



Consulting & Training

International Cyanide Management Code Recertification Audit

**Pt Nusa Halamhera Minerals – Gosowong Gold Mine
Recertification Audit
Summary Audit Report**

October 2018

Ashton Safety Health Environment
8/28 Robinson Ave
Perth WA 6000
+61 8 9228 1644
admin@ashtonshe.com.au
www.ashtonshe.com.au



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1. SUMMARY AUDIT REPORT FOR MINING OPERATIONS

Name of Mine:	Gosowong Gold Mine
Name of Mine Owner:	Newcrest Mining Limited
Name of Mine Operator:	PT Nusa Halmahera Minerals
Name of Responsible Manager:	Tommy Octaviantana – Manager, Ore Treatment
Address:	PT Halmahera Minerals Gosowong Gold Mine Halmahera Island
Cyanide Code Champion	Angga Febriyansyah – Senior Metallurgist
State Province:	North Malaku Province
Country:	Indonesia
Telephone:	(62) (21) 29049920
Fax:	(62) (21) 29049919
Email	Angga Febriyansyah <anggaf@nhm.co.id>

2. LOCATION DETAIL AND DESCRIPTION OF OPERATION

Kencana Mine is located 1 km south of the original Gosowong Pit. It is the third mine to be developed by the joint venture at the Gosowong site and the first underground mine. Underground development of the Kencana mine commenced in February 2005, with the first underground ore mined in March 2006. Gosowong currently encompasses the Kencana and Toguraci underground mines. The Kencana underground mine utilises predominantly underhand cut-and-fill with some long hole stoping, while the Toguraci underground mine uses long hole stoping and overhand cut-and-fill.

Processing technologies at the Mill include:

- Gravity separation
- Counter current decantation (CCD)
- Agitated tank leaching
- Merrill Crowe zinc precipitation
- Cyanide leaching

The processing plant at Gosowong, which has a capacity of 800,000 tonnes per year, comprises a primary jaw crusher followed by a SAG and ball mill circuit and a Vertimill circuit. The ore then undergoes a conventional cyanide leaching process. Gold and silver is recovered from the cyanide solution using the Merrill-Crowe Zinc Precipitation Process and is then smelted to produce gold and silver ore. The gold ore is then refined at Logan Mulia which is owned by PT Aneka Tambang.

A basic schematic showing the overall process can be seen below.

The location of the mine is shown below.



Newcrest Mining Limited (Newcrest) is an Australian-based corporation based in Melbourne. The company engages in gold exploration, mining, processing and in the sale of gold and gold-copper concentrate.

Newcrest’s primary gold and copper production in Australia is at Ridgeway - Cadia Valley Operations. Another Australian operation is at the Telfer Mine in the Pilbara region of Western Australia. Newcrest also operates two mines in Papua New Guinea (Lihir and Hidden Valley) and one each in Ivory Coast (Bonikro) and Indonesia (Gosowong). In August 2010, Newcrest merged with Lihir Gold, to become the world's fifth-largest gold producer.

NHM is the joint venture Indonesian company formed to manage the Gosowong Gold Mine. The mine is owned and operated 75% by Newcrest, with PT. Aneka Tambang owning the remaining 25%. It is located within the Gosowong Gold Province on Halmahera Island in the North Maluku Province of Indonesia, approximately 2,450 kilometres north east of the national capital Jakarta. The Gosowong Mining Permit, called a Contract of Work (CoW), continues until at least 2029.



3. SUMMARY AUDIT REPORT

3.1 Auditors Findings

PT Nusa Halmahera Minerals Gosowong Gold Mine is in substantial compliance with the International Cyanide Management Code. The Corrective Action Plan to bring the operation from substantial compliance to full compliance is enclosed with this summary report.

Audit Company: Ashton Safety Health and Environment

Audit Team Leader: Phil Ashton, Lead Auditor

Email: phil@ashtonshe.com.au

Signed:  (Phil Ashton – Lead Auditor)

Signed:  (Michael Waite – Auditor)

3.2 Name of Other Auditors

The Recertification Audit Team comprised:

Mr Phil Ashton (ICMI pre-certified Lead Auditor and Technical Specialist for mining, production and transport)

Mr Mike Waite (ICMI pre-certified Technical Specialist for mining, production and transport).

3.3 Dates of Audit

The on-site Re-certification Audit was undertaken 27th October 2018 and 29th October 2018 inclusive.

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 Cyanide Production and using standard and accepted practices for health, safety and environmental audits.

Name of Facility: PT Nusa Halmahera Minerals Gosowong Gold Mine

Signature of Lead Auditor:



Date: 01/04/2019





3.4 Summary Findings

Principle 1 – Production - Encourage Responsible Cyanide Manufacturing by Purchasing from Manufacturers that Operate in a Safe and Environmentally Sensitive 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 ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

Between January 2014 and October 2015 NHM purchased its cyanide from Australian Golf Reagents (AGR) in Kwinana Western Australia. After this period, cyanide has been, and continues to be purchased; from Orica in Queensland Australia. Both AGR and Orica were/are certified under the ICMI Code.

Orica is International Cyanide Management Institute (ICMI) certified for both manufacture and road transport between the Yarwun manufacturing facility in Queensland to the Port of Brisbane in Queensland. (Re-certified for transport 20th August 2018/Re-certified for manufacture 27th February 2017).

ICMC certification and recertification is conditional on compliance with requirements to 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.

Supply of solid sodium cyanide is now from Orica in Australia (Queensland). Orica is ICMI certified for both manufacture and road transport between the Yarwun manufacturing facility in Queensland to the Port of Brisbane in Queensland. (Re-certified for transport 20th August 2018/Re-certified for manufacture 27th February 2017)

The contract condition for Orica International Pty Ltd requires Orica to be International Cyanide Code Certified for production and transport.

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.



The operation is in Full compliance✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

Both Orica and Pt Trans Continent are required under contract to be compliant and certified under the International Cyanide Management Code. Under the contract for Pt Trans Continent and Orica, all sub-contractors must comply with ICMC requirements.

