SUMMARY AUDIT REPORT

for the November 2019
International Cyanide Management Code Recertification Audit

Prepared for:
Kinross Gold Corporation
Chirano Gold Mining Ltd. (CGML)

Submitted to:
International Cyanide Management Institute
1400 "I" Street NW, Suite 550
Washington, D.C. 20005

FINAL
1 April 2020

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SUMMARY AUDIT REPORT

Name of Mine: Chirano Gold Mine

Name of Mine Owner: Kinross Gold Corporation

Name of Mine Operator: Chirano Gold Mines Ltd. (CGML)

Name of Responsible Manager: Terence Watungwa, General Manager

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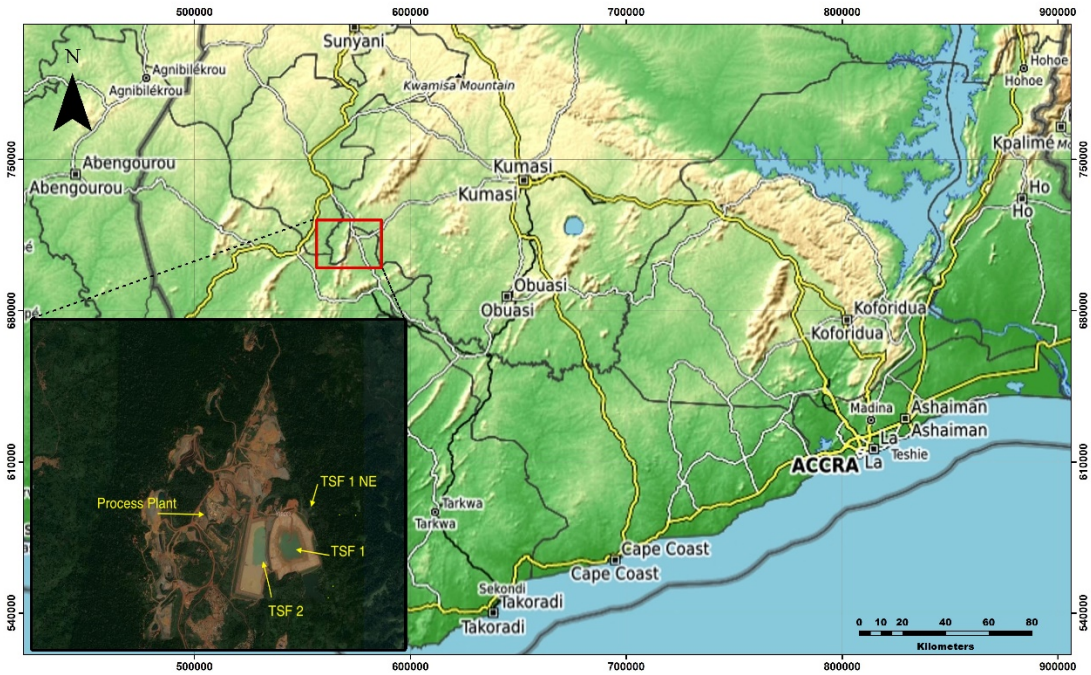
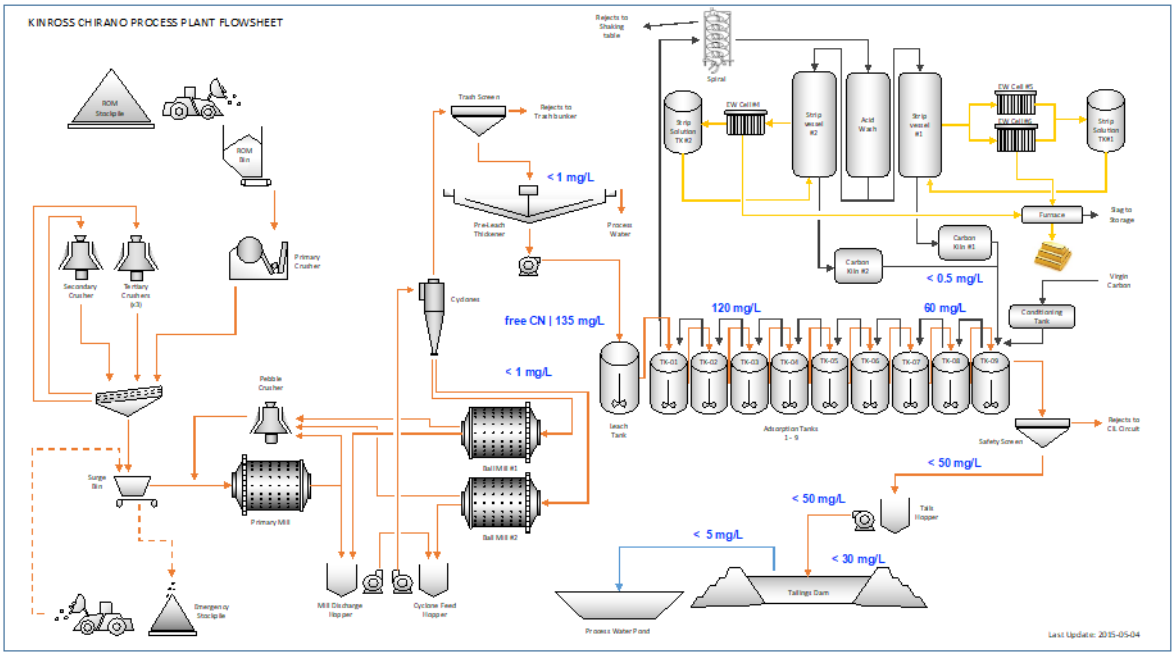
Location detail and description of operation:

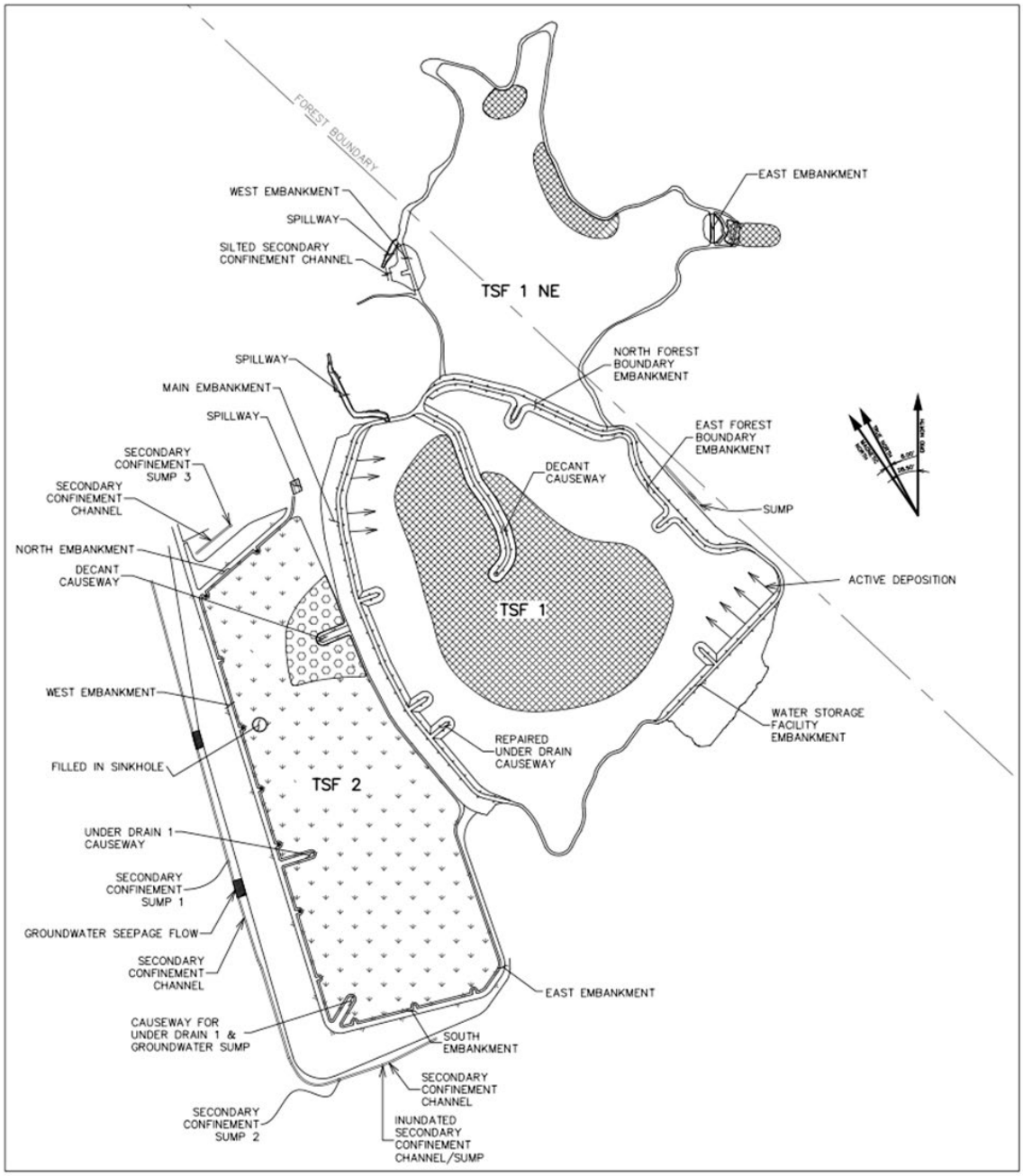
Kinross Gold (Kinross) Chirano gold mine is located in southwestern Ghana, approximately 100 kilometres southwest of the city of Kumasi. The mine lies within the Bibiani gold belt and consists of several conventional open pit mining sites as well as underground workings. Ore is transported to a centrally located processing plant, where it is crushed and milled before undergoing conventional carbon in leach (CIL) processing. The general location of the Chirano mining operation is shown on the figure below:



Cyanide facilities include a warehouse for storage of cyanide reagent in solid briquette form, a cyanide mixing and storage facility, leach tank, CIL processing circuit, a clarifier and tailings box, two lined event ponds, tailings and reclaim water return pipelines, tailing storage facilities (TSFs), reclaim water settling and management ponds, and various other process water control features and connecting pipelines. The Process Plant does not require a detoxification unit. The process is summarised in the flow diagram below.



Over the past three years, CGML has operated three tailings storage facilities, TSF 1, TSF North Extension (NE) and TSF 2. TSF 2 was filled to capacity and decommissioned for rehabilitation and closure in 2017. Currently, process tailings are deposited within the re-activated TSF 1 after a 7 m raise (referred to as Stage 7) completed in the third quarter of 2018. TSF 1NE was constructed in 2017, however deposition at this facility has halted while the current expansion (Stage 2) is under construction. CGML is in the process of permitting another tailings facility (TSF 1 South Extension) to provide additional tailings storage capacity to support future operations into 2021. The arrangement of the TSFs are presented in the figure below.


FOREST BOUNDARY
WEST EMBANKMENT
SPILLWAY
SILTED SECONDARY CONFINEMENT CHANNEL
EAST EMBANKMENT
TSF 1 NE
SPILLWAY
MAIN EMBANKMENT
SPILLWAY
NORTH FOREST BOUNDARY EMBANKMENT
EAST FOREST BOUNDARY EMBANKMENT
SECONDARY CONFINEMENT SUMP 3
SECONDARY CONFINEMENT CHANNEL
DECANT CAUSEWAY
SUMP
NORTH EMBANKMENT
DECANT CAUSEWAY
TSF 1
ACTIVE DEPOSITION
WEST EMBANKMENT
WATER STORAGE FACILITY EMBANKMENT
REPAIRED UNDER DRAIN CAUSEWAY
FILLED IN SINKHOLE
TSF 2
UNDER DRAIN 1 CAUSEWAY
SECONDARY CONFINEMENT SUMP 1
GROUNDWATER SEEPAGE FLOW
SECONDARY CONFINEMENT CHANNEL
EAST EMBANKMENT
CAUSEWAY FOR UNDER DRAIN 1 & GROUNDWATER SUMP
SOUTH EMBANKMENT
SECONDARY CONFINEMENT CHANNEL
SECONDARY CONFINEMENT SUMP 2
INUNDATED SECONDARY CONFINEMENT CHANNEL/SUMP

SUMMARY AUDIT REPORT

Auditors' Finding

The operation is: ■ in full compliance
in substantial compliance
not in compliance

with the *International Cyanide Management Code.*

CGML has experienced no International Cyanide Management Code (ICMC) compliance issues since the last ICMC recertification audit in 2016.

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Names and Signatures of Other Auditors

Technical Auditor: Adrián Juárez
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Date(s) of Audit: 4 November 2019 through 8 November 2019

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the *International Cyanide Management Institute* for Code Verification Auditors. I attest that this Summary Audit Report (SAR) accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the latest version of the *International Cyanide Management Code Mining Operations Verification Protocol; Guidance for Recertification Audits for the International Cyanide Management Code, and* using standard and accepted practices for health, safety and environmental audits.

