

***INTERNATIONAL CYANIDE  
MANAGEMENT INSTITUTE***

***Cyanide Code Compliance Audit  
Gold Mining Operations***

***Certification Summary Audit Report***

***Harmony  
Moab Khotsonong Operations  
Noligwa Gold Plant  
South Africa***

***10<sup>th</sup> – 14<sup>th</sup> February 2020***

***For the  
International Cyanide Management Code***



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Name of Operation: Harmony Moab Khotsong Operations Noligwa Gold Plant

Name of Operation Owner: Harmony Gold Mining Company Limited

Name of Operation Operator: Harmony Moab Khotsong Operations

Name of Responsible Manager: Mr Colin Du Plessis, Plant Manager

Address: Noligwa Gold Plant  
Harmony Moab Khotsong Operations  
PO Box 2  
Randfontein  
Gauteng Province  
1760

State/Province: Free State Province

Country: South Africa

Telephone: +27 (0) 18 478 7201

E-Mail: [CLDuPlessis@Harmony.co.za](mailto:CLDuPlessis@Harmony.co.za)

**Location detail and description of operation:**

Noligwa plant was commissioned in 1971 and treats approximately 115 000 tons per month of reef material from the Moab Khotsong Mine along with waste material as grinding media. Following milling in two run-of-mine mills, the slurry is thickened before being pumped to the uranium section for uranium extraction.

The uranium plant residue at pH 1.5 - 2.5 is returned to the gold plant where it is neutralised with lime in the neutralisation section. The pH neutralisation occurs in stages to pH 4.5, pH 6.5, pH 8.5 and final pH 10.5 respectively in air agitated pachucas. The neutralised slurry at pH 10.5 is pumped to the leach section for cyanide addition and gold extraction.

Liquid sodium cyanide is added to the leach feed slurry with cyanide dosing control being achieved by means of an on-line auto titrator integrated into a dosing control loop linked to the dry tonnage feed to the leach section. Gold leaching takes place in a series of mechanically agitated tanks and air agitated pachucas.

The dissolved gold in the leached slurry is recovered onto activated carbon in the CIP (Carbon In Pulp) section consisting of eight mechanically agitated adsorption tanks. The gold loaded carbon is screened out of the slurry before being washed and transferred to the elution circuit.



In the elution circuit the carbon is washed with a hot caustic solution to strip the gold back into solution, following which the gold bearing solution passes through the electrowinning section where the gold is plated onto stainless steel cathodes and smelted to produce gold bullion for refining.

The slurry exiting the adsorption section is pumped to the backfill section. Backfill material for use as underground support is produced from the neutralised CIP residue material. The initial acidification with barren solution from the South Uranium Plant effectively destroys the residual cyanide in the material used to produce the backfill. The neutralised residue material (Monitored for WAD (Weak Acid Dissociable) Cyanide, Free Cyanide with a WAD Cyanide analyser) not taken for backfill production is pumped to the final residue stream exiting the plant to the Mispah TSF (Tailings Storage Facility).

Low grade waste rock is also treated in the Noligwa gold plant through the low grade Mispah milling and recovery circuit. Following run-of-mine milling, the slurry is subjected to a cyanide leach followed by gold adsorption in a CIP plant. Cyanide dosing control to the Mispah leach circuit is achieved by means of an on-line cyanide titrator integrated into a control loop linked to the dry tonnage feed.

The loaded carbon from the CIP circuit is treated in the elution section for final recovery of gold in the electrowinning cells. The CIP residue material joins the final residue stream reporting to the Mispah TSF from where the recovered water is recycled back to the plant.



***Auditor's Finding***

**This operation is**

☐ in full compliance

**X in substantial compliance**

☐ not in compliance

with the International Cyanide Management Code.

A Corrective Action Plan has been formulated covering substantial findings in 4.3.3 and 4.9.1 – 5 and 4.9.7.

Audit Company: Eagle Environmental

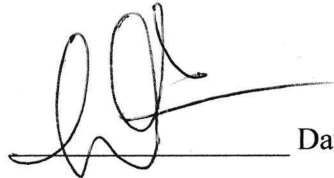
Audit Team Leader: Arend Hoogervorst

E-mail: [arend@eagleenv.co.za](mailto:arend@eagleenv.co.za)

Names and Signatures of Other Auditors:

Name : Dawid M. L Viljoen

Signature



Date: 10/8/2020

Dates of Audit: 10<sup>th</sup> – 14<sup>th</sup> February 2020

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 Mine Operations and using standard and accepted practices for health, safety and environmental audits.

Noligwa Gold Plant

Facility

Signature of Lead Auditor

Date



11/8/2020

Noligwa Gold Plant

Signature of Lead Auditor

11<sup>th</sup> August 2020

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***Auditor's Findings***

***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.*

**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:*

There is a Harmony Group Supply and Transport Agreement between Sasol South Africa Ltd., and Harmony Gold Mining Ltd, including Nologwa Gold Plant, as the sole supplier of liquid sodium cyanide, delivered by bulk tanker. Sasol is a signatory to the Cyanide Code and was re-certified as a fully compliant Production Facility with the ICMI Cyanide Code on 23 January 2019. The contract does not require that the cyanide is produced at a facility that has been certified as being in compliance with the Cyanide Code. However, as the cyanide production facility is fully certified, a finding of full compliance with Standard of Practice 1.1 is made as per the guidelines in the International Cyanide Management Institute Auditor Guidance for Use of the Mining Operations Verification Protocol.

***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 Harmony Group Supply and Transport Agreement between Sasol South Africa Ltd., and Harmony Gold Mining Ltd, including Nologwa Gold Plant, as the sole supplier of liquid sodium cyanide, delivered by bulk tanker. Sasol is a signatory to the Cyanide Code and was re-certified as a fully compliant Production Facility with the ICMI Cyanide Code on 23 January 2019. Sasol's cyanide transporter, Tanker Services Food and Chemicals/Imperial Logistics, was re-certified on 21<sup>st</sup> November 2018 as a fully ICMI Code compliant transporter.

The Agreement does not require that the cyanide transporter be certified as being in compliance with the Code. Therefore, as an alternative to executing such a written agreement, a mining operation can be found in full compliance if its producer and transporter are appropriately Cyanide Code certified.

There is no mention of the requirement to add red dye to the liquid cyanide in the Harmony Group Contract. Site procedures do not refer to the addition of dye to the storage tanks. However, The Safety Data Sheet (SDS), which forms a part of the agreement, stipulates in section 9 - physical and chemical properties, that the colour of the product is light to dark red. The Process Engineer at the Sasol Cyanide Production Plant reported that the red dye system was completed at the end of May 2019, was operational by mid-June 2019, and was in full operation from 1<sup>st</sup> July 2019, as per Sasol commitment to ICMI requirements.