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✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

From interview with relevant personnel, elements of the supply chain are well understood and examples of delivery dockets supplied provide records of tracking for a specific shipment. This is the required practice for all shipments.

Between January 2014 and October 2015 NHM purchased its cyanide from AGR in Kwinana Western Australia. After this period, cyanide has been and continues to be purchased from Orica in Queensland Australia. Both AGR and Orica were/are responsible for transport to Surabaya from the cyanide production facilities and were International Cyanide Management Code (ICMC) certified. Trans Continent were certified for transport from Surabaya to Barnabas Port. NHM were certified for the route from Barnabas Port to Gosowong Mine.

Manufacturers and transporters are all ICMC Code Certified and, as such, required risk mitigation measures and emergency procedures to mitigate residual risk are taken to be in place for certification to be achieved. Procedures to mitigate residual risk are taken to be in place for certification to be achieved.

Principle 3 – Handling and Storage - Protect workers and the environment during cyanide handling and storage

Standard of Practice 3.1

Design and construct loading, storage and mixing facilities consistent with sound, accepted engineering practices, QA QC procedures, spill prevention and spill containment measures.

The operation is in Full compliance✓ Substantial compliance Non-compliance



Basis for this Finding/Deficiencies Identified:

No additional cyanide facilities have been installed since the last recertification audit carried out in 2015. As this is a recertification audit, facilities for unloading storing and mixing cyanide have previously been audited to establish that they were designed and constructed in accordance with cyanide producers' guidelines etc. This status has not changed.

Solid cyanide is transported as pellets in bulka bags in plywood boxes with an internal plastic bag containing the solid sodium cyanide pellets. Containers are in compliance with the Australian Dangerous Goods Code (ADG) as required by Australian dangerous goods transport regulations. The bulka bags are transported inside sea containers fitted with locks and seals. The sea containers are inspected when received at Barnabas Port to ensure they are in good condition, clean and with no obvious leaks. In the unlikely event of leakage at the Port, a purpose-built concrete bund is available and any spill is managed by the NHM Emergency Response Team. This bunded area was viewed during the audit and was noted to be in good condition. As sighted, the sea containers are located over a concrete bund on raised concrete plinths so that ingress of water is prevented and the bags are removed from the containers on site and transported to the designated mixing area one at a time by forklift and crane. Bags are 1.3 tonnes and the crane is confirmed to be rated at 2 tonnes.

A mixing team of two operators, both assessed as competent in the task, consist of one in full PPE and one as an observer (from a safe area upwind). PPE used included, but was not limited to, a full chemical suit and full-face mask with appropriate canister for hydrogen cyanide and cyanide dust. A personal hydrogen cyanide (HCN) dose meter was also used, which was located in the breathing zone of the operator. The fully protected operator, as observed, was checked by the Supervisor physically (canister, PPE, competency card etc) before being involved in completion of an on-line safety compliance checklist via a specific mobile phone application. In summary, safe work practices were noted during the observation.

There are no level indicators or high-level alarms on the mixing vessel, as this is a manual operation. However, in the unlikely event of over-filling of the cyanide storage tank, there is a designed overflow line to the bund area and a sump pump which pumps back to the mixing tank. Other tanks (process tanks) use a pressure-sensor level indicator (displays "percentage full" reading) and high-level alarm (linked to pressure-sensor device – alarms when reaches 90%) to prevent the over-filling of any cyanide tanks. These tanks in summary are controlled by logic. Checking and calibration of the sensors is included in the Maintenance Management System.

Facilities for unloading, storing and mixing cyanide have been designed and constructed in accordance with cyanide producers' guidelines, applicable jurisdictional rules and sound and accepted engineering practices for these facilities. Site drainage is toward a sealed Events Pond. Unloading and storage areas for solid sodium cyanide are in a designated area, away from people and surface waters. On-site offices and the like (protected places) are well separated from cyanide storage, unloading and mixing facilities.

Liquid cyanide is not unloaded at this site. It is received in solid form and mixed to solution on site. Bags of cyanide pellets are unloaded onto a concrete pad, with the solid cyanide unloading area



situated above a concrete floor, banded to contain, recover or allow remediation of any leakage of solid cyanide residue from the container or bag.

No additional ventilation is provided to prevent the build-up of hydrogen cyanide during mixing. However, the mixing tank is located off the ground, under a roof, but otherwise in the open. Mixing is carried out in a secure, fenced and locked area where unauthorised access is prohibited. The process plant itself is located within a security fence with controlled access and security presence 24/7. Mixing is carried out separately from acids and other incompatibles, and it is understood that there is no shared drainage with incompatibles.

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

The operation is in **Full compliance** ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

Empty cyanide bags are washed three times and the rinse water added to the CN process water, then returned to the used (cyanide) plywood storage boxes with other rubbish (lime bags, plastic strapping etc) for disposal. They are then transported within the used plywood crates to a third party licensed hazardous waste disposal company for approval of disposal by the Indonesian Regulator. Empty cyanide bags, by procedure, are washed.

There are three safety showers in the area, with one above the mixing area. Appropriate bunding is provided to capture liquid waste, as previously stated. There was no evidence of cyanide (dyed pink) outside the mixing tank, or of cyanide flakes or pellets. The empty cyanide containers are consigned to a third-party hazardous waste disposal company who are prevented by Indonesian Waste Management Legislation from using the waste for any purpose other than for holding cyanide. Waste cyanide packaging is stored in a secure area before transportation by a third party for disposal. The disposal is authorised by Minister of Environment Decree Number 202 of 2004, dated April 2014 and is valid for 5 years. The transport and destruction of the waste is authorised by licence under Minister of Environment and Forestry Regulation number 68 of 2016, and a Permit has been issued by the Transport Department for the transport truck. A further MOU has been agreed between the producer, transporter and waste processor (number 629/WI/SPKLB3/11/2/2012). No cyanide containers are returned to the vendor (Orica).

