INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

Cyanide Code Compliance Audit Gold Mining Operations

Summary Certification Audit Report

African Barrick Gold Buzwagi Gold Mine Tanzania

Initial Audit
18th – 22nd February 2013
Follow up Audit
4th – 5th February 2014

Name of Operation:	Buzwagi Gold Mine
Name of Operation Owner:	African Barrick Gold
Name of Operation Operator:	African Barrick Gold
Name of Responsible Manager:	Philbert Rweyemamur, General Manager
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Detailed Background

- The Buzwagi plant was pre-certified in 2007 and first production was in June 2009.
- During the first 12 months, the plant was fed on oxide material which resulted in low soluble copper volumes in the Carbon-in-Leach (CIL) with only minor issues experienced in detoxifying the tailings stream. During the initial phase of operation, the Buzwagi plant was operated exclusively on air and SMBS for detoxification.
- Around April 2010 as plant feed changed, the required detoxification levels became difficult to maintain.
- In July 2010 the sulphur burner was brought on-line to determine whether this system would improve the overall performance of the detoxification process. Incorporation of the sulphur burner resulted in a major reduction in overall efficiency and there were also concerns with the materials of construction of the sulphur plant. Owing to these issues, the plant only operated for seven days and had to be stopped.
- By April 2011, with an intensive sampling campaign on the CIL feed as well as a geo-metallurgical mapping of the ore body, it was realized that the nominal design of 205 ppm for WAD Cyanide was incorrect and that the actual design needed to be closer to 750 ppm with the ability to cope with 2,000 ppm when high grade copper material was leached.
- Lycopodium was approached to review the design and suggest corrective actions to be taken so that Buzwagi Mine would be compliant to the ICMI standards, specifically to maintain the WAD Cyanide levels below 50 ppm in the tailings stream. Lycopodium completed a scoping level design during July 2011 on all alternative options.

- In parallel with this process, a team consisting of an expert on the INCO (International Nickel Company) process (Mr Randy Angius), an expert in oxygen utilization and measurements (Mr. Martin Verster), an agitator expert (Mr. Pieter van Aswegen) and a hydro-metallurgical expert (Dr John Rumball) were tasked to better understand the chemistry within these circuits and the challenges that would be faced to reduce the WAD Cyanide levels to within compliance standards. This team conducted two months of test work which included three full sampling campaigns of the CIL and detoxification plant.
- African Barrick Gold (ABG) Board authorized the expenditure of US$ 16.8 million in September 2011 to implement the findings of the expert team.
- An order was placed on Lycopodium in September 2011 to complete a detailed design to put into operation the above findings.
- The construction of the upgrades to the detoxification system was started on 29 March 2012 after the detailed design was completed. The upgrade included the addition of two detoxification tanks, larger lime and sodium metabisulphite (SMBS) mixing plants as well as an oxygen plant to cater for the higher oxygen consumptions required.
- The project was scheduled to be completed by the end of August 2012 apart from the 40 tonne per day oxygen plant.
- The upgraded Detox Plant was fully commissioned on 2 September 2013.

Outcome of Technical Expert Review

The review team presented the following findings:

- Initial cyanide concentration needed to be increased to improve the overall gold dissolution and recovery within the CIL circuit. This change increased the free cyanide levels in the tailings stream and, coupled with a higher soluble copper level in this stream, the original design could not destroy all the WAD Cyanide in the tailings stream.
- Free cyanide levels entering the detoxification system resulted in a slowdown of the efficiency of the INCO process. The findings showed that the reaction rate for destroying WAD Cyanide was ten times slower under these conditions.
- An oxygen level of at least 1 ppm should be maintained for the duration of the reaction.
- The sulphur burner would not work for detoxification as it decreased the oxygen levels in solution due to the high nitrogen content generated in the burner.
- The required oxygen in air supply of the existing design could only detoxify a maximum 450 ppm and did not take free cyanide concentrations in to account.
- Existing agitators flooded at about 95% of the required air flow.
- Oxygen required at 2,000 ppm would need an oxygen plant that can supply 40 tonnes per day at peak, an SMBS system that can mix 87 tonnes per day, and a lime plant that can mix 34 tonnes of slaked lime per day.
- The new plant can dose small quantities of ferrous sulphate in the tailings stream after detoxification for copper control in the slurry.
- The existing two tanks are adequate assuming 100% availability and maintaining 50% oxygen utilization. The new design would require four tanks, three operational and one standby. This is designed to maximize oxygen utilization by minimizing the inflow into the tanks.

- The current installed power on each of the two tanks was 220 kW and needed to be increased to 360 kW to attain the 50% oxygen utilization.
- Concluded from the work was that the existing system is starved of oxygen and would require all design work to focus on oxygen utilization.
- In view of the fundamental plant design changes required, compared to the original plant design, further time was required to ensure WAD Cyanide levels were within compliance standards.

Major changes had to be undertaken between the original plant design and on revised requirements resulting from sub-optimal plant performance and expert reviews. The intent was to continue with the certification audit in July 2012 with the understanding that the final certification for full compliance would be repeated in February 2013 on the residue stream detoxification system.

