



**SUSTAINABILITY**  
FUTURE GROWTH

**INTERNATIONAL CYANIDE MANAGEMENT CODE  
GOLD MINING OPERATIONS**

**BARRICK GOLD OF AUSTRALIA LIMITED  
PORGERA JOINT VENTURE  
Porgera Gold Mine Recertification Audit  
Summary Audit Report**

**May 2016**



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## **SUMMARY AUDIT REPORT**

### **Name of Mine**

Porgera Gold Mine

### **Name of Mine Owner**

Porgera Joint Venture

### **Name of Mine Operator**

Barrick (Niugini) Limited

### **Name of Responsible Manager**

Glenn Kelly, Process Manager

### **Address**

PO Box 484  
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## **LOCATION DETAIL AND DESCRIPTION OF OPERATION**

Globally Barrick has a number of operating mines, located in some of the world's most prospective gold districts in North America, South America, Australia Pacific and Africa.

Barrick's Australia Pacific region is comprised of 2 operating gold mines: Kalgoorlie; and the Porgera (47.5%) gold mine in Papua New Guinea.

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Barrick (Niugini) Limited  
Porgera Gold Mine  
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\_\_\_\_\_  
Signature of Lead Auditor

27 April 2016  
Date

The Porgera gold mine is a joint venture operation in the Enga Province in the Central highlands of Papua New Guinea (PNG). The mine is located about 130 km west of the established town of Mount Hagen, 600 km northwest of Port Moresby and about 680 km by road from the coastal port of Lae from which all materials are freighted. The mine is situated in rugged, mountainous terrain at 2,300 m elevation on the floor of the Porgera Valley, which rises to 2,800 m at the rim. The annual rainfall is approximately 3.7 m and daily temperatures range from 10°C to 25°C.

The major components on the Porgera processing plant include:

- crushing circuit and coarse and fine ore storage;
- grinding circuit;
- gravity and regrind circuit;
- flotation circuit;
- pressure oxidation and tailings neutralisation circuits;
- leaching and adsorption circuits;
- acid wash and stripping elution circuit;
- electrowinning and gold refinery;
- oxygen plant;
- chemical storage and mixing;
- cyanide destruct plant; and
- tailings pipework and infrastructure.

### **AUDITOR'S FINDING**

This operation is:


- in full compliance
- in substantial compliance
- not in compliance

with the International Cyanide Management Code.

This operation has maintained full compliance with the International Cyanide Management Code throughout the previous three-year audit cycle.

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Barrick (Niugini) Limited  
Porgera Gold Mine  
Name of Mine

  
Signature of Lead Auditor

27 April 2016  
Date

**Audit Company**

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**Audit Team Leader**


Marc Barendrecht ([marc.barendrecht@sustainability.net.au](mailto:marc.barendrecht@sustainability.net.au))



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20 April 2016

**Names and Signatures of Other Auditors**



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R John McKenna

20 April 2016

**Date(s) of Audit**

Inclusive of the period from 13 to 16 December 2015.

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.

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Barrick (Niugini) Limited  
Porgera Gold Mine  
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## **PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 1.1

not in compliance with


### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with standard of Practice 1.1, requiring the operation 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.

Porgera purchases its sodium cyanide from Orica Australia Pty Ltd under a contract dated 1 January 2012, extended to 31 December 2015, which requires that supplied cyanide is manufactured at a facility certified under the Code. Porgera is in the process of finalising a new supply contract with a certified cyanide producer. In the interim, cyanide continues to be purchased from Orica.

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## **PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 2.1

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with the Standard of Practice 2.1 requiring that the operation establishes 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 with the Standard of Practice 2.1.

For the purposes of the Code, transportation of cyanide from Orica's Yarwun production facility in Queensland, Australia to Porgera is split into two stages managed by two different entities. These are:

- Orica Australia Pty Ltd for transport between Yarwun and Port of Lae, Papua New Guinea (PNG) (via Brisbane); and
- Toll (PNG) Limited for transport between Port of Lae and the Porgera mine.

