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Paramount Gold Nevada Corp. Grassy Mountain Project

Cyanide Management Plan January 2023

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1 Introduction

The International Cyanide Management Code (Code) is an industry voluntary program for cyanide producers and cyanide consumers, such as mining companies. It focuses on the safe management of cyanide and cyanidation mill leach solutions and tailings. Companies that adopt the Code must have their mining operations that use cyanide audited by an independent third party to determine the status of Code implementation. Those operations that meet the Code requirements can be certified and a unique trademark symbol can then be utilised by the certified operation. Audit results are made public to inform stakeholders of the status of cyanide management practices at the certified operation.

The objective of the Code is to improve the management of cyanide used in gold mining, assist in the protection of human health and the reduction of environmental impacts. The Code is structured along nine Principles each with standards of practice. The principles are:

Principle 1:	Production
Principle 2:	Transportation
Principle 3:	Handling and Storage
Principle 4:	Operations
Principle 5:	Decommissioning
Principle 6:	Worker Safety
Principle 7:	Emergency Response
Principle 8:	Training
Principle 9:	Dialogue

For the Grassy Mountain Feasibility Study, plant layout designs have been developed. The design of cyanide facilities is aligned with the guidelines of the Code. However, given the feasibility level of definition for the project, it is recognised that many of the specific Code compliance actions will require further definition in subsequent development phases of the project. Further, in line with the natural progression of project development, the project specific cyanide handling and storage design criteria as well as the specific operating procedures required by the Code will be developed during future phases of the project. The Grassy Mountain project will follow the Code guidelines during detailed design and construction and aim towards International Cyanide Management Institute (ICMI) certification during operations.

2 Battery Limits

The battery limits of Ausenco's scope on the Grassy Mountain Feasibility Study (FS) for the process and engineering design for the cyanide systems are:

- receipt of cyanide from the supplier into the cyanide storage area at site
- detoxification and discharge of tailings into the Tailings Storage Facility

The process and engineering design within the battery limits is impacted mainly by the following principles from the Code, and their accompanying standards of practice:

- Principle 3: Handling and Storage
- Principle 4: Operations

This cyanide management plan has been developed to describe the implementation of elements in Principles 3 and 4 of the Code which have been incorporated in the process plant design.

The Code principles are further incorporated into various plans such as the Emergency Response Plan, the Toxic and Hazardous Substances Transportation and Storage Plan and Safety Training Plan which have been developed to describe cyanide management plans for other areas beyond the process plant design aspects described herein.

3 Principle 3: Handling and Storage

3.1 General

The objective of Principle 3 in the Code is to "protect workers and the environment during cyanide handling and storage." Two standards of practice and accompanying guidelines are provided; the standards are:

Standards of Practice:

3.1 the design and construction of unloading, storage and mixing facilities

3.2 the operation of the unloading, storage and mixing facilities

The delivery of bulk cyanide is expected to be in liquid form and will be supplied in 6,400-US gallon bulk tankers by road. The sodium cyanide will be emptied into a 13,000-US gallon storage tank at the mine site.

3.2 Reagent Receipt, Mixing and Storage – Application of the Code

"Standard of Practice 3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures."

Sodium cyanide is delivered to site in liquid form in US 6,400-gallon bulk tankers. The sodium cyanide will be transferred from the bulk tanker to a storage tank on site at the cyanide storage area, which will be completely fenced and secured. The storage tank will be able to store approximately 13,000-US gallons of cyanide to provide a 34-day operational reserve. This is the only area where cyanide is stored. The cyanide storage area is placed on an impervious concrete slab with bund walls providing 110% containment to prevent any potential seepage, giving due consideration to the potential reduction of containment volume from pumps or other equipment installed within the containment. The cyanide offloading area is placed on an impervious concrete slab with bund walls and rounded curbs for vehicle entry and exit, and containment linked to the cyanide storage area. A hydrogen cyanide (HCN) analyzer is located in the offloading and storage area. The HCN analyzer will activate local audible and visual alarms and alarms on the control system in the event that HCN gas is present.

The cyanide offloading and storage area is a relatively "low- traffic" part of the site with respect to personnel movements. A compatible reagent, alkaline lime slurry, is stored alongside cyanide in a

separate containment structure (lime mixing area). The cyanide storage area is open to the atmosphere providing adequate ventilation to prevent the potential build-up of HCN vapours.

Incompatible reagents on the site include hydrochloric acid, sodium metabisulphite (SMBS), and copper sulphate. These reagents are potentially hazardous if mixed with cyanide as it may result in the evolution of hydrogen cyanide gas. Cyanide and incompatible reagent lines will not intersect or pass over each other and will not run over or through incompatible areas.

