increase field monitoring frequency to hourly until solution level rises to normal operating level.
	>937	• Increase In-Heap Pond pump out rate as necessary and as directed by Process Manager. • Increase solution applicate rate at current leach area. • Initiate solution application to dry, non-active leaching portions of the pad. • Increase field monitoring frequency to hourly until solution level reduces to normal operating level (918 to 933 m asl). • Inspect HLF spillway on an hourly basis to confirm that there are no blockages. • Measure Events Pond solution levels on an hourly basis to ensure that the desired available storage is available at a minimum. • Inspect Events Pond spillway on a daily basis to confirm there are no blockages. • Inspect CN destruct equipment and the Mine Water Treatment Plant to ensure operability. • Inspect all backup power generation and pumping equipment on a daily basis to ensure operability. • Consult with the Environmental Superintendent regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary. • Confirm with the Vice President of Operations and General Manager that heavy equipment is operable and available for the excavation of an emergency downgradient events pond. • Activate HLF CWMP procedures as necessary.

9.2.2 Pond Water Levels

A level gauge will be installed in the Events Pond to allow monitoring of solution levels. The level will be monitored daily whenever solution, or direct precipitation, contained in the Events Pond has reached the desired available storage volumes, shown in Table 9.2-2, or weekly otherwise.

Table 9.2-2: Definitive Events Pond Volume Triggers

Phase	72-hour Draindown Volume (m^3)	0.5 m Freeboard Volume (m^3)	24-hour 100-year Event Volume (m^3)	Desired Available Storage (DAS) Volume Required (m^3)	Percentage Full of Events Pond	Elevation of Events Pond for the DAS (m asl)
1	N/A			198,340	34%	888.2
2	149,040	19,600	42,000	210,640	30%	887.7
3	149,040	19,600	58,700	227,340	24%	886.9

The Events Pond will ordinarily remain dry or occupied temporarily by direct precipitation and/or process makeup water. Any accumulation of water in the pond will be pumped into the process circuit to reduce make up water withdrawals from other sources. For the Process Manager to permit the accumulation of water in the Events Pond, the HLF solution condition must be green and under no circumstances can planned accumulation be above the definitive Events Pond volume triggers shown in Table 9.2-1. Additionally, planned accumulation cannot be permitted in the month prior to freshet. As required by the WUL no transfers into the HLF, other than potable water and water required for gold elution, are permitted if the DAS volume triggers for the Events Pond have been reached.

Trigger levels and required actions have been established for the Events Pond to ensure that the Desired Available Storage (as further described in the HLF CWMP) is maintained at all times. The trigger levels will be clearly marked on the Events Pond level gauge to allow for straightforward visual observation of the trigger level.

- Condition Green: Fluid level is between 879.5 and 884 m asl.
- Condition Orange: Solution level is between 884 and 886.5 m asl.
- Condition Red: Solution level is greater than 886.5 masl.

9.2.2.1 Events Pond Water Level Responses

To ensure that normal operating conditions are maintained, appropriate mitigative responses to specific fluid levels have been developed as shown in Table 9.2-3. The Process Manager or designate is ultimately responsible for the institution of these responses.

Table 9.2-3: Events Pond Trigger Level Responses for Phase 1 of the HLF

Condition	Solution Level (m asl)	Response
Green	879.5 to 884	• Events Pond has capacity to store the full volume of a Probable Maximum Flood without release. • No response required.
Orange	884 to 886.5	• Events Pond has capacity for the Phase 1 Desired Available Storage volume with an additional capacity of approximately 37,000 m^3 between 886.5 and 888.2 ma asl.