Orica's Australian and PNG supply chains and Toll (PNG) Ltd's supply chain have been certified under the Code. Thus the operation is in full compliance.



**Standard of Practice 2.2**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 2.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 2.2 requiring that cyanide transporters implement appropriate emergency response plans and capabilities and employ adequate measures for cyanide management.

Both of Orica's supply chains, i.e. Australian and PNG are certified under the Code and Toll (PNG) Limited's PNG supply chain is also certified under the Code. Thus the operation is in full compliance.

## **PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 3.1

not in compliance with

### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 3.1 requiring that unloading, storage and mixing facilities are designed and constructed with sound, accepted engineering practices, quality control/quality assurance procedures, spill prevention and spill containment measures.

Consultants GHD prepared a report in 2007 concluding that the cyanide unloading, mixing and storage facilities were in accordance with sound and accepted engineering practices. This report has been retained.

The only change to the unloading, storage and mixing facilities since the certification audit in 2009 is the newly constructed bulk cyanide storage area consisting of a new 300 mm thick, reinforced concrete sloping slab. No changes have occurred to the operation since the last recertification audit.

**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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 3.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 3.2 requiring that unloading, storage and mixing facilities are operated using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

Porgera has developed and implemented standard operating procedures (SOPs) to prevent exposures and releases during cyanide unloading and mixing activities. These procedures include health & safety and environmental protection safeguards and regular inspections to identify issues. In addition, procedures are available to respond to spills. Facilities are in place to recover spill reagent back into storage.

## **PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.1

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.1 requiring management and operating systems designed to protect human health and the environment are implemented and include contingency planning and inspection and preventive maintenance procedures.

Porgera have developed, implemented and reviewed SOPs for all of its cyanide facilities. These SOPs and their associated training modules include the assumptions and parameters on which the facilities are based. The "Critical Environmental Control Documents Register" identifies the documentation within Porgera's operating system that relate to operations involving cyanide risks.


Inspection of the cyanide facilities are completed regularly, including the leach, CIL and strip areas that are inspected by operators twice per day. Where issues are identified work orders are raised. Inspections are documented by the inspector and records maintained. Corrective actions are entered into Oracle for action.

The site uses the Management of Change procedure that has been developed for global application throughout Barrick's operations worldwide. The procedure outlines the principles and process for use within Barrick to manage proposed, temporary and/or permanent changes to activities, infrastructure, products and services.

There is a comprehensive program of preventative maintenance that includes appropriate coverage of mechanical and instrumented systems that must function effectively for cyanide management. The program includes tanks, vessels, pumps, fans, pipelines, valves, instruments and secondary containments that form part of Porgera's cyanide facilities.

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The operation does have the necessary emergency power resources to operate pumps and other equipment in the event its primary power source is interrupted and this back-up generating equipment is present on site.

**Standard of Practice 4.2**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.2 requiring management and operating systems be introduced to minimise cyanide use, thereby limiting concentrations of cyanide in mill tailings.

New ore types are not tested for cyanide consumption rates as the blending of ore on the run of mine (ROM) pad, additional blending in the concentrate storage tanks and the oxidisation process in the autoclaves produces a homogenous feed requiring a relatively constant cyanide addition rate.

Another factor influencing the cyanide addition rate is the direct discharge of tailings to the environment. The requirement to have a low cyanide level at the discharge point generally limits the process plant's ability to increase cyanide addition rates in the leach circuit above 200 ppm sodium cyanide.

The cyanide addition rate in the leach circuit is automatically controlled using Cyantific instrumentation in Tank 1. The addition of cyanide is automatically stopped if the instrumentation in Tank 1 records cyanide levels about 170 ppm. The Process Operators also perform manual titrations for quality purposes.

**Standard of Practice 4.3**


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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.3

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not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.3 requiring a comprehensive water management program be implemented to protect against unintentional releases.