The operation has developed and implemented plans and procedures to prevent exposures and releases during cyanide unloading and mixing activities such as: operations for mixing solid cyanide, handling cyanide containers without rupturing or puncturing, limiting the height of stacking of cyanide containers, timely clean-up of any spills of cyanide during mixing, and providing for safe unloading and manual mixing of solid cyanide by requiring appropriate personal protective equipment and having a second individual observe from a safe area. There are numerous procedures for maintenance and operating activities which have been developed. It is understood that all personnel using cyanide



related procedures are competency assessed before they undertake related tasks. Record of these checks have been provided.

The site inspection observed that safe work practices were being followed as applicable. Several safe work procedures have been developed to address requirements, with initiatives including a mobile phone app check box, which was completed during the mixing process to ensure full compliance with relevant procedure. The cyanide mixing operation was observed during the audit and full compliance was noted so that operators undertaking the task were protected from exposure to cyanide dust, cyanide solution and hydrogen cyanide. Procedures are well structured and relatively user-friendly with step-by-step instructions provided. Inspection of tanks, including the cyanide mixing and storage tank, is included in the Maintenance Management System and records were reviewed in this regard.

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, preventative maintenance procedures. and management of change procedures.

The operation is in Full compliance Substantial compliance ✓ Non-compliance

Numerous written maintenance and operating plans or procedures have been developed for cyanide facilities including those associated with unloading, mixing and storage facilities, tailings impoundments, and cyanide treatment, regeneration and disposal systems.

NHM do not utilise a heap leach system or cyanide regeneration and disposal systems.

All relevant written management and operating plans or procedures had been reviewed in April and/or September 2018 for compliance with ICMC requirements (and revised if necessary). Plans and procedures were supported by training in cyanide management and risk mitigation and the operation has plans and procedures that identify the assumptions and parameters on which the facility design was based (including applicable regulatory requirements for freeboard) which are required for safe pond and impoundment operation).

The cyanide concentrations in tailings on which the facility's wildlife protection measures were based is included to prevent or control cyanide releases and exposures consistent with applicable requirements (50ppm) and free board is maintained at 1.5m from development crest to spill way.

As an observation, the Standard Operating Procedures (SOPs) are well developed and their scope is comprehensive. However, many of the documents do not have obvious direct cyanide hazards identified and only identify generic hazards associated with tasks, advising teams to complete a "see, stop, control" assessment to identify any unique unsafe conditions. Similar SOPs only include a generic



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table, where one of the generic hazards is “chemicals”. There are specific procedures which follow a completely different format, with no generic tables. There are also some SOPs that are inconsistent with each other.

Formal cyanide management documents address procedures for situations when inspections and monitoring identify deviation from design or standard operating procedures, including operations where a temporary closure or cessation of operations may be necessary. For instance, the Cyanide Emergency Response Plan details response to credible emergency scenarios related to cyanide specific emergency events, with some scenarios also included in other documents. From discussions, all personnel displayed a good understanding of actions to be taken in the event of deviations from normal operations.

All cyanide handling equipment and spill containment including process pumps, pipes, valves and tanks are registered within the Systems Applications and Products (SAP) data base, with details of type of work/checks and frequency and checks including daily operational, pumps, electrical, pipes, valves, drains, tanks and corrosion assessment, and visual and non-destructive thickness testing. NHM had also engaged a Corrosion Consultant every two years to assess the state of corrosion on the plant. From records supplied and reviewed at the time of the site visit, there were no outstanding (ie representing a risk to the health and safety of workers or the environment) priority one maintenance requirements for the cyanide facilities. However, “medium” (fix in 1-2 years) issues, including new corrosion in tanks and fittings, were identified and will need to be addressed in that time frame. All cyanide code corrosion repair requirements were completed as Safety Work Orders. Tanks holding cyanide solutions are checked for structural integrity and signs of corrosion and leakage. Maintenance tasks and associated frequencies have been assigned for all process pumps, pipes, valves and tanks etc within SAP. All process pumps, pipes, valves and drains are registered within SAP. Specific maintenance tasks and associated frequencies have been assigned for each item. Several SAP Work Orders were reviewed to confirm compliance. Ponds and impoundments are checked for the parameters critical to their containment of cyanide and solutions and maintenance of the water balance, such as available freeboard and integrity of surface water diversions. Groundwater monitoring bores are also installed.

Numerous example records were provided for review and deficiencies were identified and included a description of the deficiency and corrective actions required. Work Orders are created from the identified corrective actions and entered into SAP. Records are retained digitally and, in some cases, as hard copies.

The operation has two power stations, with one supplying stand-by power, sufficient to operate pumps and other equipment to prevent unintentional releases and exposures. Generators are synchronised with each other.

The back-up power generating equipment is maintained and tested on a regular basis. NHM also has backup diesel generators and diesel-powered pumps in case of electrical emergencies

There is a formal procedure for response to any unintentional power outage



A preventive maintenance program has been implemented, with criticality of equipment also considered. Work orders are produced from SAP so that a schedule can be established. A site inspection during the audit showed no obvious issuers with poor maintenance.

Following review of documentation and formal/informal discussions with NHM specialists, formal and informal Inspections are conducted at established frequencies, sufficient to ensure and document that cyanide facilities are functioning within design parameters. Discussions with NHM personnel during the audit, verified a good understanding of the need for inspections and preventative maintenance. The SAP Maintenance Management System provides prompts for maintenance inspections.

However, although the operation has a “change management” procedure to identify when changes in processing or operating practices may increase the potential for the release of cyanide and these incorporated the necessary release-prevention measures intended to define the processes and/or path to be followed when a change/modification is required, the change management forms were often completed after the change/modification had been carried out. An example of this was reviewed with a work order to “Clean Scaling Material from inside the Feed/Solution Core Tank (December 2016)”. The form included both ‘before and after’ pictures which appear to be taken before the form was approved. In many cases, the Change Management Form has been used incorrectly, where, rather than a change, the work was often simple maintenance ie there was no actual change in operation, procedure or processes and the Change Management Form was being used instead of a Work Order.