*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:*

There is a Harmony Group Supply and Transport Agreement between Sasol South Africa Ltd., and Harmony Gold Mining Ltd, including Nologwa Gold Plant, as the sole supplier of liquid sodium cyanide, delivered by bulk tanker. Sasol is a signatory to the Cyanide Code and was re-certified as a fully compliant Production Facility with the ICMI Cyanide Code on 23 January 2019. Sasol's cyanide transporter, Tanker Services Food and Chemicals/Imperial Logistics (Tanker Services), was re-certified on 21<sup>st</sup> November 2018 as a fully ICMI Code compliant transporter.

The Agreement does not require that the cyanide transporter be certified as being in compliance with the Code. Therefore, as an alternative to executing such a written agreement, a mining operation can be found in full compliance if its producer and transporter are appropriately ICMI Code certified, thus meeting all the requirements for appropriate emergency response planning and cyanide management.

The auditors reviewed a sample of the document packages for cyanide shipments in 2018, 2019 and 2020 as chain of custody evidence. The packages included Sasol delivery notes from the production facility, Sasol certificates of analyses and weighbridge tickets, Harmony tanker pre-plant entry inspection checklists, Harmony cyanide off-loading checklists and Tanker Services delivery notes. The documentation was found to be in order.

**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 operation uses only liquid cyanide, delivered by bulk tanker, and no mixing or storage of solid cyanide takes place on site. As confirmed in previous certification audits, the offloading and storage facilities were designed and built, in accordance with sound and accepted engineering practices, with materials appropriate for use with cyanide and are located in concrete bunds away from people and surface waters. Cyanide storage tanks are located on concrete plinths within a concrete lined, bunded area. The tanks are each equipped with a ventilation pipe on top to prevent HCN (Hydrogen Cyanide) gas build-up. The tanks are located in an open-air environment. Annual cyanide producer technical report audits of the cyanide storage and offloading area have confirmed the acceptability of the facilities with scores of 97% and 99% for audits in 2019 and 2018 respectively. The cyanide offloading area for the liquid sodium cyanide is on concrete surfaced with bitumen, equipped with humps and drains to contain any spills. The spillage sump in the cyanide offloading area is equipped with a pump that is manually started prior to off-loading. This is run during coupling and un-coupling of delivery pipes, delivering into the main bund area for the sodium cyanide storage tanks. Tank level indicators, display at the tank site and the SCADA ("Supervisory Control and Data Acquisition" system) – computerised control system) in the Control Room. High level alarms are set at 85% and interlocked with the loading air valve to stop off-loading at 85%. All level alarms are included on the DMS planned maintenance system and are checked by instrument technicians monthly. Cyanide deliveries are managed according to tank levels and production planning. There are only deliveries of cyanide from Sasol if the tanks' capacity is available for the full tanker load.





The procedure covering cyanide unloading was reviewed and found to be effective. The offloading and storage areas for the liquid sodium cyanide are contained, barricaded, closed off with restricted access, bund walls installed, and within the main plant security area, with no public areas close by. The cyanide is also stored away from incompatible materials.

*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:*

Liquid sodium cyanide is delivered in bulk tankers from Sasol to the Plant and offloaded directly into cyanide storage tanks. No solid cyanide is used on the plant therefore the only containers used are the tankers themselves. The tanker couplings, connection pipe, and offloading couplings are washed before and after offloading. The outside of the tankers are also cleaned on their return to Sasol's premises. The offloading procedure is detailed, spelling out PPE (Personal Protective Equipment) requirements, use of a "buddy" in the process, and opening and closing of valves and connection of couplings are clearly sequenced to prevent spillages and accidental releases during off-loading. The procedure also includes the requirement for timely clean-up, and cross-referenced to the cyanide emergency procedure addressing cyanide solution spillages.

It was confirmed by interview that Sasol sodium cyanide delivered has been coloured red since the ICMI implementation date of July 2019.

**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**





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☐ not in compliance with

*Basis for this Finding/Deficiencies Identified:*

The Noligwa Gold Plant has 15 Cyanide Process Procedures, 16 Cyanide Emergency Procedures, 4 Cyanide Alarm Procedures, 9 Cyanide Engineering Procedures, 8 Cyanide PPE (Personal Protective Equipment) Procedures, 24 General Procedures, and 19 General Cyanide Procedures, supported by 13 TSF (Tailings Storage Facility) contractor detailed Standard Task Procedures including PPE and pre-work inspections, and a mandatory Code of Practice covering TSF (Tailings Storage Facility) operations. The Intasol (TSF contractor) procedures are contained in the Intasol Tailings Operational Manual and the Intasol Baseline Risk Assessment.

Design assumptions include freeboard and design storm events, defined in the Code of Practice for the TSF's, and return water pond freeboard as specified in the ISO (International Standards Organisation) Water Key Performance Indicator procedure. The procedure, "High WAD CN in residue slime" states that the maximum WAD (Weak Acid Dissociable) cyanide allowed to exit the plant is 50 ppm. It further states that Barren and Lime is added to control high WAD cyanide in the Residue Tank. An alarm will sound if WAD cyanide reaches 40 ppm.

The site uses the computerised DMS Planned Maintenance System (PMS). AngloGold Ashanti (AGA) used the SAP computerised Planned Maintenance System for the site PMS. When Harmony bought the operation and took over from 1 March 2018, PMS records were transferred from SAP to DMS. The records transfer has not been finalised as a number of records from the old SAP system need to be removed. This is being done on an on-going basis as the various records are accessed.

The system was sampled electronically and the maintenance records of various types of cyanide equipment including tanks, pumps, pipes, and valves were reviewed covering 2018, 2019 and 2020. Inspection tasks for each category inspection were reviewed and included checks for leaks, corrosion, welds, plates, gaskets, rubber lining, flanges, stubs and bolts, and baffles, as appropriate. Thickness testing was noted on all tanks. The DMS PMS includes weekly, monthly, 3 monthly, 6 monthly, annual, two yearly and 5 yearly inspections. Operational inspections include shiftly and 45 day safety officer legal inspections. The inspection frequencies are deemed sufficient to assure and document that they are functioning within design parameters.

Process plant inspections are in place and shiftly inspections were sighted. Safety issues are loaded onto the Pivot safety system and mechanical, electrical, instrumentation issues are put on a job request form and issued to the Engineering Foreman who takes further action, including loading on the DMS.

The TSF monthly inspections / checklists file, including the daily inspection reports, was sighted and sampled for July 2018, August 2019, and January 2020. The Weekly TSF inspections are filed electronically in the Spira system and downloaded in pdf format and distributed monthly. Freeboard is surveyed monthly using survey poles and formal surveys which are reported in the monthly dashboard report. The report is sent to the Plant Manager, the consulting Geotechnical Engineer and the TSF Foreman. Harmony uses the Pivot computerised system for recording and storage of inspection items.