The "Porgera Mass Balance" has been developed for metallurgical control and as a Business Risk Management function.

Porgera practices riverine disposal of its tailings after they have been treated to reduce the concentration of cyanide to less than 0.5 mg/L weak acid dissociable cyanide (WAD CN). There is no accumulation of cyanide-bearing tailings outside the actual processing plant from which a loss of containment could occur.

Initially Porgera engaged Water Management Consultants (WMC) in 2007 to assess Porgera's water balance against the Code requirements. In their report, WMC noted that the release of tailings to the wider environment is planned, intentional and fully in accordance with mine permits.

**Standard of Practice 4.4**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.4

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.4 requiring measures be implemented to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

There are no open water sources on site that contain concentrations of WAD CN greater than 50 mg/L. This is because the operation has installed a cyanide destruct circuit that reduces WAD CN levels to less than 0.5 mg/L WAD CN at the tails discharge point.

Monitoring results were reviewed for the audit period that confirmed no discharge greater than 0.5mg/L WAD CN occurred.

There have been no recorded instances of wildlife mortality on site within the audit period.



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**Standard of Practice 4.5**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.5

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.5 requiring measures be implemented to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.

The operation directly discharges the tails stream to the Anawe Erodible Waste Dump, within the Maiapam Creek valley. The tailings area released onto the Anawe erodible waste rock dump at an authorised discharge point listed within the Porgera Environmental Permit issued by the PNG Government. As such, the operation is considered to have a direct discharge to surface water.

Monitoring results reviewed for the audit period verify that operational discharge at the tails stream is below 0.5 mg/L WAD CN. This discharge then travels a further 7km to the Porgera River. The regulatory compliance point is located approximately 167 km from the tailings discharge and is located on the Strickland River. This compliance point is determined to be at the end of the established mixing zone. Monitoring results for cyanide as part of the operations environmental monitoring program were below the limit of detection for cyanide of 0.02 mg/L.

Surface water bodies around the site are monitored routinely for WAD CN and all results returned are below limits of detection.

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**Standard of Practice 4.6**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.6

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.6 requiring measures be implemented to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

The operation manages the potential for seepage from the site. The operation manages seepage by operating the Cyanide Destruction Plant for tailings released to the riverine environment and by maintaining facilities that prevent the seepage of cyanide from the processing plant. As there is no TSF at Porgera, there is no requirement to manage seepage from such a facility.

Groundwater within the vicinity of Porgera has not been designated a beneficial use by the PNG Conservation and Environment Protection Authority (CEPA).

The hydrology of the basin where the operation is situated is dominated by surface water runoff. Known groundwater expressions occur downstream of the operation at various surface water springs. These springs are known to be accessed by the local population for drinking water and other domestic requirements. As such, these springs are determined to have a beneficial use.

The operation does use tailings in the paste used for underground backfill. However, the tailings stream contains less than 0.5 mg/L WAD CN before being combined with the backfill at the paste plant. The paste plant is not considered a cyanide facility. Risks to worker health at this plant in relation to the low levels of cyanide have been assessed and deemed too low to pose any issues to workers.

The Porgera Environment Department monitors these springs on a monthly basis for WAD CN to determine if seepage may be impacting these sources. All results reviewed during the audit were below limits of detection.

**Standard of Practice 4.7**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.7

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.7 requiring spill prevention or containment measures be provided for process tanks and pipelines.

Spill prevention or containment measures are provided for all cyanide storage and mixing tanks and for process solution tanks. Cyanide process solution pipelines are associated directly with these tanks and bunding and so those containment measures are effective for pipelines as well as tanks. Cyanide reagent piping is jacketed at the locations where it crosses unsealed ground. Weep holes are in place where those jackets are close to the ground level within the bunded areas or the jackets are left open at the discharge point to enable leakage from the inner pipe to be made visible under relatively safe conditions.