It was also confirmed that there has been limited training in the Management of Change (MOC) process, although there are now plans to reinforce the requirements of the MOC Procedure, and how and when it should be used. It is noted that although the finding of substantial compliance is based on a system already being in place, there is a new commitment to provide MOC training to relevant personnel and that the process to achieve this has already commenced in good faith. It is also noted that a MOC Work Instruction and a Guide have been produced and that scheduled training will be provided based on these documents.

It is noted that, NHM have committed, in good faith, to include address MOC compliance improvements. This area for improvement is readily correctible, has already commenced implementation and does not present an immediate risk to employees, the community or the environment in respect of cyanide management.

Standard of Practice 4.2

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

The operation is in Full compliance✓ Substantial compliance Non-compliance



Basis for this Finding/Deficiencies Identified:

The cyanide rate is managed in real-time from a computer screen, supervised by a metallurgist, and is also managed by the Plant Operator in the Control Room. The cyanide feed rate is adjusted as ore types and/or processing practices/parameters change. The Operator and Metallurgical Superintendent displayed a good understanding of dose rate and related process/feed conditions to verify compliance and the Metallurgical Superintendent displayed a good understanding of dose rate and related process/feed conditions.

There are multiple control strategies in place to control cyanide addition. These strategies have continued to be used throughout the certification period and are inclusive of assessment of leaching recovery and use of bottle role tests. Set points for cyanide addition are controlled via Citect, with the set point adjusted daily dependent on feed characteristics and operating conditions. The basis for setting cyanide addition rates are the Daily Production Reports which may stipulate leach tests to be done.

It is understood there have been no engineering of chemical additions since the last certification audit which identified the addition of lead nitrate and oxygen to enhance gold recovery, in addition to addition of extra cyclones.

Standard of Practice 4.3

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

The operation is in Full compliance ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

The operation measures precipitation and evaporation on a daily basis at the mine and Tailings Storage Facility (TSF), and the GoldSIM Gosowong ICMC Water Balance Model is run every three months, updated with the latest monitoring results and re-calibrated every two years or whenever conditions change. The original Site Water Balance Model was developed for Gosowong in 2016 using the GoldSIM software platform. The model was designed as a probabilistic, dynamic simulator, running continuously and into future mine life, in a sequence of daily time-steps with select inputs being allowed to vary within defined stochastic distributions. The model simulation extends in predictive mode for four years past the calibration period to 1st July 2022. Planned tones between July 2018 and June 2019 (current life of mine) obtained from the Environment Department in April 2018 are included in the model for future predictions of feed to the Process Plant.

The operations have contingency procedures for upset water balance and a Waste Management Program has been implemented to protect against unintentional releases. The water level in the TSF is controlled by pumping from the Decant Pond and both the TSF and TSF Western Extension (TSF-WEX) have spillways (overflow approx 1m below embankment wall) to prevent overtopping and erosion of the embankment under extreme flood conditions. Water balance is facilitated by a polishing pond to the north of the TSF. Water is pumped to the polishing pond from TSF decant Pond (Decant water from TSF-WEX pumped to TSF Decant Pond). After treatment, Polishing Pond water is released



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via the Kencana Settlement Ponds. A downstream pick-up sump and pump returns discharge water to the Water Balance Reclaim System, with priority supply to the Ore Processing Plant. Excess water is discharged downstream of the Water Balance Reclaim System. Within the TSF-WEX perimeter there are bund banks/berms to ensure any pipe failure/spillage is contained within the permitted area. Any leaks, vandalism or failures must be immediately reported to the Ore Processing Shift Superintendent, an incident report completed, spillage contained and the damage repaired.

Two notch weirs have been installed upstream of the Settlement Ponds to monitor seepage inflows and a downstream V-notch to monitor discharge to the environment. Monitoring bores have also been installed to monitor groundwater levels and quality. Although it is recommended that new 1:100 and 1:1000 year rainfall events be calculated and used for future projections (particularly w.r.t. changing climate), 1:100 and 1:1000 years rainfall events have been projected by Coffey for daily and three-day conditions from Jan 2001 to June 2012.

All external tailings delivery pipelines are contained by ICMC-compliant 'pipe in pipe' pipelines. Within the TSF-WEX perimeter, there are bund banks/berms to ensure any pipe failure/spillage is contained within the permitted area and any leaks, vandalism or failures must be immediately reported to the Ore Processing Shift Superintendent, an Incident Report completed, spillage contained and the damage repaired. Embankment regrowth is not permitted and is cleared under scheduled maintenance.

The storage levels of tailings and decant water in the TSF are managed to provide sufficient freeboard to the emergency spillway, with maximum OWL freeboard of 1.5m (from design crest to design spillway invert). Onsite precipitation and evaporation are also measured daily by the Environment Team at the mine and TSF and recorded daily in the Daily Environmental Report and the GoldSIM Gosowong ICMC Water Balance Model is run every three months and updated with the latest monitoring results and is re-calibrated every two years or whenever conditions change.

NHM use the GoldSIM Water Balance Model appropriately considers:

- NHM use the GoldSIM Water Balance Model appropriately considers:
- Rates at which solutions are applied to tailings and the amounts of tailings deposited
- A design storm duration and storm return interval that provides data to prevent overtopping of ponds during the operational life of the facility
- Local rainfall and evaporation data and the amount of precipitation entering a pond or impoundment from surface runoff
- Catchment parameters, including the intercept area runoff (% rainfall); and recharge (% rainfall) and a 1 in 100 year, 72 hour rainfall event
- Other solution losses in addition to evaporation
- The effects of potential power outages or pump and other equipment failures on the drain-down from a leach pad or the emergency removal of water from a facility
- The capacity and on-line availability of necessary treatment, destruction or regeneration systems and the detoxification system and the cyanide destruction time, where solution is discharged to surface waters.



In the event that the final Polishing Pond (PP3) has a too high concentration of WAD cyanide, the water is pumped back to the first Polishing Pond (PP1) to allow natural cyanide destruction process to continue.