The copper sulphate and SMBS mixing and storage area (acidic reagent area) is separate from the alkaline reagent areas, placed on an impervious concrete slab, and contains adequate bunding for 110% containment.

The HCl system is limited to a tote and is dosed directly into the acid wash column. The acid wash column and HCl system are in a dedicated bunded acid wash area with an acid wash area sump pump. Cyanide lines will not pass through or over this area, and HCl lines will not extend beyond the bunded area.

Additional reagent inventory (totes and bulk bags) is held in storage in lockable steel shipping containers, located adjacent to the leach and CIL circuit on an impervious slab and within a concrete bunded area, with bund walls providing 110% containment of the largest vessel stored within this area. Reagent storage inventory will be kept to a minimum as far as is practical to manage potential supply chain disruptions.

Reference: 101768-0000-G-102 Plant Site Rev D General Arrangement (Appendix C of Mill Design Report included as an appendix to the CPA)

101768-0000-G-103 Process Plant Overall General Arrangement Rev C (See Appendix 1)

101768-0000-F-010 Rev D Alkaline Reagents Process Flow Diagram (Appendix B of Mill Design Report included as an appendix to the CPA)

"Standard of Practice 3.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures."

Responsibility for offloading the tanker lies with the supplier (Cyanco). Prior to offloading cyanide from the tanker into the storage tank, the driver will be fully trained and equipped with the minimum following PPE:

- Hardhat
- Full face respirator
- Rubber gloves
- Chemical resistant suit
- Rubber boots
- Personal HCN gas monitor
- Hearing protection

Once the delivery tanker is positioned in the off-loading bay and prior to offloading the area will be roped off and appropriate warning signage will be in place. Due to the sensitivity of the operation, a plant operator will be assigned to monitor the driver performing the off-loading procedure to provide assistance in the event of an emergency. The driver connects the tanker to the offloading pipe by a hose provided by the carrier.

The cyanide storage tank is equipped with overfill protection and contains automated level detection and local display of tank level in the offloading bay for the driver to verify that there is sufficient volume available in the tank before offloading.

The storage tank level will be monitored via the control system, and a level alarm will be installed to prevent overfilling and/or spillage of the tank. An additional level alarm will be installed on the sump to indicate any spillage. All valves associated with mixing and storage will be automated and fail in the safe position. A safety eyewash/shower station will be installed in bund area and mixing platform. Personal monitoring devices will also be provided to operators as backup to monitor HCN levels.

Containers and bulk bags are transported by forklift from the reagent storage area to the point of use in the process plant. Operating procedures will prohibit the transport of acidic reagents during cyanide off-loading.

4 Principle 4: Operations

4.1 General

The objective of Principle 4 in the Code is to "manage cyanide process solutions and waste streams to protect human health and the environment". Nine standards and accompanying guidelines are provided; the standards are summarised below:

Standards of Practice:

4.1 Set-up and management of an operating system and its controls

4.2 Systems to minimise the use of cyanide

4.3 Water management system to protect against unintentional releases

4.4 Protection of avian and land-based wildlife, and livestock

4.5 Protection of aquatic wildlife

4.6 Manage seepage and influence on groundwater

4.7 Spill prevention and containment measures

4.8 QC/QA procedures on construction of facilities and standards and specifications adopted

4.9 Monitoring programmes for wildlife and system waters

Cyanide process solutions and slurries are defined as where the weak acid dissociable (WAD or CN_{WAD}) cyanide concentration is greater than 0.5 mg/L.

4.2 Operations - Applications of the Code

"Standard of Practice 4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures."

Lime is added to achieve a suitable pH level in the pulp and to minimise the potential hydrolysis of sodium cyanide to form unacceptable levels of hydrogen cyanide gas (HCN). A pH control system is installed on the pre-aeration tank with interlocked control valves. The pH of the slurry in the pre-aeration and first leach tanks is measured with dual in-line pH meters. The output signals from the pH transmitters feed back to

a PID controller which regulates the lime dose rate to the pre-aeration tank to achieve a pre-set pH value in the leach tank. Separate manual valves off the lime ring main will be available for manually dosing in the leach tanks from the field.