Condition	Solution Level (m asl)	Response
		• Monitor fluid levels on a daily basis (from April 1 through ice free months) or weekly basis (freeze up until March 31) to ensure solution level remains within threshold. • Consult with the Environmental Superintendent regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary. • Inspect HLF solution application logs to confirm no increased application rates have been utilized for the lifts under active leach. • Inspect Events Pond spillway on a daily basis to confirm that there are no blockages. • Inspect solution application pumping system (both operational and redundant) to ensure that increased pumping can be utilized to put solution into dynamic storage as necessary. • Inspect dedicated Events Pond pump to ensure that pumping fluids out of the Events Pond can be undertaken if necessary. • Consider solution application to inactive areas as necessary and as directed by Process Manager (i.e., confirm dynamic storage capability is available and utilize as necessary). • Confirm with the General Manager that heavy equipment is operable and available for the excavation of an emergency downgradient events pond.
Red	>888	• Activate HLF CWMP procedures as determined by the Process Manager. • Active HLF Emergency Response Plan as determined by the Process Manager. • Cease all water transfers into the HLF and Events Pond (potable water for consumption by personnel and water for gold elution are the only exceptions). • Measure Events Pond solution levels on an hourly basis to ensure that the desired available storage is available at a minimum. • Increase solution applicate rate at current leach area. • Initiate solution application to dry, non-active leaching portions of the pad. • Inspect Events Pond spillway on an hourly basis to confirm that there are no blockages. • Inspect CN destruct equipment and the Mine Water Treatment Plant to ensure operability. • Inspect all backup power generation and pumping equipment on a daily basis to ensure operability. • Consult with the Environmental Superintendent regarding precipitation events either experienced or predicted. This may include out of schedule snow water equivalent measurements as necessary.

9.2.3 LDRS Levels

A Leak Detection and Recovery System (LDRS) has been constructed within the In-Heap Pond and Events Pond and consists of a monitoring sump equipped with an automatic, fluid-level activated pump equipped with a flow meter located between the top and bottom liners. The pump is sized to sufficiently remove fluids to minimize head on the bottom liner and collection of any potential leaks in the top liner. The pressure transducer utilized to activate the pumping system within the LDRS sump and inline flow meter will be connected via a remote link to the ADR

Plant control room to provide real time data on pumping rates and pumping duration, which will allow for the determination of volume of fluids evacuated from the sump.

The In-Heap Pond and Events Pond LDRS's monitoring sumps are to be checked daily for the presence of solution. If solutions are present, they will be sampled and analyzed for the presence of *Metal and Diamond Mining Effluent Regulations* (MDMER) Schedule 4 constituents, or as determined by the Process Manager and Environmental Manager.

Two alert levels were established for the design and operation of the In-Heap Pond and Events Pond. Alert Level 1 (AL1) provides a benchmark for liner performance in a double-lined pond under typical operating conditions based on industry standard rates for expected leakage from "normal" defects in the liner. AL1, as measured by the amount of fluid pumped by the pond's LDRS, is a low-level trigger that may indicate the presence of a small hole or defect in the top geomembrane. Alert Level 2 (AL2) provides a high-level trigger that indicates serious malfunction of the liner system.

9.2.3.1 HLF LDRS

Contained solutions in the HLF LDRS monitoring port are to be evacuated and measured for volume. The flow meters are to be monitored with alarm settings programmed in concert with the VWP measurements of In-Heap Pond levels such that an alarm is activated, based on solution level, and solution volumes pumped by the fluid level activated pumps. The HLF LDRS sump is inspected on a daily basis to monitor fluid levels and the pumping rate of the fluid activated pump, if it has been activated. The pumping rate will then be compared to the solution levels of the In-Heap pond gathered by the VWPs and if an alert level has been reached, the mitigation measures described in the HLF Emergency Response Plan will be followed.

All information will be recorded for comparison with follow-up measurements, and for comparison with alert levels established for the In-Heap Pond. The presence of process solution in any of the ports is expected but excess volume is a potential indication of a leak in the liner.

The LDRS sump has containment capacity for approximately 10 hours of AL2 leakage assuming that the In-Pond is completely full. At the planned normal operating volume, the LDRS sump has sufficient capacity for approximately 21 days of AL2 leakage rates assuming that no intervention (including the operation of the fluid level activated pump) is undertaken.

Table 9.2-4 provides the response levels based on the observed leakage rates for each 1m increment of solution level within the In-Heap Pond.

Table 9.2-4: In-Heap Pond Liner Leakage Trigger Level

In-Heap Pond Elevation (masl)	Calculated Alert Level 1 (L/day)	Calculated Alert Level 2 (L/day)	Response Level 1 Leakage Rate (L/day)	Response Level 2 Leakage Rates (L/day)	Response Level 3 Leakage Rate (L/day)	Response Level 4 Leakage Rate (L/day)
913	160	3,300	<100	100 - 160	160 - 3,300	>3,300
914	810	16,000	<160	160 - 810	810 - 16,000	>16,000
915	1,300	26,000	<810	810 - 1300	1,300 - 26,000	>26,000
916	1,900	39,000	<1,300	1,300 - 1,900	1,900 - 39,000	>39,000
917	2,600	53,000	<1,900	1,900 - 2,600	2,600 - 53,000	>53,000
918	3,500	69,000	<2,600	2,600 - 3,500	3,500 - 69,000	>69,000

