April 2015

INTERNATIONAL CYANIDE MANAGEMENT CODE RECERTIFICATION AUDIT

Morobe Mining Joint Venture Hidden Valley Gold Mine Certification Audit Summary Audit Report

Submitted to:
International Cyanide Management Institute (ICMI)
1400 I Street, NW Suite 550
Washington, DC 20005
UNITED STATES OF AMERICA

REPORT

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Distribution:

1 Electronic Copy – International Cyanide Management Institute
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SUMMARY AUDIT REPORT
FOR OPERATIONAL GOLD MINES

Name of Mine:	Hidden Valley Gold Mine
Name of Mine Owner:	Morobe Mining Joint Venture
Name of Mine Operator:	Morobe Mining Joint Venture
Name of Responsible Manager:	Morne Swart, Process Plant Manager
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LOCATION DETAIL AND DESCRIPTION OF OPERATION:

The Hidden Valley Gold Mine (HVGM) is located in Morobe Province in Papua New Guinea, approximately 300 km northwest of the nation's capital, Port Moresby, and 90 km southwest of the sea port of Lae.

The operation is owned by the Hidden Valley Joint Venture (HVJV), one of three unincorporated joint ventures between subsidiaries of Newcrest (50 percent) and Harmony Gold Mining Company Limited of South Africa (50 percent), formed in 2008 and referred to collectively as the Morobe Mining Joint Ventures (MMJV).

HVGM is an open pit gold and silver mine, consisting of three main lodes – Hidden Valley, Kaveroi and Hamata. Gold and silver doré produced at HVGM is transported to the Perth Mint in Australia to be refined.

Construction of the HVGM began in 2007 and commercial production commenced in September 2010. The joint venture is continuing to ramp up operations to target annual production of 250 000 ounces of gold and 2.5 to 3 million ounces of silver (100 percent basis).

For the financial year ending 30 June 2013, the site produced 170 008 ounces of gold and 1 712 656 ounces of silver (100 percent basis).

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Name of Facility	Signature of Lead Auditor	Date

SUMMARY AUDIT REPORT
AUDITORS FINDINGS

The Hidden Valley Gold Mine is:

☐ in full compliance with

☒ **in substantial compliance with** **The International Cyanide Management Code**

☐ not in compliance with

Audit Company: Golder Associates

Audit Team Leader: Edward Clerk, Exemplar Global (105995)

Email: eclerk@golder.com.au

Name and Signatures of Other Auditors:

Name	Position	Signature	Date
Ed Clerk	Lead Auditor and Technical Specialist		30 April 2015
Mike Woods	Auditor		30 April 2015

Dates of Audit:

The Certification Audit was conducted over a total of nine days (12 person days) spread across three site visits conducted on:

- 13 November 2012 to 15 November 2012
- 12 February 2013 to 13 February 2013
- 14 May 2013 to 17 May 2013.

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's *Gold Mining Operations Verification Protocol* and using standard and accepted practices for health, safety and environmental audits.

Hidden Valley Gold Mine
Name of Facility


Signature of Lead Auditor

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Date

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PRINCIPLE 1 – PRODUCTION

Encourage Responsible Cyanide Manufacturing by Purchasing from Manufacturers that Operate in a Safe and Environmentally Protective Manner

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

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 1.1**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM 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.

Orica Australia Pty Ltd (Orica) manufactures solid cyanide for HVGM at its Yarwun facility in the state of Queensland in Australia. The cyanide is packaged in sparge isotainers.

HVGM has a *Sodium Cyanide Supply Agreement* (Supply Agreement) with Orica. The agreed term of the Supply Agreement is stated as five years from the commissioning date (1 May 2009).

The Supply Agreement requires Orica to comply with the provisions of the Code for the handling, storage and transport of its cyanide only. The Supply Agreement does not specifically require that the cyanide supplied by Orica be produced at a facility that has been certified as being in compliance with the Code. However, Orica's Yarwun facility was recertified as being compliant with the ICMC on 29 October 2013. The Recertification Audit of the cyanide producer assures compliance with this Standard of Practice.

Cyanide is not purchased from an independent distributor.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 2.1, requiring that the operation establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

HVGM purchases its cyanide from Orica under a written Supply Agreement that designates Orica as being responsible for the aspects of cyanide transportation required by the Code.

Clause 8 of the Supply Agreement notes that ownership of delivered cyanide passes from Orica to HVGM when payment is received by Orica from HVGM. Risk in cyanide delivered to HVGM, passes from Orica to HVGM once the cyanide has been delivered into the applicable storage facility.

At the time of the audit Orica delivered cyanide to HVGM using two supply chains covering the entire route between Orica's Yarwun facility and HVGM:

- Orica Australian Supply Chain
- Orica Papua New Guinea Supply Chain.

Orica's Australian Supply Chain was Certified on 5 October 2010 and its Papua New Guinea Supply Chain was Recertified on 3 July 2013.

The Supply Agreement does not extend to any subcontractors used by the producer, distributor, transporter or the operation for transportation-related activities.

The use of Certified supply chains by Orica assures that the designations of responsibilities required in this question have been adequately addressed.

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

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 2.2**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM 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.

HVGM's Supply Agreement with Orica does not specifically require that the transporter be certified under the Code. However, Orica's Australian Supply Chain was Certified on 5 October 2010 and its Papua New Guinea Supply Chain was Recertified on 3 July 2013. The Re/certification Audit of the cyanide supply chains assures compliance with this Standard of Practice.

The operation does have chain of custody records identifying all elements of the supply chain (producer, transporter(s), interim storage facilities) that handle cyanide brought to its site. HVGM has delivery dockets showing the origin and delivery point of its purchased cyanide. HVGM also have consignment notes that show the transport route. The transporter's delivery dockets are signed by the delivery driver and a HVGM representative, confirming the condition and that the seals on the isotainers match those on the delivery docket.

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PRINCIPLE 3 – HANDLING AND STORAGE

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

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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 3.1, requiring that cyanide handling and storage facilities are designed and constructed consistent with sound, accepted engineering practices, quality assurance/quality control (QA/QC) procedures, spill prevention and spill containment measures.

Facilities for unloading and storing of cyanide delivered by isotainer have been designed and constructed in accordance with cyanide producers' guidelines and accepted engineering practices for these facilities. The cyanide mixing and storage area consists of sparge isotainer unloading area, two reagent storage tanks, bag hoist (no longer used), bag splitter (no longer used), mixing tank and caustic tank. The facility consists of a bunded concrete pad that overflows into the CIL containment area. Sparge isotainers are delivered directly to the cyanide mixing and storage area for unloading.

The cyanide mixing and storage area appeared to be located away from people and surface waters and consequently it was not considered necessary to evaluate the risk for potential for releases to surface water and/or human exposure.

Isotainer sparging is conducted on a concrete surface that can minimise seepage to the subsurface.

The cyanide mixing and storage area unloading facility has been designed and constructed such that cyanide is unloaded on a concrete surface. The unloading pad has been designed to drain any unplanned spillage to the cyanide reagent tank containment sump allowing spillages to be recovered and pumped to CIL Tank 1.