Chirano Gold Mine		1 April 2020
Name of Mine	Signature of Lead Auditor	Date

SUMMARY AUDIT REPORT

1. PRODUCTION **Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.**

Standard of Practice

1.1 Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide, and to prevent releases of cyanide to the environment.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 1.1

Summarize the basis for this Finding/Deficiencies Identified:

CGML has continued to purchase sodium cyanide exclusively from Cyanco Corporation LLC (Cyanco) produced at the Alvin production facility in Texas, USA. Cyanide is procured under written agreement *Contract for Purchase and Sale of Sodium Cyanide (Solid)* between Cynaco and Kinross Gold Corporation (Kinross) dated 13 June 2017. The contract expires on 31 December 2022. The contract covenants that each part of the supply chain comprising the Cyanco Alvin, Texas production plant, transportation to the Port of Houston, ocean carriers and road transportation in Ghana is to be certified in full compliance with the ICMC and that certification is to be maintained for the duration of the contract. Review of the International Cyanide Management Institute (ICMI) website confirms that the Cyanco Alvin Plant was originally ICMC certified in 2013 and recertified in February 2017.

2. TRANSPORTATION **Protect communities and the environment during cyanide transport.**

Standards of Practice

2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 2.1.

Summarize the basis for this Finding/Deficiencies Identified:

Terms for delivery of solid sodium cyanide are detailed in the *Contract for Purchase and Sale of Sodium Cyanide (Solid)* dated 13 June 2017 (Purchase Contract). Schedule B details specific purchase conditions and delivery of solid sodium cyanide to the Chirano mine designated storage facility on Incoterms Delivered Duty Paid (DDP). The Purchase Contract allocates responsibility to Cyanco and their contracted transporters for packaging, labelling, storage, transport, unloading, evaluation of routes, safety and maintenance of means of transportation, task and safety training for transporters and handlers, and security and emergency response. Cyanco is also responsible for the addition of dye through a written undertaking. Unloading at the Chirano mine storage warehouse is the responsibility of CGML.

2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 2.2.

Summarize the basis for this Finding/Deficiencies Identified

The Purchase Contract dated 13 June 2017 requires that each element of the supply chain is to be certified in full compliance with the ICMC. Cyanco's supply chain comprises the Cyanco Global Ocean Supply Chain and North American Rail & Truck Supply Chain for transport of cyanide from the Alvin production facility to the Port of Houston and departure from the Port of Houston to Port of Tema. Transporter partners forming part the supply chain include Action Resources Inc, Quality Carriers Inc and TransWood Inc for road transport to the Port of Houston and ocean transport by Maersk or MSC with receipt at the Port of Tema. Review of the ICMI website confirms that the Global Ocean Supply Chain was initially certified in March 2013 and last recertified in January 2018; and the North American Rail & Truck Supply Chain in October 2018. USA transporter partners were certified as follows: TransWood Inc in December 2019, Action Resources Inc in December 2018 and Quality Carriers Inc in December 2017. Vehrad Transport and Haulage Limited (Vehrad) is contracted by Cyanco for road transport from the Port of Tema to CGML. Vehrad's initial date of certification was July 2008 with recertification most recently completed in January 2018.

Chain of custody records are retained by CGML and comprise Bills of Lading and Way Bills provided for each consignment and all solid sodium cyanide orders are tracked by JD Edwards resource planning software. Records confirm the transport route from the point of origin at the Cyanco Alvin production plant to the receiving point at the Chirano Mine.

3. HANDLING AND STORAGE **Protect workers and the environment during cyanide handling and storage.**

Standards 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.

The operation is: ■ in full compliance
in substantial compliance
not in compliance…with Standard of Practice 3.1.

Summarize the basis for this Finding/Deficiencies Identified:

Facilities for unloading, storing and mixing of cyanide have not changed since the 2016 re-certification audit. These facilities have been designed and built in accordance with sound and accepted engineering practices. It is the auditor's opinion that the facilities have maintained the design intent to provide safe measures for workers and ensure the recovery of any spills.

The unloading area and storage warehouse remains located within a secure area within the larger Process Plant perimeter. The warehouse comprises a covered portal frame building of concrete floor construction, with the section allocated to cyanide storage access controlled, separated, well ventilated and secured from other storage areas. The front of the warehouse is secured by lockable wire frame doors to allow for ventilation. During preparation of cyanide solution reagent, sodium cyanide boxes are transferred as required to the mix area which is sited in a secure fenced and bunded area. The unloading areas, warehouse and mix area are located away from surface waters and designed with a minimal slope to reduce the potential for uncontrolled runoff.

The cyanide mixing and storage tanks are located within a concrete bund with competent concrete surfacing to prevent seepage to the subsurface. This area is also open to atmosphere with adequate ventilation to prevent the build up of cyanide gas. The entire concrete surface is bunded at the perimeter to act as a secondary containment and fitted with a sump and a pump to collect any spills. Concrete surfacing and containments were generally noted to be in good condition. The mixing facility containment is interconnected with the secondary containment servicing the CIL and leach tanks with sufficient capacity to contain the contents of the largest cyanide solution tank and is equipped with sumps and pumps to return any potential spill to the storage tank. The mixing facility is a fenced and secured compound located within the secured fenced boundary of the Process Plant and is only accessed when conducting a cyanide mix. Readily recognizable safety showers and eye wash stations are located on the upper deck of the mixing tank. The steel mix and storage tanks are labelled with their volumes, the date of the last non-destructive test and the date of the next test.

CGML employs several methods to prevent overfilling of cyanide storage tanks such as use of level indicators, high level alarms and remote surveillance of the mix area from a control room. Procedures require that the level indicators and alarms are inspected periodically and if any malfunction is identified a corrective maintenance order is issued.

The field component of the audit identified areas where improvements could be made and were subsequently rectified. These included installation of high-level alarms at each tank, improvements to the visibility of level indicators, a fixed pH meter at the mixing tank was tested and repaired, the hopper door hinges were upgraded to ensure correct operation, and hopper windows were cleaned to improve visibility.

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.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 3.2.

Summarize the basis for this Finding/Deficiencies Identified:

Cyanide packaging materials are collected and stored in a warehouse adjacent to the cyanide storage area. The packaging is loaded into an empty shipping container which remains available after a cyanide delivery and returned to the cyanide vendor for disposal. CGML does not dispose of waste containers or packaging on-site. The handling of empty containers observed during the field inspection was in accordance with this procedure. Once opened, cyanide bags are rinsed by dedicated spray nozzles located on the bag splitter and housed inside the enclosed hopper above the mix tank before being retrieved for disposal.

CGML has developed procedures to prevent to prevent exposures and releases during cyanide unloading storage and mixing. The mix procedure includes pre-inspection checks of equipment, safety showers and pH readings of the solution in the mixing tank. Routine inspections are also undertaken of valves, pumps and piping to ensure that there are no leaks and procedures detail the operation of all valves and couplings for mixing solid cyanide. Procedures also address the handling of cyanide containers in a manner to prevent rupturing or puncturing during unloading and crane lifting of shipping containers from the delivery truck, storage, delivery to the mixing plant, and handling during the mixing process.

Procedures address destuffing of boxed cyanide from shipping containers. While sodium cyanide boxes in the storage area are routinely stacked two boxes high, this was not addressed in the destuffing procedure which was subsequently amended to include this requirement.

Recovery of spills inside the bunded area for both solid cyanide and cyanide solutions are addressed in procedures which detail steps required to ensure worker safety, description of

personal protective equipment (PPE) required, hydrogen cyanide (HCN) threshold to prevent entry into the area, reporting, halting the spill, recovering the spilled material and cleaning.

Cyanide mixing procedures set out the required PPE during mixing consisting of a full-face respirator, chemical suit, rubber gloves and rubber boots. Cyanide mixing and preparation of mix reagent is undertaken by a two-man team. During an observed cyanide mix, it was noted that the second operator based on the ground was handling waste packaging concurrent with the cyanide mix process with attention diverted and was not observing the mix process from a safe distance. The procedure was subsequently updated, requiring that one of the mix personnel observe the mix process from a safe position if the task is not being monitored remotely. CGML subsequently updated the procedure and provided evidence of operator training.

The sodium cyanide supplier (Cyanco) delivers cyanide with red dye incorporated and thus no manual addition of dye is required. A sample of prepared reagent was visually observed and confirmed to contain colourant dye.

Several observations of the mix area and process were noted during the field component of the audit which required correction by CGML. These included inaccurate readings from a pH probe, grimy hopper windows obscuring visibility, a poorly executed repair to the base of the mixing tank and the hopper door remaining open during mixing. CGML subsequently completed corrective actions to these observations.

During the site audit the hoist mechanism used for lifting cyanide bags for the mixing process was faulty and inoperable. Consequently, CGML employed a nonstandard method to raise the cyanide bag into the mix hopper using a mobile crane. This was observed to present several potential hazards to worker safety. According to discussions with the production superintendent and mix personnel, this method had previously been used when other past hoist failures had occurred. Subsequent to the field component of the audit, CGML revised the mixing procedure to include the use of a mobile crane; and revised the cyanide mixing permit template to update the requirements for health and safety checks and assessments before conducting the mix. Operators received training of the revised procedures.

***4. OPERATIONS* Manage cyanide process solutions and waste streams to protect human health and the environment**.

Standards 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.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.1.

Summarize the basis for this Finding/Deficiencies Identified:

CGML has developed a set of written Standard Operating Procedures (SOP) and plans for management of operations which consists of the following components:

- the cyanide receiving area and warehouse;
- cyanide mixing facility, with mixing and solution storage tanks;
- the CIL circuit (leach tank, nine adsorption tanks, and the desorption circuit);
- event ponds
- tailings and reclaim water pipeline, with associated pumping stations;
- tailings pipeline leak collection pond;
- tailings storage facility (TSF) 1 and TSF 1 North Extension (TSF 1NE) and
- associated piping systems and other infrastructure

Mine ore is transported to a central processing plant for crushing, milling and carbon-in-leach processing with tailings deposited at the TSF complex comprising TSF 1, TSF 2 and TSF 1NE. Currently, process tailings are deposited within the re-activated TSF 1. TSF 2 was filled to capacity and decommissioned for rehabilitation and closure in 2017. Deposition is currently halted at TSF 1NE.

Process water used in the mill is a mixture of decant water from the TSF and overflow from the pre-leach thickener. Over the past three years, the cyanide concentration in this process water has been maintained consistently in the general range of 0.005 mg/L to 0.01 mg/L, below the 0.5 mg/L weak acid dissociable (WAD) cyanide threshold. The WAD cyanide exceedances above 0.5 mg/L previously noted in the 2016 recertification audit have not been repeated and therefore the mill and pre-leach thickener remain as non-cyanide facilities.

CGML retains documents related to the original design for the Process Plant and commissioning packages for the redesign in 2008 to 2009. Design documents for TSF 1 and TSF 2 were prepared by Knight Piésold Consulting (KPC). Following the 2016 re-certification audit, TSF 1 was raised by 7 meters, sufficient to store tailings for two years of production. Design criteria included considerations for the probable maximal flood (PMF, 24-hour, 875 mm) storm, a Maximum Normal Operating Pond Elevation (MNOPE) be maintained at or below

2310 m elevation and providing 2 m freeboard, and containment of the 1:100-year 24-hour storm above the MNOPE with 1.22 m freeboard (which exceeds Ghanaian requirements). The WAD cyanide concentrations at the TSF 1 are below 50 mg/L and usually below 10 mg/L. Review of records since 2016 show that WAD cyanide concentrations at the tailing's spigots are generally below 30 mg/L. Procedures establish that maximum WAD cyanide concentration at the spigots to not exceed 40 mg/L.

Following the 2016 re-certification audit, TSF 1NE was constructed and commenced operations. At the time of the audit tailings deposition had ceased, and the Stage 2 raise was being built. Design documents include design criteria in accordance with Ghana regulations, the Kinross Corporate Responsibility management system and international best practice (Canadian Dam Association Guidelines). Design criteria used for this TSF included design flood storms (1:100 year 24-hour storm & PMF, 24-hour storm) and earthquake loads.

CGML has a suite of operating manuals and procedures in place for the safe and environmentally sound operation of the Process Plant and TSFs. This include documented equipment inspections, monitoring of process solutions, flows and pond levels. Preventative maintenance schedules are maintained in a software management system JD Edwards. The system initiates inspections scheduled on monthly or weekly frequencies depending on the component or aspect to be inspected. The results of these scheduled inspections are corrective maintenance work orders, to be scheduled depending on how critical the finding is.