Buzwagi made the necessary improvements in time to meet the new audit deadline, but while its upgraded treatment system was capable of reducing the concentration of cyanide in the tailings discharged to its impoundment to the required level, there was insufficient time to treat all the water that was already stored in the impoundment to this level. Barrick requested that ICMI extend the deadline for six months to allow Buzwagi to upgrade its tailings treatment system to meet Cyanide Code requirements. ICMI's Board of Directors extended the deadline to February 27, 2014.

Location Detail and Description of Operation

Buzwagi Gold Mine is owned by African Barrick Gold and is located 6 km south east of Kahama town in Shinyanga region, along a tarmac road between Isaka and the Tanzanian/ Burundian borders.

The mine's 20 kilometre perimeter is fenced. Security towers are strategically placed alongside the fence. A 75 ha water harvest area, with an associated downstream water storage pond of approximately 1.5 million cubic metre capacity, and a floating cover to prevent evaporation, was constructed to recover water and address the negative water balance of the site.

The Processing Plant was commissioned in the second quarter of 2009 and was designed to operate on:

- Feed tonnes of 4.3 million tonnes per annum
- Feed grade of 2.0 g/t of gold and 0.15% copper
- Recovery of 92% of gold and 65% copper
- Production of 250,000 ounces of gold and 4000 tonnes of copper

To achieve economic recovery of gold and meet operational responsibilities and obligations, the following steps were incorporated in the Buzwagi Processing Plant flow sheet.

1) Primary Crushing

This is a primary gyratory crusher (Metso 62-45) for SAG mill feed preparation. Ore from the ROM is reduced from 900 mm to 80% passing less than 125 mm by this unit.

2) Grinding and Classification

This comprises a 6MW SAG Mill, 6MW Ball mill and a pebble crusher. Crushed ore is further reduced to less than 80 % passing 125 µm, to liberate sulphides and other minerals, to permit recovery by downstream processes.

3) Gravity Concentration

Two 48" Knelsons and a single module Intensive Cyanidation Reactor are employed on this stage. Liberated gold particles are recovered by means of centrifugal gravity concentration, and dissolved into solution through the intensive cyanidation reactor. The solution is then passed through an electrowinning cell, where gold is plated on cathodes.

4) Flotation

Flotation practices are applied to treat the whole feed stream before the Carbon in Leach (CIL) process. This was employed to protect the CIL against copper, especially from CuCN sol. Copper species are responsible for elevated cyanide consumption and the Flotation circuit was incorporated on the flow sheet to address the economics and cyanide environmental impact, in conjunction with revenue gained from the copper concentrate. Dried copper concentrate is shipped to an offsite smelter for further treatment.

5) Carbon In Leach, Elution and Electrowinning

Gold is dissolved from slurry into solution by capitation, and is adsorbed onto activated carbon in the CIL circuit. The loaded carbon is then transferred to the elution circuit, where the gold is dissolved back into solution. The solution, called pregnant solution, is then passed through the electrowinning cells, where gold is plated on the cathodes.

6) Smelting

Gold sludge is recovered from the electrowinning process and dried. The material is then melted in a furnace to separate the gold and the slag. Gold is poured into Dore bars and shipped to offsite refineries.

7) Cyanide Detoxification

The overall objective of the cyanide destruction plant is to ensure that the free cyanide and weak acid dissociable cyanide (WAD cyanide) levels discharged to tailings are below the maximum target required by the International Cyanide Management Code. The cyanide destruction reaction reduces WAD cyanide in the CIL discharge prior to tailings thickening from a nominal level of 450ppm to a few ppm. The process used to this effect is the International Nickel Company (INCO) process. The facility is designed for a maximum WAD cyanide feed level of 1,000ppm and discharge level of less than 50 ppm. Cyanide destruction is carried out using Sodium Metabisulphite (SMBS or $Na_2S_2O_5$) and oxygen. This process utilises Sulphur Dioxide (SO_2) and oxygen in the presence of a soluble copper as a catalyst to oxidise cyanide to the less toxic compound cyanate (OCN^-). The reaction is carried out at a pH of 8.0 to 9.0 in an agitated tank. The SMBS solution provides the SO_2 for the reaction. There is sufficient copper in the feed ore to avoid the need to add copper sulphate as a catalyst. Oxygen is also required in the reaction and is supplied from a dedicated Pressure Swing Adsorption (PSA) Oxygen plant.

8) Tailing Disposal

Process Plant tailings are deposited on a fully lined Tailing Storage Facility (TSF) after cyanide destruction. Tailings are deposited as slurry at 50 – 60% and the water is decanted and pumped back to the Plant for recycling in the cyanide. The TSF is re-designed and raised in stages to cater for the tailing storage requirements.

Auditor's Finding

This operation is

X in full compliance

☐ in substantial compliance *(see below)

☐ not in compliance

with the International Cyanide Management Code.

* The Corrective Action Plan to bring an operation in substantial compliance into full compliance must be enclosed with this Summary Audit Report. The plan must be fully implemented within one year of the date of this audit.