Routine inspections of stormwater diversions form part of 90 day safety officer inspections and deviations are reported by exception. The plant does not have storm water cut-off trenches and all water in the plant is considered “dirty water”.

There is a probabilistic water balance in place, and no scenario has been identified where the need has been highlighted to shut down the plant to prevent overtopping. Proactive planning and management of containment dams, dam levels and normal and abnormal conditions contributes to reduction of risk and the unlikely need to temporarily cease plant operations under abnormal precipitation events. Thus, emergency power is not required to prevent unintentional releases in the event of a power failure. A series of procedures covering abnormal occurrences in the plant will be used to cover any other situations where a non-routine temporary closure may be necessary.

The plant will shut down in the case of TSF pipe leaks as per the standard Operating Procedures. The plant maintenance shutdowns, as per the planned maintenance schedules, are also undertaken.

The Plant has a change management procedure in place. A Management of Change (MOC) Procedural HAZOP (Hazard Operability) study regarding a cyanide tanker delivery escort with CCTV (Closed Circuit Television) surveillance dated 3 May 2018 was sighted and reviewed demonstrating the functioning of the procedure.

*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 current focus on cyanide addition management is on recovery and diagnostic leach work to maximise gold recovery and optimise reagent consumption on the reverse leach flow sheet. Samples are sent quarterly to SGS Laboratories for the Mispah and High Grade section residues. Bottle roll tests on uranium and gold are also submitted to the SGS Laboratories on uranium and gold in the high grade feed. Results were reviewed for 2018 and 2019.

In the Noligwa and Mispah sections, the cyanide dosing rate is controlled by a ratio controller with input from the mass flow system at the dosing tank. A TAC 1000 on-line free cyanide analyser is used to measure cyanide in the feed leach tank and adjust the ratio automatically. Use is made of a Bredel hose pump and a frequency drive to vary pump speed, as required.

Set points are changed by the Instrumentation Department on instruction from the Plant Manager. This was confirmed during interviews and review of documentation provided

by the Instrumentation Technician. The focus on cyanide control is to accommodate cyanide consumption variation in the Surface Material fed to the Mispah section. Current controls in the Nologwa and Mispah sections are deemed by the Plant to be appropriate.

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

☐ in full compliance with

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

☐ not in compliance with

*Basis for this Finding/Deficiencies Identified:*

The operation has an Excel spreadsheet-based probabilistic water balance (PWB) which includes daily deposition data, design storm events (1:50 and 1:100 year 24-hour storm events), frequency and distribution of precipitation events for each day of 2018 and 2019. The assumptions for the Plant are 5% moisture in the ROM (run-of-mine), 65% moisture in tailings and negligible evaporation and seepage. The TSF assumptions are 47% solution in situ, 18% evaporation losses, 4% seepage losses and 1.28% other losses.

Rainfall is measured and recorded daily in rain gauges on site and the reports are available in the Citect SCADA (Supervisory Control and Data Acquisition (SCADA) software). Dam levels are recorded daily and also fed into the Citect SCADA system.

The TSFs are using the conventional paddock dams and thus no run on is appropriate. Storm water cut off trenches are in place to prevent any potential run on. Freeboard is surveyed monthly using survey poles and formal surveys which are reported in the monthly dashboard. This report is sent to the Plant Manager, the consulting Geotechnical Engineers, and TSF Foreman.

The return water dams are run at maximum operating levels to cater for power failures (80% and 28% of total capacity). This was confirmed in graphs in the ISO procedure, Surface water management procedure for Vaal River and MWS (Mine Waste Solutions) for the Environmental Department, Mine Waste Solutions, and Vaal River Tailings Management which covers the return water dams' level parameters. The procedure, Water Key Performance Indicators for Environmental Management Department, Metallurgy and MWS lists levels for dam management and water demand priorities for both Harmony and AGA sites.

The Environmental Manager reported that the aforementioned two procedures could only be used by Harmony for one year from the purchase date (1 July 2018.) He further reported that no Harmony procedures were in place to replace the AGA procedures once the one year transitional period had expired. Thus, it is not clear what Harmony procedure, process or system, would be used to implement the water balance and prevent overtopping of ponds and impoundments and unplanned discharge of cyanide solutions to the environment. Whilst there may be informal practices in place to implement this currently, these are person-driven and need to be formalised to ensure that the appropriate information is incorporated into the Harmony Corporate Memory for continuity and

training purposes. It is recognised that the complexities of the sale of the site and the new corporate identities and changing priorities may have contributed to the delay in getting the systems updated before the ICMI certification audit, making this a substantial compliance.

The return water dams are equipped with ultrasonic level detectors (included in DMS PMS system monthly inspections) and use is made of telemetry to the central control room to record data. The pumps are controlled either manually or automatically. The Plant emergency dams, outside the Plant fence, are operated automatically and are equipped with electronic level measurement showing on the Plant SCADA. The procedure, Monitoring and Controlling Reservoir Levels – preventing Overtopping, describes the actions to be followed when monitoring and controlling the 8# reservoir dams.

The spreadsheet probabilistic model includes maximum rainfall analyses for 2018 and 2019. There was no data showing that the maximum 24 hour rainfall event fell outside the 1:50 and 1:100 year 24 hour storm events. Reviewing the latest annual reports and, except for the notes on low deposition density, no revision in operating practices due to precipitation events were noted. Thus, no emergency power is required, at this stage, to prevent overtopping of the return water dams.

*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 Plant uses an on-line Cynoprobe WAD-Free cyanide analyser to sample the residue from the two residue tanks: High grade and Low grade. The samples are taken every 20 minutes at the tailings pumps and recorded in the system. The data is recorded 6 times per day in a spreadsheet. Electronic files were sighted and reviewed.

**2018** - WAD cyanide daily averages from March to December were reviewed. No exceedances of 50mg/l WAD cyanide were recorded for both the High grade and Low grade residue streams.

**2019** - WAD cyanide daily averages from January to December 2019 were reviewed. No exceedances of 50mg/l WAD cyanide were recorded for both the High grade and Low grade residue streams.

**2020** WAD cyanide daily averages for January 2020 and no exceedances were recorded for both the High grade and Low grade residue streams were recorded.

As there are no ponds where the WAD cyanide levels exceed 50mg/l, therefore no additional measures are required to protect wildlife.

The WAD cyanide values for the two streams were low due to the residue material diverted to the backfill plant, and the use of acidic barren solution from the Uranium

Plant which is acidic and high in Iron. This hydrolyses and complexes the cyanide and so destructs the cyanide in residue.

The Cynoprobe calibration is undertaken by MINTEK (South Africa's national research and development (R&D) organisation for all aspects of mineral processing, extractive metallurgy and related technology and manufacturers of the Cyanoprobe) and calibration records were sighted and reviewed.