The leached slurry will be reduced from a design CN_{WAD} concentration of 200 mg/L from the CIL circuit to the operating target of less than 15 mg/L, which is half of the not-to-exceed regulatory limit applicable to tailings introduced to the TSF pursuant to Oregon Administrative Rule 340-043-0130 (OAR). The final WAD cyanide concentration in the plant tailings stream will be continuously monitored by automated titration to ensure compliance with the lowest practical levels and the not-to-exceed regulatory limit of 30 mg/L. A secondary means of control and monitoring of the cyanide destruction process is provided through automated ORP (Oxidation Reduction Potential) measurement. The detox tank is also fitted with dual pH meters and automated lime addition to maintain pH in the required operating range.

WAD cyanide levels will be monitored and assessed from samples collected from the TSF and reclaim pond during operations to ensure the WAD cyanide concentrations achieve the lowest practical levels that also result in a Hazard Quotient of < 1.0 for representative wildlife species when analyzed following the EPA's Guidelines for Risk Assessment (EPA 1998) and the Guide for Performing Screening Ecological Risk Assessments at DOE Facilities (Sutter 1995).

Hydrogen cyanide (HCN) detectors will be located in the process plant leach-CIL and cyanide destruction areas. The HCN detectors will activate local audible and visual alarms and alarms in the event that HCN gas is present. Personal cyanide monitoring devices will be provided to personnel working in the leach, CIL and detox areas. Clear and unambiguous signs and safety eyewash/shower stations will be provided at key locations in areas of regular worker activities.

Equipment, containment structures and piping within the process plant will be routinely inspected and maintained in accordance with a planned maintenance program and procedures.

"Standard of Practice 4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings."

In the leach circuit, cyanide solution is added to the two leach tanks to ensure efficient use of the cyanide, mitigating the risk of overdosing cyanide. An automated cyanide analyzer (titrator type) measures the free cyanide concentration in the first and second leach tanks, and alarms if outside of target range. The cyanide analyzer controls sodium cyanide addition to the first leach tank. Further addition of trim cyanide to the second leach tank is provided if the free cyanide concentration is below target when measured manually by the operators.

"Standard of Practice 4.3 Implement a comprehensive water management program to protect against unintentional releases."

A site water balance was developed for the project which considered average annual flows. The overall process has a negative water balance and therefore does not require to discharge process solution to the environment.

All cyanide containing vessels will be located on impervious concrete slabs and bunded to provide 110% containment of the largest vessel. In the event that a spill or release occurs outside the bunded catchment areas, site grading and ditching has been designed such that all contact water flows to a lined catchment pond sized to contain the runoff from a 100-year 24-hour storm event. Water entering the catchment pond will be returned to the process plant for use as process water or will be evaporated.

The TSF design (by Golder Associates Inc.) allows for a minimum freeboard above the supernatant pool of 3 feet above the operating depth for a 500-year, 24 hour plus peak design storm event and wave action (refer to the TSF Design Report, included as an appendix to the CPA).

"Standard of Practice 4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions."

The Code includes a limit of 50 mg/L WAD cyanide for exposure of birds, other wildlife and livestock. This recommended limit applies solely to water in tailings impoundments, heap leach facilities and other open ponds and impoundments to which wildlife has access. This recommended limit also applies to process solution ponds and open solution trenches or channels at a heap leach pad, as well as leach solution ponded on the surface of a heap due to poor infiltration.

However, as described above, the OAR criterion for WAD cyanide in onsite impoundments is 30 mg/L, which is more conservative than the Code guidelines. To be compliant with both OAR and Code criteria the Grassy Mountain project will be managed such that WAD cyanide concentrations in onsite impoundments will not exceed 30 mg/L in accordance with the OAR and have an operating target of less than 15 mg/L.

The mitigation measures planned at Grassy Mountain are cyanide destruction to the lowest practical level that will

1) not exceed the OAR standard of 30 mg/L WAD cyanide in the liquid fraction of the slurry reporting to the TSF, and

2) result in a Hazard Quotient of < 1.0 for representative wildlife species when collected from the TSF and reclaim pond and analyzed following the EPA's Guidelines for Risk Assessment (EPA 1998) and the Guide for Performing Screening Ecological Risk Assessments at DOE Facilities (Sutter 1995).

WAD cyanide levels will be optimized and further investigated during operations to reduce the WAD cyanide concentrations to achieve the lowest practical levels that also meet the two conditions stated above.

The facility will include site perimeter fencing to restrict access by wildlife and livestock. In addition, the Reclaim Pond for TSF underdrain collection will be covered with bird deterrent balls to reduce the likelihood of wildlife accessing the surface of the water.

Once in the tailings storage facility, natural processes such as photodegradation by UV light and biodegradation will also contribute to the minimization of cyanide species in the lined TSF and Reclaim Pond.

Reference Wildlife Protection Plan included as an appendix to the CPA.