The *CGML Tailings Storage Facility and Water Storage Facility Operation Manual* describes inspection requirements, which includes tailings pipelines, decant tower, underdrainage system, embankments and instrumentation. It also describes the maintenance program. Similar inspections applied to TSF 2, which is no longer in use. The inspections are conducted every shift using a checklist to identify issues related to the embankment, pipelines, pumps, flanges, spigots, incidents, freeboard, road conditions, presence of vegetation and wildlife.

CGML maintains a *Management of Change* procedure that ensures any proposed modification to a plant, equipment, control system, process condition, and operating procedures be evaluated for safety, health and environmental impacts, and be signed off before the change is implemented. Approval is required before the change becomes operational.

The Kinross Authorisation for Expenditure (AFE) process remains in place and requires that major facility upgrades or proposed changes with significant capital expenditure undergo an environmental and health and safety review. Three important changes in the period since the 2016 audit were implemented and followed the AFE process:

- TSF 1 Stage 7 raise, completed in the third quarter of 2018;
- TSF 1 North Extension was built in 2017, operated from 2017 to 2018. During the audit, the Stage 2 raise was under construction;
- Cyanide was removed from the elution circuit in the first quarter of 2017.

The TSF operating manual address procedures to be implemented in the event of an upset resulting from a power failure, earthquake event, excessive seepage, extreme rainfall,

embankment failure, or overtopping; and includes emergency procedures for rupture of the delivery/distribution systems, blockage of TSF pipelines and tailings overflow.

The TSFs are operated in line with the International Commission of Large Dams (ICOLD) guidelines which includes requirements for annual audits by a qualified and experienced geotechnical engineer to ensure that they are operated in a safe and efficient manner.

CGML inspect its cyanide facilities with a frequency sufficient to ensure that the facilities are functioning within design parameters. The TSF is inspected every shift by the plant operators and the information is recorded in *TSF Inspections Log Sheet*. Quarterly TSF inspections (surface water diversion channels, pipeline corridors, event ponds and spillways) are undertaken by the engineer of record (KPC) and documented in *TSF Inspection Report*, and additionally by an engineering contractor Glocal Engineering Limited (Glocal) and documented in a *TSF Environmental Audit Report.* Based on review of the tailings safety and compliance inspection reports completed over the past three years, Glocal has concluded that the tailings facilities are being adequately managed. KPC concluded that, in general, the dams are in sound structural condition with no evident signs of failure and made recommendations for certain actions to maintain the facility in good condition.

CGML procedure, *Short-Term and Medium-Term Temporary Closure* remains in place and provides guidance in the event of a short- or medium-term Process Plant closure long enough to significantly alter ability of the plant to continue routine activities. The procedure identifies those processes that are required to be maintained during a short-term closure, including regulatory obligations, security, process piping and pumps, secondary containment, tailings and facility inspections and hazardous materials management. Medium term closures would also consider interim reclamation activities necessary to stabilize tailings dam faces and other slopes. If the temporary closure period exceeds 90 days, or if site anticipates that it will exceed 90 days, CGML will begin to evaluate procedures to carry out permanent closure.

Other procedures apply to the Process Plant operation that account for cyanide management in the event of non-standard operations. Procedure *CIL Operations* provides a checklist of key operating steps within the CIL circuit, actions to take under abnormal operating conditions and a troubleshooting list. These include consideration of HCN levels, process cyanide concentrations and pH levels. Procedure *Power Failure* addresses actions to be taken in the event of a partial or total power failure and provides instruction to the operator on actions to follow to avoid process spillage including isolating or opening valves, closing screen sprayers, halting of pumps and actions to follow once power is restored. Procedure *Cyanide Mixing* identifies potential issues that may arise from abnormal conditions during mixing and the necessary actions to be taken including cessation of the operation, checks on pumps/valves/filters, cordoning off areas and notifying a supervisor.

The inspection programme for the cyanide facilities is recorded within the JD Edwards system and organized based on the specifications of the equipment and therefore this system functions as a preventive maintenance program. The system initiates work orders scheduled at frequencies (monthly or weekly) that depend on the specific component or equipment. The

result of these scheduled inspections are corrective maintenance work orders, to be scheduled depending on how critical the finding is. The Process Plant is inspected following work orders triggered by the JD Edwards system, and based on the specifications provided by the manufacturer, considering every component of the cyanide circuit. The elements included are the cyanide lines from the mixing tank to CIL tanks and elution area (weekly), dosing pump (monthly), transfer pump (monthly), agitator at the mix tank (weekly), and recirculation pumps (weekly). Deficiencies are recorded and scheduled for action within JD Edwards system. Sample records were reviewed for the period 2017 through to 2019 which showed time and materials used to close the work order. CGML operates two lined event ponds that form part of an integrated secondary containment system for leach and CIL tanks and two lined process water ponds. These are periodically visually inspected, and the liner welds are pressure tested for integrity.

Non-destructive testing is conducted annually on tanks to test wall thickness and provide certification for Process Plant tanks including the CIL and cyanide mixing and storage tanks. Tanks are inspected for signs of corrosion and leakage as observed in inspection checklists. During the field portion of the audit, signs of initial corrosion was observed at the base level entrance of one of the CIL tanks and several bolts were noted be missing from base level drainage valves of the CIL tanks. Subsequent to the field component of the audit, both items were addressed through repairs and replacement of bolts. Secondary containment areas are inspected during daily shift inspections and weekly plant inspections to ensure that they are clear of debris or other items that may reduce the containment capacity and to identify any deficiencies in concrete that may impact the integrity of the containment. Testing is conducted annually on HDPE pipes and liners on ponds. It is the auditor's opinion that these inspections are conducted at frequencies sufficient to ensure that facilities are functioning within design parameters.

CGML operates with energy supplied by the national electricity grid. Additionally, CGML has an emergency power generator set (10 units equivalent to 22.5 MW), enough to run the entire Process Plant. During a power cut, and while transitioning to the emergency generators, a portion of the tailings in the pipeline will return to the tailings hopper which reports to the event pond. Most of the tailings in the pipeline will not return to the Process Plant since the pipeline is at a lower elevation. The weekly inspection includes a review of battery voltage, checks for fuel leaks, coolant leaks, operation of the automatic control switch and a test run to check voltage, frequency, oil pressure, coolant temperature and operation of radiator cooling fans.

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

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.2.

Summarize the basis for this Finding/Deficiencies Identified:

Ore is controlled and blended to reduce the variation in ore quality directed to the Process Plant thereby simplifying management of the cyanide feed rate to achieve and maintain optimal gold recovery. Procedure *CM/PP/RG-CN-005 CIL Operations* defines the optimum cyanide concentrations in the leach tank as 150 ppm (or mg/L) the point at which cyanide addition occurs, and that of the final CIL tank (TK-09) 60 ppm. Tails from the CIL circuit are directed to the tailing's hopper. The tails are diluted with reclaimed water from the TSF prior to discharge to the TSF and therefore, the process does not require a cyanide detoxification unit. Monthly measurements at the tailing's spigot show readings below 50 ppm for total cyanide, below 40 ppm for WAD cyanide and below 35 ppm for free cyanide, and the total cyanide concentrations at the TSF 1 decant water is normally well below 10 ppm, although with occasional elevations above this. Free cyanide in the leach process is monitored for optimization and determines addition rates at the leaching tank. CGML measures free cyanide every two hours and the data is recorded on *Leach and Adsorption Log Sheets*.

4.3 Implement a comprehensive water management program to protect against unintentional releases.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.3.

Summarize the basis for this Finding/Deficiencies Identified:

CGML has developed a comprehensive, probabilistic and deterministic water balance that considers water inflows and outflows for the whole site. The model is based on historical climatic and hydrologic data to evaluate seasonal, annual, and decadal patterns that have occurred in the past to more accurately identify extreme (wet and dry) conditions that may occur in the future. The model is run on a monthly time-step and the results are summarized and presented on a monthly basis. It utilizes the Index Sequential Method (ISM) to simulate possible combinations of historical climatic events and mine operational conditions. Therefore, the water balance model is based on deterministic inputs, although it can provide deterministic and probabilistic results. The deterministic climatic dataset for the Chirano Project consists of 75 years of data.

Outcomes from the model are analysed from both a deterministic approach and a probabilistic approach. The deterministic analyses summarize the direct outcomes from the model by calculating the minimum, average, and maximum values for the various water volumes and flows tracked within the model for each month simulated. The probabilistic analyses are based on the deterministic outcomes from the model, which include necessary statistical parameters (e.g., average, standard deviation, skewness, etc.) for use in the probabilistic evaluations. These analyses have the capability of extrapolating beyond the deterministic outcomes using the Gumbel Extreme Type I probability distribution.

The model considers tailings deposition, the amount of rainfall in the event of a 1:100 year, 24-hour storm event, data from the on-site Chirano weather station, runoff from the upgradient watershed, infiltration that reports to subsurface flow; the amount that reports as groundwater recharge, reclaim water to the Process Plant, water entrained in the tailings, and any emergency spillway discharges to the environment (should this occur); and the phreatic surface beneath the TSFs. The model includes consideration that direct discharges into the environment are not allowed. Freezing and thawing conditions are excluded due to the tropical environmental conditions.

CGML conducts inspections on the TSFs (daily and quarterly) and ponds (monthly) to implement the water balance model. These are conducted daily by operators and quarterly by the engineer of record. The TSFs were designed to maintain a 1.22 m minimum operating freeboard, with capacity to contain the 1:100 year 24-hour storm event. The quarterly inspection reports prepared by the engineer of record provides measurements on the actual freeboard of the TSFs, event ponds and process water ponds and a review of these reports confirms that a minimum operating freeboard of 1.5 m has been maintained. The water balance report shows that the actual rainfall data is used for the water management predictions.

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

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.4.

Summarize the basis for this Finding/Deficiencies Identified:

CGML has five ponds in use at the time of field audit, TSF 1 supernatant pond, two event ponds and two process water ponds, where open solutions may be retained for any length of time. All have WAD cyanide concentration below 50 mg/L. The WAD cyanide concentrations measured at the TSF 1 spigots are below 50 mg/L, and generally below 30 mg/L. The WAD cyanide concentrations at the TSF 1 supernatant pond are below 5 mg/L. Therefore, there is no need to cover any pond or impoundment for the protection of wildlife and livestock. Daily TSF inspections include monitoring for the presence of animal and bird mortalities and observations are included on the inspection sheets. No mortalities have been reported in the past three years.

The event ponds are used for emergencies and routinely for temporary storage of solutions during maintenance operations. Although there is potential for WAD cyanide concentrations in the event ponds to periodically be greater than 50 mg/L, a monitoring procedure is in place to ensure that solutions and sediment are removed within seven days if WAD cyanide concentration exceed 50 mg/L. Weekly inspection records were available for the past three years show conformance to this procedure. The process water ponds store water recycled from the TSF ponds with WAD cyanide concentrations well below 0.5 mg/L and usually below 0.1 mg/L.

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

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.5.

Summarize the basis for this Finding/Deficiencies Identified:

CGML is designed to operate as a zero-discharge facility. Nevertheless, CGML maintains a network of surface water monitoring stations to regularly check water quality, including sampling locations downstream of the TSF on the Suraw River (monitoring points SP2, SR1, SP and S10). WAD cyanide concentrations over the past three years were recorded below 0.005 mg/L.

CGML does not have an indirect discharge into the environment. The reclaim and event ponds are constructed with a high-density polyethylene (HDPE) liner. The TSFs are designed to minimize the potential for seepage. The dam containment embankment is constructed with an impermeable ($1x10^{-8}$ – $1x10^{-9}$ m/s) silty clay core and cut-off trench. Additionally, to minimize impact to the underlying aquifer, the base of the containment basin has been compacted to achieve a permeability of less than $1x10^{-8}$ m/s. Tailings are also placed in a manner to keep the supernatant pond away from the embankment dam and minimize the height of the phreatic surface within the dam. Underdrains have been placed within the containment base to promote drainage and consolidation of the tailings. These underdrains flow to a collection tower and liquid draining from the tails is pumped back to the supernatant pond.

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

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.6.

Summarize the basis for this Finding/Deficiencies Identified:

CGML does not have an indirect discharge into the environment. The reclaim and event ponds are constructed with a high-density polyethylene (HDPE) liner and the TSFs are designed to minimize the potential for seepage. Tailings are also placed in a manner to keep the supernatant pond away from the embankment dam and minimize the height of the phreatic surface within the dam. Underdrains have been placed within the containment base to promote drainage and consolidation of the tailings and flow to a collection tower and liquid draining from the tails is pumped back to the supernatant pond.

Villages located near CGML use groundwater for a potable water supply. CGML has elected to use the Akoben EPA Water Quality Standard for drinking water defined as 0.005 mg/L for free cyanide as a reference standard. Groundwater monitoring wells are sampled monthly for water quality analysis. Review of data since 2016 shows that free cyanide has been recorded below the detection limit of 0.005 mg/L in groundwater monitoring wells TMB1, TMB2, TMB3, TMB4, TMB6, TMB7 located downgradient of the Process Plant and TSFs (TSF 1 Stage 7 raise and North Extension). CGML also monitors water quality in two potable water wells (AKT1 and ETW1) located in the villages of Akoti and Etwebo; and G4 at Kwawkrom and G6 at Paboase. Water quality data collected through monthly sampling at the monitoring wells shows WAD cyanide levels below the method detection limit of 0.005 mg/L and below the threshold for drinking water standards of 0.005 mg/L for the entire three year recertification period.