Intasol staff inspect for wildlife mortality daily and record any observation on their daily reports. No cyanide-related wildlife mortalities have been observed since the take over from AngloGold Ashanti. Intasol records were sampled and reviewed. As no wildlife mortalities have been observed, it can be concluded that maintaining the WAD cyanide below 50 mg/l in ponds and impoundments is effective in preventing wildlife mortalities.

*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 are no direct discharges to surface water from these cyanide facilities.

The downstream values for the Vaal River VRS 03 sample point may be of questionable value as there are many potential sources of pollution entering the river and Noligwa can do nothing with the data and cannot be held accountable for pollution if identified.

No instances where the downstream river samples exceeded 0.02 mg/l WAD cyanide were observed since the previous recertification. Therefore, no remedial action has been required to prevent further degradation.

*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 mining processing plants' process water is the only beneficial use of groundwater in the immediate area and all other water for domestic and livestock use is supplied in pipes by the Midvaal Water Company.



There is no numerical standard established by the applicable jurisdiction for WAD cyanide or any other species of cyanide in groundwater, therefore there are no compliance points below or down gradient of the gold plants or tailings facilities. Groundwater monitoring is undertaken to establish whether the tailing facilities are having an impact on the surrounding groundwater. No values above 0.02 mg/l free cyanide have been recorded since Harmony took over the operation.

The procedure, Backfill Quality Assurance, was reviewed. This stipulates the procedure to be followed to ensure that the backfill quality meets the required specification regarding its cyanide content. The procedure states that the permissible cyanide concentration in the backfill product is 25 ppm (Free Cyanide) and 50 ppm (Sodium Cyanide, total). If free cyanide is above 25ppm, the Production Metallurgist rejects the batch and it is pumped to residue.

The procedure above is based upon the MINTEK Technical Info: PWL AGA BF 100112 dated 12 January 2010 prepared for AngloGold Ashanti and being used under exactly the same conditions by Harmony.

Harmony adopted the AngloGold Ashanti procedures and supporting documentation when they took over the operation. Thus, the technical data supporting the health and safety risk management remain the same. Backfill certificates for 2018, 2019 and 2020 were sighted and sampled.

Borehole sampling results sighted indicate cyanide at below limits of detection and thus no cyanide remedial activity was required.

*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 tanks are placed in bunded areas or on concrete surfaces. There are no cyanide process tanks without secondary containment. The Mispah leach and carbon adsorption flat bottomed tanks are placed on solid concrete bases, with the conical leach tanks, residue tanks and neutralising tanks placed on plinths and steel legs. The eluate tanks are placed on solid concrete bases inside concrete bunds. All bunded areas are equipped with spillage pumps that can pump any spilled cyanide or slurry containing cyanide back into the process tanks/storage tanks. Large quantities of clean cyanide solution are returned to the storage tanks. If the liquid is from an unknown source, the pH and cyanide concentration are measured before it is pumped to the leach. Spillages of leach are pumped into the leach tanks, and spillages from CIP (Carbon in Pulp) are pumped back into the CIP. Contaminated water that flows via lined trenches into the settlement ponds is used as process water.





All bunds are sized to hold a volume greater than that of the largest tank within the containment area and any piping draining back to the tank, with additional capacity for the design storm event. The residue bund is linked to the settling dams via concrete trenches. The plastic lined settling dams are operated at 60% level leaving 17,600m<sup>3</sup> available as secondary containment for CIP and residue tank secondary containment. The backfill largest tank volume is 810m<sup>3</sup> and the bund (designed for spillage control only) is linked to the settling dams.

Reagent strength cyanide pipelines are located within secondary containment (launders) or above competent secondary containment and all flanges are covered with flange covers. Any spillage in the launders report back to the cyanide tank bunds or other secondary containment. The Engineer confirmed in an interview that the slurry pipelines were replaced with HDPE (High Density Polyethylene)-lined steel pipelines as a spill prevention measure. All unlined slurry pipelines are part of the DMS PMS system (including thickness testing). The Outside Services Foreman from the Plant inspects the tailings lines daily and it was confirmed in an interview that Intasol conducts daily residue pipe patrols.

There is no risk to surface water from pipelines within the Gold Plant or between the Gold Plant and TSF. This was confirmed during site inspection.

Cyanide tanks and pipelines are manufactured from materials compatible with cyanide and high pH conditions.

*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:*

During a previous AngloGold Ashanti re-certification audit, the current Auditors noted the following:

- The original certification audit in 2007 confirmed quality control and quality assurance programs for the cyanide facilities stating “ Sighted Databook, AngloGold Ashanti Ltd. Area 36 Leach tanks, mechanicals and supporting structures Volume 1 Contract 15 856: Handover Certificate HOC 006, accepted by D Mc Arthur on 20/04/06 as per ISO 9001 certifying substantial completion of work as per drawings and specifications and that all tests to ensure compliance with legal and specified requirements have been carried out. Sighted relevant drawings, quality control documents, inspection certificates signed off, ITPs, grout release records, blast profile readings, quality control plan W005 of 1/3/05 daily project control report for Walker Industries of 30/3/2005 – refurbishment of two cyanide tanks 10 and 11, sighted x-ray reports – Projecon Services report no 1480/1 QC notes, radiographic report by PEL construction, steel quality certificates, plinths





refurbished – sighted official letter of 19 April 2007: Audit of civils at cyanide plant – Noligwa Gold Plant, Vaal River Operations, Signed by Dr F Wagener, Pr. Eng. Reg no 690332, declaring the remedial work to the civils have been completed to his satisfaction. Verified original drawings: P&ID 1105019-VR-08G-55-F002.1 rev 2 10 May 2010 signed by relevant staff and pipe and valve specifications are cyanide specific during re-certification audit in July 2010...”

It was confirmed that no new cyanide facilities were constructed since the sale of the Operation from AngloGold Ashanti to Harmony.

A Structural safety audit for Noligwa Plant dated Sept 2018, covering the whole plant, by JH Dickman Pr.Eng., ECSA (Engineering Council of South Africa) Reg. no.20140475) was reviewed, repair work classification includes emergency repair that required repairs in 12 months. No emergency repairs were identified. Repairs recommended in the report are included in a spreadsheet (sighted) run by the Engineer and used in budgeting of repairs. No urgent cyanide-related repairs were identified in the report but there are separate plans to replace the high strength cyanide pipeline.

The Moab Khotsoeng Operations, Mispah Dam 2 Surveillance, Annual Audit Report, 2018, dated February 2019 was sighted and reviewed. The synopsis did not highlight any significant issues that could affect the safe operation of the TSF. The synopsis mentioned that Mispah compartment 1 will be commissioned after the crack issue was rectified. The compartment was re-commissioning in March 2019. The subsequent quarterly reports (Second Quarter 2018 to Fourth Quarter 2019) did not identify issues with the repairs.