There are methods in place to prevent the overfilling of cyanide dissolving and storage tanks. With regards to the sparging process, the PLC prefill set point is established to give a target concentration of 27% w/w sodium cyanide. The amount of water added for prefill is approximately 54 m^3, which raises the tank level from empty to between 50% up to 70%, depending on the prefill level. A level transmitter and level switch, control the mixing tank level independently of the two site cyanide storage tanks. HVGM undertake six monthly calibrations of the level sensors for the cyanide mixing tank. Preventative maintenance records for the level transmitter and level switch were reviewed.

Cyanide mixing and storage tanks are located on concrete surfaces that can prevent seepage to the subsurface cyanide.

The mixing tank is a 104 m^3 bullet tank elevated above a concrete surface. The tank also has a dual skin.

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The two cyanide storage tanks are located on concrete ring beams. The base of the storage tank sits on 30 mm of compacted oil sand which is underlain by a 1.5 mm thick HDPE liner above compacted fill. Potential leaks in the base of the tank would be captured by the liner and directed to tell tales in the wall of the ring beam.

An inspection of the secondary containments for the cyanide mixing and storage area indicated that they were constructed of concrete and that they would provide a competent barrier to leakage.

Cyanide is stored within two tanks that are roofed and vented to atmosphere. The mixing tank has an external overflow/venting pipe draining to a seal port solution of high pH to prevent the generation of HCN. The cyanide mixing and storage area is located within a locked fenced area within the fenced plant site area. Cyanide was observed to be stored separately 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.**

☒ **in full compliance with**

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

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

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

The isotainers are not re-used for any other purpose except for the delivery of cyanide. The isotainers are owned by Orica, remain under the control of Orica and are returned to Orica for reuse after each delivery.

HVGM has a procedure that outlines the process for the operation of all valves and couplings for unloading and mixing sparge isotainers. Cyanide isotainers remain on the truck during the unloading process. The isotainers do not require lifting as they are not stored on site.

Procedures require all hoses and coupling to be washed at the completion of the sparging event, and all residue to be hosed into the sump. Procedures also outline the steps involved to safely sparge cyanide isotainers. The procedure includes PPE requirements and notes that MMJV operators are to observe the process.

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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 including 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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.1, requiring that the operation implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

Written management and operating plans or procedures have been developed for cyanide facilities including unloading and storage facilities, tailings impoundments and cyanide treatment systems. Numerous procedures have been developed and implemented for the following operational areas that involve cyanide solutions equal to or greater than 0.5 mg/L WAD cyanide:

- Cyanide unloading and storage facilities
- Grinding and milling
- Leach/CIL
- TSF
- Flotation circuit
- Mill cyclone
- INCO cyanide destruct system
- Caro's Acid plant

There are also formalised systems and procedures covering:

- Preventative maintenance
- Emergency management

The operation has developed a *Cyanide Management Plan* (CMP) that covers all areas of cyanide management. It also details requirements for regular inspections and calibrations.

The TSF is managed in accordance with the *Hamata Tailings Storage Facility, Operation, Maintenance and Surveillance Manual,* which includes the regulatory requirements, safety and security, operations, maintenance, surveillance and emergency response.

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The plans and procedures identify the assumptions and parameters on which the facility design was based and applicable regulatory requirements. The CMP details the assumptions and parameters on which MMJV's facilities were designed.

The plans and procedures describe the standard practices necessary for the safe and environmentally sound operation of the facility, including the specific measures needed for compliance with the Code, such as inspections and preventative maintenance activities.

The TSF is inspected weekly in accordance with the CMP. The checklist is completed using the *Process Plant Weekly Hazard Inspection Checklists.*

Preventive maintenance programmes are implemented and activities documented to ensure that equipment and devices function as necessary for safe cyanide management. This includes the process plant, cyanide mixing and storage facilities and the pipelines, pumps and valves. The CMP also details requirements for regular inspections and calibrations, including.

The operation has a policy to identify when changes in the site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures.

The *Change Management* policy is in place for changes to equipment, software, procedures or process that may introduce hazards to safety or the environment or affect the operational efficiency of the site. The policy states that all personnel have a responsibility to identify a change.

Once a change has been identified, personnel should raise a *Request for Change* form. After describing the change, the form is forwarded to the Business Unit Manager for review. The Business Unit Manager assesses the level of change as high, moderate or low impact. Once this has been done, the form is sent to the Admin Environment and Safety Department. For a high impact change, it is added to the agenda for the next Site Safety Committee (SSC) meeting. The SSC assess the change using a checklist. Following this, the action can be completed.

As the management of change procedure includes a risk assessment process and that process requires the input and consultation with personnel responsible for environment and health and safety aspects on the site, the management of change procedure is interpreted as meeting the intent of the ICMC.

The operation has developed formal cyanide management documents that address contingency procedures for situations when inspections and monitoring identify a deviation from design or standard operating procedures. The *Cyanide Emergency Response Plan* (CERP) details procedures for the following incidents:

- Personnel cyanide exposure
- Catastrophic release of hydrogen cyanide gas
- Cyanide transport emergency
- Fires involving cyanide
- Liquid cyanide spill outside bunded area
- Major loss of power
- Tailings dam release
- Floods

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- Seepage.

The operation also has an *Emergency Procedures Manual* (EMP) that provides the framework for managing emergencies on site that is applied to cyanide related incidents.

Procedures are in place at HVGM to guide the safe shutdown and start-up of major cyanide facilities (e.g. flotation, CIL and detoxification circuits).

HVGM has a *Trigger Action Response Plan* that details the procedures required for controlling WAD cyanide discharged to the TSF. The *Caro's Operation and Management* procedure details how the Caro's plant should be run, and the limits at which the detox should be discharged at (≤0.5 ppm WAD cyanide).

The operation has developed procedures and processes to inspect cyanide facilities on an established frequency sufficient to assure and document that they are functioning within design parameters.

Preventive maintenance programmes have been developed for the site and activities documented to ensure that equipment and devices function as necessary for safe cyanide management. Pronto is the platform used to manage the maintenance and inspection programmes for the site.

The process plant has been divided into a number of operational areas and inspection forms developed for each area to address the safety inspection requirements detailed in Section 247 of the Mines Safety Regulations. The inspections are conducted weekly.

Weekly Hazard Inspection Checks are also conducted around the process plant. Deficiencies identified within the 247 Inspections and Weekly Hazard Inspections are tracked through to close out through Pronto.

All process (including TSF) pumps, valves and tanks are registered within Pronto. Specific maintenance tasks and associated frequencies have been assigned for each item.

HVGM does inspect secondary containments for their integrity, the presence of fluids and their available capacity, or to ensure that any drains are closed and, if necessary, locked, to prevent accidental releases to the environment. It is inspected weekly through the *Process Plant Weekly Hazard Inspection Checklist.*

HVGM inspects the leak detection system monthly. If any leaks are detected, the solution is sampled for free cyanide.