4.7 Provide spill prevention or containment measures for process tanks and pipelines.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.7.

Summarize the basis for this Finding/Deficiencies Identified:

Since the 2016 re-certification audit, containment measures associated with Process Plant tanks have not changed. All tanks (mixing, storage, leach, and CIL) are located within competent secondary concrete containment. These secondary containments are equipped with sumps and pumps to collect any spill for return into the process solution tanks. The event ponds are lined and equipped with pumps to return any spill into process tanks. The Process Plant has a total secondary containment capacity of 7,070 m^3 which is 220% greater than the largest tank volume of 3,200 m^3 and able to accommodate any additional precipitation from the design storm event.

CGML has spill prevention systems in place. The leach tank and CIL tanks are constructed on ring-beam foundations. These tanks are each equipped with horizonal piezometer leak detection systems that are monitored weekly for potential leakage. CGML conducts annual tank inspections and non-destructive ultrasonic wall thickness testing.

CGML retains procedure *Handling Liquid Cyanide Spills Inside a Bunded Area* remains in place and is applied mainly in process, cyanide mixing and storage areas.

CGML does not have cyanide pipelines that present a risk to surface waters. The pipelines at the Process Plant are inspected with sufficient frequently to identify leaks and prevent releases into secondary containment and to the environment. Pipelines transferring cyanide solution from the cyanide mix and storage area into the leach tanks are located within the bunded secondary containment of the leach and CIL tanks. All cyanide pipelines at the Process Plant are within the secondary containment of the leach and CIL tanks.

A portion of elevated tailings pipelines leaving the tailings box and transferring tailings slurry into the TSFs is routed within the Process Plant fence and is serviced by a competent wall built to contain any potential spill. The wall is located across the access road to the Process Plant, is very visible and in an accessible location. Tailings pipelines outside the Process Plant fence are routed over a channel with a geosynthetic liner, which is also used to transfer the reclaim water from the TSF back to the Process Plant. The process pipelines are constructed of carbon steel or HDPE and therefore compatible with cyanide and high pH conditions.

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

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.8.

Summarize the basis for this Finding/Deficiencies Identified:

The Process Plant infrastructure (mixing, storage, leach, CIL thickener tanks, secondary containment and lined event ponds #1 and #2) has not altered since the 2016 re-certification audit. CGML retains all QA/QC documents at the Process Plant document storage room.

CGML implemented a QA/QC program for the construction of the TSFs which are part of the cyanide facilities. Due to the nature of these works, the materials used are limited to silts, clays, waste rock, clean rock, and erosion protection material (riprap). CGML retains all QA/QC documents for the active TSFs and also those phases constructed prior to this ICMC audit period.

TSF 2 was closed and is in an advance stage of reclamation. Construction of Stage 5 raise (the last stage) was completed in December 2015. The construction report was not available at the time of the 2016 audit, however, was reviewed during this audit and QA/QC documentation was confirmed as in place.

The TSF 1 Stage 7 raise construction report (KPC, 2018) considers suitability of materials, and presents a summary of the specifications for construction materials and summary test results for compaction testing. Every weekly field report for TSF 1NE from May 2016 to January 2017 (37 in total) presented the QA/QC tests conducted and reported any deviations from the design which were captured in the as-built drawings.

TSF 1 Stage 7 and TSF 1NE construction reports concluded that both facilities were constructed in accordance with the design intent and the technical specifications adopted for the works. The reports were prepared by a KPC senior project engineer and approved by the engineering manager.

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

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 4.9.

Summarize the basis for this Finding/Deficiencies Identified:

CGML has developed a written plan for monitoring activities *Environmental Monitoring Plan Surface and Ground Water* (EMP), last reviewed in February 2019 and prepared by the Environmental Laboratory and Chemical Control Supervisor. The EMP includes sampling parameters; sampling methods; sample packaging; preservation; labelling and shipment; sample documentation; sampling location and frequencies; and a monitoring plan for avian and terrestrial wildlife. The EMP was approved by the health, safety and environmental manager at CGML, who has held this position for 11 years, has more than 18 years of experience in this type of position, and who holds a PhD in environment and sustainable development. The EMP provides guidance on the data to be collected during sampling. Information is recorded in a field book where a detailed description at the sample location is noted, including date, time, weather conditions, person responsible for sampling, number and volume of containers, type of sample, field observations and field measurements (pH, temperature, and dissolved oxygen). Example records were reviewed during the audit and found to be in order.

CGML does not have a direct discharge to surface waters. Monitoring stations TNFB and TEFB are both positioned downstream of TSF 1 to monitor the runoff water quality. Readings for WAD cyanide all were below 0.005 mg/L for the period 2016-2019. CGML monitors groundwater downstream of TSF 2 at monitoring wells TMB1, TMB3, TMB4 and TSES (all WAD cyanide readings are below 0.005 mg/L for the period 2016 to 2019) and at monitoring wells AKT1 and ETW1 at Akoti and Etwebo villages respectively. All monitoring results were below 0.005 mg/L WAD cyanide for the period from 2016 to 2019.

CGML monitors surface waters at stations SR1 and S10 on the Suraw river downstream of the site and readings for WAD cyanide were noted to be below 0.005 mg/L for the period 2016 to 2019.

CGML conducts its monitoring program with a frequency adequate to characterize the receiving environment. All surface water and groundwater monitoring stations are monitored on a monthly basis, considered a suitable frequency to identify any chemical changes. The EMP also requires surface and groundwater monitoring to be conducted whenever there is a suspected release of a pollutant. Surface water and groundwater monitoring is reported to the EPA as part of permit requirements with no adverse findings noted.

CGML inspects and maintains records of wildlife mortality related to contact with and ingestion of cyanide solutions. The Environmental Department records wildlife mortality in a

field book for every monitoring station and for every sampling event (monthly). The TSFs are inspected every shift and the inspection checklist includes items to note birds on the TSF, any bird mortality and the presence of any other animal. These records are retained on file. A sample of records for the period 2017 to 2019 were reviewed and showed no mortality related to exposure to cyanide solutions.

5. DECOMMISSIONING **Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.**

Standards of Practice

5.1 Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of 5.1.

Summarize the basis for this Finding/Deficiencies Identified:

As noted in the 2016 recertification audit, CGML developed a Cyanide Decommissioning/ Closure and Post Closure Land Use Plan dated 2015. The current Mine Closure Plan (CGML, January 2019) replaced the 2016 version.

CGML has developed a written procedure for decommissioning of Process Plant cyanide facilities *JDS Energy and Mines, October 2018: CGML, Assets Value Recovery and Decommissioning Plan Report*. The report presents decommissioning methodology and a schedule including a task description and sequence for cleaning and emptying tanks and pipelines, tailings slurry pumps and pipelines, and reclaim water pipelines from the TSF to the Process Plant; and the management of hazardous wastes. The plan includes a list and description of all pumps of the cyanide circuit.

CGML has developed a written closure and rehabilitation plan for TSF 1 *(Tailings Storage Facility 1 Stage 7 Detailed Design, CGML by KPC, December 2016)* detailing goals and objectives, the basis of closure design, closure measures, environmental and social risk assessments, monitoring, reporting and stakeholder consultation. A written procedure for the closure of TSF 2 has also been prepared (*CGML, June 2016: Final Closure Plan for Tailings Storage Facility 2*) and presents closure goals, an estimated budget and a schedule for closure. A closure and rehabilitation plan for TSF 1NE is presented in *KPC 2015: TSF 1 North Extension, Detailed Design, CGML* and details goals and objectives, the basis of closure design, closure measures, environmental and social risk assessments, monitoring, reporting and stakeholder consultation.

CGML has also developed a written closure plan *CGML, January 2019, Mine Closure Plan* that describes the regulatory framework, options for closure measures (TSF, waste rock dump, open pits), plant site decommissioning, post closure monitoring and maintenance.

5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 5.2.

Summarize the basis for this Finding/Deficiencies Identified:

The *Mine Closure Plan* (January 2019) contains a decommissioning cost estimate for all CGML facilities (including cyanide management infrastructure) that projects third-party costs (based on standard estimate references and unit rates) for progressive rehabilitation, pre-closure, and post-closure phases of the project in an amount of approximately US$ 27.987 M. This plan includes options for closure of the TSFs, waste rock dumps, open pits, disturbed area, and decommissioning of the plant site. The estimated cost to close the TSFs (TSF 1 and TSF 1NE) is approximately US$ 2.52 M and the estimated cost for decommissioning and dismantling of the Process Plant is approximately US$ 5.5 M, totalling US$ 8.02 M. These cost estimates are based on third party costs. CGML conducts bi-annual reviews and updates of the cost estimate based on third party costs, as required by the Ghana's EPA in order to update the financial guarantee.

CGML has maintained the same financial mechanism approved by the Ghanaian EPA, as described in the 2016 recertification audit report. The reclamation security agreement between CGML and the Ghana EPA, dated August 2015, is valid and current and establishes:

a) The initial amount of the security is to be equal to the total cost estimate of any outstanding liability;
b) The cost estimate means the estimate of cost involved in performing the work described in the reclamation plan;
c) The reclamation plan is delivered by CGML to the EPA, which is subject to annual review;
d) CGML is required to provide evidence to the Ghana EPA of a cash deposit;
e) The initial security will be in the amount of US$ 27,422,354 made up of a bank guarantee of approximately US$ 21.9 M and a cash deposit of about US$ 5.48 M

The financial guarantee of US$ 27,422,354 is therefore substantially greater than the estimated funding to close and decommission cyanide related facilities which is estimated at US$ 8.02 M.

6. WORKER SAFETY Protect workers' health and safety from exposure to cyanide.

Standards of Practice

6.1 Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 6.1.

Summarize the basis for this Finding/Deficiencies Identified:

CGML continues to maintain a suite of documented standard operating procedures (SOPs) that address cyanide related safe work practices during unloading, mixing, plant operations, decontamination and confined space entry. In addition to SOPs CGML continues to implement a system of Job Safety Analysis (JSA) assessments for non-routine work tasks, including cyanide related tasks, where a SOP may not be available. The JSAs are prepared for work activities where there is a potential for injury, near misses or losses, for tasks undertaken by new workers for which there is no SOP, rarely performed tasks, or were work conditions or environment has changed. The JSAs are prepared by the worker and signed off by a supervisor and identifies the task steps, potential hazards and identifies controls measures. JSAs prepared for new tasks also require input from the Health Safety and Environment (HSE) Department who together with the worker and supervisor would conduct a risk assessment of the task. JSAs form part of the preventative maintenance system and are automatically generated when work orders are created from JD Edwards (JDE) maintenance software.

Confined space entry is deemed a high hazard task requiring a *Confined Space Entry Permit*. The Permit and SOPs *Confined Space Entry CP/04-04* and *Cleaning Internal of Cyanide Mixing and Storage Tanks CM/PP/01-02* sets out requirements for confined space entry including approval of the maintenance superintendent, planning by all parties and preparation of a JSA and an emergency rescue plan; and consideration must be given to the use of specialised safety equipment, availability of first aid, PPE, emergency and exit procedures and availability of standby staff. Any confined spaces are to be well ventilated and atmospheres tested and certified as safe prior to entry. Where cleaning and entry into cyanide mixing and storage tanks is necessary, a safety officer is required to first check gas levels. Cleaning of cyanide mixing and storage tanks also requires the use of appropriate PPE.

Since 2018 preparation of cyanide solution requires a *Cyanide Mixing Permit*. The permit records the duration of work, pre-start HCN level, and provides a supervisor checklist for safety showers/eyewash, sump pump, pH meter, that the hopper window is clear, PPE requirements and barricading.

Hazard booklets are still used to identify workplace hazards. The observer of the hazard fills out a *Hazard Report Form*, and the observation is discussed at the daily production meeting.

Hazard booklets are supplemented with an electronic software system for capturing observations known as *iAuditor* and a manual system of identifying hazards which are recorded on a *Hazard Report Form* and *Hazard Correction Form.* These systems record the observation or condition noted, detail a corrective action plan, completion date and allocates responsibilities for close outs. These observations are logged on a tracking system, monitored daily and provided/discussed at daily production meetings. Corrective actions are logged and tracked on INX safety management software system.

CGML has implemented a system to identifying key risk areas and control measures for critical tasks such as for cyanide mixing. This is used to develop a *Critical Control Verification Inspection (CCVI)* form specific to a critical task against which worker activities can be observed and reviewed against the associated SOP. Issues arising out of the CCVI are tracked on a *Critical Control Tracker* with reports generated weekly and provided to management.