In-Heap Pond Elevation (masl)	Calculated Alert Level 1 (L/day)	Calculated Alert Level 2 (L/day)	Response Level 1 Leakage Rate (L/day)	Response Level 2 Leakage Rates (L/day)	Response Level 3 Leakage Rate (L/day)	Response Level 4 Leakage Rate (L/day)
919	4,400	89,000	<3,500	3,500 - 4,400	4,400 - 89,000	>89,000
920	5,600	110,000	<4,400	4,400 - 5,600	5,600 - 110,000	>110,000
921	6,800	140,000	<5,600	5,600 - 6,800	6,800 - 140,000	>140,000
922	8,200	160,000	<6,800	6,800 - 8,200	8,200 - 160,000	>160,000
923	9,700	190,000	<8,200	8,200 - 9,700	9,700 - 190,000	>190,000
924	11,000	230,000	<9,700	9,700 - 11,000	11,000 - 230,000	>230,000
925	13,000	270,000	<11,000	11,000 - 13,000	13,000 - 270,000	>270,000
926	16,000	310,000	<13,000	13,000 - 16,000	16,000 - 310,000	>310,000
927	18,000	370,000	<16,000	16,000 - 18,000	18,000 - 370,000	>370,000
928	21,000	420,000	<18,000	18,000 - 21,000	21,000 - 420,000	>420,000
929	24,000	490,000	<21,000	21,000 - 24,000	24,000 - 490,000	>490,000
930	28,000	550,000	<24,000	24,000 - 28,000	28,000 - 550,000	>550,000
931	32,000	640,000	<28,000	28,000 - 32,000	32,000 - 640,000	>640,000
932	36,000	720,000	<32,000	32,000 - 36,000	36,000 - 720,000	>720,000
933	41,000	820,000	<36,000	36,000 - 41,000	41,000 - 820,000	>820,000
934	47,000	940,000	<41,000	41,000 - 47,000	47,000 - 940,000	>940,000
935	53,000	1.100.000	<47,000	47,000 - 53,000	53,000 - 1,100,000	>1,100,000
936	61,000	1,200,000	<53,000	53,000 - 61,000	61,000 - 1,200,000	>1,200,000
937	69,000	1,400,000	<61,000	61,000 - 69,000	69,000 - 1,400,000	>1,400,000
938	77,000	1,500,000	<69,000	69,000 - 77,000	77,000 - 1,500,000	>1,500,000
939 (embankment crest)	83,000	1,700,000	<77,000	77,000 - 83,000	83,000 - 1,700,000	>1,700,000

The associated response activities that are to be considered, and instituted as deemed necessary by the Process Manager, for each response level are provided below.

Potential Response Actions for Level 1

- Rates considered within normal range and standard activities related to the HLF may continue.
- Conduct routine monitoring and testing as considered in this Manual.

Potential Response Actions for Level 2

- Increase visual monitoring frequency as directed by the Process Manager.
- Lower In-Heap Pond fluid levels to allow for determination of potentially impacted fluid elevation range and to reduce overall leakage volume.
- Increase monitoring frequency of underdrain vault pump out rate to twice per week.
- Increase sampling of underdrain monitoring vault fluids to twice per week.

- Increase sampling frequency of down gradient monitoring wells to monthly.

Potential Response Actions for Level 3

- Increase visual monitoring frequency as directed by the Process Manager.
- Lower In-Heap Pond fluid levels to allow for determination of potentially impacted fluid elevation range and to reduce overall leakage volume.
- Increase monitoring frequency of underdrain monitoring vault pump out rate to daily.
- Increase sampling of underdrain monitoring vault fluids to daily.
  - If PLS solution identified, temporarily cease solution application in affected area, drill and case borehole and pump bentonite or similar material to affected area for failure in HLF
- Increase sampling frequency of down gradient monitoring wells to weekly.
- Increase sampling frequency of surface water quality stations W21 and W4 to weekly.
- Restrict leaching operations in affected area of liner failure in HLF
- Install interlift liner where practical
- Contain any spill of PLS to the greatest extent possible