Audit Company: Eagle Environmental

Audit Team Leader: Arend Hoogervorst

E-mail: arend@eagleenv.co.za

Names and Signatures of Other Auditors:

Name : Dawid M. L Viljoen Signature _____ Date: 14/7/14

Dates of Audit: 18th – 22nd February 2013 & 4th – 5th February 2014

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 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 International Cyanide Management Code Verification Protocol for Gold Mine Operations and using standard and accepted practices for health, safety and environmental audits.

Buzwagi Gold Mine

Facility

Signature of Lead Auditor

14/7/2014

Date

Auditor's Findings

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

Standard of Practice1.1: 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.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 1.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
African Barrick Gold, under an umbrella contract for all Barrick global subsidiaries, obtains its cyanide, on behalf of Buzwagi Gold Mine, from Orica, who produce and transport the product. Orica is a signatory to the ICMI Cyanide Code, and the contract requires that the producer must comply to the provisions of the Cyanide Code. Orica's Yarwun production facility is fully certified, as a cyanide production facility, under the ICMI code, and supplies solid sodium cyanide to African Barrick Gold for use at their Buzwagi Gold Mine.
A once off, trial, supply of solid sodium cyanide was ordered via Samsung from Tongsuh. Samsung is an ICMI certified consigner and Tongsuh is a certified ICMI producer.

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

Standard 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.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 2.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
There is a formal contract between Orica and Barrick (on behalf of African Barrick Gold Buzwagi Gold Mine) which covers the responsibilities and requirements for safety, security,

unloading, emergency response (spills prevention and clean-up), route planning and risk assessments, community liaison, emergency response resource access and availability, training, and communication.
A once off, trial, supply of solid sodium cyanide was ordered via Samsung from Tongsuh. Samsung is an ICMI certified consigner and Tongsuh is a certified ICMI producer.

Standard of Practice 2.2: Require that cyanide transporters implement appropriate emergency response plans and capabilities and employ adequate measures for cyanide management.

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 2.2**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
Buzwagi Gold Mine currently uses Code certified transporters and consignors and is therefore deemed to be Code compliant. The Australian Supply Chain covers the transportation of sodium cyanide solution and solid sodium cyanide from the manufacturing facility in Yarwun, Australia, by road and rail direct to its end point users within Australia and the Port of Brisbane and was fully certified on 5th October 2010. Orica's transport supply chain for East Africa was published on the ICMI website on May 19th 2011. The East Africa Supply Chain covers the transportation of solid sodium cyanide by ship from the Port of Brisbane, Australia to the Ports of Mombasa, Kenya and Dar es Salaam, Tanzania via the Mediterranean Shipping Company. Within Kenya and Tanzania solid sodium cyanide is transported by road to end point users by Freight Forwarders Kenya and Freight Forwarders Tanzania.
Cyanide was ordered as a once off trial from a different producer via Samsung (as consignors). The various transporters in the supply chain include transport from the producer Tongsuh Korea, the port of Pusan, ocean transport using MAERSK (covered under the Samsung supply chain certification), transport from the port of Dar es Salaam to the site at Buzwagi using a certified transporter, FFT, to site in Buzwagi. The port of Dar es Salaam is not currently specified in the certified Samsung supply chain, but is in the process of being included in the Supply Chain (referenced on Samsung listing on ICMI website).

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

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 3.1**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
The design company's Quality Assurance and Quality Control and drawing sign-off's verify that the cyanide storage and the cyanide solution mixing and storage were built as per the designs which are deemed accepted engineering practices for cyanide unloading, storing and mixing facilities. Pipe material specifications are according to the design company standard. The cyanide dry solid store and cyanide mixing and storage tanks are situated inside the plant security area with access controlled entrance. The cyanide store gates are locked as additional security.
The cyanide mixing tank and cyanide storage tank are equipped with ultrasonic level sensors with level indication at the tanks and at the control room CITECT 7.1 system. The cyanide make-up process is fully automated with interlocks to the water valve, to the mixing tank, and to the cyanide transfer pump to the storage tank. High level alarms are set at H 78% HH 95% for the mixing tanks and H 90%, HH 92% HHH 95% for the storage tank. The physical level for the cyanide mixing and storage tank level indicators at 100% is 300mm below the overflow pipe. Secondary containments built from concrete, with waterproof membrane on the compacted fill before the placement of the concrete, for all the slabs provide a competent impervious barrier to leakages and provide adequate and appropriate containment for the tanks.
The reagent strength cyanide tanks are placed in the same bund as the sodium hydroxide tank and next to the sodium meta bisulphite storage tanks, which are placed in a separate, bunded area. A double bund exists between the two bunds as additional protection in case of full bunds.
The cyanide store building is designed with ventilation in the form of wire gates, and open sides at the top of the walls of the shed as well as ventilation at the roof apex. The cyanide mixing tank is open at the bag breaking area, and the cyanide storage tank is equipped with a ventilation pipe.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 3.2**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
No liquid cyanide is delivered and all cyanide used is mixed from solid sodium cyanide briquettes. The procedures covering offloading from containers, stacking of boxes (maximum of four high), mixing and disposal of packaging were sighted, reviewed and found to be effective. The disposal of packaging procedure requires that the cyanide boxes and plastic bags are taken to a designated area outside the plant to be burnt.
The mixing procedure spells out the sequence of tasks clearly to avoid spillages and releases and includes pre-work inspections, required PPE, and the use of a buddy.