There are no other aspects of a facility design that can affect the water balance

In addition, the Water Management and Release Procedure requires a freeboard of 0.5 m to be maintained at all times. The spillway is intended to operate in 1:100 years.

The Polishing Pond is contained within the TSF footprint.

Regular inspections of the TSF and Polishing Pond are conducted twice per day, checked and recorded.

Freeboard is measured daily by the Environment Team.

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 ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

Two notch weirs have been installed upstream of the Settlement Ponds to monitor seepage inflows and a downstream V-notch to monitor discharge to the environment and monitoring bores have been installed to monitor groundwater levels and quality. All external tailings delivery pipelines are contained by ICMC-compliant 'pipe in pipe' pipelines and open water WAD cyanide concentrations do not exceed 50ppm.

Daily Environmental Work Progress Reports reviewed show no exceedances of 50ppm WAD cyanide. However, if daily monitoring results indicate a concentration greater than 40 ppm, this triggers an 'incident' with reporting and response implications. Maintaining a Weak Acid Dissociable Cyanide (WAD) concentration of less than 50ppm (effectively <40 ppm) has been shown to be effective in preventing significant wildlife mortality as the Daily Environmental Work Progress Reports have a section to record wildlife deaths and no wildlife mortalities have been recorded.

Standard of Practice 4.5

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

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**



Basis for this Finding/Deficiencies Identified:

Levels of free cyanide have been recorded below the detection limit of 0.022 mg/L free cyanide outside of the defined and approved mixing zone in the receiving environment, and levels have been maintained below that which puts wildlife at risk.

All wastewater discharge points are classified as a compliance point and are licensed by the North Halmahera Environmental Agency. The wastewater discharge points are equipped with a V-notch weir and flowmeter to measure wastewater flow.

The operation has no indirect discharge to surface water, but there is a direct discharge from the Gosowong Pit Lake to the Tabobo River and from the Settle-Pond to the Tabobo River and The Kobok River (before the junction with the Bora River). Monitoring results reviewed for the assessment period indicate that direct discharges to surface water have not exceeded 0.5 ppm WAD cyanide, with the concentration of free cyanide being 0.022 mg/L or lower downstream of the various release points outside of the approved mixing zone via daily cyanide sampling. Tailings discharge to the ponds have generally been <25mg/L after detoxification.

It was noted that a review, carried out in 2016 for ICMI recertification, confirmed that the laboratory was unable to achieve the required detection limit of 0.02mg/L and the detection limited was noted to have been 0.05mg/L.

Validation of the analysis method, after changes were made to achieve the required detection limit (related to maintaining constant temperature in the laboratory via installation of additional air conditioners), was carried out by Intertek in June 2016 to confirm a detection limit of 0.02mg/L.

During the period when the detection limit of 0.05mg/L applied, independent external duplicates were subject to analysis using methodology with a level of detection of 0.005mg/L. Monthly independent results during the period 02/09/15 – 01/11/18 for the Bora River showed all levels at <0.005mg/L, with the exception of one level at 0.008mg/L.

Standard of Practice 4.6

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

The operation is in Full compliance ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

NHM has implemented preventative maintenance and monitoring measures to manage seepage to protect the groundwater beneath and/or immediately down gradient of the operation.

‘Groundwater’ has not been assigned as ‘beneficial use’ by the regulator and groundwater is not utilised by local villages, although the Indonesian regulatory limit for free CN in groundwater reflects the ICMC level of 0.02 mg/L.



Both the TSF and the Polishing Pond have been constructed with an impermeable layer and the operation does not use mill tailings as operational backfill. Any seepage is collected in the Blanket Filter Drain under the toe of the TSF, and groundwater bores are monitored by the Environment Team (several bores were destroyed when WEX was constructed and are in the process of being replaced).

Free cyanide concentrations in the groundwater at the compliance points below or down gradient of the facility, are at or below level mandated by the Indonesian regulatory limit for free cyanide, with monitoring results reviewed indicating that free cyanide levels continue to be below 0.01 mg/L (detection limit).

Standard of Practice 4.7

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

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

It is understood there have been no modifications since the last certification audit.

There is a preventative maintenance program in place and all equipment/spares used are confirmed as compatible.

Spill prevention and/or containment measures are provided for all cyanide unloading, storage, mixing and process solution tanks. Cyanide process tanks and storage tanks are located in concrete bunded areas, all of which by inspection, were in good condition and maintained free of spillage and rain water so that containment capacity is maintained. Designated pipe containments drain to secondary containment areas and there is pipe in pipe for the TSF line and/or lines that are buried beneath road ways. The return water line conveys a low solution strength of approximately 0.5mg/L WAD cyanide or less. It is subject to stringent preventative maintenance and is inspected every six hours by Mill Operators. Lines observed appeared to be in good condition and are subject to regular inspections as detailed in SAP. Therefore, status remains the same.

Differential flow continues to be monitored to identify any large pipeline failure with auto supply cut-off provided.

There are procedures to check for accumulated spillage and rainwater in spill containment areas (eg Water Processing Pond Procedure, Security Sump Pump, Ball Mill Pump Boxes and Cyclone Pack Underflow Boxes).

All changes to parts and materials are subject to management of change processes.



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Cyanide tanks and pipelines have been constructed of materials compatible with cyanide and high pH conditions. Ongoing maintenance with compatible materials is specifically addressed in the Management of Change Procedure.

A discussion with maintenance personnel and a site inspection confirmed that cyanide tanks and pipelines are only replaced with proven spares or like-for-like materials.

Maintenance records confirm that repairs eg tank patches are also constructed of materials compatible with cyanide and high pH conditions.

Emergency procedures are in place to minimise the impact arising from acceptable residual risk. A risk-based inspection (RBI) program was adopted for all solution and leach tanks. All bunds were noted to be in good condition and adequately sealed. NHM has installed a series of three groundwater monitoring bores around the plant as a check to confirm that the tanks are not leaking. The bores are monitored monthly and show free cyanide levels <0.01 mg/L.