Pumps and valves are registered within Pronto. Specific maintenance tasks and associated frequencies have been assigned for each item.

Freeboards for the TSF and polishing ponds are inspected to confirm that they are still within the design limits. HVGM inspect the TSF pond level and plot on a graph against rainfall. This allows HVGM to predict the TSF pond level rise.

Inspections are documented, including the date of the inspection, the name of the inspector, and any observed deficiencies. The nature and date of corrective actions are also documented and records are maintained.

Primary power is supplied from a grid system by the PNG Power Corporation. Prior to the grid power system being connected to the site in 2011, power for the operation was derived from a series of diesel powered generators. These generators are now the backup system capable or powering the entire site. The generators are on site and are included within the maintenance system for the site.

The switch from mains power to backup power is a semi-automatic process that takes approximately one hour to complete. The loss of power does result in process releases to containment from the grinding are, CIL area.

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Standard of Practice 4.2: **Introduce management and operating systems to minimise 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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.2, requiring that the operation limit the use of cyanide to that optimal for economic recovery of gold so that the waste tailings material has as low a cyanide concentration as practical.

The operation has a programme to determine appropriate cyanide addition rates in the mill and evaluate and adjust addition rates as necessary when ore types or processing practices change cyanide requirements. The cyanide addition set point was determined during the initial feasibility study. Bottle roll tests and plant trials are used to confirm or adjust this rate.

HVGM has evaluated a number of control strategies for cyanide addition. Two free cyanide and one WAD cyanide anlaysers are installed within the process plant to control cyanide addition within the leaching circuit and to check cyanide levels in the tails feed post the Inco cyanide destruct system. The free cyanide units have been installed to control cyanide addition in the Cons Leach and CIL.

In early 2012, the operation ceased adding cyanide to the CIL circuit as it was determined that residual cyanide contained in the Cons Leach CCD underflow and process makeup leach water was sufficient. HVGM has implemented its strategy to control its cyanide addition, including:

- Metallurgical test work.
- Bottle roll leach test work to adjust set points and other plant parameters (residence time, carbon concentration, cyanide set point, etc.)
- Online analysers.

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**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.3, requiring that the operation implement a comprehensive water management programme to protect against unintentional releases.

HVGM has developed a comprehensive, probabilistic water balance. The water balance model was developed in GoldSim software as a daily time-step probabilistic model. The model was developed to comply with the ICMC. Model simulations are run on daily time steps over an identified period with one or multiple results. A realisation is defined as a single model run under one set of stochastic inputs.

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The purpose of multiple realisations is to test the system under multiple rainfall patters and provide results based on probability.

HVGM has a water balance that considers the following in a reasonable manner for the facilities and the environment:

- Application rates are considered in the model, with the moisture content of the processed ore assumed to be 10%. Final tailings slurry and TSF inflow is calculated from the known ore in the following tailings properties.
- The model considered a design storm duration and storm return interval that provides a sufficient degree of assurance that overtopping of the TSF can be prevented during the operational life of the facility.
- The model considers synthetic daily rainfall records of 1000 years duration at 18 locations within the Watut River catchment at Nauti. This data series were developed based on available site rainfall records.
- A daily runoff record was input into the model from synthetic records. Flows from the undisturbed and regenerated land areas will be based on the runoff record of these synthetic data. Flow from surfaces such as cleared areas, hardstand/roads, pits and watercourses are based on a runoff coefficient applied to the daily rainfall record.
- The effects of potential freezing and thawing conditions are not relevant to the HVGM environment.
- Solution losses, such as evaporation and recycling systems are included in the model. Evaporation is accounted for as initial losses in the rainfall-runoff model that was used to generate the synthetic runoff data sets.
- The model considers power outages by inputting a reliability element in GoldSim to randomly apply downtime to pumps and treatment facilities to represent power outages and breakdowns.
- The model does consider the discharges to surface water as it considers the outlet to Pihema River, calculated based on contributing flows and verified with historical data.
- The spatial extent of the model includes the catchments contributing to the TSF. Over the life of the mine the TSF footprint will increase based on the construction schedule. The model also includes the seepage collection system which is downstream of the TSF.

Inspection and monitoring activities are undertaken to implement the existing water balance. Freeboard and seepage are monitored, and can be input into the model.

The ponds and impoundments at HVGM are operated with adequate freeboard above the maximum design storage capacity determined to be necessary from water balance calculations. The TSF is designed to have a freeboard of 5.0 m above design flood level.

Annual design reports and audit reports prepared by a consultant include the basis for freeboard allowance on the TSF and the results of annual monitoring that demonstrates the operation within these target levels.

Precipitation is measured on site, and these are compared to design assumptions by the TSF consultant in a weekly report. Rainfall can be controlled via a ‘dashboard’ in the model.

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

The operation is

☐ in full compliance with

☒ **in substantial compliance with Standard of Practice 4.4**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in SUBSTANTIAL COMPLIANCE with Standard of Practice 4.4, requiring that the operation implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

The operation does not have open waters where WAD cyanide exceeds 50 mg/L WAD cyanide. The TSF is the only open water at HVGM that has the potential to contain a cyanide solution in excess of 50 mg/L WAD.

Monitoring of the TSF Decant Pond is conducted by the Environment Department on a daily and weekly basis for WAD, total and free cyanide. Daily samples are analysed within the Environmental Department Lab and monthly samples are sent to an external, independent laboratory. Monitoring results for the TSF Decant Pond has indicated WAD cyanide levels have been consistently less than 50 mg/L since June 2012 and less than 10 mg/L since June 2013.

Wildlife has been observed in the vicinity of the TSF and consequently the WAD cyanide limit of 50 mg/L has been applied to the TSF spigot discharge. HVGM established an internal upper limit of 50 mg/L WAD cyanide at its INCO discharge point in order to maintain a WAD cyanide concentration of less than 50 mg/L at the TSF spigot discharge points.

Prior to May 2013, the cyanide destruct addition rate was manually controlled. In May 2013 online analysers were installed for both free and WAD cyanide. The results were displayed on the distributed control system (DCS) to guide the manual operation of the INCO reagents (sodium metabisulphite (SMBS) and copper sulfate) such that the output from the INCO circuit was generally maintained below 50 mg/L WAD cyanide. The INCO reagents control was automated in late 2013 which further reduced the variability of the WAD cyanide levels being discharged into the TSF.

The deficiency observed relates to excursions above the 50 mg/L limit between May 2013 and February 2014. The current data set is based on a sampling location at the INCO discharge point which is located approximately 1 km from the TSF and associated spigots. In late December 2013, a manual sampling point was installed on the TSF line at the Hamata Crusher about 800 metres downstream of the INCO Reactor. On the 10 January 2014, a second manual sampling point was installed on the TSF line at the power station about 700m downstream of the INCO Reactor to enable sampling in the event that the tails are diverted to the saddle dam.

When compared to the INCO Reactor sample results for the same period, the Hamata Crusher sample results show a reduction in WAD cyanide levels of up to 50% and consistently below the required 50mg/l WAD cyanide. This is due to the continued degradation of cyanide within the pipeline between the INCO Reactor and the TSF. The data set at the Hamata Crusher sample point, however, is too short to draw a finding of Full Compliance.