Porgera engaged consultants GHD in 2007 to review the sizing of the secondary containment measures associated with cyanide process solutions tanks. The report concluded that the secondary containments were compliant and that all tank and pipeline materials are compatible with cyanide and high pH conditions.

Since completion of the Cyanide Destruction Plant, tailings lines outside the secondary containment areas are not classified as cyanide solution pipelines.

In addition, Porgera have undertaken and completed the compliance works as recommended by GHD in 2007 and reported in the 2009 certification audit. That is:

- Lysimeters have been installed as a leak detection system beneath each cyanide solution tank with a ring beam – the lysimeters are monitored monthly by the Porgera Environment Department.
- Refurbishment of the CIP Spillage Pond and Gold Room Spillage Pond to ensure that its high-density polyethylene (HDPE) liner provides an effective element in the secondary containment system for process tanks.
- Reconfiguration and extension of arrangements for cyanide process tank bunds to overflow via spoon drains and to flow under a plant road to the Spillage Pond.

- Construction of a new culvert to enable tails lines to cross the plant road and to provide a flow path for spillage to the Spillage Pond.
- Installation of additional concrete surfacing in areas identified by GHD as being at risk of process spillage.

**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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.8

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.8 requiring quality control/quality assurance procedures be implemented to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

Verification of the quality control/quality assurance program has been completed in the original certification audit in 2009 and subsequent recertification audit in 2013.

The documents provided as evidence during the certification audit were sighted again during this audit but as they had been reviewed and referred to in the 2009 certification audit, they were not reviewed during this audit.

No new cyanide facilities have been constructed during the audit period.

**Standard of Practice 4.9**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 4.9

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 4.9 requiring monitoring programs be implemented to evaluate the effects of cyanide use on wildlife and surface and ground water quality.

The operation has developed a range of standard procedures for monitoring activities, written by appropriately qualified personnel.

The procedures specify how and where samples should be taken and include information related to preservation techniques and chain of custody.

The operation monitors for cyanide in process water discharge and in surface waters down gradient from site. The Process Department takes two-hourly samples of the tails stream and analyses for WAD CN. Separately, the Environment Department takes twice daily WAD CN samples.

Monitoring undertaken has not recorded any instances of wildlife mortality on site within the audit period.

Monitoring is conducted at frequencies to adequately characterise the medium being monitored and identify changes in a timely manner.

## **PRINCIPLE 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 the cyanide facilities to protect human health, wildlife and livestock.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 5.1

not in compliance with

### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 5.1 requiring procedures for effective decommissioning of the cyanide facilities be implemented to protect human health, wildlife and livestock.

The operation has developed two primary documents which outline the requirements for the decommissioning of cyanide facilities. These are the Porgera Decontamination and Decommissioning Plan (DDP) and the Barrick Porgera Mine Closure Plan (MCP).

The DDP was in revision at the time of the site audit and was provided in January 2016 to confirm that all requirements of this Standard of Practice have been met. The MCP was last revised in 2013. Both these documents contain written procedures outlining the requirements for decommissioning of cyanide facilities.

The DDP contains an implementation schedule and was reviewed in January 2016.

### **Standard of Practice 5.2**

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


in full compliance with

The operation is  in substantial compliance with Standard of Practice 5.2

not in compliance with

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**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 5.2 requiring an assurance mechanism be established capable of fully funding cyanide related decommissioning activities.

The operation is in Full Compliance with Standard of Practice 5.2. The current estimated closure costs for overall site closure have been updated in October 2015 and are \$170.2M AUD. Overall closure costs based on life of mine are calculated at \$227.1M AUD. Within this overall closure cost estimate, Cyanide Decontamination costs have been estimated at \$2,193,323 AUD.

These costs are updated every 12 months by SRK Consultants who were engaged to develop the site wide Mine Closure Plan. Costs are developed and tracked in the BRCE Mine Closure Cost Calculator. Costs within this document are for third parties to conduct the work.