Potential Response Actions for Level 4

- Increase visual monitoring frequency as directed by the Process Manager.
- Lower In-Heap Pond fluid levels to allow for determination of potentially impacted fluid elevation range and to reduce overall leakage volume.
- Maintain monitoring frequency of underdrain monitoring vault pump out rate at daily.
- Increase sampling of underdrain monitoring vault fluids to daily.
  - If PLS solution identified, temporarily cease solution application in affected area, drill and case borehole and pump bentonite or similar material to affected area for failure in HLF
- Increase sampling frequency of down gradient monitoring wells to daily.
- Increase sampling frequency of surface water quality stations W21 and W4 to daily.
- Increase sampling frequency of surface water quality stations W99 and W5 to weekly.
- Isolate leak if possible
- Restrict leaching operations in affected area of liner failure in HLF
- Install interlift liner where practical
- Unload ore and repair any damaged liner for failure in HLF
- Contain any spill of PLS to the greatest extent possible

9.2.3.2 Events Pond LDRS

Contained solutions in the Events Pond LDRS monitoring port are to be evacuated and measured for volume by inline flow meters. The Events Pond LDRS sump is to be inspected on a daily basis to monitor fluid levels and the pumping rate of the fluid activated pump, if it has been activated. The pumping rate is then compared to the fluid levels of the Events Pond measured by the level gauge and if an alert level has been reached, the mitigation measures described in the HLF Emergency Response Plan are to be followed.

All information is to be recorded for comparison with follow-up measurements, and for comparison with alert levels established for the Events Pond. The presence of solution in any of the ports is expected but excess volume is a potential indication of a leak in the liner.

The Events Pond sump was designed to store one hour of AL2 flows so that when the geocomposite is transmitting the maximum flow the LDRS sump pumps only need to run once per hour.

Events Pond Elevation (masl)	Calculated Alert Level 1 (L/day)	Calculated Alert Level 2 (L/day)	Response Level 1 Leakage Rate (L/day)	Response Level 2 Leakage Rates (L/day)	Response Level 3 Leakage Rate (L/day)	Response Level 4 Leakage Rate (L/day)
883	4,700	150,000	<3,000	3,000 – 4,700	4,700 – 150,000	>150,000
884	7,800	250,000	<4,700	4,700 – 7,800	7,800 – 250,000	>250,000
885	11,000	350,000	<7,800	7,800 - 11,000	11,000 – 350,000	>350,000
886	14,000	460,000	<11,000	11,000 – 14,000	14,000 – 460,000	>460,000
887	18,000	580,000	<14,000	14,000 – 18,000	18,000 – 580,000	>580,000
888	22,000	700,000	<18,000	18,000 – 22,000	22,000 – 700,000	>700,000
889	26,000	830,000	<22,000	22,000 – 26,000	26,000 – 830,00	>830,000
890	31,000	970,000	<26,000	26,000 – 31,000	31,000 – 970,000	>970,000
891	35,000	1,100,000	<31,000	31,000 – 35,000	35,000 – 1,100,000	>1,100,000
892	40,000	1,300,000	<35,000	35,000 – 40,000	40,000 – 1,300,000	>1,300,000
893	45,000	1,400,000	<40,000	40,000 – 45,000	45,000 – 1,400,000	>1,400,000
894	51,000	1,600,000	<45,000	45,000 – 51,000	51,000 – 1,600,000	>1,600,000
895 (spillway invert 894.5)	57,000	1,800,000	<51,000	51,000 – 57,000	57,000 – 1,800,000	>1,800,000
895.5 (crest)	60,000	1,900,000	<57,000	57,000 – 60,000	60,000 – 1,900,000	>1,900,000

The associated response activities that are to be considered, and instituted as deemed necessary by the Process Manager, for each response level are provided below.

Potential Response Actions for Level 1

- Rates considered within normal range and standard activities related to the HLF may continue.
- Conduct routine monitoring and testing as considered in this Manual.

Potential Response Actions for Level 2

- Increase visual monitoring frequency as directed by the Process Manager.
- Lower Events Pond fluid levels to allow for determination of potentially impacted elevation range and to reduce overall leakage volume.

- Electrical leak detection and repair of damaged location
- Increase sampling frequency of down gradient monitoring wells to monthly.
- Take inventory of available HDPE pipe to determine if sufficient length is available for pump out or gravity drain of solution to downgradient emergency pond location. If insufficient length in inventory, contact supplier to determine availability and delivery timeline.
- Take inventory of available LLDPE (or HDPE) liner to determine if sufficient material is available for lining of downgradient emergency pond. If insufficient material in inventory, contact supplier to determine availability and delivery timeline.