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The Auditor considers a finding of Substantial Compliance is warranted because:

- The operation has made a good-faith effort to comply with the Code. This is evident through the commitment to purchase and install online WAD cyanide analysers on the INCO discharge. The installation of the unit has resulted in a significant reduction and greater consistency in the WAD cyanide levels being discharged into the TSF.
- The deficiency can be readily corrected. This is evident by the current performance of INCO system using data provided by the WAD cyanide analysers. The installation of the unit has resulted in a significant reduction and greater consistency in the WAD cyanide levels being discharged into the TSF. This trend appears to be improving over time. The installation of the new sampling location at the Hamata Crusher shows significant reductions in WAD cyanide levels resulting from continued degradation of cyanide within the pipeline between the INCO Reactor and the TSF. An extended record of WAD cyanide levels at this new sampling location is likely to lead to compliance with this Standard of Practice.
- The deficiency does not present an immediate or substantial risk to employee or community safety, health or the environment. This is evident through wildlife monitoring which has indicated wildlife has not been impacted.

Maintaining a WAD cyanide concentration of 50 mg/L or less in open water is effective in preventing significant wildlife mortality. Monitoring for wildlife is conducted and no wildlife mortalities have been observed since the inception of monitoring.

The operation does not use a heap leach process.

Standard of Practice 4.5: **Implement measures to protect fish and wildlife from direct or 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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.5, requiring that the operation implement measures to protect fish and wildlife from direct or indirect discharges of cyanide process solutions to surface water.

The operation has a direct discharge to surface water. Supernatant water from the TSF is pumped to the Process Water Tank. An off-take from the Process Water Tank is directed to the Caro's Acid plant that is used to decrease the levels of cyanide in TSF decant liquor prior to discharge into Pihema River. Immediately on leaving the reactor that forms Caro's Acid, the hot Caro's Acid is quenched by mixing with raw water. This quenched Caro's Acid is discharged directly into a stirred tank where contact is made with process water from the TSF, enabling cyanide destruction to take place. The Caro's Process Tank discharge (detox discharge) is sent to a buffer tank where lime is added to precipitate copper. Depending on the results of sampling of the detox discharge and subsequent modelling, the detox discharge is automatically directed to either Pihema River or back to the TSF.

When the detox discharge is directed to Pihema River, the Environment Department is notified and they ensure daily samples are taken at sample point (Caro's Acid Plant Discharge (D10)) along the discharge line

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prior to the end of pipe discharge point (Pihema River). Results from January 2013 to June 2013 show WAD cyanide levels below 0.5 mg/L at D10.

The operation has a regulated mixing zone in the Watut River approximately 16 km downstream of the operation. The mixing zone has been established in the Environment Permit WD/L3(50). Results observed from April to July 2013 indicated that free cyanide levels at the sampling point (A1) were at 0.002 mg/L.

Samples are collected and analysed on site and checked through off site laboratories. Laboratory analysis of both free and WAD cyanide are conducted using a Hach Pyridine kit. The Environmental staff also sample the TSF supernatant pond and Caro's discharge to surface water and analyse for WAD cyanide on site using the Picric method.

The operation does have an indirect discharge to surface water. Seepage from the TSF expresses in a rocky depression and enters Pihema River. HVGM has two sampling points, A68 and A69. A68 is downstream of the TSF, with A69 located upstream. Results observed from 2012 and 2013 indicate that free cyanide levels at these point were mostly below the detection limit of <0.004.

Indirect discharges from the operation have not caused cyanide concentrations in surface water to consistently rise above levels protective of a designated beneficial use for aquatic life.

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

☒ **in full compliance with**

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

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.6, requiring the operation implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of groundwater.

HVGM does implement specific water management or other measures to manage seepage to protect groundwater beneath and/or immediately downgradient of the operation. However, The PNG Government has not established a beneficial use for groundwater within the area and groundwater is not used by the operation nor neighbouring villages. Drinking water for villages is provided by surface water flows. As no beneficial use exists or is designated, there is no applicable numerical standard for protection of that use.

The operation does not use mill tailings as underground backfill.

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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	

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.7 requiring that the operation provide spill prevention or containment measures for process tanks and pipelines.

Spill prevention measures are provided for all processing facility cyanide unloading, storage, mixing and process solution tanks. With the exception of the ILR and CIL Eluate Tanks which are on concrete plinths, all other cyanide solution tanks are installed on concrete ring beam with oily sand above a continuous HDPE base. Despite the continuous HDPE liner, each tank has four leak detection pipes installed as part of their design.

A cyanide corrective works programme was undertaken during 2012 to address insufficient secondary containment volumes and the integrity of containments. By mid-2013 all cyanide unloading, storage, mixing and process solution tanks are situated within secondary containments that have been sized to contain the largest tank within the containment, any piping draining back to the tank, and a design storm event (1:25 years).

Procedures are not required to prevent discharge to the environment of any cyanide solution or cyanide-contaminated water that is collected in the secondary containment area of the facility.

All bund walls have sump pumps that pump process slurry, reagents back into the process tanks for reprocessing or use. Sump pumps have been sized according to acceptable engineering standards.

HVGM has a *Detoxification of soil contaminated with cyanide bearing solutions* procedure which covers remediation of contaminated soil.

The operation has undertaken a cyanide capital works programme to undertake significant works to provide spill prevention or containment measures for all its cyanide process solution pipelines. These were completed mid-2013.

A report prepared by a consulting engineer in September 2011, evaluated cyanide pipelines for special protection needs where it was considered that the lines present a risk to surface water. It was determined that no further protection was needed as the pipelines surveyed were bearing WAD cyanide less than 0.5 mg/L

Cyanide tanks and pipelines appear to be constructed of materials compatible with cyanide and high pH conditions (HDPE, carbon steel, mild steel and stainless steel are used for all pipelines containing cyanide within the site).

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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.**

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 4.8**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.8 requiring that operations implement Quality control and quality assurance (QA/QC) procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

QA/QC programmes have been implemented during construction of all new cyanide facilities, including cyanide unloading, storage, mixing facilities and other cyanide facilities.

The original operation was designed and built by Ausenco. A review of the Ausenco Commissioning Register showed that each construction module was subject to the following checks:

- Construction signoff
- Commissioning signoff
- Mechanical signoff
- Electrical signoff.

Quality control and quality assurance programmes have also been implemented for new and modified cyanide facilities since the construction of the original plant by Ausenco. HVGM undertook a cyanide corrective civil works programme to gain compliance with the Code. At the time of the audit, as-built drawings were in the process of being prepared for the completed works. In the absence of completed as-built drawings, a report produced by the MMJV Civil and Structural Engineer noted that the programme of works were completed in accordance to the design specifications. The MMJV Civil and Structural Engineer was in charge of the project.