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

☐ not in compliance with

*Basis for this Finding/Deficiencies Identified:*

The Plant Sampling Procedure for Specialised Speciation and Environmental Samples for cyanide sampling was reviewed and found to comply with Cyanide Code requirements. MINTEK is South Africa's national mineral research organisation, specialising in mineral processing, extractive metallurgy and mining related areas. MINTEK's cyanide specialist chemist, Mr Peter Lotz, (also an ICMI Mining Technical Auditor) originally developed the AGA Plant Sampling Procedure for Specialised Speciation and Environmental Samples for sampling of contaminated soils and solutions. This procedure was used as the basis for the current Plant specific sampling procedure, Sampling Procedure for Specialised Speciation and Environmental Samples which was confirmed to be Code compliant.

Outside sampling, including borehole and surface water samples for cyanide speciation, is done by GCS Water and Environmental Consultants and sent to Midvaal Water Company Laboratories for processing. The GCS sampling procedure was not sighted

during the audit. The Environmental Manager subsequently reported that GCS had a process but no written procedure covering cyanide sampling tasks. Therefore, the auditors were unable to verify the process for compliance with the specific Code requirements in 4.9.1- 4.9.7 for cyanide sampling. See Corrective Action Plan.

Wildlife mortalities are checked daily by the Intasol, the TSF contractors. No cyanide-related wildlife mortalities have been reported since Harmony took over the Operation from AGA. Based upon Plant documentation, the auditors deem the frequency with which the surface water and groundwater is monitored to be adequate to characterise the medium being monitored and identify any changes in a timely manner. This has not been cross-checked with the GCS process.

**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:*

A Cyanide Plant Decommissioning Procedure which describes the process to be followed prior to and during decommissioning (decontamination of cyanide equipment prior to demolition) was sighted and reviewed. A Detoxification of cyanide contaminated and / or redundant equipment and disposal of cyanide contaminated waste procedure which describes the decontamination and disposal of cyanide equipment was also sighted and reviewed

An implementation schedule was confirmed to be present in the Decommissioning procedure and both procedures were confirmed to be reviewed 2 yearly.

*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:*

A Summary Spreadsheet on financial status of the rehabilitation trusts, November 2019, including Harmony Moab Khotsong Operations, was sighted and reviewed.

Also sighted and reviewed was a Digby Wells report "Closure Cost Assessment Report - Closure Cost Report", dated July 2019. The report states, "...The total closure cost for 2019 according to the Digby Wells methodology when radiation clearance and cyanide decontamination costs were considered along with rehabilitation and infrastructure demolition and removal, was calculated to be R 498,562,216 (excluding VAT)..." Section 11, Cyanide decontamination, states, "...A figure of R 626,266 has been included for the cleaning and removal of sodium cyanide systems. This figure is based on a quotation from a reputable Cyanide Cleaning Specialist..." Closure liabilities are updated annually to take account of any changes at the facilities.

The Bambanani, Joel, Matjabeng and Tsepong Rehabilitation Trust Fund Annual Financial Statements for the year ending 30 June 2018, signed by Registered Auditor, Hendrik Odendaal, of PWC, Sunninghill, Johannesburg, on 24 April 2019 were sighted and reviewed. The Trust Fund was set up to provide funding for Harmony Mining's statutory obligations for closure and environmental rehabilitation. The notes in the accounts report that Harmony Moab Khotsong Operations (including the former AngloGold Ashanti Noligwa Plant) is a member of the Trust and in 2018, the Trust received R325 million in rehabilitation funds, following the Harmony Group's acquisition of Moab Khotsong Operations.

**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 Noligwa Gold Plant has 15 Cyanide Process Procedures, 16 Cyanide Emergency Procedures, 4 Cyanide Alarm Procedures, 9 Cyanide Engineering Procedures, 8 Cyanide PPE Procedures, 24 General Procedures, and 19 General Cyanide Procedures, supported by 13 TSF (Tailings Storage Facility) contractor detailed Standard Task Procedures including PPE and pre-work inspections, and a mandatory Code of Practice covering TSF operations. The Intasol (TSF contractor) procedures are contained in the Intasol Tailings Operational Manual and the Intasol Baseline Risk Assessment. All procedures require the use of appropriate Personal Protective Equipment (PPE) and pre-work inspections.

Design assumptions include freeboard and design storm events, defined in the Code of Practice for the TSF's, and return water pond freeboard as specified in the ISO

(International Standards Organisation) Water Key Performance Indicator procedure. The procedure, "High WAD CN in residue slime" states that the maximum WAD cyanide allowed to exit the plant is 50 ppm. It further states that Barren and Lime is added to control high WAD cyanide in the Residue Tank. An alarm will sound if WAD cyanide reaches 40 ppm.

The site uses the computerised DMS Planned Maintenance System (PMS). AngloGold Ashanti used the SAP computerised Planned Maintenance System for the site PMS. When Harmony bought the operation and took over from 1 March 2018, PMS records were transferred from SAP to DMS. The records transfer has not been finalised as a number of records from the old SAP system need to be removed. This is being done on an on-going basis as the various records are accessed.

The system was sampled electronically and the maintenance records of various types of cyanide equipment including tanks, pumps, pipes, and valves were reviewed covering 2018, 2019 and 2020. Inspection tasks for each category inspection were reviewed and included checks for leaks, corrosion, welds, plates, gaskets, rubber lining, flanges, stubs and bolts, baffles, as appropriate. Thickness testing was noted on all tanks. The DMS PMS includes weekly, monthly, 3 monthly, 6 monthly, annual, two yearly and 5 yearly inspections. Operational inspections include shiftly and 45 day safety officer legal inspections. The inspection frequencies are deemed sufficient to assure and document that they are functioning within design parameters.

Process plant inspections are in place and shiftly inspections were sighted. Safety issues are loaded onto the Pivot safety system and mechanical, electrical, instrumentation issues are put on a job request form and issued to the Engineering Foreman who takes further action, including loading on the DMS PMS.

There is a Clearance Certificate and Confined Space Entry Procedure, which includes reference to A-rated vessels (which cover cyanide tanks), use of buddies and other cyanide-related risk controls.

The TSF monthly inspections / checklists file, including the daily inspection reports, was sighted and sampled for July 2018, August 2019, January 2020. The Weekly TSF inspections are filed electronically in the Spira system and downloaded in pdf format and distributed monthly. Freeboard is surveyed monthly using survey poles and formal surveys which are reported in the monthly dashboard report. The report is sent to the Plant Manager, the consulting Geotechnical Engineer and the TSF Foreman. Harmony uses the Pivot computerised system for recording and storage of inspection items.