SOP for Cleaning Internal of Cyanide Mixing and Storage Tanks requires draining and flushing of tanks before cleaning. Subsequent to the field component of the audit, the procedure was revised to require decontamination of any cyanide related equipment prior to conducting maintenance by flushing with water. Evidence of training on the revised procedure was provided.

SOP Working on Pumps and Pipes Carrying Cyanide requires that before commencing with any servicing work on cyanide pumps or lines these are isolated, drained and washed with raw water. Any pipework that is removed is required to be flushed with raw water within a bund before being disposed. Responsibility is allocated to the shift supervisor to ensure that the cyanide system is depressurised, and the mechanical supervisor is responsible for ensuring that maintenance personnel have the adequate knowledge and understanding of the hazards involved in performing the task. All tools used during servicing are required to be washed before being returned to the tool store.

Mandatory PPE requirements are applicable to all employees and contractors and for entry onto the processing plant and comprises safety helmets, safety glasses, safety footwear and high visibility clothing with reflectors. Additional PPE is required for cyanide related tasks and are specified in task specific SOPs. For cyanide mixing, SOP *Cyanide Mixing* requires the use of a chemical suit/disposable overall, PVC rubber gloves, safety helmet, full face respirator and in date filter cartridge, rubber boots and an HCN Gas monitor. Other SOPs similarly specify additional PPE for tasks where cyanide may be encountered. For maintenance work, minimum mandatory PPE requirements are specified depending on the nature of the potential hazard including the use of chemical suites, full face respirator, elbow length rubber gloves and rubber boots. Signs indicating mandatory PPE use are also posted in prominent areas including at the cyanide mixing areas. PPE requirements for operators are tracked on a spreadsheet which is kept current by the Safety Department.

SOPs for offloading of cyanide boxes, cyanide box destuffing, conveying boxes from storage to the cyanide mix area, cyanide mixing, servicing of cyanide pumps and lines require that pre-work inspections are carried out. These include inspection of work areas, checking of PPE,

testing of safety showers and eyewash stations, inspection of equipment, barricading of work areas, and the use of HCN monitors and warning signage as necessary. JSAs and Work Permits also require that pre-work inspections are carried out.

CGML continues to implement *Management of Change Procedure* applicable to all CGML employees and contractors. The procedure requires that no modification to plant, equipment, control systems, process conditions and operating procedures can be carried out without authorisation from a responsible manager or their delegate. Risk assessments of proposed changes are required to consider hazards to health, environmental damage, damage to equipment, adverse effects to the process and the effects to public.

The change procedure is detailed in nine steps comprising initiation and appraisal, risk assessment, approval, implementation, verification, documentation, training, audit, and review. After the initiation stage a multidisciplinary team is convened as appropriate to assess the proposed process change and the potential impacts. Management of change documentation is agreed and signed by the continuous improvement (CI) facilitator, safety superintendent/plant safety officer, planning superintendent, mechanical engineering superintendent and CI analyst with final approval provided by the head of department overseeing the requested change. After implementation, the change is verified to confirm that objectives have been met, relevant documentation updated, and that related training has been completed. Finally, a management review of the change is required to evaluate the effectiveness of the change.

CGML implements an Authorisation for Expenditure process FE authorisation process where major facility upgrades that require significant capital expenditure will also be subject to a review process.

CGML actively engages with workers in developing and evaluating health and safety procedures and worker input is obtained through several mechanisms:

- *Daily Toolbox Talks:* These are conducted at the beginning of each shift and are mandatory for the shift team. Safety topics are discussed such as appreciation of chemical hazards, use of appropriate PPE, preparation of JSAs, pre-start and pre-shift inspections, fire and fire extinguisher safety, cyanide handling, field level risk assessments, confined space entry, respiratory protection, safety showers/eyewash, hygiene and housekeeping. The meetings are interactive and provide an opportunity for worker participation and concerns to be raised and discussed. Safety actions which come out of the daily toolbox talks are shared at plant production meetings and tracked.
- *Weekly Meetings:* Interactive meetings are conducted by the Health and Safety and Engineering departments at which health and safety inspection observations are discussed including any cyanide related observations and maintenance issues.
- *Mine Health Safety and Environment Monthly Meetings:* These are attended by all departments and managers during which mine wide safety issues are discussed and feedback provided.

- *Shift Monthly Meetings:* at which health safety and environmental issues specific to a shift or department are discussed and where worker input can be provided.

Preparation of JSAs includes worker participation and input into completion of hazard booklet forms also provides opportunities for worker observations and inputs to be provided regarding any safety issues or concerns. Task observations conducted using *iAuditor* software and *Hazard Correction Forms* provide an opportunity for one-on-one interaction with workers and operators, during which input can be obtained. The general manager's suggestion box is available at the site entrance for worker feedback. In addition, the general manager conducts a "Safety Road Show" approximately quarterly during which worker's concerns and feedback can be solicited.

6.2 Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 6.2.

Summarize the basis for this Finding/Deficiencies Identified:

Procedures *CIL Pre-Start Checks* details steps to be followed for operation of the CIL circuit and identifies the evolution of hydrogen cyanide gas as a potential hazard. Procedure *CIL Circuit Start Up Procedures* also specifies that pH is measured and maintained at target ranges. Procedure *CIL Operations* requires that pH in CIL tanks within the circuit is maintained at between 10 and 11. Any pH decrease to below 10 requires the addition of lime. Operators are required to manually sample and check pH every two hours. Target levels for leach tank 1 pH is 10.2 – 10.5 and adsorption (ADS) Tank 1 and ADS Tank 9 pH 9.5 – 9.8 with lime adjustment made as necessary. Manual readings taken at leach tank 1 are verified against an automated pH meter. Inspection of a sample of records indicates that pH was being maintained above these target ranges. The *CIL Operations* SOP requires that operators inform the shift supervisor of any large pH variation of >0.5 units in the leach tank.

SOP *Cyanide Mixing* requires that caustic is added to the mixing tank to adjust pH to 10.5 prior to closing the caustic valve and before adding sodium cyanide. The mill control room monitors pH during the mix process.

Plant infrastructure remains generally uncovered, open to the atmosphere and well ventilated and the potential for build-up of significant concentrations of HCN is low. Nevertheless, areas where potential build-up may occur have been identified and fitted with five fixed OTIS 6000 Gen II HCN monitors at the leach tank addition point, elution circuit, gold room, cyanide mix area and the tailings hopper. The units are set to alarm at HCN concentrations of 4.7 ppm and 10 ppm respectively. The cyanide mix area is also monitored by remote camera during mix operations. CGML currently maintains two MSA Altair 5X and six BW Gas Alert Extreme

portable HCN monitors for use in areas where there is a risk of exposure to HCN. These units are assigned to the cyanide mix tank area, the storage warehouse and for use in the mill.

Upon an alarm, workers are required to evacuate the immediate area to designated assembly points. Where an alarm indicating a level of 10 ppm HCN is triggered, the area is to be cordoned and any person entering the area for assessment or investigation are required to wear full body protection and a full-face respirator.

Where cyanide related tasks are undertaken, workers are also required to use portable HCN monitors and full-face respirators fitted with filter cartridges. Procedure *High Cyanide Gas* requires that where a HCN gas level of 10 ppm is recorded by either personal/portable or fixed HCN monitors, the shift supervisor is required to be notified and the area is to be cordoned with "Danger - Hydrogen Cyanide Gas" barricades. Any persons entering an atmosphere with HCN concentrations above 10 ppm are required to wear full body protection and a full-face respirator with in-date cartridges. Workers are instructed to turn the lime feeder to 100% and bags of lime are to be added if necessary, to reduce the potential for HCN gas generation. Where HCN gas concentrations exceed 60 ppm, the area is to be immediately evacuated, barriers erected, and entry may only be by personnel trained in and using self-contained breathing apparatus (SCBA).

CGML continues to implement SOP *Respiratory Protection Plan* for the protection of all employees from respiratory hazards through proper selection and use of respirators and applies to employees who are required to wear respirators during normal operations, non-routine tasks or emergency situations such as the spill of a hazardous substance. Operators are required to replace filters/cartridges once a month and before the expiry date on the cartridge; or when airflow becomes restrictive. Non-routine users may extend the use of filters/cartridges beyond one month, however, must not exceed the expiry date and must adhere to the manufacturer's recommendations for use and environmental conditions. Filter/cartridge expiries are tracked by sectional supervisors on a monthly basis and are also audited by the HSE team.

The Occupational Hygiene Department conducts qualitative and quantitative respirator fit testing for the emergency response team (ERT) and all employees identified as requiring use of respirators. Respirators are checked after each use and at least monthly for condition of face piece, head straps, valves, filters/cartridges and rubber components.

Fixed and portable HCN monitors are calibrated to alarm at HCN concentrations of 4.7 ppm and 10 ppm. Calibration of portable and fixed monitors is carried out by an external specialist Ultimate Resurgence Services on a 90-day frequency on a schedule allotted by JDE and in accordance with the manufacturer's minimum calibration schedules. Review of records from 2016 to 2019 confirm calibration certificates and test reports were available for fixed and portable monitors. Subsequent to the field audit, CGML updated the calibration frequency to once every 30 days for fixed Otis gas monitors to align with the advisory posted in the manufacturer's operation manual. The Health and Safety Department also conducts routine

daily plant inspections during which portable HCN monitors are also regularly inspected for working condition.

CGML has continued to display clearly visible signage throughout the plant instructing where cyanide may be present or in use. Pipelines containing cyanide solution were labelled with purple colour coded signage with the direction of flow also shown. Mandatory PPE signage is displayed at the entrance to the Processing Plant, and a board indicating PPE requirements for reagent mixing is displayed on the barricade fencing around the cyanide mix area. A similar sign is also posted in the emergency change room used by the Process Plant ERT. No drinking or eating signage was displayed throughout the plant and smoking is also not permitted within the plant, offices or in vehicles. Signage prohibiting eating, drinking and smoking is posted at the barricade fencing of the cyanide mix area.

Signs are posted on fencing at the event and stormwater ponds prohibiting swimming and that the water may not be consumed. Signage at the TSF warns of the presence of cyanide and prohibits swimming and water consumption in both English and the local language.

Sodium cyanide is received from Cyanco with colourant dye included and which is activated during the mix procedure. Visual inspection of a sample of cyanide solution obtained post the mix tank confirmed the presence of dye.

Thirty-two emergency showers and eyewash stations are located at key areas throughout the processing plant including at the mill, CIL plant, mix tank area, elution and warehouse. All emergency showers and eyewash stations are supplied with a green light for visible identification and accumulators for pressure regulation. Prior to each shift, operators conduct a pre-work inspection that includes a check that safety showers and eyewash stations are operational. The emergency showers are inspected weekly by the Engineering and Maintenance Department and weekly planned maintenance inspections are scheduled through the JDE preventative maintenance system. The Health and Safety Department also conducts daily visual inspections during which any issues with safety showers and eyewash stations may be captured through the *iAuditor* system or *Hazards Correction Form.*

CGML has located fire extinguishers at key locations throughout the mill and Process Plant and in areas where sodium cyanide and cyanide solution are used and stored. Fire extinguishers of ABC dry chemical type and are inspected monthly for pressure, condition of equipment and expiry date by the Safety Department and replaced or refilled as required. Inspections are recorded on inspection tags. Fire extinguishers are also checked annually by the Ghana National Fire Service. The CGML loss control officer also trains workers on the use of fire extinguishers.

The workforce is made up of English speakers and material safety data sheets (MSDS) in English are available on a shared intranet drive and in hard copy at the Health and Safety Department for workers who do not have computer access. Hard copy MSDS sheets are also posted at areas where cyanide is used and stored such as the mix area, mill control room and storage warehouse. CGML has prepared a *Cyanide First Aid Training Manual* which is a

reference document that applies to all authorized CGML Process Plant operators and those involved with cyanide related tasks. The manual describes the forms of cyanide, use within the plant, cyanide hazards, the health effects of exposure, first aid treatment and the use of Oxy-viva and resuscitator kits. Elements from the manual such as first aid procedures are included in a presentation titled *Cyanide Awareness* and which is used for training of Process Plant workers.

SOPs for cyanide storage and mixing and operation of the CIL plant contain detailed descriptions of first aid measures for various routes of exposure including eye contact, absorption, inhalation and ingestion. Workers are also provided with a Cyanco produced pamphlet *"Cyanides, Handle with Care Emergency Response Procedures"* which provides information on cyanide safety, emergency response and first aid procedures.