These checks detailed in the hand over report included soil compaction for earthworks such as tank foundations and earthen liners and for construction of cyanide storage and process tanks. For cyanide corrective civil works programme, the works were reviewed the MMJV Civil and Structural Engineer and a report produced that noted that the works were completed in accordance to the design specifications.

A QA/QC records have been retained for cyanide facilities and were available for inspection. Appropriately qualified personnel have reviewed cyanide facility construction and provided documentation that the facility has been built as proposed and approved.

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

The operation is

☒ **in full compliance with**

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

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 4.9 requiring that operations implement monitoring programmes to evaluate the effects of cyanide use on wildlife, surface and groundwater quality.

HVGM has developed written standard procedures for monitoring activities. The procedures state that the Environmental Manager is responsible for ensuring surface, ground, mine and process water monitoring. Other procedures describe the QA/QC programme that will ensure that surface water and sediment monitoring undertaken is accurate, valid and reliable.

The procedures were developed by an environmental consultancy and reviewed by HVGM's Environmental Coordinator Monitoring who has a Bachelor of Science in Applied Chemistry from Papua New Guinea University of Technology.

Resumes for environmental personnel that developed the procedures were viewed on the audit and the Auditor determined that sampling and analytical protocols have been developed by appropriately qualified personnel.

The procedures specify how and where samples should be taken, sample preservation techniques, chain of custody procedures, shipping instructions, and cyanide species to be analysed.

The *Daily Data Collection Form* contains a column where comments on sampling conditions can be recorded. A review of a completed forms noted that the comments column included information on wildlife activity, surface water and reasons as to why a sample was not taken.

HVGM does monitor for cyanide in discharges of process water to surface water and groundwater downgradient of the site.

HVGM monitors surface water at a regulated mixing zone in the Watut River, approximately 16 km downstream of the operation.

The operation does monitor for WAD cyanide in groundwater down gradient of the process plant site. HVGM sample eight boreholes. The data reviewed shows that cyanide has not exceeded 0.004 mg/L.

The operation does inspect for and record wildlife mortalities related to contact with and ingestion of cyanide solutions. Wildlife is monitored on a weekly (documented) and daily basis.

Of the parameters formally included within the existing programme, it is considered that the monitoring frequencies are adequate to characterise the medium being monitored and to identify changes in a timely manner.

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PRINCIPLE 5 – DECOMMISSIONING

Manage Cyanide Process Solutions and Waste Streams to Protect Human Health and the Environment

Standard of Practice 5.1: **Plan and implement procedures for effective decommissioning of 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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 5.1, requiring that a decommissioning plan is developed and implemented for effective closure of cyanide facilities to protect human health, wildlife and livestock.

HVGM has developed written procedures to decommission cyanide facilities at the cessation of operations. The *Decommissioning Plan* details the decommissioning requirements for the cyanide facilities located on the HVGM Lease including the organisational team development, the pre and post operations decommissioning plan, a decommissioning budget and schedule and the general safety requirements that will be utilised during the decommissioning process.

The *Decommissioning Plan* also provides an indicative schedule of activities to be conducted regularly during operations to maintain relevance of the plan and leading up to ceasing of operations and upon decommissioning.

The *Decommissioning Plan* developed for cyanide facilities requires the plan to be reviewed on an annual basis.

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

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 5.2**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 5.2, requiring that operation establish an assurance mechanism capable of fully funding cyanide related decommissioning activities.

HVGM has developed an estimate of the cost to fully fund third party implementation of the cyanide-related decommissioning measures as identified in its mine closure plan. A consultant developed a *Mine Closure Plan* in 2009, which included the development of closure costs. The estimated closure costs were prepared using Australia's New South Wales Department of Primary Industries Rehabilitation Cost Calculation Tool. The costs included 'Third Party Project Management and Contingencies (including Environmental Monitoring'. Third party contractor rates were used.

In March 2012, another consultant updated the closure costs, adding an inflation rate of 3.3% to all unit prices, amongst other updates.

The operation does review and update the cost estimate at least every five years and when revisions to the plan are made that effect cyanide-related decommissioning activities. The operation had a cost estimate developed in 2009 and this was been updated in March 2012.

The operation has established self-insurance or self-guarantee as a financial assurance mechanism and the operation has provided a statement by a qualified financial auditor that it has sufficient financial strength to fulfil this obligation as demonstrated by an acceptable financial evaluation methodology.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 6.1 requiring an operation to identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

HVGM has developed procedures that describe how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination prior to maintenance will be conducted to minimise worker exposure.

HVGM has a confined space entry procedure for the entry into confined space that requires training of personnel and a permit to enter into a confined space. There is an overarching permit to work system that takes into account isolation processes and confined space.

HVGM uses its intranet system to publish and maintain its operating procedures. The operator task procedures have been loaded into the IBIS document control system. A comprehensive set of procedures are available for cyanide related tasks including unloading and responding to cyanide.

The procedures do require the use of PPE and address pre-work inspections.

The standard PPE for the site is long sleeve shirts, long pants, steel capped boots, safety glasses and hard hat. There is signage located at work areas denoting what personal protective equipment (PPE) must be worn when entering and working in the area. Signage at the entry to the cyanide delivery and storage area requires persons to wear personal HCN monitors.

The operation has a policy to identify when changes in the site's processes or operating practices may increase the potential for the release of cyanide and to incorporate the necessary release prevention measures.

The Change Management Policy is required for changes to equipment, software, procedures or process that may introduce hazards to safety or the environment or affect the operational efficiency of the site. The policy states that all personnel have a responsibility to identify a change.

HVGM does solicit and actively consider worker input in developing and evaluating health and safety procedures.

HVGM runs a number of consultation processes on safety issues. Regular meetings are held which have a safety focus:

- Daily Production Morning Meetings
- Daily Superintendent Meeting
- Safety Representative meetings (monthly)

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- Departmental Safety Meetings (each swing)
- Managers' Safety Meetings (monthly).

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.**

The operation is
- ☒ **in full compliance with**
- ☐ in substantial compliance with **Standard of Practice 6.2**
- ☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 6.2 requiring an operation to operate and monitor cyanide facilities to protect worker health and safety and periodically evaluates the effectiveness of health and safety measures.

The operation has determined the appropriate pH for limiting the evolution of HCN gas during mixing and production activities. The pH set point at the time of the Audit was 10.5.

The operation does use ambient and personal monitoring devices to confirm that controls are adequate to protect workers. The operation engaged Key Process Improvements Pty Ltd to undertake an occupational hygiene study which focused on all work areas where cyanide is used. The report concluded that:

> *…that HVGM workers are not exposed to levels of HCN gas above the Code limits and international accepted limits.*

The report has also recommended measures that should be implemented to ensure that work exposures to HCN gas continue to be kept well below the recommended exposure limits. The operation has implemented these measures and therefore the controls are adequate in preventing cyanide exposure.

The report identified areas and activities where workers may be exposed to cyanide in excess of 10 parts per million on an instantaneous basis and 4.7 parts per million continuously over an 8-hour period. Where this occurs the operation requires the use of PPE.