There is a probabilistic water balance in place, and no scenario has been identified where the need has been highlighted to shut down plant to prevent overtopping. Proactive planning and management of containment dams, dam levels and normal and abnormal conditions contributes to reduction of risk and the unlikely need to temporarily cease plant operations under abnormal precipitation events. Thus, emergency power is not required to prevent unintentional releases in the event of a power failure. A series of procedures covering abnormal occurrences in the plant will be used to cover any other situations where a non-routine temporary closure may be necessary.

The plant will shut down in the case of TSF pipe leaks as per the standard Operating Procedures. The plant maintenance shutdowns, as per the planned maintenance schedules, are also undertaken.



The Plant conducts monthly Health and Safety Meetings, which are attended by the Plant Management, Section Safety Stewards and Full Time Safety Stewards who represent the workers. These meetings include discussions on any changes to health and safety procedures. Examples of cyanide-related issues discussed include: - cyanide emergencies and the use of the cyanide trailer (2018), 2019 discussion on the colour code of cyanide pipes and Cyanide inspections (2019), and cyanide symbolic signs, cyanide route signage, and the replacement of thiosulphate with activated charcoal (2020). A combined weekly safety meeting was used when all plant staff were notified that the reagent strength liquid cyanide was coloured red/pink.

*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:*

The pH level in the leach is interlocked with the cyanide pumps, when the pH dips to 10 the cyanide pumps will stop and will only restart at 10.5.

The Plant uses 5 Fixed Polytron HCN gas monitors at offloading, float, Mispah leach, High grade leach, and Residue (2) identified as potential HCN gas hot spots; 9 PAC 7000 personal HCN gas monitors and 11 X-am 5000 personal HCN gas monitors. One PAC 7000 HCN gas monitor is held by the TSF Operational Supervisor for Mispah 1 and 2. The monitor alarm settings are at 4.7 parts per million HCN gas then at 10 ppm on an instantaneous basis. Calibration records were sighted for the past 12 months for all monitors, carried out by the manufacturers. Quarterly calibration frequency exceeds manufacturer's requirements of 6 monthly. The "Procedure to Follow When HCN Is Detected by Portable Gas Monitoring Equipment (PGM)", rev 12, dated January 2020 spells out clearly the step-by-step actions to be taken when low or high level alarms for fixed and/or portable monitors are triggered. These involve actions on the part of investigating foremen in full PPE and evacuation of workers from the affected area. Subsequent actions include investigation of causes.

All safety showers have an integrated eye wash. Safety showers were located at appropriate locations including adjacent to the offloading area and at the top of the leach tanks. This was confirmed during site inspection. Safety showers are tested per shift as observed in the shiftly inspections. Water pressure, symbolic signs, activation platform function and water sprays and eye wash fountains open and clean, form part of the inspection. Safety showers are tested per shift as observed in the Daily Cyanide Checklist. Safety showers form part of the DMS PMS system for 6 monthly mechanical inspections. These were checked in the electronic review of the DMS PMS system. The fire extinguishers on the Plant were all observed to be dry powder. Fire extinguishers are



checked monthly and monthly inspection tickets on extinguishers were sampled and checked. Fire extinguishers are serviced annually by an outside contractor, Fest Fire Security. Invoices detailing the services and the type and number of fire extinguishers (powder and CO<sub>2</sub> Units) covering 2018 and 2019 were sighted. Sodium Cyanide Solution MSDSs (Material Safety Data Sheets) were sighted on the outside of the cyanide liquid storage tank area and in the First Aid cabin next to the offloading area.

Warning signs were observed during the site inspection in areas where cyanide is used e.g. offloading point for liquid sodium cyanide storage tanks and dosing points for leach tanks. The signage included advising workers that cyanide is present, and that smoking, open flames and eating and drinking are not allowed, and that, if necessary, suitable personal protective equipment must be worn at the cyanide offloading and cyanide dosing areas. Warning signage was observed at the TSF, and return water dams, including no drinking water signage.

It was observed during the site inspection that identification of pipes included flow direction at the Gold Plant during site visit. All reagent strength cyanide pipes are colour coded purple. Cyanide storage tanks are colour coded red with a purple band as per the colour coding index.

Accident and incident reporting and investigation procedures, based upon the Harmony incident/accident reporting system, were found to be in place and effective. The full documentation of an incident that occurred on 12 November 2019 was reviewed.

*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:*

It was observed that First Aid rooms at the Cyanide Storage Area, top of Leach tanks, and bottom of the leach tanks, contain water, oxygen, and antidote kits, available for use. Separate manual resuscitators are available in First Aid Room cabinets. All process and engineering foremen, and control room operators have radios for communication. The fully equipped (except for antidote kit) emergency trailer is parked at the gate.

The Ancron Hospital was reported to be equipped to handle cyanide emergencies and the Harmony Chief Medical Officer visited the hospital and provided them with cyanide training. ER24 (ambulance and paramedics) is part of the emergency response for Harmony. The ER24 headquarters for the Moab area is located at Vaal Reefs Village. ER 24, 24 hr Emergency Response have oxygen, resuscitator, radio and qualified personnel available to assist with any cyanide exposure incident.

Cyanide antidote kits are inspected by the Services Foreman. Inspection registers including cyanide antidote kit, for August to December 2018, January 2019 to December 2019 were sighted. Inspection registers for 2018 and 2019 were also sighted for SCBA





(Self-Contained Breathing Apparatus) sets, medical oxygen, and the First aid station, Cabins and Trailer.

The West Vaal Hospital cyanide antidote and emergency equipment is inspected by the Noligwa Safety Officer - the antidote kit was inspected during the last full cycle drill dated 6 June 2019.

The antidote Tripacks are replaced from St Helena Hospital in Welkom. Orders are placed 3 months before expiry. This is done to ensure that the antidote is not expired. It was confirmed during the site inspections that the cyanide antidote kit was stored in fridges as recommended by the manufacturer.

Cyanide Appointees, having undertaken the relevant first aid training, make up the cyanide Emergency Response Team (ERT), trained to conduct cyanide related first aid. First Aid Rooms were observed during the site visit. ER24 are contracted to provide emergency assistance and transport patients to Ancron Hospital (from 1 January 2020). The West Vaal Hospital was used from the Harmony take-over of Noligwa Plant (1 July 2018). The Emergency Response Team members are all trained to administer Amyl Nitrate antidote ampoules and oxygen but intravenous injections are only administered by medical personnel. It was confirmed during the site inspection that the cyanide ERT lists are put up in the cyanide offloading cabin.

Mandown drills are used to assure that the medical facility is competent and equipped to handle emergencies. Hospital staff are specifically trained to handle cyanide emergencies.

***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 Noligwa Gold Plant Emergency Preparedness and Response Plan, which contains the following: Statement of Strategic Intent; Management Roles and Responsibilities; Plan Maintenance and Change Management; Escalation Points and Incident Levels; Plant Training and Testing; Emergency Scenario Response Plan; Plant Process Description; and Crisis Management Plan. Noligwa Gold Plant has 16 Cyanide Emergency Procedures which, along with General Emergency procedures, are used to manage the various cyanide emergency scenarios identified.