Incidents are investigated in accordance with a *General Incident Reporting and Investigation* procedure which details the process for reporting and investigating all incidents. The responsibilities of employees, supervisors, superintendents, the general manager and heads of department and the Health and Safety Department are defined. All incidents are first recorded onto a *Statement of Occurrence Form* which is logged into INX. Corrective actions are assigned and then closed. The INX system includes a root cause analysis module which guides the operator through analysis of the incident and sets corrective actions. Final comment and signoff that an investigation has been completed can be provided by the general manager and HSE manager. Since 2016, CGML have not experienced incidents resulting in worker exposure to cyanide.

6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 6.3.

Summarize the basis for this Finding/Deficiencies Identified:

Medical oxygen resuscitator kits (Oxy-viva) are stored at the sodium cyanide storage warehouse, the mix area, and the mill control room. Additional medical oxygen cylinders are available in the site ambulances and the site clinic. Safety shower and eyewash stations are located at key areas of the Plant including the cyanide mix areas and the storage warehouse and are readily visible by installed green lighting.

Since 2016, CGML has completed construction of an emergency change room located adjacent to the plant security gate. This area contains emergency response equipment including five SCBA kits and replacement cylinders and PPE for use by the Process Plant ERT in response to emergencies. An additional 10 SCBA units are available in a light vehicle operated by the loss

control officer. The underground mine rescue team also retains a further 18 Drager BG4 SCBA rebreather units.

CGML maintains cyanide antidote kits to administer to patients if required. Up until November 2018, Cyanokits (hydroxocobalamin) were the preferred form of antidote, however, can only be applied intravenously by a trained medical practitioner and for this reason were stored in the clinic. Due to Cyanokit supply issues, the clinic has retained five TriPac-Cyano type antidote kits containing amyl nitrite, sodium nitrite and sodium thiosuphate. These are stored in a refrigerator which is temperature checked twice a day. A daily inspection checklist of medication including of cyanide antidotes is completed by clinic personnel. A review of the checklist identified that the TriPac-Cyano was incorrectly referred to as Cyanokit and the expiry date was not noted. Subsequent to the field component of the audit, CGML modified the checklist to note the date and the naming convention of the item was altered to "Cyanide Antidote".

All operators have access to two-way radios where emergencies can be reported on channel 1; and supervisors and managers are equipped with mobile phones. The plant continues to operate Gaitronics emergency phones located throughout processing areas and Cisco phones from within site offices. Emergency buttons linked to alarms are located at key locations within the Process Plant. The security control room monitors radio channel 1 and telephones and, upon an emergency being declared, activates an emergency siren. Since 2016, CGML has also purchased manual air raid sirens which can be mobilised to areas as required. The mix area is also monitored by remote camera during mixing operations.

The Safety Department conducts monthly inspections of Oxy-viva kits with condition of the kits recorded on a checklist *Plant Oxy-viva Inspection*. Medical oxygen cylinders in the clinic are inspected on a weekly basis. When required, oxygen is refilled by a contractor Air Liquide, who also conduct an inspection of the condition of oxygen cylinders and Oxy-viva bottles and provide a replacement as necessary. The safe operation, monitoring, testing, refurbishment and oxygen replacement requirements for Oxy-viva kits are detailed in procedure *Oxy-viva Resuscitator Operating and Maintenance Procedure* details.

SCBA kits and bottles are inspected monthly using a checklist *SCBA Inspection* for cylinder condition and pressure, backpack, harness assembly and face plate and hoses. During the field component of the audit, it was noted that the SCBA bottles were of fibreglass construction with year of manufacture given as 2013 and had not been hydrostatically tested within a 5-year period as directed by the *Oxy-viva Resuscitator Operating and Maintenance Procedure*. CGML indicated that this was due to the lack of external suppliers in Ghana capable of conducting such tests on fibreglass bottles. Subsequent to the field audit, CGML replaced all fibreglass cylinders with metal fabricated types to allow hydrostatic testing for which Ghanaian suppliers are available.

The mine rescue team also retains 18 Drager BG4 Rebreather units which are inspected weekly and the condition of masks, connecting hoses and canisters noted on a checklist. Every

six years, Drager also conduct an inspection of BG4 units including a hydrostatic test and provide a test certificate.

CGML maintains six first aid boxes (one each in the mill control room, crusher control room, warehouse, first aid post and two in the emergency change room) which are inspected for contents monthly and noted on checklist *First Aid Kit Inspection.*

First aid equipment stored within the ambulance is inspected weekly following a checklist which includes first aid equipment, medical equipment and first aid boxes. Clinic responders to an emergency are required to don PPE including full face respirators. Inspection of the clinic identified that the respirators maintained in stock had expired in June 2016. Additionally, an unsealed filter cartridge was observed with the date of first use or unsealing not recorded. Subsequent to the field audit CGML removed and replaced all respirators stored at the clinic with replacement respirators having an expiry date of May 2024. Medical responders were also retrained on respirator protection and safety.

CGML has two emergency response plans: an overarching emergency response plan *Emergency Response Procedures – Surface* (ERP-S) and a Process Plant specific *Process Plant Emergency Response Plan* (ERP-P). These plans address responses to emergencies including minor and major cyanide releases. The ERP-P details emergency responses specific to the Process Plant and related activities and includes emergency procedures to be followed in the event of a minor or major solid/liquid cyanide release, fire emergencies including those involving cyanide, responses to injuries and/or fatalities, tailings dam failure, uncontrolled seepage from tailings dams and tailings/return water pipeline failure. Evacuation responsibilities and procedures are also described.

Response to cyanide exposures are also provided in a Cyanide First Aid Manual and in a training presentation Cyanide Awareness which and procedures are also posted on signs at prominent locations around the Process Plant.

Emergency call out procedures require that the person discovering the emergency tune to radio channel 1 or call MTN cellular phone provider short code 6466, declare "emergency" three times and provide information such as name, department, organisation, location of the emergency, the type of emergency, the number of people injured, and any special items or assistance required. The call out procedure is also prominently displayed at key areas within the Process Plant, on the back of security badges carried by employees and contractors and on adhesive labels within vehicles.

CGML operates a clinic staffed by two doctors, four nurses, two first responders/ambulance drivers, two laboratory technicians, and an x-ray technician. The clinic is always manned during working hours and after 5 pm at least one nurse is present and a doctor always available on call. Medical staff receive training on the SOP Kinross Chirano Medical Centre Standard Operating Policy & Procedure, Cyanide Management Protocol which describes

protocols for the medical treatment of cyanide exposures. The clinic also has instructions posted for dealing with cases of cyanide poisoning.

CGML operates two ambulances to provide response capability to medical emergencies. Additional medical capability is provided by the Process Plant ERT comprising five members. All members are trained in emergency response and application of first aid including medical oxygen. The Process Plant ERT is supported by the 41 members of the mine rescue team who are also trained in first aid procedures. The Process Plant manages a first aid post located near to the main security gate containing first aid equipment and medical oxygen (Oxy-viva). Any cyanide exposure patients can receive initial first aid by the Process Plant ERT at this location if required. Clinic personnel provide training to workers within the Process Plant on the application of medical oxygen and the use of Oxy-viva medical oxygen with instruction also provided in a training video.

Upon a medical emergency involving cyanide, the security control room would contact the clinic, declaring a suspected cyanide exposure. A nurse and responder would don protective equipment and mobilize by ambulance to the incident location. If necessary, cyanide antidote would be applied. The ERT provides initial first aid and response through washing the patient and removing clothes for disposal by the Environmental Department, before handing the patient the medical team. The patient would then again be washed, administered with oxygen and observed. If necessary, cyanide antidote would be applied.

Three Oxy-viva medical oxygen kits are stored in process areas for use by initial responders with one each located in the mill control room, the warehouse and the first aid post adjacent to the Process Plant entry. The clinic also retains a stock of medical oxygen cylinders located within a storage area of the clinic and in the two ambulances.

CGML's two ambulances are capable of transporting any cyanide exposure patients to offsite medical facilities including to Bibiani District Hospital and to Komfo Anokye Teaching Hospital (KATH) in Kumasi. Written arrangements are in place with Bibiani District Hospital and verbal agreements have been made with KATH to provide medical assistance in the event of cyanide emergencies. *Emergency Response Procedures – Surface* details procedures for emergency referral cases to offsite medical facilities in the vicinity of the mine and which can be carried out under the supervision of the medical superintendent or doctor. Kinross has maintained a corporate level agreement with Healix International (Healix) where evacuation by air ambulance to Accra or international locations may be required and which are detailed in a *Medical Emergency Response Plan* developed jointly by Healix and CGML.

The ERP-P requires that emergency response exercises are conducted on a frequency of two per year, one of which must be a cyanide related scenario. Since the 2016 Recertification Audit, CGML has conducted the following mock drills:

- April 2017: The drill involved a cyanide spill during transportation to the Process Plant requiring cleanup.

- July 2017: Scenario comprised the collapse of a worker in an enclosed space as a result of hydrogen cyanide gas.
- March 2018: A drill considering cyanide exposure involving a plant operator collapsing near to a confined space suspected of containing cyanide gas.
- January 2019: Cyanide exposure and rescue of a forklift driver arising from inadequate PPE which resulted in exposure to HCN gas.
- August 2019: A mock drill involving the spill of residual sodium cyanide briquettes from an emptied box to ground.

Corrective actions identified during each of these drills were recorded and actioned.

CGML continues to implement the Kinross Crisis Management System (KCMS) which addresses management structures, responses and communications during a crisis level emergency. The KCMS is managed through an online crisis management software tool, EMQnet. Since the 2016 recertification audit, CGML has conducted desktop emergency drill scenarios to test the system in October 2016, June 2017, October 2018 and October 2019. The October 2019 scenario involving a cyanide truck rollover within the mine site resulting in injuries and potential cyanide contamination of waterways. Each of these drill scenarios were observed and reviewed by an external training company Dynamiq with recommendations for improvements provided.

7. EMERGENCY RESPONSE **Protect communities and the environment through the development of emergency response strategies and capabilities.**

Standards of Practice

7.1 Prepare detailed emergency response plans for potential cyanide releases.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.1.

Summarize the basis for this Finding/Deficiencies Identified:

CGML continues to manage emergency response through two emergency response plans: an overarching emergency response plan ERP-S and a plant specific ERP-P. The ERP-S details emergency call-out procedure, security control responsibilities, general responsibilities of employees, supervisors, superintendents and managers, and response to be followed for medical evacuation and emergency referral cases. The ERP-S is supplemented by the ERP-P, emergency plans applicable to underground mining operation and the Kinross Crisis Management System (KCMS) which addresses management structures, responses and communications during a crisis level emergency.

The ERP-P details emergency responses specific to the Process Plant and related activities and includes emergency procedures to be followed in the event of a minor or major solid/liquid cyanide release, fire emergencies including those involving cyanide, responses to injuries and/or fatalities, tailings dam failure, uncontrolled seepage from tailings dams and tailings/return water pipeline failure. Evacuation responsibilities and procedures are also described. The ERP-S and ERP-P continue to be supplemented with discrete standard operating procedures that address cyanide and emergency situations including handling of solid and liquid cyanide spills in and out of containment, cyanide waste handling and disposal, and the medical centre cyanide management protocol.

CGML has produced an *Environmental Management Plan (EMP)* to meet requirements of Regulation 24 of the Ghanaian Environmental Assessment Regulations LI 1652 (1992). The EMP describes management of cyanide spills and emergency response procedures.

First aid procedures are described in the ERP-P whereby the discoverer or shift supervisor may apply first aid if safe to do so. Detailed first aid procedures are also included in the *Medical Centre Standard Operating Policy & Procedure, Cyanide Management Protocol* and the *Cyanide First Aid Training Manual*. Operating procedures address power failure in the CIL circuit and provides instructions to the operator to contain slurry within the tails floor area.

Transportation emergencies remain the responsibility of Cyanco and their contracted transported Vehrad. Review of the Vehrad SAR confirms that a Transport Management Plan has been developed for the route an Emergency Response Plan is in place which considers scenarios such as truck breakdown, no-spill and spill accidents, driver injury, armed robbery, communications failures and product diversions. Verhad's dedicated emergency response team would respond to the majority of scenarios with additional assistance coordinated through the Ghanaian EPA. The cyanide Purchase Contract specifies the product packaging for the form of solid sodium cyanide to be supplied and the mode of transportation. Packaging is to be in accordance with jurisdiction laws and include labelling about the use, safety and treatment of sodium cyanide.

Emergency response actions are set out in the ERP-P and ERP-S. The person discovering the emergency is required to follow the emergency communication and call out process to contact the emergency control room on radio channel 1 or Dial MTN short code 6466 or 1000 on Cisco phones, provide information on the type of emergency (e.g. cyanide exposure, fall from height, fire etc.), location, number of injured persons (if any) and equipment or vehicles involved. Contact details are also provided for incident control team members. Roles and responsibilities are allocated to employees the process manager, safety superintendent and subordinates, plant emergency response coordinator and the ERT.