The operation has installed static HCN monitors in strategic locations across the plant, which has alarms connected to the DCS in the control room. The static monitors have an audible alarm if HCN gas values are above 4.7 and 10 ppm.

Operational procedures detail the PPE that must be worn by the person performing tasks and within specific areas. There are also specific procedures for the use or respirators and HCN monitors. The standard PPE for the site is long sleeve shirts, long pants, steel capped boots, safety glasses and hard hat. Personnel were observed to be wearing HCN monitors and PPE appropriate to the task and area.

HCN monitoring equipment is maintained, tested and calibrated as directed by the manufacturer. The monthly calibration process is managed through Pronto and records are retained for at least one year.

Warning signs have been placed where cyanide is used. The signs warn workers of the presence of cyanide and prohibit smoking, open flames and eating and drinking. PPE signage is provided at entrances to work areas advising mandatory PPE for the area.

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Showers, low-pressure eyewash stations and dry powder or non-acidic sodium bicarbonate fire extinguishers are located at strategic locations throughout the operation and are they maintained, inspected and tested on a regular basis. The permit to work system requires the inspection of work areas prior to commencement of the task. The operation also has a pre-task assessment process which involves a checklist (in English and Pidgin) that prompts assessment of the task and requires assessment via JSA and supervisor for high risk activities. The checklist considers training, procedures, tools and work environment for the task. This includes inspections of safety equipment.

A site inspection of the process plant verified that suitable signage is in place that:

- Identifies unloading, storage, mixing and process tanks and piping as containing cyanide (where relevant).
- The direction of flow in pipes containing cyanide.

MSDS information is provided in English and first aid procedures and informational material on cyanide is provided in English and Pidgin. MSDS information has not been translated into Pidgin due to the imprecise nature of the language rendering the translation of critical information impractical.

Procedures are in place and being implemented to investigate and evaluate cyanide exposure incidents to determine if the operation's programmes and procedures to protect worker health and safety, and to respond to cyanide exposures, are adequate or need revising.

The operation has a tiered investigation system with investigation levels based on a potential outcome for the incident scenario. The *Safety Management Manual* details the incident notification and investigation process, which requires all incidents to be reported using the *Hazard/Incident Report Form*.

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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 6.3 requiring an operation develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

The operation does have water, oxygen, a resuscitator, antidote kits and a radio, telephone, alarm system and other means of communication or emergency notification readily available for use at cyanide unloading, storage and mixing locations.

HVGM has oxygen and antidote kits located at the Ridgeline Medical centre and in the site's 4WD ambulance. This Ridgeline facility is approximately 20 to 30 minutes' drive from the processing plant area. The medical clinic also had a store of spare oxygen cylinders and oxy-viva equipment. HVGM does have a first aid room located at the Hamata Plant metallurgy building that contains oxygen, a trauma bag and first aid supplies. The key is kept at the safety personnel cubicle in the main building.

There is a fire system installed at the process plant and emergency showers are installed at strategic locations on the plant with an adequate water supply. The operators were observed to be wearing radios and this is the primary means of notifying an emergency.

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The operation does inspect its first aid equipment regularly to ensure that it is available when needed, and materials such as cyanide antidotes are stored as directed by their manufacturer. Weekly inspection checklists for equipment and medication stored in the medical rooms and ambulance were viewed by the Auditor and considered to be complete. A medical equipment service provider is contracted to service medical equipment including oxy-vivas and regulators. The company undertakes an annual service and provides a repair/replacement service to the site.

HVGM has written a CERP for the response to a cyanide related emergency. The Section 9.1 of the CERP details Personnel Cyanide Exposure procedures. The medical centre also has a procedure for cyanide poisoning covers required equipment, symptoms, immediate treatment, administration of antidote and support care.

The site ERT is the primary responder for worker exposures and would undertake the recovery and decontamination of a worker exposed to cyanide that was not capable themselves. The ERT are trained in emergency first aid and HAZMAT response. The worker would then be treated by the site medic at the scene or at the on-site clinic.

The site medic has 24 hour access to a Doctor through a medical services company (International SOS (ISOS)). The site medic also has 24 hour access to a Doctor through ISOS and a contract with Dr Garup, a doctor based at the Lae International Hospital (LIH) with expertise in management of cyanide patients.

The operation has developed a *Medical Protocols Manual* that outlines the process to treat major injuries.

The Emergency Response Coordinator advised that the worker once decontaminated and treated by the site medic would be transferred to off-site medical facilities by helicopter. The operation has a contract with MEDEVAC Pacific Limited and helicopter transfer would be used for transport during daylight hours where weather conditions are suitable.

For night transfers and poor weather conditions the patient would be transferred by road to Lae in the ambulance or back up ambulance by operational personnel.

The operation has made formalised arrangements with its on-site medical provider and the local hospital so that these providers are aware of the potential need to treat patients for cyanide exposure. The operation has undertaken a review and training sessions with the hospital personnel and according the operation is confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures. On 13 November 2012, HVGM provided training to LIH staff in the principles of effective cyanide exposure management – decontamination, basic life support and advanced life support including the appropriate use of cyanide antidotes.

Mock emergency drills are conducted periodically to test response procedures for various cyanide exposure scenarios. Lessons learned from the drills are incorporated into response planning. HVGM has conducted worker exposure scenario drills on 12 November 2012, 12 August 2013, 28 November 2013 and 4 February 2014. The scenarios involved the collapse of a worker in a cyanide area. The reports detail the sequence of events and key roles, along with debrief notes and corrective actions.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.1 requiring an operation prepare detailed emergency response plans for potential cyanide releases.

HVGM has developed a tiered Emergency Management System to address potential emergencies at the operation, including accidental releases of cyanide. This includes and Emergency Management Plan (EMP), which overarches and Emergency Procedures Manual, Duty Cards and a CERP.

The CERP describes the emergency response processes to be implemented in the event of a cyanide related emergency as a result of HVGM's operations both on and offsite.

The CERP details procedures for the following incidents:

- Personnel cyanide exposure
- Catastrophic release of hydrogen cyanide gas
- Cyanide transport emergency
- Fires involving cyanide
- Liquid cyanide spill outside bunded area
- Major loss of power
- Tailings dam release
- Floods
- Seepage.

Cyanide is delivered to the site in boxes and isotainers via road transport. Section 9.3 of the CERP covers a cyanide transport emergency for on-site and off-site from Lae to HVGM. It should be noted that cyanide is delivered by a Code certified transporter who is responsible for emergency response until the cyanide has been unloaded at the site. However, HVGM will provide assistance in the event of an emergency.

The CERP considers a cyanide transport emergency, which considers:

- The physical form of cyanide (i.e. solid)
- The method of transport (i.e. road)

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- The packaging (i.e. isotainers and formerly IBCs packed into shipping containers)
- Stakeholders along the transport route from Lae.

The emergency response documentation does describe specific response action, such as clearing site personnel and potentially affected communities from the area of exposure, use of cyanide antidotes and first aid measures.

The EPM describes evacuation procedures on site, whilst the CERP considers the evacuation of potentially affected communities through the establishment of “hot zones”, whereby all people must be excluded from, except emergency response personnel.