Potential Response Actions for Level 3

- Increase visual monitoring frequency as directed by the Process Manager.
- Lower Events Pond fluid levels to allow for determination of potentially impacted fluid elevation range and to reduce overall leakage volume.
- Return fluids within Events Pond into dynamic storage.
- Increase sampling frequency of down gradient monitoring wells to weekly.
- Increase sampling frequency of surface water quality stations W21 and W4 to weekly.
- Isolate leak if possible.
- Electrical leak detection and repair of damaged location.
- Ready heavy equipment for excavation of downgradient emergency pond.
- If insufficient length of HDPE pipe available for drainage to downgradient emergency pond location, procure sufficient supply.
- If insufficient supply of LLDPE/HDPE liner available for lining downgradient emergency pond location, procure sufficient supply.

Potential Response Actions for Level 4

- Increase visual monitoring frequency as directed by the Process Manager.
- Return fluids within Events Pond into dynamic storage.
- Isolate leak if possible.
- Electrical leak detection and repair of damaged location.
- Construct lined downgradient emergency pond. Once constructed, transfer any excess fluids to downgradient emergency pond.
- Remove and replace liner system in Events Pond.
- Increase sampling frequency of down gradient monitoring wells to daily.
- Increase sampling frequency of surface water quality stations W21 and W4 to daily.

- Increase sampling frequency of surface water quality stations W99 and W5 to weekly.
- Contain any spill of PLS to the greatest extent possible

9.2.4 Movement

Movement of the embankment is monitored in two ways, with survey monuments and one inclinometer. A series of eight survey monuments are located along the crest of the embankment at 50 m intervals to allow monitoring of potential movement. Survey monuments are typically used to monitor settlement and/or horizontal movements of embankments. Survey pins are constructed with rebar embedded at least 0.8 meters into the dam surface, as needed. Since the soft material in the foundation was sub excavated and the dam fill is compacted, significant settlement or lateral movement is not expected. In addition, the current design and construction of the dam can tolerate some movement without significantly impacting the liner or stability. Survey pins were installed in a straight line and are visually monitored for lateral movement. This is to done as part of the routine surveillance.

An inclinometer casing is installed through the dam. The inclinometer allows accurate measurement of ground movement and deformation. A probe is lowered down the casing to collect data. A comparison of data over time allows evaluation of the deformation location and velocity. The inclinometer is to be monitored on a quarterly basis and recorded for the annual geotechnical review.

9.2.5 Seepage and Underdrain Monitoring

The HLF underdrain system provides for the collection and drainage of subsurface water beneath the lined facility to limit upward hydrostatic pressure on the HLF liner. The drains convey subsurface water to collector pipes that discharge to an outlet monitoring vault. The vault is configured to allow for sampling of drain flows for water quantity and quality, and is equipped with an automatic, fluid level activated pump system to return flows to the Events Pond for use as make up water or return flows via an exfiltration gallery, to groundwater. A flow meter is installed in the return flow pipe. During normal operations, the return flow system is configured to return flows to containment in the HLF system.

In addition to providing control for groundwater seepage, the underdrain system also provides some leak monitoring capability for the upper HLF.

When fluids are returned to lined containment, continuous analysis of specific conductance will be undertaken and full suite external laboratory analysis (as defined in the WUL) will be conducted on a monthly basis. When flows are sent to the infiltration gallery, daily sampling is required to show compliance with discharge criteria in the WUL.

Changes in flow will be less easy to establish until a good baseline flow record is established. As noted above, the vault is equipped with a flow meter. While groundwater flow is fairly steady and does not experience large fluctuations, we expect that flow in the vault will diminish over time as the HLF liner expands over the Ann Gulch basin. At this time, a flow criterion is not proposed until we better understand the natural variability of the system. We expect to have that information within the first year of monitoring through all seasons, and it will be represented by a measurable percentage increase in flow.

Additionally, separate non-perforated collection pipes for each phase of the HLF allow the outflows from each area to be monitored independently. This allows for more focused mitigation actions in the case of the detection of leakage in the underdrain monitoring vault.

Table 9.2-1 summarizes the monitoring and frequency for operational conditions. Records of monitoring activities should be maintained and made available for the annual geotechnical review.