There is also an Intasol Emergency Preparedness Plan (Mispah) and the Harmony Gold Mining Company Limited Noligwa (Mispah TSF) Operations, Tailings Dams, Mandatory



Code of Practice for Mine Residue Deposits which includes a section on TSF emergencies.

*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:*

The Plant conducts monthly Health and Safety Meetings, which are attended by the Plant Management, Section Safety Stewards and full time Safety Stewards who represent the workers. These meetings include discussions on any changes to health and safety procedures. Examples of cyanide-related issues discussed include: - cyanide emergencies and the use of the cyanide trailer (2018), 2019 discussion on the colour code of cyanide pipes and Cyanide inspections (2019), and cyanide symbolic signs, cyanide route signage, and the replacement of thiosulphate with activated charcoal (2020). A combined weekly safety meeting was used when all plant staff were notified that the reagent strength liquid cyanide was coloured red/pink.

Emergency drills are used to involve the workforce in the response planning process and drill reports indicated evaluation and feedback. The community is not directly involved in the Plan but is informed on its contents during dialogue sessions. Drills are used to involve hospital and ambulance staff in emergency response planning processes. The Harmony Medical Officer has conducted meetings and training with hospital staff on cyanide emergencies. The TSF contractor contacts the Plant in the event of any emergencies on the TSF.

*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 Emergency Response Plan details clear duties, roles and responsibilities and training for the various emergency scenarios. The emergency equipment inventory was 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.



Periodic drills involving internal and external stakeholders ensure that roles and responsibilities are understood and clearly implemented.

A procedure is in place to ensure that the ER24 ambulance has unrestricted access to the Plant to evacuate patients (including cyanide victims). The West Vaal hospital was used for cyanide emergencies until December 2019. Thereafter, the Ancron hospital took over the function and the medical staff were given cyanide training by the Harmony Chief Medical Officer.

*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 Preparedness Plan includes details of incident classification and escalation guidelines, appropriate emergency notification and reporting (internal and external) and the call-out procedure and contact information lists which are updated regularly. Contact details are posted where they would be used, and not in the procedures, to enable quicker updating of contact details. Internal and external communication (including the Media) is dealt with in the Plan covering plant and TSF emergencies. Public Consultation and Disclosure/Emergency Communications is covered in a plant emergency procedure which would also include notification of cyanide exposures, should they occur.

*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 cross-references to detailed and specialised procedures which cover clean-up and remediation relating to cyanide releases, emergency sampling, pipeline failures and spills, as appropriate to the site-specific identified scenarios. Use of neutralization processes and materials is clearly covered, as is disposal of contaminated materials and debris. The use of treatment chemicals, such as ferrous sulphate, hypochlorite, and hydrogen peroxide in surface water is prohibited and cross referenced



to a specific ferrous sulphate handling procedure. Drinking water is piped to users from Midvaal Water Company therefore alternative water supplies are not required.

*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 Nologwa Emergency Response Plan and related emergency procedures are required to be reviewed every two years. Drill reports including gassing and splashing were sighted. A man down full cycle drill was conducted from Nologwa to West Vaal Hospital on 6 June 2019. Shift emergency drills covering absorption through the skin were conducted with yellow shift in February and April 2019, green shift in December 2018, yellow shift in October 2018 and gas inhalation for blue shift in December 2018. Evidence was sighted of learning points emerging from the various cyanide drills.

**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 staff entering the plant get Harmony E-learning induction before being allowed into the plant. Card access is not activated for new people entering the plant and all expired cards are not allowed access into the Plant. The training matrix was reviewed and confirmed that all staff in the Plant are covered, including refresher training (yellow in the matrix cell indicates expiry of training in two months), Metallurgy, Engineering, and Security. Contractors, including the TSF Intasol staff, are detailed on a separate matrix, which was sighted and reviewed. Cyanide refresher training is carried out once a year at the e-learning centre and at the Plant.

The basic cyanide first aid training video (includes a written computer test, pass mark 100%) used was viewed and included: - cyanide transport route, PPE, safety signs at



offloading; Oxygen, cyanide antidote (including activated carbon); the “buddy” system; Pac 7000 HCN personal gas monitor; clearance certificates; basic cyanide first aid; no eating or drinking allowed in cyanide areas; Emergency man down alarm and detail emergency response in case of emergencies; ambulance entry; use of cyanide antidotes; activated carbon and oxygen; clearance of the area when safe; ambulance is treated as a confined space; hospital hand over; and decontamination and hospital treatment information; and cleaning and disposal of PPE after incident.

The content of Basic Cyanide Induction covering, Handling Cyanide Safely in a Metallurgical Plant, was reviewed and contained the following: - Methods of poisoning including inhalation of cyanide fumes, dust, HCN gas; Eye contact; Skin adsorption and Ingestion. Health effects - toxic, require immediate treatment; Symptoms - high levels: Collapse, respiratory failure, loss of consciousness, death; Symptoms - low levels: Irritation of respiratory tract, headaches, dizziness, nausea, vomiting, general weakness, breathing difficulties. The following items were also included: - effect of low pH; hot spot areas and how can cyanide exposure occur; cyanide PPE; inspections; barricades; specific requirements for cyanide emergencies; and cyanide antidote kits.

All plant staff were notified when the reagent strength liquid cyanide was coloured pink. A weekly combined safety meeting (sighted attendance lists dated 29/1/2020) including management and employees, discussed, "Employee to be aware that cyanide colour changed to red liquid".

Hard copy records for employees and contractors are kept for at least the life of the Plant.

*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:*

Workers are trained to perform their normal production tasks, including unloading, mixing, production and maintenance with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases. The training matrix was observed that defines what training each worker is to receive based on their position and the tasks required of that position. Training includes the Safe Working Procedures as part of the training material. The cyanide matrix covers all disciplines including Engineering (Maintenance), and Metallurgy (Plant Operations).

Minimum generic standards for positions are in place and signed off. These standards are included in the live training matrix where site specific training requirements are detailed. The training matrix was reviewed and confirmed the inclusion of required standards for each job.



All positions and tasks where high cyanide risk exists, must in addition receive training as a cyanide appointee and be found competent in the training. Once trained, Cyanide Appointees and Off-loaders are put onto a list (including the training expiry dates) at the offloading cabin so that it can be confirmed that training is up to date before any permit to carry out work in an area where cyanide may be released is issued. The Human Resources routing form covers all the necessary sign-offs before an access card is issued. That includes all the necessary sign offs by the training department. Transferred employees are covered by the internal transfer system and will receive section induction at the new plant.