The CERP also details procedures first aid measures and the use of cyanide antidotes.

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

The operation is
- ☒ **in full compliance with**
- ☐ in substantial compliance with **Standard of Practice 7.2**
- ☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.2, requiring an operation involve site personnel and stakeholders in the planning process.

The operation has involved its workforce and potentially affected communities in the emergency response planning process. Employees are provided with access to emergency response procedures so they may review and make suggestions regarding the content. Further opportunity for comment regarding these procedures is available during emergency drill debriefs and cyanide awareness training.

Community representatives were consulted as part of a series of workshops conducted in April 2013 on cyanide awareness. These workshops gave the stakeholders opportunities to communicate issues of concern, including emergency response.

The community workshops also provided a forum to make them aware of the risks associated with accidental cyanide releases and the appropriate communications and responses that are to occur between site and the public.

The operation has identified the LIH and two on-site contractors associated with medical care and transport as having roles in the emergency response process. A workshop was conducted with the hospital in order to involve them in the planning process and he two on-site contractors are integrated into HVGM’s emergency management system, including involvement in mock drills.

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

The operation is

☒ **in full compliance with**

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

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.3 requiring an operation designate appropriate personnel and commit necessary equipment and resources for emergency response.

The CERP does address the following cyanide related elements:

a) Designates the General Manager as having the overall responsibility for the implementation of emergency response functions and for the provision of resources and equipment. The Emergency & Crisis Management Coordinator is the alternate position at HVGM with explicit authority to commit emergency resources.

b) Identifies emergency response teams, including the coordinators, supervisors, officers and volunteers.

c) Requires appropriate training for emergency responders. This includes weekly training and participation in mock drills.

d) Includes call-out procedures and 24 hour contact information for the coordinators and response team members. ERT members all possess pagers.

e) Specifies the duties and responsibilities of the managers, coordinators and team members. This includes through the use of Duty Cards.

f) List emergency response equipment, including personal protection gear, available along transportation routes and/or on site. This includes a fire tinder, HAZMAT trailer, medical centre and ambulance.

g) Include procedures to inspect emergency response equipment (bi-weekly) and medical equipment (weekly) to ensure its availability.

h) Describes the role of external entities included in emergency response (namely a helicopter transportation company, a medical services company and LIH).

HVGM is located in a remote area of the highlands and all emergency response is facilitated by the ERT. There is no capacity within the vicinity of the mine to provide external assistance. As such, the Police and Fire Department have not been assigned a specific role in responding to an emergency. As such, they have not been involved in mock cyanide drills.

The operation has a contract with Pacific Helicopters to provide transport for medical evacuation to LIH and with ISOS to provide 24 hour on-site paramedic services and to arrange the transportation of cyanide victims.

The nearest public hospital capable of dealing with acute cyanide poisoning is located in Lae. HVGM trained medical staff at the hospital on 13 November 2012 to familiarise them with the use of cyanide antidotes and assess baseline capabilities in dealing with cyanide medical emergencies evacuated from site.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.4 requiring the development of procedures for internal and external emergency notification and reporting.

HVGM has procedures and contact information for notifying management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency, as well as potentially affected communities of the cyanide related incident and any necessary response measures, and for communication with the media. These procedures and contact information are contained within the *Catastrophic Events and Stakeholder Notification* procedure and the *Emergency Information* Directory.

Standard of Practice 7.5: **Incorporate in 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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.5, requiring an operation develop procedures for internal and external emergency notification and reporting.

The CERP does provide detail in relation to decontamination, remediation and disposal of spill clean-up debris, as well as the provision of alternate drinking water.

The plan provides for the use of ferrous sulphate and sodium hypochlorite to neutralise spills to soil. The spill area is then excavated and removed to the crusher area for safe disposal. The underlying soil is tested using a cyanide test kit and the process repeated until the desired cyanide concentration is reached.

Should spills occur to or near water, the CERP requires that the Community Affairs Department is notified. This department will notify local communities of any potential affects and will provide alternate drinking water if and when required (including bottled water and tanker water).

The CERP does prohibit the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide that has been released into surface water. Specifically, the CERP states that:

> *This plan subscribes to the recommendations of the Cyanide Code in that no chemicals are to be added to a flowing waterway in the event of a cyanide spill as these may only exacerbate the situation with their own toxicity characteristics.*

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The CERP addresses the potential need for environmental monitoring to identify the extent and effects of a cyanide release, and include sampling methodologies, parameters and, where practical, possible sampling locations. Following an emergency, the CERP requires that a post-emergency monitoring plan be produced that details:

- The purpose of monitoring
- The type of monitoring to be undertaken – environmental (soil, water) or HCN gas monitoring and the sampling methodologies
- Monitoring locations based on actual and potential exposures
- Duration and frequency of monitoring
- Persons to undertake the monitoring
- Equipment
- The expected end result.

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

The operation is
- ☒ **in full compliance with**
- ☐ in substantial compliance with **Standard of Practice 7.6**
- ☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 7.6 requiring an operation periodically evaluate response procedures and capabilities and revise them as needed.

The operation does review and evaluate the cyanide related elements of its CERP for adequacy on a regular basis. The CERP has been updated in October 2012, February 2013 and again in July 2013.

HVGM has conducted worker exposure scenario drills on 12 November 2012, 12 August 2013, 28 November 2013 and 4 February 2014. The scenarios involved the collapse of a worker in a cyanide area. The reports detail the sequence of events and key roles, along with debrief notes and corrective actions.

Provisions are in place to evaluate and revise the emergency response plan after any cyanide related emergency requiring its implementation. The CERP states:

> *This document will be subject to periodic review (every 3 years) and/or in response to incidents involving cyanide and/or the outcomes of scheduled emergency response drills.*

The above has been followed, with the CERP having been reviewed following the containerised cyanide leak in late 2012.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 8.1 requiring an operation train workers to understand the hazards associated with cyanide use.

The operation does train personnel who may encounter cyanide in hazard recognition.

Cyanide is located in the Hamata Process Plant area and all persons entering this area must complete the Process Plant Induction and the cyanide awareness induction. At the time of the audit there was a planned shutdown and the shutdown workforce were observed being inducted including cyanide awareness.

Cyanide hazard awareness training is conducted on an annual basis. The training attendance records are loaded into the IBIS system and refresher participation is manually checked. A review of training matrix showed that personnel have completed the required training.

HVGM has set up an IBIS action notification to ensure all ERT are competent and attend cyanide awareness training and refresher training at a minimum of 12 month intervals.

Cyanide training records are retained and entered onto the IBIS training database. The database includes information on the participant, trainer, topic and date. This system has capacity to generate reports on completion and expiry of training courses.

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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.**

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 8.2**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

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

HVGM does train workers 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 operation bases their operator training on the certificate course in Resource Processing and the organisation is a registered training organisation. The training is provided by a team of trainers that were trained by the processing plant design and construction firm when the plant was commissioned. New employees spend time (one on one) with the trainer and are teamed with an experience co-worker where the trainer is not available.