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

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

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 4.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Gold Plant has core cyanide procedures, Process Policies and Procedures and Standards. There are 6 Cyanide specific procurement procedures, 53 Process plant cyanide specific Safe Work Procedures (SWPs), 11 Process Plant Engineering SWP's, and 5 cyanide-related Environmental procedures. The General Process plant standard operating procedures register was also reviewed. These procedures cover the cyanide equipment in the process plant and the detox facilities as well as maintenance procedures involving cyanide facilities. The Tailings Storage Facility (TSF) is operated as per the Pangea Minerals Limited Buzwagi Project Tailings Storage Facility and Water Management Infrastructure Operations Manual.
There are a variety of operational inspections carried out covering prior to start up checks, CIL, Cyanide Mixing, the Elution Circuit, Float and the Grinding circuit. These are augmented by monthly safety inspections. On the TSF, the shift operator/shift supervisor carry out daily checks of the water storage pond, and the plant site water pond harvesting area. There are also dawn and dusk TSF daily inspections covering bird fatalities, bird species sighted, bird scaring canons, liner damage, the under-drains system, discharge points, and pond size.
A Barrick Corporate change management procedure is in place and functioning and change management exercises are signed off by Health, Safety and Environmental officials.
Throughout the site, preventative maintenance and inspections have been controlled by a software-based, Planned Maintenance System (PMS) called PRONTO. Key pumps, tanks, bunded areas, pipes and pipelines, and equipment were checked on the system and found to be

systematically maintained through visual and mechanical checks, thickness tests and historical reviews.
Routine daily, weekly and monthly inspection reports, legal inspections, and checklists for the TSF and the plant were sighted. Emergency power generation is in place, but is not required to prevent unintentional releases as the TSF freeboard is sufficient to contain the storm event in the decant pond if no power is available.

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

X in full compliance with

The operation is
- □ in substantial compliance with **Standard of Practice 4.2**
- □ not in compliance with
- □ not subject to

Basis for this Finding/Deficiencies Identified:
The original mineralogy on which the plant design was based, included the following assumed metals contents, which affects the cyanide consumption and WAD cyanide assumptions in the tails: Oxide: 0.062% Cu, Saprock: 0.086% Cu, Primary ores 0.141% Cu (Max peak of 0.3% Cu). The current mineralogy delivers copper values of between 0.04 % Cu and 0.41% Cu (Sept to Dec 2012). The operation's ore characteristics changed, resulting in exceedance of the design detoxification capacity: Design 250 mg/l and maximum 450 mg/l versus current maximums of over 800mg/l. An upgraded detoxification plant design was done, funded and constructed to accommodate the variation in mineralogy. This will result in reducing the WAD cyanide in the tailings to the original design assumption of less the 50 mg/l WAD cyanide at the TSF tip. Past optimisation included optimising the float to minimise soluble copper from entering the CIL. An ore mineralogy and optimisation program in place includes daily information from the Geology Manager, including the proposed blend which is then discussed with the Process Manager for the optimal blend required. A revised dosing optimisation strategy was produced in February 2014, following the full commissioning of the new Detox plant.
Cyanide is controlled using a TAC1000 controller and manual titration in the CIL no 1 and 6 tanks to control terminal cyanide at required levels. Changes in control philosophy were considered to improve cyanide consumption. Two stage controls are being evaluated. A single cyanide feed line using peristaltic pumps is being considered to improve cyanide control. Cyanide consumption has reduced from 1.22 kg/t in 2010 to 0.87kg/t currently, as a result of a combination of optimisation initiatives since the commissioning of the plant.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.3**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
The site uses a Knight Piésold probabilistic water balance which uses Extent software, using Excel spread sheets for data input. The model includes baseline data used when no new data is available and can do stochastic as well as deterministic runs. Input data comes from an electronic weather station. Model testing indicated that there is no risk of overtopping of the TSF during power outages.
The TSF stochastic model does not indicate any risk of overtopping over the dry / wet season from 2007 to Feb 2012. A maximum rainfall PMP (Probable Maximum Presentation) event of 818mm over 24 hours did not indicate any overtopping of the TSF at the design freeboard of 1m. No revision of operating practices were identified during the model runs.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.4**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
The sample values have been as follows: at the spigot (compliance point), samples at 31 August 2013 were 82 mg/l WAD cyanide and went down to 3,1 mg/l WAD cyanide on 28 September 2013. Thereafter all sample values, to date, were below 50 mg/l WAD cyanide, which coincides with the performance from the full commissioning of the Detox plant. The pond values in the Supernatant pool at TSF saw values reducing from the original exceedance value on 4 September 2013 at 213 - 91 mg/l WAD cyanide and thereafter, all values were below 30 mg/l WAD cyanide with the 4 February 2014 value showing 19 mg/l WAD cyanide. The plant process water pond values reduced from the original exceedance as follows: the values reduced from 21 August 2013 at 166 to 10.2 Mg/l WAD cyanide on the 28 September 2013, thereafter, all values were below 30,5 mg/l WAD cyanide, with the 4 February 2014 value being 13 mg/l WAD cyanide.
Since the commissioning of the Detoxification system, only 8 cyanide attributable bird deaths were seen. The cause of death was identified and the problem corrected, with no mortalities recorded since Nov 2013.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.5**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
There has never been a direct discharge since the mine has started and the closest river is 50 km away. There are seasonal wetlands in the vicinity but no discharge to these areas occurs. Groundwater is monitored via boreholes. No cyanide levels are detected above limits of detection, indicating that no indirect discharge of cyanide containing solutions takes place.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.6**