Differential flow meters have been installed at the process plant and valve station near the TSF, which are automatically tripped in the unlikely event of a catastrophic line failure; the tailings pump is automatically tripped. Secondary containments for cyanide unloading, storage, mixing and process tanks are sized to hold a volume greater than that of the largest tank within the containment and any piping draining back to the tank, and with additional capacity for the design storm event and the containment facilities, drainage channels and Water Processing Pond (WPP) have been designed to a 1:25 year storm event and evidence justifying the selection of the design storm event was observed.

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 ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

Quality control/quality assurance procedures and Work Orders have been implemented as required, with change management procedures where appropriate. Project files and Project Completion Reports were also completed.

Quality assurance and quality control (QA/QC) programs that are documented have addressed the suitability of materials and adequacy of soil compaction for earthworks such as tank foundations and earthen liners, the installation of synthetic membrane liners used in ponds, and for construction of cyanide storage and process tanks. They have also addressed the suitability of materials and adequacy of foundation material for the WEX, as documented in the Project Completion Reports and Project Files. QA/QC records for cyanide facilities were cited and included Project Completion Reports and Project Files containing QA/QC documentation. Appropriately qualified personnel have reviewed cyanide facility construction and provided documentation that the facility has been built as proposed



and approved records have been retained for cyanide facilities. These were in the form of Project Completion Reports and Project Files containing QA/QC documentation.

QA/QC documentation has been provided for all new/modified cyanide facility construction and has been cited for numerous new/modified cyanide facility construction and maintenance, including for the WEX.

As this is a recertification audit, facilities for unloading storing and mixing cyanide have previously been audited to establish that they were designed and constructed in accordance with cyanide producers' guidelines etc. This has not changed. No additional cyanide facilities have been installed since the last recertification audit carried out in 2015.

The operation has retained the QA/QC records for all currently active cyanide facilities.

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 ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

Monitoring requirements have been developed by competent personnel with appropriate qualifications. The procedures address all required aspects including sampling methodology, preservation, transport requirement and requirements for chain of custody records.

Monitoring is undertaken at several locations inclusive of process ponds on site, the discharge point to the environment, and within the receiving environment. Groundwater monitoring is also performed. Records of monitoring and results were well maintained.

The frequency of monitoring continues to be adequate, with twice daily or once daily sampling of the Polishing Pond/wildlife and TSF respectively, and daily monitoring of the receiving environment. Groundwater bores are also monitored monthly.

The Daily Environmental Work Progress Report includes a section detailing any deaths of wildlife. These records are signed and dated. Wildlife presence around the TSF and WEX is assessed and, if mortalities were to occur, it is a procedural requirement that they must be recorded and investigated as an incident. This is recorded in the Environment Monitoring Guideline at Tailing Dam (S6TS) and Polishing Pond (S10PP) Safe Work Practice. There have been no wildlife mortalities during the certification period under review.



Principle 5 – Decommissioning - Protect Communities and the Environment from Cyanide through Development and Implementation of Decommissioning Plans for Cyanide Facilities.

Standard of Practice 5.1

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

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

The operation has developed written procedures to decommission cyanide facilities at the cessation of operations, including a process to decontaminate equipment and remove residual cyanide. The Cyanide Facilities Decommissioning Plan was revised and reviewed for this cyanide audit in September 2018. Revisions include an amendment to include processes to decontaminate equipment, remove residual cyanide and for the control of surface or groundwater during decommissioning works. The Cyanide Facilities Commissioning Plan also includes an implementation schedule for decommissioning activities, which has been upgraded/amended since the last ICMC audit as required to bring into full compliance. The Cyanide Facilities Decommissioning Plan Appendix 1 (Gosowong Gold Mine Decommissioning Schedule) includes a table with ‘tasks’, ‘responsibility’ and a Gant chart of ‘months from closure’ to provide context.

An additional report on decommissioning and costs was developed in August 2017. This is in addition to the development of a report for submission to the Minister of Energy and Mineral Resources which was required under regulation as a result of changes to the post mining schedule.

Standard of Practice 5.2

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

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

NHM is in full compliance with Standard Practice 5.2 requiring establishment of an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

A cost estimate was provided in 2015, as stated in the last ICMI audit report. This is in compliance with the five years review requirement. A further costing for third party funding of decommissioning measures is included in the Liberty report as referenced (08/2017).

The NHM Gosowong Cyanide Facility Decommissioning Plan has been approved by the Department of Energy and Mineral Resources, and NHM has paid the appropriate reclamation bond and mine closure bond.



Principle 6 – Worker Safety – Protect Workers Health and Safety from Exposure to Cyanide

Standard of Practice 6.1

Has the operation developed procedures describing how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces, and equipment decontamination prior to maintenance should be conducted to minimise worker exposure, and to ensure that changes to procedures are subject to management of change review?

The operation is in Full compliance Substantial compliance ✓ Non-compliance

Basis for this Finding/Deficiencies Identified:

Numerous procedures have been developed to address a wide range of tasks, including those associated with cyanide. Personnel do not undertake tasks if they are not, by assessment, competent to do so. These procedures are produced in draft and not signed-off until they have been reviewed by relevant managers and their teams. Procedures provide good step-by-step detail and are user-friendly. An Occupational Hygiene Procedure provides a program for hygiene monitoring based on the West Australian system.

A number of procedures have been developed by NHM in relation to cyanide-related tasks as listed. Procedures address purpose, scope, responsibilities, hazards, risk mitigation requirements (in tabular format), training requirements and response to emergencies. All procedures are in a reasonable and user-friendly format.

Procedures do include specific personal protective equipment (PPE) requirements (generally under Section 6).

Pre-work inspections are addressed in the See-Stop-Control Program which is a general requirement across all work carried out.

It is understood that Tool Box meetings and other meetings are used in this respect.

There is a formal process for review of procedures whereby they are sent to relevant department heads for review and approval.