No financial mechanism is required for the operation by the PNG Government. As such the operation is required to self-guarantee a financial assurance mechanism which has been independently verified by a financial auditor.

The operation is owned jointly by two companies. Both companies (Zijin Gold and Barrick Australia Limited) have provided financial statements that they hold the required funds for cyanide decommissioning activities. The financial positions of both companies were reviewed by PWC, an independent financial auditor, and determined that both companies had the required financial capacity to meet the costs of cyanide decommissioning activities.

## **PRINCIPLE 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 and control them.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 6.1

not in compliance with

### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 6.1 requiring potential cyanide exposure scenarios be identified and measures taken as necessary to eliminate, reduce and control them.

Written management and operating plans or procedures have been developed for cyanide facilities including unloading, mixing and storage facilities, leach plants, cyanide treatment and disposal systems. All the documents reviewed during the audit contained information related to safe work practices required to minimise worker exposure.

All documents reviewed included requirements for personal protective equipment (PPE). Pre-work inspections are conducted through a range of different mechanisms, including Job Hazard Assessments (JHAs) and Field Level Risk Assessments (FLRAs).

The site uses the Management of Change procedure that has been developed for global application throughout Barrick's operations worldwide. The procedure is intended to maximise Barrick's improvement opportunities whilst minimising the risks.

Worker input is included during the development and revision of health and safety documents.

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**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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 6.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 6.2 requiring cyanide facilities are operated and monitored to protect worker health and safety and the effectiveness of the health and safety measures are periodically evaluated.

The Porgera metallurgists have determined that, based on its solution chemistry, a target pH of 10.5 shall be maintained throughout its operation to limit the evolution of hydrogen cyanide (HCN) gas. The target pH is communicated to the operators as part of the Leach Circuit Training program and by way of a set point board in the control room.

The operation has identified areas and activities where workers may be exposed to cyanide in excess of 10 ppm and employees are made aware of these areas and activities through induction, procedure training and signage.

In addition, the operation uses a combination of both static and personal monitoring devices to confirm that controls are adequate to limit worker exposure to HCN gas. HCN monitoring equipment is maintained, tested and calibrated and the records retained.

Appropriate signage and labelling is in place warning of the dangers of cyanide and emergency features including fire extinguishers, showers and eye wash stations are present, functional and regularly inspected. Tanks and piping containing high and medium strength cyanide are adequately labelled. The tanks are painted with a lilac band and accompanying signage. The pipe was either painted lilac and/or had a lilac stick-on label with arrows indicating the direction of flow. MSDS's and first aid instructions are posted at all designated cyanide areas. An electronic MSDS database, Chemwatch, is available via the intranet.

The Porgera Incident Reporting and Investigation Procedure is in place and is capable of investigating and evaluating cyanide exposure incidents.



**Standard of Practice 6.3**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 6.3

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 6.3 requiring emergency response plans and procedures be developed and implemented to respond to worker exposure to cyanide.

The operation has the necessary equipment to respond in the event of a worker's exposure to cyanide. An adequate water supply was observed for rinsing and cyanide decontamination at numerous showers and eyewash stations located strategically around the site. An adequate supply of oxygen was observed in the safety boxes strategically placed around the processing plant, in the Medical Facility and ambulances. There is a radio system and telephone which can be used to raise the alarm in an emergency.

The mill area safety equipment and emergency cabinets are inspected by both Operations (on a weekly and a fortnightly basis) and Emergency Response personnel.

The operation has developed and implemented both a Cyanide Emergency Response (CER) Standard Operating Procedure (SOP) and a Response to Cyanide Exposure Standard Working Procedure (SWP) to respond to cyanide exposures. Mock emergency drills are conducted annually and cyanide training is a core competency of all ERT team members.

The onsite Medical Centre provides First Aid or medical assistance to workers exposed to cyanide. The facility is open 24 hours and a doctor is on call during the night shift. In addition, Porgera has made formalised arrangements with the regional hospitals.