All employees are required to follow the evacuation procedure described in the ERP-P and upon sounding of the evacuation alarm must evacuate the building or area and proceed to the assembly point. The process manager is responsible for development, implementation and maintenance of the ERP-P and is designated as the incident controller for emergencies occurring in the plant or the TSF. Supervisors are responsible for accounting for personnel in

the event of an emergency. The emergency response coordinator initiates and directs the appropriate emergency response with the Process Plant ERT providing support to the mine rescue team.

The ERP-P also sets out specific responses to each of the emergency scenarios considered i.e. minor or major solid/liquid cyanide release, fire emergencies including those involving cyanide, responses to injuries and/or fatalities, tailings dam failure, uncontrolled seepage from tailings dams and tailings or return water pipeline failure.

Procedures for the control of releases are described in the ERP-P and in standard operating procedures and include specific responses for dry and liquid cyanide releases and spills both in and out of containment. The procedures also require that any spill is to be stopped at source by isolating, tagging and locking out pumps or valves that are causing the spill.

The ERP-S sets out roles and responsibilities for all employees, supervisors, superintendents and managers. Responsibility is also assigned to supervisors, superintendents and managers to initiate an evacuation if warranted. The ERP-P sets out procedures for contacting communities and the public in the event of a tailings dam or pipeline failure. The community and public relations (CPR) superintendent in consultation with the human resources (HR) & CPR manager is responsible for contacting and informing all local communities along the main water course of the spill and may take necessary actions to ensure the health and safety of all residents downstream of a spill including delivery of any freshwater. The Kinross Crisis Management System is still applicable and sets out communication requirements that vary depending on the overall level of severity of an incident. For low severity incidents such as a minor spill or an injury that does not result in lost time or hospitalization, communication is limited to within the Site Crisis Management Team (SCMT). For medium severity incidents the Regional Crisis Management Team (RCMT) would be engaged and for high severity incidents that could affect a local community, the Corporate Crisis Management Team (CCMT) would become involved.

7.2 Involve site personnel and stakeholders in the planning process.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.2.

Summarize the basis for this Finding/Deficiencies Identified:

The ERP-P was developed with input from key personnel including supervisors, heads of department and the HSE Department. The plan is to be reviewed following any incident or mock exercise or when it is necessary to implement the plan and at least once every two years. The ERP-P is also required to be reviewed with plant employees at least annually. Input into the emergency response planning process is also obtained from the ERT after every mock drill or response to an emergency by means of critique, review and post incident debriefs. Desktop drill scenarios conducted as part of the KCMS are subject to review at which input and

feedback is obtained from participants and which may be used to revise and further develop responses to crisis level emergencies. Community outreach programs maintained by CGML provides opportunities for consultation and input to maintain the emergency response procedures and plans as current.

CGML has continued to engage extensively with communities through programmes managed by the Community Relations Section. Quarterly and monthly meetings are held with communities within the catchment area during which concerns, or issues related to the mine may be raised. CGML continues to implement a cyanide education program for key communities which includes topics such as cyanide transport, use of cyanide in the mine, the properties of cyanide and its toxicity and to avoid the area in the event of a spill. These education programs provide opportunity to obtain community stakeholder input into cyanide management. Communities are also instructed on contact procedures to follow in the event of a cyanide release or emergency and provided with the emergency contact number of the control room and members of the Community Relations Section. Mine tours and educational visitors are provided to key stakeholders including to community representatives which include education on the operations and how cyanide is managed. CGML has an open-door policy regarding stakeholder concerns and evaluates and responds to requests for information to address queries or concerns on a case-by-case basis.

CGML has maintained formal agreements with Bibiani District Hospital to provide supplementary medical services for cyanide exposure patients if necessary. Informal verbal arrangements are also in place with KATH and CGML has also maintained dialogue with local police/military to provide support where required. In addition to its own firefighting capability, CGML has a mutual aid agreement with Ghana National Fire Service (Bibiani-Anhwiaso-Bekwai District) for provision of assistance in the event of an emergency.

Kinross Gold Corporation has a corporate level agreement with Healix for provision of health, travel and security management services and have jointly developed a *Medical Emergency Response Plan.*

7.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.3.

Summarize the basis for this Finding/Deficiencies Identified:

The ERP-P lists incident control members and designates the process manager as the incident commander. The Process Plant ERT has five permanent ERT members formally appointed by CGML. The names and contact details of the ERT are maintained at the security control room and posted at the emergency change room. The Process Plant ERT is supported by the mine rescue team comprising 41 members details of whom are also retained by the security control

room. The ERP-P designates the process manager with responsibility for training of site and area personnel in the appropriate aspects of the plan. Annual training requirements are set out including an overview of the ERP-P, basic fire prevention and use of fire extinguishers, hazard identification and risk assessment, and cyanide training.

The ERP-P contains call out procedures and 24-hour contact information is provided for incident control members. Callout procedures listing the actions to follow and with emergency phone numbers are also posted at key locations around the processing plant and on adhesive labels which are displayed in site vehicles and at other key locations.

ERT members are formally appointed in their roles and their duties and responsibilities detailed in an appointment letter. The roles and responsibilities of the ERT are listed in the ERP-S; and the ERP-P sets out responsibilities for the process manager, safety superintendent, the plant emergency response coordinator and the emergency response team as well as general responsibilities for all employees. Specific emergency procedures and responsibilities for these scenarios are also provided. The Kinross Crisis Management Plan sets out roles and responsibilities of senior managers and emergency response coordinators in the event of a crisis level emergency.

The ERP-P includes a list of emergency and first aid equipment to retained and maintained in the Process Plant or made available for emergencies including the contents of the ambulance and the fire and rescue tender, safety showers, Oxy-viva kits, respirators and filter cartridges and SCBA. A list of key contractors and suppliers is also provided. Vehrad maintains its own emergency response equipment on sodium cyanide transport vehicles.

The ERP-P requires that inspections and tests of emergency equipment and facilities are to be carried out and recorded on a logbook or checklist. This requirement is supported by checklists for the inspection of emergency response equipment conducted by the Health and Safety Department.

CGML continues to maintain its own emergency response capability including the Process Plant ERT, mine rescue team, a clinic and medical responders, two ambulances and fire truck and as such do not have designated roles and responsibilities for outside responders in the ERP-P. Nevertheless, in the event of a medical emergency the site clinic has established formal arrangements with Bibiani District Hospital to provide medical assistance and through discussion maintained a relationship with KATH medical facility. A *Medical Emergency Response Plan* developed jointly between Healix and CGML provides procedures and responsibilities for evacuation including by air ambulance to the nearest care centres in Ghana and to external countries. Additionally, through a mutual agreement with the Ghana National Fire Service, assistance may be requested for a fire emergency and contact information for the Sefwi Wiawso and Bibiani Fire Services area is also listed in the ERP-S.

7.4 Develop procedures for internal and external emergency notification and reporting.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.4.

Summarize the basis for this Finding/Deficiencies Identified:

The ERP-P sets out emergency call out procedures including contact information for the security control room and incident control members who comprise the general manager, operations manager, departmental managers, superintendents, safety officers, environmental officers, the designated cyanide champion and the senior loss control officer.

Specific emergency procedures are followed depending on the nature of the emergency with minor variations. Minor cyanide releases require the discoverer to contact the control room who in turn contacts the shift supervisor. The shift supervisor is required to assess the situation to determine if medical assistance is required (and if so to declare an emergency) and necessary clean-up measures. Procedures for major cyanide releases are similar but also requires that security at the main gate access directs any emergency response vehicles to the location of the emergency. The shift supervisor contacts the control room operator to initiate the emergency siren and thereafter reports to the emergency control centre and assumes the duties of the incident controller. The incident controller then briefs the production superintendent (or nominee) and the emergency controller of the nature of the incident, casualties and potential for escalation. Procedures for fire emergencies are similar.

Tailings dam failure, uncontrolled seepage and tailings/return water pipeline failures requires additional notification of the ERT, process manager, metallurgical superintendent, mining manager, HSE manager, safety superintendent, environmental superintendent, human resources & CPR manager and the security superintendent. The CPR superintendent in consultation with the HR & CPR manager is required to contact local authority community representatives (assemblymen and chiefs) along the main water course to notify all persons downstream of the spill. The ERP-S has contact information for paramount chiefs, chiefs and assembly members in surrounding communities

The ERP-S also provides general emergency call out procedures similar to the ERP-P and contains phone numbers for key personal including the medical superintendent, fire service, regulators, the Inspectorate of Mines, the Ghana Environmental Protection Agency (EPA), Forestry Commission, Chamber of Mines; and police, hospitals, fire services, military and other emergency services. Contact information is also provided for paramount chiefs, chiefs and assembly members in surrounding communities. The clinic also retains procedures to be followed and contact details for Healix and air ambulance services in the event that air evacuation of a patient(s) by air ambulance is required.

The Kinross Crises Management System ranks crises level emergencies in order of severity which triggers different levels of management response. The KCMS allocates responsibilities for internal and external notification and communication with stakeholders including for regulators. Contact information for external stakeholders including regulators and medical facilities is held on in the EMQnet contact directory which is accessible online.

7.5 Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.5.

Summarize the basis for this Finding/Deficiencies Identified:

CGML maintains standard operating procedures that address cyanide spills inside and outside of containment and describe spill recovery actions such as collection of dry cyanide material into plastic bags, reintroduction of residual materials into the process, collection of washings inside the containment and reintroduction into the system. For spills outside of containment, soils are to be recovered to visual extent of impact and washed into the mill sump floor; or for larger volumes, loaded onto a truck and transported to the tailings facility. The use of sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat spills is prohibited due to toxicity to aquatic life

Procedure *Cyanide Spill Monitoring Procedure After Cleanup* remains in place and details monitoring for effectiveness of cleanup after a liquid or solid cyanide spill. This includes the frequency of sample collection from water and soil, sampling methodology, remedial targets; and sample storage, handling and transportation requirements. The ERP-S and ERP-P requires that if any water body is seriously impacted by tailings facilities failures, an alternate water supply to the community will be provided by CGML. Alternate water supplies would be provided for any situation involving cyanide that may affect water supplies. The ERP-P requires that for a tailings dam or pipeline failure, the HSE manager, in consultation with the processing and mining managers is to decide on a strategy to contain the spill and take water samples of affected water bodies for analysis and advise management accordingly.

CGML has produced an EMP to meet requirements of Regulation 24 of the Environmental Assessment Regulations LI 1652 (1992). The EMP sets out steps for managing any significant environmental impact that may result from operation of the company including the use of cyanide in the process. The EMP describes management of cyanide spills and a description of emergency response procedures.

For transport related releases, Vehrad Transport Management Plan include remediation actions and address containment, recovery and treatment of spills, recovery of solids, neutralisation

or removal of soils, treatment and/or disposal of soils, reclamation of sodium cyanide, transport of contaminated materials and water resource treatment.

7.6 Periodically evaluate response procedures and capabilities and revise them as needed.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 7.6.

Summarize the basis for this Finding/Deficiencies Identified:

Provisions in the ERP-P require that the plan is reviewed after every incident or mock exercise or at least after every two years. The process manager is responsible for ensuring that the plan is developed and maintained. Responsibility for reviews is allocated to the processing manager, engineering manager, production superintendent, environmental superintendent, metallurgical superintendent, maintenance superintendent, safety superintendent, safety officers and plant operators; with approval required from the HSE manager after each review.

The ERP-P specifies that emergency response exercises are to be conducted periodically with a minimum of two per annum to be conducted for hazardous chemical spills of which at least one must involve cyanide. The ERP-P and procedure *Process Area Emergency Response Drills and Drill Evaluation* sets out requirements for drill planning and scheduling, design, evaluation, and reporting, as well as preparation and execution of corrective action plans. Post incident analysis and debriefs on the effectiveness of emergency management process and are to be recorded and included in reviews of the ERP-P. Since 2016, CGML has completed a total of five mock drills in the Process Plant all of which involved cyanide related scenarios: Review of drill records retained on INX confirmed that corrective actions identified as part of the drills were assigned and closed.

***8. TRAINING* Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

Standards of Practice

8.1 Train workers to understand the hazards associated with cyanide use.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 8.1.

Summarize the basis for this Finding/Deficiencies Identified:

All new employees and contractors entering the Process Plant are required to attend a general induction which addresses general site safety information, minimum PPE requirements and awareness of cyanide hazards. Workers conducting tasks within the Process Plant are required to attend a site specific induction which includes training on SOPs specific to the work area including cyanide specific tasks. Topics covered include the use of appropriate PPE, cyanide awareness, cyanide hazards, pH management to limit HCN generation, spill and decontamination procedures. Training on SOPs also includes pre-operational checks, the use of JSAs, hazard booklets and *Hazard Correction Forms* which include the identification of hazards, risk assessments and implementation of control measures. Training is provided by the Health and Safety Department and the processing training officer.