The Procedure – Cyanide Equipment Decontamination Procedure Using Sodium Hypochlorite (09/09/2018) addresses requirements for decontamination of equipment, packaging, PPE and any other material that has been contaminated with cyanide, inclusive of tanks and associated equipment. The procedure is directed at preventing personal exposure and environmental contamination.



The Confined Space Management Plan, which contains good detail, requires a Confined Space Entry Permit to be raised before entry, supported by a Job Safety and Environmental Analysis (JSEA). Section G IV requires purging and/or cleaning of confirmed spaces to be included in the JSEA. Requirements for air quality testing are also included.

A critical procedure, “Management of Change” has been produced and implemented to a certain extent with improvements in training in the process planned for the near future. The Change Management Procedure provides good detail on changes and why change review is necessary. A risk matrix is provided to assess the degree of risk. The procedure addresses when a change review is required for procedural, administrative, process and engineering changes.

There has been some suggestion that the need for change management in specific situations is poorly understood and that some forms are completed after the work has been completed. The change management process is a critical risk control and, as a result, all relevant personnel need to be competent in the process for implementation.

The finding of substantial compliance is based on a system already being in place and commitment to provide MOC training to relevant personnel and that the process to achieve this has already commenced in good faith. It is noted also that a MOC Work Instruction and Guide have been produced and that scheduled training will be provided based on these documents. This area for improvement is readily correctible and does not present an immediate risk to employees, the community or the environment.

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 ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

pH levels are monitored on a continual basis with automatic lime dosing and the pH set at 10.5, which is sufficient to reduce the HCN evolution to an acceptable level for most of the time. Manual checks are made by operators on a scheduled basis. Fixed hydrogen cyanide sensors are provided around areas of hydrogen cyanide risk and personnel are required to wear personal hydrogen cyanide monitors in risk areas. These areas were verified during site inspection. All sensors are bump tested and calibrated in compliance with manufacturer’s instructions.

Alarm actions for operators are detailed in Section 5 of the procedure, as referenced, in tabular format and photographs, and require specific actions for alarms at:

- 10ppm and higher (evacuate to Muster Station/notify main control room/do not return until levels <10ppm and until wearing an HCN monitor)



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- 4.7ppm – 10ppm or potentially unsafe levels (evacuate the immediate area/prepare to wear HCN Monitor/notify Supervisor/request review for irregularities/do not return unless wearing an HCN monitor or static monitor no longer alarms).

Incidents related to cyanide have been reported and correct root causes identified for action as required. Risk of exposure to HCN is incorporated into SOPs as required. The requirement to wear HCN monitors is included in Section 6.6 of Replace Cyanide Pump Procedure. This requirement is also stated in Section 3 of the Procedure and Assessment of Mixes Sodium Cyanide Solution.

HCN alarms were also being used to signify when pH was too low and excessive HCN was being produced. It should be confirmed that the need to evacuate areas is fully understood.

Safety showers were in good condition and monthly checks are carried out in the safety showers. This action is raised through SAP

Fire extinguisher inspection records are maintained and all lines are colour coded/labelled and indicated flow direction. Warning placards and labels were noted to be in good condition.

MSDSs for cyanide were available in English and Indonesian at strategic areas around site. Other safety information was noted to be included in training material and within Material Safety Data Sheets (MSDS).

Placards are provided, as required, by site inspection and tanks are marked.

There is a standard smoking and eating policy enforced. This is reinforced at induction.

Standard of Practice 6.3

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

The operation is in Full compliance Substantial compliance ✓ Non-compliance

Basis for this Finding/Deficiencies Identified:

Advice provided that the NHM clinic is the only nearby facility for treatment of cyanide exposures. The clinic is well positioned to provide response in this regard. In the unlikely event of additional treatment being required, arrangements are in place for medi-vac via the medical contractors.

It is noted that a well-stocked and managed clinic is available on site. A competent Emergency Response Team is also available on a 24/7 basis. A variety of and relevant stock of emergency response equipment is also available and is well maintained. These areas correctly reflect the unavailability of external resources and the resultant need for sufficient internal resources.



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There is availability of oxygen at various locations in the process area ERT area and security. Safety showers, located throughout the Mill area, were confirmed to be in operational condition. Antidote kits (Cyano-kit – essentially hydroxocobalamin) were viewed in the Clinic and were in date. A check register on the oxygen was viewed. Emergency vehicles are available and inspection check sheets were sighted for the fire tenders and ambulances. Communication on site and in vehicles is available via 2-way and mobile phone coverage, and first aid equipment is available at both the mine and the port.

The Emergency Management Plan (EMP) is the overarching document for all emergency response at NHM. It provides specific instruction in relation to cyanide poisoning and credible emergency scenarios related to cyanide and describes requirements for emergency response and crisis management. The Emergency Response Plan (ERP) is supported by six sub-plans, one of which is the Gosowong Cyanide Emergency Response Plan. This Plan covers the following key areas:

- Receiving of cyanide at Barnabas Port, transport to site and use of cyanide, cyanide waste discharge
- Consequences are classified for cyanide – Contained and limited/Uncontrolled/Severe in impact and dollar terms.

Various degree of response applies to each.

- Emergency Management Team (EMT) and Crisis Management Team (CMT) are both required for major and crisis events (level 2 events)
- The plan requires annual review and update or when changes are made
- Mock drills are to be undertaken annually
- A training matrix is provided
- Sodium hypochlorite and other equipment is on site
- There needs to be a specific response to off-site spills in Section 4
- There is no requirement to evacuate in Section 5 table

Cyanide emergency procedures are also provided in:

- Transport Route Selection and Transportation
- Loading and Unloading Procedures
- Cyanide Transportation
- Escort of Material from Port to Site

The Transport Route Selection and Offsite Emergency Management Plan provides response requirements for off-site incidents.