The medical evacuation of a workers exposed to cyanide is managed by the medical staff. The Serious Injury/Illness procedure describes the measures and action to be taken to transport workers to offsite medical facilities.

## **PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.1

not in compliance with

### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.1 requiring detailed emergency response plans are prepared for potential cyanide releases.

The operation has developed a Cyanide Emergency Response (CER) SOP which addresses potential accidental releases of cyanide that may occur on site.

This document forms part of the site's overall emergency response which includes the high level Emergency Management Team (EMT) Plan and the Processing Incident Management Plan.

The purpose of the EMT Plan is to provide guidelines for the successful and professional management of "crisis" incidents affecting Porgera Mine, its employees, their families, contractors and the public.

The Medical Centre maintains the Response to Cyanide Exposure safe work procedure (SWP) that provides detailed guidelines for the emergency first aid and medical treatment in the form of antidotes.

### **Standard of Practice 7.2**

Involve site personnel and stakeholders in the planning process.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.2 requiring the involvement of site personnel and stakeholders in the planning process.

The current Cyanide Emergency Response (CER) SOP is a revised version of the externally developed Cyanide Emergency Response Plan (CERP). Section 8.4 of the CERP, developed by Emergency Training Consultants Pty Ltd, noted that it was developed with collaboration from:

- Orica;
- Porgera’s Safety Department, Environmental Department, Mill Department, Community Affairs, Medical Department, Fire Rescue, Logistics and Technical Services;
- Barrick Gold Employees (Porgera, Lawlers, Granny Smith, Plutonic and Kanowna).

The CER SOP states that the plan “... *is to be reviewed and revised following all cyanide-related emergencies and exercises*”. Review and revision solicit and incorporate feedback from stakeholders as required and updated roles and responsibilities are distributed to stakeholders as appropriate.

**Standard of Practice 7.3**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.3

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.3 requiring appropriate personnel are designated and the necessary equipment and resources are committed for emergency response.

The CER SOP designates primary and alternate emergency response coordinators and lists the key on site personnel who will be contacted during a cyanide emergency at Porgera Joint Venture (PJV). It states that these managers “... *have authority to commit the resources necessary to implement the CER SOP when on site*”.

The duties and responsibilities of the Incident Management Team (IMT) – Processing, Process Manager, Anawe Production Superintendent, Anawe Shift Foreman, Maintenance Manager, Safety & Health Specialist, Emergency Response (ER) Coordinator, Security Control Centre Supervisor, ER Team Members and employees are detailed within the CER SOP.

Appropriate training for emergency responders is managed by the OH&S Department. Required competencies have been identified and training has been carried out.

In addition, the medical equipment resources (oxygen and antidote kits) on site and their location are listed. Preventative maintenance schedules have been established to check medical and ERT equipment. Records of the checks were sighted at the audit.

Excluding medical services, Porgera does not anticipate the involvement of external assistance with cyanide emergencies but includes the following regulatory agencies as having a potential role in an emergency:

- PNG Department of Mining;
- Conservation and Environment Protection Authority; and
- Environmental Coordinator Enga Province.

Mock emergency drills are conducted periodically to test response procedures for various emergency scenarios and lessons learned from the drills are incorporated into response planning via debriefs.

#### **Standard of Practice 7.4**

Develop procedures for internal and external emergency notification and reporting.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.4

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.4 requiring procedures are developed for internal and external emergency notification and reporting.

The CER SOP includes the contact information for notifying management, regulatory agencies, outside response providers and medical facilities.

In addition, the CER SOP details the procedures for communicating with the media, that is there is an onsite Communications and Media Manager and all forms of communication outside of Porgera Mine must be directed through this person.

**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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.5

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.5 requiring response plans and remediation measures are incorporated into monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

The CER SOP describes:

- how to clean up both solid and liquid cyanide;
- how to neutralise soils, including the use of ferrous sulphate for spills to soils;
- how to decontaminate equipment and the resultant wash water; and
- how to decontaminate waterways.