 not in compliance with

Basis for this Finding/Deficiencies Identified
The TSF is fully lined to prevent seepage. The TSF is further equipped with under drains and a pump system to return any seepage back to the TSF and plant. The plant process water pond is fully lined and the plant is equipped with extensive concreted surfaces and competent secondary containments. Six boreholes, up and downstream of the TSF and plant, are analysed for free cyanide, WAD cyanide, and Total cyanide. All values recorded are at below limits of detection.
No backfill is used in the mine and there was no evidence of seepage causing degradation of the environment.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 4.7**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
All cyanide equipment including tanks, thickeners and mills, is placed inside concrete bunded areas draining to the events bund. All bunds are equipped with sumps and dedicated sump pumps returning any spillage back to the process. All tanks are placed on ring beams are designed with impermeable linings and leak detectors. The new Detox tanks are placed on ring beams, with an impervious membrane fitted with a leak detection point. The tanks are placed inside bunds, draining to the events bund. The cyanide area sump pump will start automatically when the level in the sump is high and, if and only if, the cyanide concentration in CIL tank 1 is not above the set point. The reagent strength tanks are made of steel, pipelines are made of steel, with butt welds and no flanges.
The reagent strength pipelines are designed to be flangeless, butt welded lines, and are placed on pipe racks running above concrete spillways draining to the events bund. Other slurry and solution pipelines run across concrete spillways draining to the events bund. The TSF slurry and return water pipelines are placed inside a lined trench draining back into the events bund. The pipelines on top of the TSF is placed within the TSF footprint. No sections of the pipeline posing a risk to surface water have been identified and there are no rivers close by.

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

	X in full compliance with
The operation is	□ in substantial compliance with **Standard of Practice 4.8**
	□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Buzwagi electronic, Quality Assurance/Quality Control (QA/QC) program documentation for the original construction of the plant in 2008 was reviewed. The program covers the whole plant, including the cyanide facilities as per the ICMI definitions. A site inspection confirmed that a Detox plant upgrade project has been completed. The QA/QC program was conducted by Group 5. Furthermore, an independent engineering company was appointed by African Barrick Gold to monitor and consult on QA/QC, for the project construction and commissioning.
The African Barrick Gold Buzwagi Project Tailings Storage Facility 2010 Technical Audit Report states, "This report is intended to form part of the design and audit suite of reports for the tailings storage facility at Buzwagi and a summary of the general design criteria has been included within this report to enable it to be read as a stand-alone document. However, it is intended that the referenced documents be utilised to confirm design concepts or intent where additional detail is required." Thus this forms part of the on-going QA/QC documentation of the TSF. The 2013 tailings and surface water management technical audit stated that there were no significant issues noted. A Memorandum from the Engineers entitled " Buzwagi Gold Project - TSF under drainage operation review" dated 17 December 2013, signed by Brett

Stevenson - Principal Engineer (Geotechnical Engineer) and Dave Morgan Managing Director. Recommendations (subsequently implemented and completed by the end of December 2013) included that the under drainage outlet system be modified to enable discharge of the under drainage, thus preventing possible bird mortalities.

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

X in full compliance with

The operation is

□ in substantial compliance with **Standard of Practice 4.9**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
A water sampling procedure and a monitoring program is in place to sample both surface and groundwater for cyanide. The general sampling procedure specifies roles and responsibilities, actions and methods, cleaning of equipment, preparation, sample labelling, sampling, sample preservation, the sampling packaging and transportation, and notification by the laboratory. Monitoring, sample preservation and custody and chain of custody procedures were developed by a team and approved by the appropriately qualified Environmental Scientist. Boreholes are monitored quarterly, ponds monthly, surface water monthly, and the river quarterly. TSF daily inspections include monitoring for bird mortalities.
Future planning is to use on-line sampling and analyses of the tailings thickener underflow discharge pumped to the TSF, using the WAD 1000 analyser. The results will be used as the compliance values for WAD CN pumped to the discharge spigots at the TSF.