"Standard of Practice 4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water."

The Grassy Mountain project will have no direct discharge to surface water. The TSF and Supernatant Pond are designed to function together as a zero-discharge facility. Indirect discharges to surface water are protected by secondary containment for process equipment, pipelines and the TSF. Pipelines to and from the TSF will be installed in an HDPE lined containment trench. The TSF is provided with secondary containment and monitoring features designed to prevent releases to groundwater that could eventually emerge as springs or seeps to surface as detailed in the TSF Design Report by Golder Associates, Inc. (included as an appendix to the CPA). The process plant tanks and equipment are provided with 110%

secondary containment as detailed in the Mill Design Report by Ausenco (included as an appendix to the CPA)

"Standard of Practice 4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water."

All cyanide storage, leach, CIL and detox tanks will be installed on cast in-situ concrete slab-on-grade (impervious to prevent seepage). All CIL tailings will be treated in the cyanide destruction circuit before the tailings slurry is pumped to the TSF. Cyanide destruction will be carried out to achieve the lowest practical level with an operating target of 15 mg/L, which is half of the OAR standard of 30 mg/L WAD cyanide in the liquid fraction of the slurry reporting to the TSF. This is also more stringent than the Code guideline of "not to exceed 50 mg/L WAD cyanide" at the point of discharge into the TSF. The proven and effective air/SO_2/Cu^{2+} process is selected for this cyanide destruction duty.

The CIL tails overflow the last CIL tank and pass through a CIL tailings sampler prior to the cyanide detoxification tank, where lime will be added to buffer pH, copper sulphate will be added as a reaction catalyst, and sodium metabisulphite (SMBS) will be added as an SO_2 source. Low-pressure air is also sparged to aid the oxidation of cyanide to cyanate. Detoxified slurry will overflow to a carbon safety screen before gravitating to the tailings pumpbox. The tailings discharge line out of the process plant bund will be double contained with leak detection to alert pipeline failure or spillage.

The TSF is provided with secondary containment and monitoring features designed to prevent releases to groundwater as detailed in the TSF Design Report by Golder Associates, Inc. (included as an appendix to the CPA).

Reference: 101768-0000-G-103 Process Plant Overall General Arrangement (see Appendix 1)

The TSF impoundment area and upstream embankment slopes will be continuously lined with primary and secondary lining systems to provide dual containment of process solution (refer to the TSF Design Report by Golder Associates, Inc. included as an appendix to the CPA).

Backfill operations in the underground mining area will utilize cemented rock fill and not plant tailings, therefore no cyanide solution will be introduced into underground workings through the backfill operation.

"*Standard of Practice 4.7 Provide spill prevention or containment measures for process tanks and pipelines*."

Secondary containment is provided for tanks and pipelines containing cyanide solution with 0.5 mg/L or greater WAD cyanide concentrations.

The leach, CIL and detox tanks will be installed on cast in-situ concrete slab-on-grade (impervious to prevent seepage). The slab supporting the tanks is part of the containment slab but 300 mm higher, in octagonal shape and placed monolithically with the containment slab. The slab has the same construction as the typical slab-on-grade, with 50 mm Styrofoam underside to provide insulation, 150 mm drain rock underneath the Styrofoam, and structural fill below down to the firm load bearing strata. The leach-CIL area bunded volume is sufficient to contain 110% of the live volume of the largest tank, giving due consideration to rainfall and to the potential reduction of containment volume for pumps or other equipment installed within the containment. Floor sump pumps in the area return any spillage to the circuit for re-processing. Cyanide piping will be socket welded carbon steel, with double block and bleed isolation.

The cyanide storage tank is elevated and supported by a structural steel frame. This design promotes ease of inspection and limits corrosion potential on the underside of the tank. Concrete slabs for the tank support structure are of similar construction to the CIL tank slabs described above.

Secondary containment volumes and tank level control are described in Section 3 above.

The tailings slurry flows through a tailings discharge pipeline and will have dual containment initially provided through a buried pipe-in-pipe configuration before daylighting to an HDPE lined containment trench. TSF decant water is returned through a decant water pipeline, which runs in the same containment trench used for the tailings discharge pipeline.

Reference: 101768-0000-G-103 Process Plant Overall General Arrangement Rev C (See Appendix 1)

"Standard of Practice 4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications."

Reference: Quality Assurance Plan included as an appendix to the CPA

"Standard of Practice 4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality."

Reference: Inventory of Project Monitoring Plans included as an appendix to the CPA

Reference: Monitor Well Plan included as an appendix to the CPA

Appendix 1 – Process Plant Overall General Arrangement