In addition, it prohibits the use of hypochlorite, ferrous sulphate and hydrogen peroxide to treat cyanide that has (or could potentially be) released into surface water and addresses the need for environmental monitoring, including sampling methodologies, parameters and possible locations.

**Standard of Practice 7.6**

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 7.6

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 7.6 requiring response procedures and capabilities are periodically evaluated and revised as needed.

The CER SOP states that it *"... is to be reviewed and revised following all cyanide related emergencies and exercises (in the absence of incidents, review and revision should occur immediately after the cyanide emergency exercises) and revision information kept on file"*.

The CER SOP has recently been reviewed in October 2015.

Mock emergency drills have been conducted annually and debriefs are conducted after all mock drills. The resulting corrective actions are entered into the operations incident management system, RIMS, for tracking until they are closed out.

## PRINCIPLE 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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 8.1

not in compliance with

### Summarize the basis for this Finding/Deficiencies Identified:

Porgera is in FULL COMPLIANCE with Standard of Practice 8.1 requiring workers are trained to understand the hazards associated with cyanide use.

The operation utilises the cyanide awareness training package as the main training function for providing all personnel with cyanide hazard recognition.

The Cyanide awareness training presentation and manual contains types of cyanide onsite, health effects, symptoms and response requirements.

The training is conducted by appropriately qualified Process Department personnel. All employees working in the mill area receive the training. The training is valid for 12 months after which time the employees are required to attend the same course as a refresher training exercise.

Training records are retained and a sample of these records was reviewed for the audit period.

**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.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 8.2

not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 8.2 requiring appropriate personnel are trained to operate the facility according to systems and procedures that protect human health, the community and the environment.

The operation trains workers in cyanide related SOPs through a Competency Based Assessment (CBA) process.

Appropriately experienced supervisors act as trainers and are responsible for mapping and tracking employees' progress in accordance with the training needs analysis. All SOPs are signed off by the Process Training team.

All employees receive an Individual Development Plan (IDP), which has been mapped by operational management to the employee's job description. Training associated with the IDP is then scheduled to occur as the employee proceeds with their job tasks. The IDP was formed as a result of specific Training Needs Analysis (TNA) workshops that were conducted prior to the ETAMS system being implemented.

There are a number of appropriately qualified personnel on site who provide training related to cyanide management tasks.

Training records retained include the names of the employees and the trainer, the date of training, the topics covered and if the employee demonstrated an understanding of the training materials.



### Standard of Practice 8.3

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

in full compliance with

The operation is  in substantial compliance with Standard of Practice 8.3

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 8.3 requiring appropriate workers and personnel are trained to respond to worker exposures and environmental releases of cyanide.

The Cyanide Awareness Training which is provided to all personnel addresses cyanide releases. Refresher training is conducted annually.

All employees working in the mill area receive the training. The training is valid for 12 months after which time the employees are required to attend the same course as a refresher training exercise. Information presented in this course requires employees to:

- Immediately notify the Emergency Response Team (ERT);
- Sound the alarm;
- Secure the area; and
- Standby and await ERT.

Cyanide emergency response training is a core competency of all ERT team members. The ERT conduct training drills on a weekly basis. Hazchem forms a significant part of the training and cyanide scenarios have been specifically included in these drills. All Emergency Service Officers (ESOs) completed Certificate III in Emergency Response (provided by WEST Rescue. The Certificate III training includes hazardous materials training.

Mock emergency drills are conducted periodically to test response procedures for various emergency scenarios including both environmental and worker exposure scenarios and lessons learned from the drills are incorporated into response planning via debriefs. Records of completed drills and training are retained.