HVGM has a structured training programme and training for cyanide related tasks is included in induction materials, procedures and training manuals. The material is supported by procedures that describe how the task is to be performed and the controls needed for the task.

The training is provided by a team of trainers that were trained by the processing plant design and construction firm when the plant was commissioned. Training is also provided by MMJV employees who are appropriately qualified in their tasks to train others. The trainers do have qualifications in training and assessing.

Employees are trained prior to working with cyanide, following training in Cyanide Awareness as part of their initial induction programme to the mill areas that must be completed by all employees.

Refresher training on cyanide management is provided to ensure that employees continue to perform their jobs in a safe and environmentally protective manner. HVGM uses the Cyanide Awareness Training as the refresher training programme.

HVGM does evaluate the Cyanide Awareness Training through the use of a written knowledge assessment completed by the participant at the completion of the training session. Cyanide awareness is tested via written questionnaire.

Records are retained throughout an individual's employment documenting the training they received. The records include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

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

The operation is

☒ **in full compliance with**

☐ in substantial compliance with **Standard of Practice 8.3**

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 8.3 requiring an operation train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

HVGM uses the cyanide awareness and process plant induction to inform unloading, mixing, production and maintenance personnel on the actions to take if cyanide is released. The approach detailed for operators is to raise the alarm and evacuate the area and wait for the ERT to provide assistance and response. A review of training records and interview with ERT and process personnel confirmed training is conducted in the procedures to be followed if cyanide is released.

The ERT are trained in decontamination and first aid and take part in drills to test and improve skills. A mock exercise was recently conducted that involved four members of the ERT. The ERT also have weekly skills training that are recorded in the Safety Training Log Book. Instruction is provided to process plant operators and maintenance personnel during the induction process. These personnel do not take part in drills as the CERP is based on the ERT providing the response.

Emergency Response Coordinators and members of the ERT are trained in the procedures included in the EMP regarding cyanide, including the use of necessary response equipment. The ERT are trained in decontamination and first aid and take part in drills to test and improve skills. A mock exercise was recently conducted that involved four members of the ERT. The ERT also have weekly skills training that are recorded in the Safety Training Log Book.

The operation has made off-site Emergency Responders, such as community members and medical providers, familiar with those elements of the CERP. On 13 November 2012, HVGM provided training to LIH staff in the principles of effective cyanide exposure management – decontamination, basic life support and advanced life support including the appropriate use of cyanide antidotes.

HVGM uses the Cyanide Awareness Training as the programme to provide refresher training for response to cyanide exposures and releases. The operation is in the process of implementing an annual refresher programme. Additionally, regular mock drills are undertaken as a form of periodic training.

Simulated cyanide emergency drills periodically conducted for training purposes. The ERT recently conducted an exercise to test ERT's response to a cyanide exposure. The exercise identified a number of improvements that need to be made. HVGM has conducted worker exposure scenario drills on 12 November 2012, 12 August 2013, 28 November 2013 and 4 February 2014. The scenarios involved the collapse of a worker in a cyanide area. The reports detail the sequence of events and key roles, along with debrief notes and corrective actions. HVGM plans to conduct more worker exposure scenarios to ensure all worker rotations are captured.

Records are retained documenting the cyanide training, including the names of the employee and the trainer, the date of training, the topics covered, and how the employee demonstrated an understanding of the training materials. The Cyanide Awareness Training is provided by the Safety Supervisor and the names of the employee, date or training and topic is recorded on the front of the knowledge assessment sheet. The knowledge assessment is the demonstration of understanding the training material. This information is uploaded into the IBIS database.

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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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 9.1 requiring an operation to provide opportunity for stakeholders to communicate issues of concern regarding the management of cyanide.

HVGM has a programme in place for interaction with the community and for the community to raise concerns. The operation conducts tours of the mine and the Morobe Miner, Edition 15 cover story describes mine tours with over 200 people visiting the mine in a two month period. The tour covers operations including tailings and chemical management.

The operation meets with community leaders on a monthly basis and concerns regarding operations can be raised at these meetings.

HVGM completed a series of workshops with community representatives and stakeholders of three villages; Watut, Wampar and Mumeng on cyanide awareness. These workshops were conducted in April 2013 and provided the opportunity for stakeholders to communicate issues of concern.

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

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 9.2 requiring an operation to initiate dialogue describing cyanide management procedures and responsively addressing identified concerns.

There are opportunities for the operation to interact with stakeholders and provide them with information regarding cyanide management practices and procedures. The site tour programme is a key opportunity for the operation to interact with stakeholders and provide information on cyanide management.

The tour and the regular patrols undertaken by the operation provide opportunities for the operation to interact with the stakeholders and provide information regarding cyanide.

HVGM has established an External Stakeholder Advisory Panel (ESAP) to provide independent advice to the Joint Venture regarding environmental and related community impacts resulting from the operation of the HVGM.

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Standard of Practice 9.3:	**Make appropriate operational and environmental information regarding cyanide available to stakeholders.**	
	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Standard of Practice 9.3**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

HVGM is in FULL COMPLIANCE with Standard of Practice 9.3 requiring an operation make appropriate operational and environmental information regarding cyanide to stakeholders.

HVGM has developed written descriptions of how their activities are conducted and how cyanide is managed. The operation has formally disseminated cyanide in verbal form where a significant percentage of the local population is illiterate.

HVGM completed a series of workshops with community representatives and stakeholders of three villages; Watut, Wampar and Mumeng on cyanide awareness. At the end of the workshop, the presentations' power point slides were distributed to participants. These presentations were in Pidgin and English.

In October and November 2012, HVGM conducted a river patrol that involved meeting communities along the river. This patrol covered 33 villages, with approximately 2166 people attending the sessions. During this patrol, cyanide booklets were handed out in English and Pidgin.

HVGM has the mechanisms to make information publicly available on the cyanide release or exposure incidents. This includes:

- Procedures outlining notification requirements for the media, regulators and potentially affected communities.
- The Morobe Miner, which is produced regularly and provides a summary or incidents that have occurred on the project.
- Newcrest produces sustainability reports and this includes spills and incidents that occur at HVGM. The *Newcrest Sustainability Report* lists all companywide incidents as a total figure. This report is available on the Newcrest website.

In addition, the Constitution of Papua New Guinea (PNG) has provisions on Freedom of Information. It states that:

> *Every citizen has the right to reasonable access to official documents, subject only to the need for such secrecy as is reasonable in a democratic society…*
>
> *Provision shall be made by law to establish procedures by which citizens may obtain ready access to official information.*

HVGM is required to report spills and incidents resulting in injury/fatality to the Department Of Environment and Conservation and Mineral Resource Authority of Papua New Guinea. HVGM operate under the assumption that once information on such events is provided to the regulator, it is publicly available as guided by the provisions in the Constitution.

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LIMITATIONS

Your attention is drawn to the document “Limitations”, which is included as Appendix A to this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

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Name of Facility	Signature of Lead Auditor	Date

Report Signature Page

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APPENDIX A

Limitations

LIMITATIONS

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