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

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

X in full compliance with

The operation is

□ in substantial compliance with **Standard of Practice 5.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
There is a Pangea Minerals Barrick Buzwagi Project decontamination and decommission plan, as part of the ICMI Cyanide Code Compliance Project, in place. Section 5 "Cyanide facilities", includes a schedule table, starting 24 months before closure and running until 24 months after closure. The Plan is reviewed annually.

Standard of Practice 5.2: Establish an assurance mechanism capable of fully funding cyanide related decommissioning activities.

X in full compliance with

The operation is
- □ in substantial compliance with **Standard of Practice 5.2**
- □ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Barrick Third Party Contractor Cost estimate model dated 15 Oct 2012 was sighted, including a line item on decontamination, verified for US$ 235 000. The estimates are reviewed annually.
There are no jurisdictional requirements for the decommissioning of the cyanide-related activities but Barrick provides this through a Corporate Guarantee backed by a report of independent certified public accountants: Barrick Gold Corporation Statement of Financial Strength for the ICMI 30 April 2012.

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

Standard of Practice 6.1: Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce or control them.

X in full compliance with

The operation is
- □ in substantial compliance with **Standard of Practice 6.1**
- □ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Gold Plant has core cyanide procedures, Process Policies and Procedures and Standards. There are 6 Cyanide specific procurement procedures, 53 Process plant cyanide specific Safe Work Procedures (SWPs), 11 Process Plant Engineering SWP's, and 5 cyanide-related Environmental procedures. The General Process plant standard operating procedures register was also reviewed. These procedures cover the cyanide equipment in the process plant and the detox facilities as well as maintenance procedures involving cyanide facilities. The Tailings

Storage facility (TSF) is operated as per the Pangea Minerals Limited Buzwagi Project Tailings Storage Facility and Water Management Infrastructure Operations Manual.
There are a variety of operational inspections carried out covering prior to start up checks, CIL, Cyanide Mixing, the Elution Circuit, Float and the Grinding circuit. These are augmented by monthly safety inspections. On the TSF, the shift operator/shift supervisor carry out daily checks of the water storage pond, and the plant site water pond harvesting area. There are also dawn and dusk TSF daily inspections covering liner damage, the under-drains system, discharge points, and pond size.
A Barrick Corporate change management procedure is in place and functioning and change management exercises are signed off by Health, Safety and Environmental officials. Appropriate PPE and pre-work inspections are specified in procedures for all cyanide-related tasks. A Mine wide Health and Safety meeting is held, along with shiftly operations and maintenance safety meetings. Weekly toolbox talks are held on Mondays, and Job Hazard Analyses involves all levels in the workforce. Interviewees confirmed that the workers are part of the pre-shift meetings where safety and health issues can be brought up. Safety representative structures are in place and also used.

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

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 6.2**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
A pH of above 10.5 is maintained in the CIL tanks and a minimum of pH of 12 is used in the cyanide mixing plant. At the detoxification plant, a pH 7.5 to 8.5 is maintained. It was confirmed in design criteria where test work determined that the pH needed to be controlled between 10 and 11. and pH alarms at 9.5 L, and 9.2 LL. Fixed HCN gas monitors are located at: the Pregnant solution tank, the Gold room, the CIL at the dosing point, the Cyanide mixing area (2), and the Detox tanks (2). Fixed monitor installations are based on the risk and potential of high cyanide gas formation and the list of potential hot spots are trained during the cyanide awareness program. There are 7 Dräger PAC 7000 personal HCN gas monitors available for use on site. Signage is used to indicate where cyanide gas risks are possible. The Manufacturer requires monitor calibration at 6 monthly intervals and calibration records were reviewed.
On-going inspections and checks are also used to monitor and check facilities and that emergency response equipment is functioning. Safety equipment such as safety showers, low pressure eye wash stations, and fire extinguishers are numerous, regularly inspected, and adequately signposted.

A site wide pipe colour coding system is in operation which includes cyanide pipe colour coding and directional flow signage. Laminated MSDS's are available in strategically located boxes on the site. Formal employee interviews were used to check awareness and sensitivity to health and safety measures and the response from employees and contractors alike, was found to be appropriate and acceptable. Accident and incident reporting and investigation procedures were found to be in place and effective.

Standard of Practice 6.3: Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 6.3**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
Radios are used for cyanide emergency calls to the control room operator (down to operator level). All showers are linked to an alarm in the control room and a general alarm can be activated in the control room. The plant has Oxy-viva oxygen kits in place at the control room (8 spare cylinders in the store), first aid responders cabin, and an ERT emergency response kit. Antidote kits are stored in fridges and replaced as directed by manufacturers. Running water is available throughout the plant. Cyanide first aid equipment is inspected monthly.
All workers on the plant are trained in emergency response including Oxy-viva use (confirmed during interviews). Each shift crew has a team of 6 emergency responders who will attend to emergencies, with the rest moving to the emergency assembly point. A fully trained Mine emergency response team is in place that will provide advance cyanide emergency 1st aid on the plant site. A fully equipped mine clinic is situated outside the plant, staffed with doctors on call 24 hours per day. Paramedics are stationed at the clinic during daytime and on call after hours. The Clinic has the ability to handle a maximum of 2 patients in the emergency room with 2 beds in an observation room. 3 large oxygen cylinders are available: 2 in clinic and 1 in store, and 1 small cylinder is in the ambulance. Cyanide PPE is available in clinic.
A contract is in place with ISOS (Medivac service provider) to evacuate patients to Nairobi Hospital, as per the decision of the Clinic Doctor in charge. Mutual Aid Agreements are also in place with the close by Bulyanhulu Gold Mine to take cyanide patients. ERT training drills are conducted as per a schedule. The lessons learned include review of the emergency program, and a re-briefing of staff. Training staff were present during drills and training deficiencies were noted and action plans developed. Full cycle man down gassing scenario drills have been carried out and problem areas identified from the previous drill were resolved.