## **PRINCIPLE 9 – DIALOGUE**

### **Engage in public consultation and disclosure.**

#### **Standard of Practice 9.1**

Provide stakeholders the opportunity to communicate issues of concern.

in full compliance with

The operation is  in substantial compliance with Standard of Practice 9.1

not in compliance with

#### **Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 9.1 requiring stakeholders are provided the opportunity to communicate issues of concern.

The operation continues to provide a variety of means for stakeholder communication to occur. A major development during the audit period was the development and implementation of a Grievance Procedure, which was commenced in 2013. The Grievance Procedure allows members of the local community to liaise with the operation about a variety of concerns. No grievance notices regarding cyanide have been received to date.

The site employs a number of Community Relations Officers (CROs) who liaise with the communities nearby the mine site as well as along the highway which provides access to the site. The CROs have ongoing and regular discussions of an informal nature with community members about all aspects of the mine operation and provide any feedback to the operation.

The site invites members of the local community to visit the site and provides a tour for these visitors. Visitors have included councillors (village leaders), teachers and students.

Internally, site inductions for all employees, contractors and visitors are required prior to working on the site. Questions are encouraged during the site induction.

#### **Standard of Practice 9.2**

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


in full compliance with

The operation is  in substantial compliance with Standard of Practice 9.2

not in compliance with

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Barrick (Niugini) Limited  
Porgera Gold Mine  
Name of Mine

  
Signature of Lead Auditor

27 April 2016  
Date

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 9.2 requiring dialogue is initiated describing cyanide management procedures and responsively address identified concerns.

The operation initiates dialogue with stakeholders regarding cyanide through a number of means.

This includes:

- Notices on notice boards;
- Billboards; and
- Radio communication (in multiple dialects).

The operation also distributes the Porgera Positive (an internal newsletter) on a monthly basis to both internal and external stakeholders. These publications include information related to cyanide.

The site employs a number of CROs who liaise with the communities nearby the mine site as well as along the highway which provides access to the site. The CROs have ongoing and regular discussions of an informal nature with community members about all aspects of the mine operation and provide any feedback to the operation. The CROs are able to converse in four separate languages used in the area: English, Pidgin, Enga and Ipili. All CROs also complete the mill induction so that they gain a greater awareness of the use of cyanide on site and can communicate this if required.

The site invites members of the local community to visit the site and provides a tour for these visitors. Visitors have included councillors (village leaders), teachers and students. Information related to cyanide is provided during these site visits.

The Porgera Environment Advisory Komiti (PEAK) meets twice a year. External stakeholders include government, non-governmental organisations (NGOs), Mineral Resource Authority, University groups and Porgera District Women's Association. PEAK is independent of Porgera and operates under its own control. Information on cyanide use is presented at these meetings.


**Standard of Practice 9.3**

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

in full compliance with

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Barrick (Niugini) Limited  
Porgera Gold Mine  
Name of Mine

  
Signature of Lead Auditor

27 April 2016  
Date

The operation is  in substantial compliance with Standard of Practice 9.3  
 not in compliance with

**Summarize the basis for this Finding/Deficiencies Identified:**

Porgera is in FULL COMPLIANCE with Standard of Practice 9.3 requiring appropriate operational and environmental information regarding cyanide is made available to stakeholders.

At an operational level, Porgera have developed written descriptions of how their activities are conducted and how cyanide is managed and these are communicated through the processes referred to in 9.1.1.

All written information produced by the operation, excluding the Ipili Wai Pii, is produced in both English and Tok Pisin and in some cases Tok Ples.

Community consultation is completed verbally in the language of the community and the CROs are able to converse in four separate dialects used in the area: English, Pidgin, Enga and Ipili.

The communications strategy following an incident would depend on the circumstances surrounding each individual incident. At a minimum, Porgera would:

- adhere to all regulatory and corporate reporting requirements;
- communicate and consult directly with any community regarding a cyanide incident where not to do so would increase the risk to that community;
- Porgera will not deliberately mislead the community as to consequences resulting from an incident involving cyanide; and
- report all incidents through established internal reporting protocols.