Table 9.2-1: Monitoring Frequency

Task	Frequency
Inspect overall HLF and Events Pond	Weekly
Measure LDRS levels at HLF and Events Pond	Continuous using remote link
Measure water level at HLF In-Heap Pond	Continuous using remote link
Measure pumped seepage at monitoring vault	Weekly download from datalogger
Measure dam and HLF pad piezometers	Continuous using remote link
Visually monitor dam crest pins	Monthly
Survey dam crest pins	Quarterly
Measure inclinometers	Quarterly

9.3 ANNUAL INSPECTIONS - ENGINEER OF RECORD OR DESIGNATE

Annual inspections are intended to be part of a more thorough review of the condition of the facility, and are carried out by a qualified engineer, experienced with the design and maintenance of the HLF. The annual inspections will be conducted by July 1st and will include the following main items:

- Visual inspection of the HLF and dam by the engineer, including taking appropriate photographs of the observed conditions;
- Review of routine inspection records prepared by operating personnel in the past year;
- Review whether or not recommendations from previous year's inspection(s) have been addressed, and any incidents or actions arising from those previous recommendations;
- Review of instrumentation and monitoring data;
- Review of the previous year's operations including reports of any incidents (and remedial measures) that may have occurred;
- An evaluation and interpretation of the structural performance of the embankment and related components, and identify any potential safety deficiencies or recommended items that need to be addressed in the coming year;
- Review construction records, QA/QC data and as-built information on dam construction; and
- Evaluation of the OMS Manual to assess the need for updating.

The results of the inspection and review will be documented in a report that will be provided to the independent third-party engineering firm engaged for the annual inspection required as per QML-0011.

9.4 ANNUAL PHYSICAL STABILITY INSPECTION - INDEPENDENT ENGINEER

As required by QML-0011, annual inspections of the physical stability of all engineered structures, including the HLF and the Events Pond, are conducted an independent engineer. The inspections are undertaken by October 1st each year with a written report prepared by the independent engineer provided to Yukon Government Department of Energy, Mines and Resources within 90 days of completion of the inspection. Each annual report includes a summary of the stability, integrity and status of the inspected structures, works and installation and provides recommendations for remedial actions made as a result of the inspection.

Based on the recommendations, in consultation with the Engineer of Record, VGC is to then take appropriate (sometimes immediate) steps to implement the recommendations for remedial action made as a result of the inspection.

9.5 EVENT-DRIVEN INSPECTIONS

Special inspections are to be carried out if any of the following events occur:

- Unusual events such as an earthquake or large precipitation event;
- Unusual operating events such as rupture of a pipeline or a power loss that lasts longer than 8 hours;
- Slide of the stacked ore;
- Unusual observations such as cracks, excessive settlements, sinkholes, large slope or foundation deformations in the embankment; or
- Instrument readings that deviate from historical trends, or are within site specific designated “alert” action levels.

Special inspections after unusual events are necessary to evaluate whether there has been any damage requiring correction, any safety measures or special operating procedures that need to be implemented, or if there is a need to initiate procedures as outlined in the HLF CWMP or the HLF Emergency Response Plan.

9.6 COMPREHENSIVE DAM SAFETY REVIEW

A dam safety review (DSR) will be completed no later than five years after construction of the HLF. The Canadian Dam Association, Dam Safety Guidelines (CDA, 2007) recommend a comprehensive DSR be carried out every 7 years during operations, prior to decommissioning and following closure. The comprehensive review provides independent verification of:

- Safety and environmental performance of the HLF, including the embankment;
- Adequacy of the surveillance program;
- Adequacy of delivery of OMS requirements;
- Design basis with respect to current standards and possible failure modes; and
- Compliance with new engineering standards (including analysis to confirm if necessary).

The DSR includes a review of the design, operation, maintenance, surveillance and emergency plan, to determine if they are safe in all respects and, if they are not, to determine required safety improvements. A DSR is a systematic evaluation of the safety of a dam, by means of comprehensive inspection of the structures, assessment of performance, and review of the original design and construction records to ensure that they meet the current criteria. Special attention should be given to those areas of design and performance having known or suspected weakness or which are crucial to dam safety. The level of detail required for a DSR should be commensurate with the importance, design conservatism and complexity of the structure, as well as with the consequences of failure. The DSR must address three fundamental components:

- The dam(s) are appropriately evaluated in terms of a thorough visual inspection, a review of salient documentation and a review of any relevant monitoring information (e.g., piezometers) as they relate to the safety of the dam(s).
- Potential failure modes for the dam(s) are recognized and tested against the available information to determine what, if any, of the candidate failure modes may be possible given the as-evaluated state of the dam(s).
- The dam(s) is provided a classification in terms of its potential for environmental impacts, economic losses, and loss of life.