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

Standard of Practice 7.1: Prepare detailed emergency response plans for potential cyanide releases.

X in full compliance with

The operation is

□ in substantial compliance with **Standard of Practice 7.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
There is a Buzwagi Emergency Response Plan (Revision 3 dated 7 January 2014) in place and functional, which includes site-specific cyanide emergency scenarios and responses. Cyanide first aid procedures are included in the Plan. The Plan combines existing procedural responses and emergency provisions to deal with the various scenarios and includes and identifies the emergency response team and coordinators who are on all shifts. These preparations are regularly reviewed in the light of changes, mock drill learning points and employee feedback.

Standard of Practice 7.2: Involve site personnel and stakeholders in the planning process.

X in full compliance with

The operation is

□ in substantial compliance with **Standard of Practice 7.2**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
Although the Community is not directly involved in the emergency plan, the communities are made aware of cyanide through dialogue discussions. The workforce were formally briefed / informed of the detail on the ERP and there are structures available such as safety meetings, toolbox talks, appropriate risk assessments, and use of emergency drill feedback and debriefing sessions. The workforce is involved in the testing of the plan through emergency drill feedback.

Standard of Practice 7.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.

X in full compliance with

The operation is

□ in substantial compliance with **Standard of Practice 7.3**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The ERP designates emergency controllers and the cyanide emergency response team. The roles and responsibilities of the controllers and team are defined in the Plan. The emergency response team will commit the resources necessary to deal with the emergency. Competency of emergency response coordinators is checked through mock drills. The Plan includes emergency response training be undertaken. Emergency equipment lists were checked and site inspections confirmed availability and readiness. The Plan includes contact references (telephone, cell phone, etc) of internal and external resources for the various scenarios, particularly with detail where external resources and skills might be needed. Emergency Team members were checked and training records and assessments showed the individuals to be prepared and equipped for cyanide emergencies. Periodic full scale drills are held to ensure that roles and responsibilities are understood and clearly implemented.

Standard of Practice 7.4: Develop procedures for internal and external emergency notification and reporting.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 7.4**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Emergency Response Plan includes full details of appropriate emergency contacts and reporting, and the call-out procedure and contact information lists which are updated regularly. Communication to the outside media follows the guidelines outlined in the Crisis Management Plan and is channelled via the General Manager and Company Public Relations Officer based in Dar es Salaam.

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

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 7.5**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Emergency Response Plan describes measures for clean-up and neutralisation of solid or solution spills (included in a specialised cyanide clean-up and decontamination procedure), sampling, PPE and materials to be used. The use of treatment chemicals such as ferrous sulphate, hydrogen peroxide and hypochlorite in surface water is prohibited, unless human life is under direct threat. The Plan includes no provision for alternative drinking water supplies as there are no communities receiving water from sources that could be contaminated by the mine.

Standard of Practice 7.6: Periodically evaluate response procedures and capabilities and revise them as needed.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 7.6**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The Emergency Response Plan is reviewed annually and at any time major changes occur (e.g. after an emergency or emergency drill, or change in contact details for key personnel). Furthermore, "…The Emergency Plan will be revised in line with recommendations from emergencies, emergency drill debriefs and recommendations from Emergency Plan reviews at other operations..."

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

Standard of Practice 8.1: Train workers to understand the hazards associated with cyanide use.

X in full compliance with

The operation is □ in substantial compliance with **Standard of Practice 8.1**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
All people entering the plant undertake the cyanide awareness course. The course describes the cyanide hazards, cyanide appearance and includes cyanide first aid. All Process Plant staff receive Oxy-Viva training (Oxyviva CPR cyanide). Written tests are given and the pass mark is 75%. Site cyanide training programs were reviewed. Refresher training is conducted annually.

Electronic, spreadsheet-based records are kept in addition to scanned records. It is Government policy to keep training records for 5 years after employees leave the Company.