The Nologwa Gold Plant trainer, Mr. Charles Harford, is a Registered Assessor, and has undertaken courses in Best Practice in Training, Presenting with confidence and professional train the trainer.

Competency assessments are done to initially determine competency in performing tasks by trained assessors. The Mine Conducts Planned Task Observations (PTOs) and conducts refresher training if deviations are identified by the PTO. Periodic PTO's are done by Supervisors to monitor ongoing compliance to procedures. Deviations on PTO's are recorded in the Pivot Safety System and corrective actions will follow, as appropriate, which includes retraining, coaching or disciplinary measures. On the TSF, refresher training in terms of task training for the 13 Standard Work Procedures is done annually on return from leave.

Hard copy records for employees and contractors are kept for at least the life of the Plant. All hardcopy training records, including trainer, date of training, topics covered and assessment records, are archived at the Metallurgy training centre. where the hardcopies are being scanned. All training done is loaded on Empower system and this was confirmed for the training records of the interviewees.

*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 employees and contractors receive Basic Cyanide First Aid training during the induction training. Cyanide Appointees form the Emergency Response Team in the plant. The Cyanide Appointee training unit standard covering cyanide releases (Unit MeT-G136 (USS 252337)) was sighted and reviewed. It includes basic first aid treatment for cyanide exposure, entering in confined spaces, cyanide neutralisation and spillage management. Cyanide Appointees have all obtained a certificate in Self Contained Breathing Apparatus (SCBA) and Confined Space Rescue training. The Medical Response Team (ER 24, Casualty Department Nurses) receive Intermediate Cyanide First Aid training, followed by a Cyanide First Aid Test. Attendance registers dated 7 Feb



2020 for cyanide first aid for 12 ER24 Employees were sighted. Cyanide Poisoning Training was given to the nursing staff at the Ancon Hospital on 11 Dec 2019 by the Harmony Chief Medical Officer. No local community members are involved in the Emergency Response.

Refresher Basic Cyanide First Aid is conducted every 12 months, Intermediate Cyanide First Aid is assessed every 12 months as part of the training for Cyanide Appointee and Off-loaders, Advanced Cyanide First Aid (including SCBA) is refreshed every 2 years, and Cyanide Appointee and Off-loading training is refreshed every year. In addition, Cyanide Emergency drills are undertaken monthly. The Training Officer is present at the full cycle drills and will identify and correct any training issues observed.

Hard copy records per person per plant and per contractor are also kept for at least the life of the plant.

**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 meetings are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide.

Harmony took over the Mine from another ICMI signatory, AngloGold Ashanti, on 1 July 2018. The Harmony strategy on Dialogue with stakeholders is to manage the process centrally. Noligwa has no external neighbours other than the surrounding farmers who have surface rights to farm land.

The main interaction with farmers is via an agreement on the preparation of fire breaks and emergency arrangements in the event of veld fires. This is independently carried out by an appointed contractor.

The Harmony Environmental Manager represents the Mine on the KOSH (Klerksdorp, Orkney, Stilfontein, Hartebeestfontein) Water Quality Forum which liaises and discusses water quality issues amongst all the major stakeholders in the area (Municipalities, water supply companies, mines, National Department of Water Affairs and Sanitation). Any pollution or cyanide-related issues would be discussed in this Forum. There have been no incidents or discussions on cyanide since the site was taken over by Harmony. Minutes of the latest meeting held on 6th November 2019 were sighted and reviewed.

Awareness sessions are conducted with Emergency Services and Law Enforcement Officials to promote liaison and communication with those off-site authorities who are responsible for the implementation of protective measures during an incident.





Awareness sessions were conducted at the Noligwa Gold Plant and South Uranium Plant on 28th January and 12 February 2020. The delegates attending the 28th January session were from the Free State Road Incident Management (RIMS) Committee (RIMS is an initiative of the Department of Transport administrated through South African National Roads Agency Limited (SANRAL)). It includes all emergency services and law enforcement agencies who will respond to incidents including dangerous goods (Cyanide). Sasol and Harmony – NUFCOR (Nuclear Fuels Corporation of South Africa (Pty) Ltd) are members of the RIMS National Technical Committee. The delegates on the 28 January 2020 site visit were from the North West Province including the Steering Committee of Dr Kenneth Kaunda District Municipality.

*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 meetings are two-way dialogue sessions involving both dissemination of information and the answering of questions on cyanide.

Harmony took over the Mine from another ICMI signatory, AngloGold Ashanti, on 1 July 2018. The Harmony strategy on Dialogue with stakeholders is to manage the process centrally. Noligwa has no external neighbours other than the surrounding farmers who have surface rights to farm land.

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Awareness sessions are conducted with Emergency Services and Law Enforcement Officials to promote liaison and communication with those off-site authorities who are responsible for the implementation of protective measures during an incident.

Awareness sessions were conducted at the Noligwa Gold Plant and South Uranium Plant on 28th January and 12 February 2020. The delegates attending the 28th January session were from the Free State Road Incident Management (RIMS) Committee (RIMS is an initiative of the Department of Transport administrated through South African National Roads Agency Limited (SANRAL)). It includes all emergency services and law



enforcement agencies who will respond to incidents including dangerous goods (Cyanide). Sasol and Harmony – NUFCOR (Nuclear Fuels Corporation of South Africa (Pty) Ltd) are members of the RIMS National Technical Committee. The delegates on the 28 January 2020 site visit were from the North West Province including the Steering Committee of Dr Kenneth Kaunda District Municipality.

*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 not developed any written descriptions of how their activities are conducted but rather relies on guided site visits to explain operations to stakeholders. During the two awareness sessions in January and February 2020, there was a site visit to the Noligwa Gold Plant and the Plant Metallurgical Engineer took delegates through the Gold Plant and explained the full process including Cyanide dosing, precautions and emergency preparedness. There is a limited population in the area and they are all mostly literate.

Harmony Group communication policy is followed and any cyanide incident response would need to be prepared by the Corporate Communications Dept. The Harmony Website contains an item, "Harmony and the Cyanide Code" (<https://www.harmony.co.za/component/k2/item/47-cyanide-code>), The Cyanide Code is mentioned in the sustainable development report. Information on significant cyanide exposures and releases would be made available, after appropriate investigations, on the company website (<https://www.harmony.co.za/responsibility/environment/materials-waste>) and via the annual Sustainable Development Report, should incidents occur.

Incidents are reported to the Department of Mineral Resources (DMR) by mine management. Mine releases are reported to Department of Water Affairs (DWA) and Department of Environmental Affairs (DEA) following an investigation by the Environmental Department. Government Departments do not make reported information public but information is included in Company Annual Reports, if cyanide releases occur. Sasol Polymers and Tanker Services are responsible for releases as a result of tanker incidents en route to the mine.

No cyanide accidents or incidents have occurred since certification under Harmony or AngloGold Ashanti.