9.7 DATA INTERPRETATION AND DOCUMENTATION

Documentation of surveillance activities are maintained by the Process Manager and Environmental Superintendent and include recording of:

- Routine visual observations (departures from normal conditions);
- Instrumentation monitoring and testing;
- Analyses and evaluations, including the evolution of the storage capacity of the In-Heap Pond and plots of data versus time (e.g., for level gauges, piezometer, monitoring vault readings) to examine changes over time and support HLF adaptive management decisions; and
- Reviews.

Documentation includes, as a minimum, the following:

- Routine inspection log;
- Surveillance network monitoring report
- Quarterly instrumentation reports;
- Annual engineering inspection reports;
- Biannual review of data and annual environmental monitoring and surveillance report
- Comprehensive dam safety report five years after construction of the HLF, and every seven years thereafter.

Documentation includes a hard copy (paper) and electronic filing system for inspection reports, photographic and video records, incident reports, instrumentation readings, instrumentation plots, annual inspections and third-party reviews, so that they can be quickly retrieved for review and in case of an emergency.

9.8 REPORTING

The Process Manager is to review collected data records from facility monitoring and assess the need for maintenance activities or response. The reporting procedures for various levels of surveillance are summarized below.

Performance meets design expectations

Data will continue to be plotted as recorded and documented in the monthly and annual reports.

Conditions may require adjustment to design, operation, maintenance or surveillance

The results of the routine maintenance and surveillance programs may result in a caution warning that requires action. At that time, the Process Manager will formally notify the Engineer of Record and request assessment of the data and to advise any remedial actions or potential modification to HLF components to bring the facility back into design expectations. The frequency of monitoring should be increased to confirm the measurements and to assess if the rate of change is increasing, stabilizing, or decreasing.

Potential Emergency Response Alert

Certain unexpected or unplanned events may trigger an emergency response alert. Examples of these events include earthquakes or large precipitation events that exceed the design storm event. The Process Manager will immediately inform the following personnel, who will determine what immediate action should be taken and whether the Emergency Response Plan should be implemented:

- Site Management including the General Manager, Environmental Manager, Health, Safety and Security Manager;
- Chief Operating Officer;
- Engineer of Record; and
- Yukon Government Departments (EMR, Water Resources, Environment, etc.) and Environment Canada.