Daily toolbox talks and weekly and monthly health and safety meetings are attended by workers, supervisors and management level staff and include training and discussion on cyanide hazards and management. Regular "HSE Time Out" meetings are held at which a safety topic is discussed, including cyanide management.

All workers receive annual refresher training that includes the same cyanide awareness, hazard identification and SOP topics as provided for new employees. Training is recorded on a *Site Induction/Refresher Training Declaration Form*. CGML has allocated a process training officer and an assistant to track training requirements for the Process Plant. Cyanide awareness training is tracked on a matrix. The ERT also conducts periodic mock drills which includes cyanide hazard recognition and emergency response.

Cyanide training records are retained in paper copy and electronically using a system of training matrixes. Records are retained for the duration of the employee's tenure and for five years thereafter as a minimum. Training records are in the form of attendance registers signed by the trainer and trainee and include records for general induction, cyanide awareness, refresher and task specific SOPs and those that relate to the handling and management of cyanide.

8.2 Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 8.2.

Summarize the basis for this Finding/Deficiencies Identified:

All employees are required to attend mandatory general induction which includes general site safety information, minimum PPE requirements and awareness of cyanide hazards. Employees working at the Process Plant receive task specific training conducted by the process training officer. Task training is tracked on a training matrix with each task in the Process Plant supported by a series of topics and SOPs specific to the role/task and requiring completion by the worker. These include cyanide related tasks. Training includes a written test on SOPs to confirm understanding before workers are allowed to operate in the Process Plant and if unsuccessful, are required to be retrained. Furthermore, workers are required to undergo on-the-job training with a supervisor or experienced plant operator and must be shown to be competent at their roles before being allowed to work unaccompanied.

All Process Plant workers are required to undergo cyanide awareness training and task specific training in addition to the general mandatory Process Plant induction training. SOPs specific to work tasks, including those involving the handling of cyanide, describe the hazards associated with the task, control measures, PPE requirements and permitting requirements where applicable. The SOPs are maintained on the company intranet and are available to all employees, either directly or through request from their supervisor. Training on the use of medical oxygen and Oxy-viva kits is provided by a clinic doctor and other medical professionals based at the clinic.

Process Plant training is provided by the Process Plant trainer who is an experienced operator with approximately 9 years of experience and with a chemistry degree. The training and development coordinator has an MBA Degree and is chartered by the Institute of Personal Development in the UK with 8 years of experience. All trainers involved with Process Plant training are university graduates. Graduates assigned to the mine under the Ghana National Service Programme are trained in accordance with a National Service Personnel Training Program and are mentored by process trainers, shift supervisors and the senior metallurgist.

New employees or employees transferring from other work areas/departments also undergo on-the-job training under the direct supervision of an experienced operator or supervisor for one to two weeks for each area of the plant. Feedback from the overseeing supervisor or superintendent is provided to the Training Department and if necessary further training and an examination is held before the new employee is allowed to work alone.

All Process Plant employees are required to attend refresher training which is tracked on a matrix retained by the Training Department. In addition to annual refresher training, daily

toolbox talks and weekly and monthly safety meetings includes cyanide related topics such as hazard identification, cyanide awareness, use of PPE and JSA preparation. The ERT conducts periodic mock drills, generally annually, which are also considered as refresher.

CGML continues to implement a system of task observations with the most recent initiative being CCVI forms. This is used as a formal process to observe and assess tasks and activities against the related standard operating procedure. The CCVI system is supplemented by observations captured using *iAuditor* and *Hazard Correction Forms* which are also used as methods of task observations. Where there is a need for corrective action, these are entered into INX safety and incident tracking software for tracking to completion.

The HSE Department and the Training Department retains training records for the duration of a worker's employment term. Records observed included training records for general and Process Plant induction, cyanide awareness, SOPs and task specific training, emergency equipment use and mock drills. Records comprised attendance sheets, written exams and task training sheets, and include the training topic, name of trainer and trainee, trainee signature and date of training.

8.3 Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 8.3.

Summarize the basis for this Finding/Deficiencies Identified:

Personnel working in the Process Plant are required to attend general induction, Process Plant specific induction and complete specific task and work area training, the training elements of which include cyanide awareness, operating procedures and use of PPE; and emergency response procedures. Workers are trained to follow the emergency response procedures listed in the ERP-P. The initiator is required to contact security, provide the location and description of an emergency, to first ensure their own safety before undertaking any mitigation actions, isolate the area, abandon the area if necessary, stop releases through shutdown procedures, provide first aid if safe to do so and manage spills in accordance with spill management procedures.

All employees in the Process Plant including those involved in unloading, mixing production and maintenance receive cyanide awareness training including the application of first aid. First aid procedures include administering oxygen, removal of contaminated clothes and washing the patient. Members of the ERT are specifically trained in the application of first aid and oxygen by the Process Plant first aid trainer. Medical responders based at the site's clinic are trained in emergency response, the application of medical oxygen and cyanide antidote and decontamination procedures.

The Process Plant ERT currently comprises five permanent members drawn from within the Process Plant and are formally appointed by CGML. The ERT receives training on cyanide awareness and hazards, cyanide safety, chemical hazards and controls, use of SCBA, use of Oxy-viva kits, respirator use, fire safety and emergency response, first aid, response to cyanide spills and confined space rescue. The Process Plant ERT is currently supported by the mine rescue team who comprise 41 members and are also trained in cyanide awareness, first aid and the use of SCBA.

Clinic staff are trained by the on-staff doctors on the application of Cyanokits and other cyanide antidotes and on SOP *Kinross Chirano Medical Centre Standard Operating Policy & Procedure, Cyanide Management Protocol* which details medical protocols for the treatment of cyanide exposures. Medical staff also receive training on the use of PPE such as respirators when responding to a cyanide emergency.

Periodic mock drills to simulate cyanide emergencies are carried out as required by the ERP-P with the participation of the ERT, operators, supervisors, superintendents, managers, the HSE Department and clinic medical personnel. Since the 2016 recertification audit, the ERT has conducted five mock drills involving both cyanide release and exposure scenarios. Mock drills are reviewed and evaluated, and any necessary corrective actions recorded and tracked on INX. The Kinross Crises Management System is also periodically tested through desktop drill scenarios which evaluates responses to, and management of, crises level emergencies. Four desktop mock drill scenarios were conducted since the previous recertification audit.

CGML evaluates drills in accordance with ERP-P. Emergency response exercises are conducted annually including at least one exercise involving cyanide. Procedure *Process Area Emergency Response Drills and Drill Evaluation* describes drill planning, scheduling, design, evaluation, reporting and preparation, and execution of corrective action plans. The ERP-P is required to be reviewed after every incident or drill that reveals a procedural shortcoming. Review of drill records from 2017 through to 2019 confirmed that corrective actions identified as part of the drills were assigned, addressed and closed. Where necessary training procedures were also revised. KCMS drills involving desktop scenarios are also reviewed and assessed and any necessary changes to procedures made if required.

CGML continues to maintain in house capability to respond to most types of fire or medical emergencies and therefore has not allocated specific roles to outside responders. However, CGML has continued to maintain a formal written agreement with Bibiani District Hospital to provide medical support; and informal agreements are also maintained with KATH for use of medical facilities for any referrals. The clinic retains procedures for contacting Healix where evacuation by air ambulance to Accra or international locations may be required.

Through a cyanide education program, communities are instructed on the procedures to follow in the event of a cyanide release or emergency including procedures to contact the mine in the event of an emergency. Mine tours are also undertaken with key stakeholders and include discussion on cyanide management.

Annual refresher training is provided for all process personnel and the ERT and includes cyanide awareness and hazard training, spill procedures and emergency response procedures including for cyanide poisoning and initial first aid measures.

Training records for Process Plant employees and the ERT, are retained by the Training Department, training & development coordinator and HSE Department. Cyanide records are retained in paper copy and electronically on spreadsheet matrixes. Training records comprise attendance registers, written exams and signoffs for inductions, task specific operating procedures, cyanide awareness training, emergency response and equipment training. Training records include the topics covered and names and signatures of the trainer and trainee. Records are retained for the duration of the employee's tenure and for five years thereafter as a minimum. Understanding of training topics is demonstrated through completion of written examinations and employees are also required to undergo on-the-job training with a supervisor or experienced operators until proven to be competent at their tasks.

***9. DIALOGUE* Engage in public consultation and disclosure**.

Standards of Practice

9.1 Provide stakeholders the opportunity to communicate issues of concern.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 9.1.

Summarize the basis for this Finding/Deficiencies Identified:

CGML is in a populated rural area of Western Ghana and surrounded by communities of several small villages which are situated near to the mine, mill, Process Plant and tailings facilities. CGML has continued to maintain a strong community outreach programme, managed through the community relations section (CRS) of the HR Department and who are responsible for liaison between communities and CGML. The CRS currently comprises six permanent employees and three interns.

CGML has maintained a Community Consultative Committee (CCC) which meets quarterly to discuss community issues including development of the area. Representatives at these meetings include the paramount chiefs, municipal assemblies, sub-chiefs, farmer representatives, female leaders of communities, police, fire services, and representatives of the Health and Education departments. The general manager also conducts quarterly courtesy calls with paramount chiefs and sub-chiefs.

CGML actively engages in community meetings with community representatives to discuss relevant issues. The frequencies of these meetings may increase depending on the topical issue at hand and effects on the community. Additionally, CGML continues to provide mine tours whereby communities may visit to observe operations and how cyanide is managed. In addition to communities, mine tours are also provided to stakeholders such as schools, youth groups, religious organisations, regulators and officials. These visits provide opportunities for issues of concern to be raised and addressed by CGML.

CGML has continued to provide cyanide awareness education/training to communities identified as most likely to be affected by cyanide issues. Through the education program local communities are also able to identify cyanide transportation vehicles, are aware of the meaning of hazard signage and not to approach cyanide transport vehicles.

CGML continues to maintain an "open door" policy regarding stakeholder concerns and evaluates issues and concerns raised, complaints or requests for information. A complaints and grievance mechanism remain in place where public concerns and complaints are registered on a CRS database. Complaints received may be lodged by telephone, in person or at community meetings and noted on a form. Community leaders are provided with contact numbers for the community relations section and for the security control room, and emergency contact numbers are displayed on the exterior of mine vehicles. Review of records from 2016 through 2019 identified no complaints related to cyanide with most concerns related to access issues and water/silt runoff affecting crops and flooding.

CGML's, community relations performance was previously audited annually by the Ghana EPA as part of the AKOBEN (Environmental Rating Methodology for Mining Companies (AKOBEN 2008)), however this programme was suspended in 2015. The Ghana Chamber of Mines has continued to contract an independent consultant to conduct annual environmental audits. Although the results of these audits have not been provided to CGML, no notifications of adverse findings have been received.

9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 9.2.

Summarize the basis for this Finding/Deficiencies Identified:

CGML engages with local communities and stakeholders using several fora. These include monthly community meetings, quarterly CCC meetings and general manager courtesy meetings with community leaders, and mine tours which provides information on cyanide use in the operation. Community education on cyanide consists of a verbal discussion of issues related to cyanide with topics including the mode of road transport and recognition of cyanide trucks, meaning of hazard and warning signage, the properties of cyanide, use in the

operations, handling and management, environmental effects, the effects of exposure and CGML management controls to prevent the release of cyanide. A CGML employee, who is also a member of the local community, attends these sessions.

9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Standard of Practice 9.3.

Summarize the basis for this Finding/Deficiencies Identified:

Low literacy rates are present in surrounding communities. Consequently, community cyanide awareness education is delivered verbally in Sefwi, the locally spoken language. Cyanide education is conducted by CGML and includes an employee who is from the local community to allow fluent verbal communication. For emergency situations, contact telephone numbers are prominently displayed on mine vehicles and direct contact information for the CRS is also provided to community leaders.

Many members of the local community continue to be employed in mine operations and this contributes to community familiarity with cyanide management. Based on discussions with the Senior Community Relations Officer, community education on cyanide use is an ongoing process and the proactive approach by CGML has continued to improve understanding resulting in fewer concerns about cyanide use and management. Local communities can distinguish cyanide transportation vehicles and recognise hazard warning signage. General information regarding cyanide management and use is also posted on the Kinross website.

In the period since the 2016 recertification, CGML has not experienced cyanide exposures resulting in hospitalization or fatality; or cyanide releases requiring response or remediation, resulting in significant adverse effects to health or the environment or that exceeded applicable cyanide limits. Should such releases occur, the notification requirements set out in the KCMS and ERP-P would apply. For cyanide exposures CGML would notify the police in the event of a fatality and follow the Kinross Crisis Management System which sets out communication requirements for notifying regulators and the media. CGML would also engage with communities where these may be affected through various fora and under the framework and guidelines set out in the KCMS.

Should cyanide releases occur, notification protocols identified in the KCMS would apply. Furthermore, the ERP-P sets out notification requirements including for government and outside agencies and to provide suitable information and communication to local communities and public where these may be affected.