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

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 8.2**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
The plant task training matrix details the training module requirements for each job on the plant. The training matrix also details the training needs analyses per person, showing the training completed as well as training required. Training was verified during a review of the records of the staff interviewed. There are 5 Trainers who are doing training in the process plant some of whom have certificates in training and assessment from the Australian Institute for Training and Technology Transfer. All employees go through cyanide awareness before being allowed onto the plant. Staff are signed off, following assessment by a Trainer, to confirm competency before being allowed to work in the cyanide plant alone. A gate card control system blocks a person from entering the plant without being cleared following cyanide training. Employees are rotated throughout the plant at periods of between 6 and 19 months. On returning to an originally trained job, the employee will be assessed and retrained as necessary. Written tests, job observations and interviews are used to test effectiveness of task training. Electronic, spreadsheet-based records are kept in addition to scanned records. It is Government policy to keep training records for 5 years after employees leave the Company.

Standard of Practice 8.3: *Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.*

X in full compliance with

The operation is in substantial compliance with **Standard of Practice 8.3**

 not in compliance with

Basis for this Finding/Deficiencies Identified:
All plant employees are trained as first responders. They will react when first on the scene. A mine wide, emergency response team will be called out to provide advanced first aid and paramedic assistance as well as spill response. Emergency Response Team (ERT) Training includes additional specialised training in HAZMAT confined space, equipment checks, fire

fighting training, hose drills, 1st aid, vehicle rescue, ropes, CPR, HAZCHEM, and BG4 (breathing apparatus training).
The community is made aware of cyanide and the transport of solid cyanide but does not form part of the ERP, and no local responders are involved in the ERP. The ERT receives weekly continuous improvement training which includes cyanide. Plant cyanide response training is done 12 monthly. ERT training drills are conducted according to a schedule. Periodic mock drills are undertaken and training personnel attend these drills and formally evaluate response and performance. It is Government policy to keep training records for 5 years after employees leave the Company.

9. DIALOGUE: Engage in public consultation and disclosure.

Standard of Practice 9.1: Provide stakeholders the opportunity to communicate issues of concern.

X in full compliance with

The operation is

- □ in substantial compliance with **Standard of Practice 9.1**
- □ not in compliance with

Basis for this Finding/Deficiencies Identified:
Dialogue is two way and thus the forum for receiving issues and presenting responses is the same. The list of stakeholders identified includes districts, wards, and villages. The Community Engagement and Sustainable Development Plan defines Stakeholder Identification: Employees, Families of employees, Mwendakulima Village, Mwime Village, Chapulwa Village, Authorities (The District Commissioner represents Central Government and heads the District Committee.) There are 15 Heads of Departments in the District Council of Kahama). Engagement with stakeholders includes public meetings with presentations in English and Swahili. The Cyanide Awareness Community Engagement Plan for 2013 includes schools, villages, and government institutions for March, June (held in July) and September and December 2013. At meetings, several questions were asked regarding cyanide transport, cyanide risks and cyanide effects.

Standard of Practice 9.2: Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

X in full compliance with

The operation is

- □ in substantial compliance with **Standard of Practice 9.2**
- □ not in compliance with

Basis for this Finding/Deficiencies Identified:
Dialogue is two way and thus the forum for receiving issues and presenting responses is the same. The list of stakeholders identified includes districts, wards, and villages. The Community Engagement and Sustainable Development Plan defines Stakeholder Identification: Employees, Families of employees, Mwendakulima Village, Mwime Village, Chapulwa Village, Authorities (The District Commissioner represents Central Government and heads the District Committee.) There are 15 Heads of Departments in the District Council of Kahama). Engagement with stakeholders includes public meetings with presentations in English and Swahili. The Cyanide Awareness Community Engagement Plan for 2013 includes schools, villages, and government institutions for March, June (held in July) and September and December 2013. At meetings, several questions were asked regarding cyanide transport, cyanide risks and cyanide effects.

Standard of Practice 9.3: Make appropriate operational and environmental information regarding cyanide available to stakeholders.

X in full compliance with

The operation is
□ in substantial compliance with **Standard of Practice 9.3**

□ not in compliance with

Basis for this Finding/Deficiencies Identified:
The site has leaflets in English and Swahili with cyanide awareness as topics. There is also a cartoon poster in Swahili on how the Buzwagi mine uses cyanide. Presentations are given in English and Swahili. Literacy levels in the area are high, estimated at 80%. The Local language is Kisukuma but all people can speak and / or understand Swahili.
The operation has the mechanisms and procedures to make information publicly available following a cyanide release or exposure incidents. An Incident Reporting Protocol is in place and environmental incidents that occur during the year (including cyanide incidents) are reported to the National Environmental Management Committee (a regulatory organisation) who will make this information appropriately and publically available. A Corporate Environmental reporting standard contains classifications of environmental incidents and appropriate reporting requirements.
The site incident reporting and investigation standard includes a classification of cyanide related incidents. A cyanide injury would be classified as a high potential incident and a flash report would be generated within 48 hours and circulated within the Company and Corporate. The decision of the release of information outside the Company would be made by the Corporate head office.
A site Environmental Communication procedure covers Internal and External Communication and information is released to the Corporate legal and Corporate affairs department who will release the information. The site is not allowed to release information. At the Barrick website, www.barrick.com, the "Barrick 2011 Responsibility report" is available and contains

performance data which includes health, safety and environmental statistics since 2004. The 2011 report includes an example of an incident at Buzwagi involving wildlife mortalities.