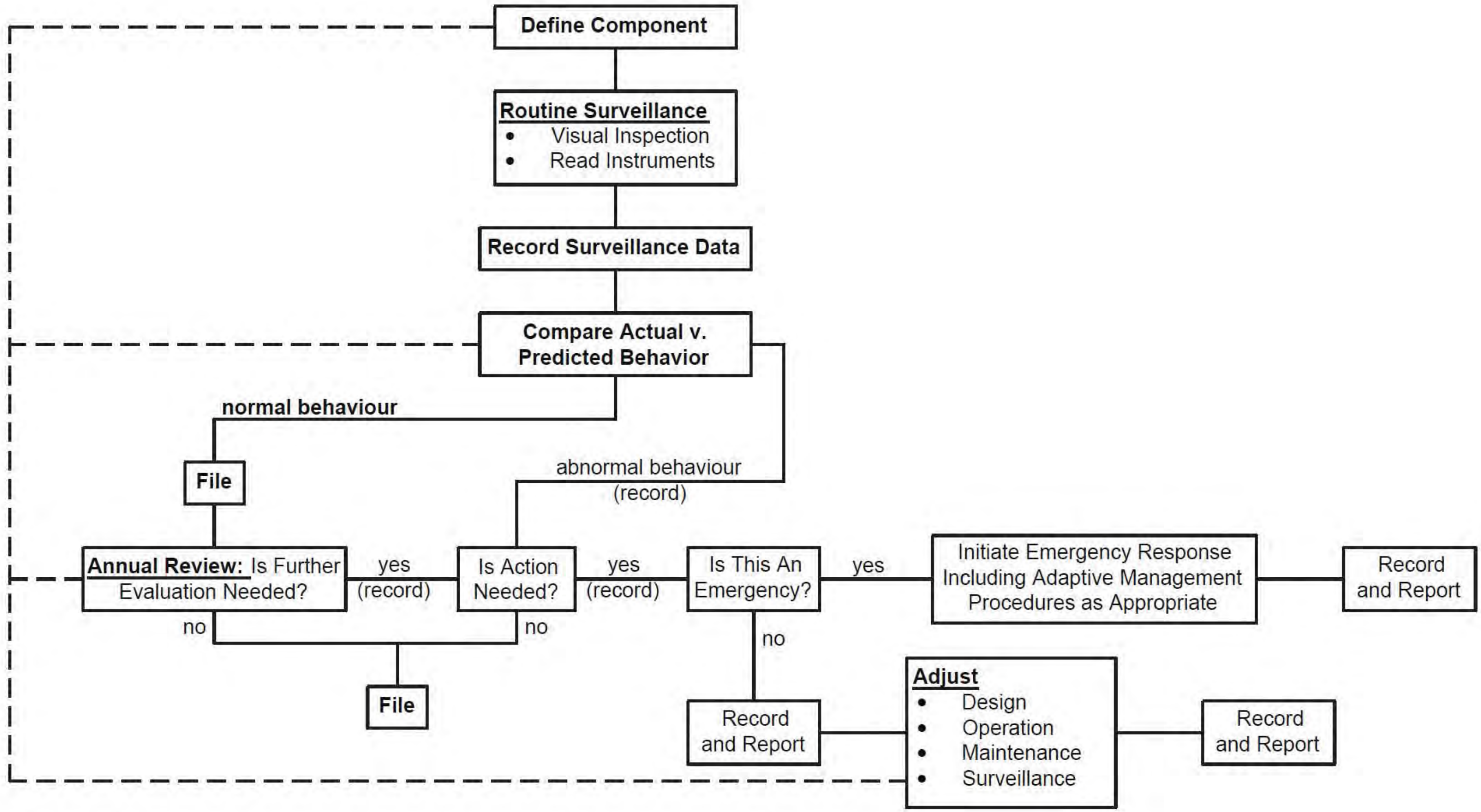
Environmental Monitoring and Reporting

The Environmental Superintendent is responsible for overseeing sample and data collection and analysis, and reporting as per WUL requirements to the YWB and Inspector. This reporting will include the collection of all data required to allow for the monthly reporting of the following items:

- Daily average available storage volume;
- Month end volume of water stored in the HLF, inclusive of the snow water equivalent of any snow cover on the pad, Events Pond, and the Events Pond watershed below the ADR Plant;
- The total monthly volume and the average pumping rate of HLF solution pumped for irrigation or rinsing of the ore;
- The total monthly volume and the average pumping rate of HLF solution pumped from the In-heap Pond to the ADR Plant;
- The total monthly volume of water flowing or pumped from the In-heap Pond to the Events Pond;
- The total monthly volume of water pumped from the Events Pond to the ADR Plant of the In-heap Pond;

- The total monthly volume of precipitation (in SWE if snow) falling on the HLF and the Events Pond watershed;
- The total monthly volume of water transfers into the HLF;
- The total monthly volume and average treatment rate of any HLF solution treated in the mine water treatment plant and released to the environment;
- The daily average moisture content of ore delivered to the HLF; and,
- The monthly volume of water added to the HLFF as ore moisture content.

Data acquired from all environmental programs is to be compiled bi-annually, and reported annually in the QML Annual Report (due March 31st of the subsequent year). The Annual Report for the Type A Water Use License is due no later than March 31st of the subsequent year.



Notes:		Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
		Date: 2018/04/01	Figure: 9.1-1	Heap Leach Facility Surveillance Flowchart

9.9 BACKUP GENERATORS AND PUMPS

Backup power generation and pumping equipment and supplies are available to operators in the event of routine or event driven maintenance, in the event of a power outage, or an emergency.

9.9.1 Back-up Power

As an additional designed contingency, back-up power is available for all phases of the project. Generators are on site to provide back-up power to the pumping system in the event of a power loss or failure from the gridline. The HLF water balance evaluated various power loss scenarios, as mentioned above, including the 100-yr 24-hr event concurrent with a 72-hr draindown of the heap. Although the facility solution storage provides sufficient capacity, 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 is kept as close to empty as possible during power failure events.

VGC-CMP-SOP-010, Backup Generator Operations and Maintenance, describes back-up power generation and establishes the process for using back-up generators in the event of temporary loss of grid power. The procedure is to ensure that power is provided for essential facilities and equipment (e.g., solution circulation pumping stations and critical camp facilities) in the event of disruption to electrical supplies, as well as ensuring back-up generators are properly maintained and available for emergency use as necessary.

9.9.2 Pump Redundancy

The HLF solution management systems includes redundancy in the various pumping systems associated with the HLF. Barren pumps installed at the barren pumping station 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 m3/hr) at the barren pumping station during the life of the facility and during operations; three pumps for operations (1,500 m3/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 the 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 design provides a contingency plan 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.

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