There is a requirement to conduct mock drill exercises annually in the Cyanide Emergency Response Plan. Several were conducted, then reviewed and achievements recorded with areas for improvement (although it was noted that some exercise record forms were not fully completed). There have also been additional exercises. However, some critical and credible emergency exercises, such as fire impacting on cyanide facilities and cyanide spills on route from the Port to Site have not been



undertaken during the certification period. The Cyanide Emergency Response Plan (Section 3.2) requires a liquid cyanide spill exercise during 2016, a cyanide truck incident during 2016 and a fire incident mock exercise during 2016 and 2018. Although there has been substantial improvement in mock exercises during the certification period, these scenarios have not been addressed, although it is recognised that several exercises undertaken during the certification period and supporting training have direct relevance to all exercises listed in the Cyanide Emergency Response Plan.

It is noted that, in good faith, NHM have committed to undertake additional mock emergency response exercises in compliance with the Cyanide Emergency Response Plan. The critical exercise related to an off-site spill event has now been completed. This additional area for improvement is readily correctible and does not present an immediate risk to employees, the community or the environment.

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.

The operation is in Full compliance ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

Detailed emergency plans have been prepared including a plan which is specific to response to credible cyanide emergency events under various environmental conditions. The following are addressed:

- Cyanide (CN) Poisoning Procedure (First aid for various scenarios)
- Detoxification of soils
- Spill to water
- Uncontained spills (wet and dry conditions)
- Contained spills (wet and dry conditions)
- Fire
- Hydrogen cyanide (HCN) release
- Transport on and off site
- Provision of flow diagrams to support understanding
- Pipe, valve and tank ruptures
- Overtopping of ponds
- Power outages and pump failure
- Uncontrolled seepages
- Uploading and mixing
- TSF Failure



The plans provide detail in relation to what needs to be done, when, where and to what standard. Duty cards are also provided for key emergency response personnel.

The Cyanide Emergency Response Plan addresses response to emergencies associated with solid sodium cyanide inside the Port, from the Port of Barnabas to site and within the site itself. Various scenarios for solid sodium cyanide spills are considered including spill in dry conditions, wet conditions and spills to surface waters. All these conditions can exist en-route. Other documents include detail related to response to emergencies. Various response scenarios are provided in the Cyanide Emergency Response Plan and also address evacuation requirements and first aid response. A distance of 100m has been nominated for evacuation of non-essential personnel.

Section 5.10 in the Cyanide Emergency Response Plan addresses Detoxification Plant failure. This section details procedures to be followed in the event of unacceptable levels of WAD cyanide after treatment, exceedance of WAD cyanide from the Water Processing Pond and exceedance of free cyanide in surface waters. The procedure requires to cease discharge and to take steps to rectify any problems, inclusive of monitoring to ensure there has been no unacceptable release to the environment. Contingency measures for exceedance of water quality standards are provided. Flow diagrams are also provided to explain the process for actions and emergency response.

Standard of Practice 7.2

Provide stakeholders the opportunity to communicate issues of concern.

The operation is in Full compliance✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

During the period of certification to which this report relates, it is noted that there has been formal and informal communication and consultation with the community. This has been achieved by a number of formal presentations and site tours for Heads of Districts, schools, universities and community representatives.

Plans have been developed for late 2018 and 2019 addressing target audiences, key messages and a schedule.

It is noted that there is no requirement for external involvement in emergency planning, but awareness has been provided during all interactions with the community.

Standard of Practice 7.3

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

The operation is in Full compliance✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:



There is a stable Emergency Response Team of 18 personnel on site. It is understood that this manning level is maintained at all times, assisted by what is a stable workforce. The General Manager has overall responsibility for response to emergency events, including those associated with cyanide. This is stated in the Cyanide Emergency Response Plan, which details all required areas, as stated in the last ICMI audit report:

- Document Owner – Safety Superintendent
- Roles of the ERT and ERT Captain
- Links with the Crisis Management Team in Melbourne
- Initial notification and response two-yearly training required in fire-fighting, tailings spill, first aid, hazardous materials, cyanide decontamination, cyanide emergency
- PPE available and monitoring equipment
- Containment equipment available and treatment chemicals
- First aid response

An external contractor provides medical response.

Substantial emergency response equipment and a competent Emergency Response Team is confirmed to be available on a 24/7 basis. Records of equipment have been viewed and Emergency Response Team numbers confirmed via training records.

The Gosowong Gold Mine Cyanide Emergency Response Plan provides names, positions and 24hrs numbers for key personnel, inclusive of the ERT Coordinator. The ERT Coordinator maintains a list of ERT contact numbers. The Radio Security Officer has a flow sheet to follow.

Standard of Practice 7.4

Develop procedures for internal and external emergency notification and reporting.

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

All response is provided by NHM personnel.

The combination of plans addresses internal and external notification requirements.

Requirements for initial notification and activation requirements are provided in the Emergency Management Plan. Duty Cards are provided in the Emergency Management Plan. Relevant duty cards require internal and external communication. The External Liaison Officer and Internal Liaison Officer play a role in this regard, but other roles also feed information into these positions and the Crisis Management Team.



The Cyanide Emergency Response Plan provides a listing of Emergency Communications Off-Site. The listing provides names and contact numbers (internal and mobile) for NHM site personnel and, externally, Heads of Districts.

The External Liaison Officer reports to the Emergency Management Team (EMT) Team Leader and is responsible for contact with the media, as stated in Duty Card 6 of the Emergency Response Plan. This contact must only be made after all information on the emergency is received.

Substantial emergency response equipment and a competent Emergency Response Team is available on a 24/7 basis.

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.

The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

Remediation measures are provided in the Cyanide Emergency Response Plan. A Procedure addresses general isolation requirements after a spill, stopping entry of cyanide into water courses, decontamination of areas and requirements to test to ensure all contamination has been removed. A diagram of site decontamination zones is also provided and non-use of hypochlorite solution, ferric sulphate and hydrogen peroxide where contamination of surface waters is a risk. The Procedure also provides for the supply of fresh water to affected communities and provides a consolidation of responses for various scenarios.

There are different decontamination procedures used which are dependent on the location where loss of containment has occurred.

Section 4.3 and 4.4 of the Gosowong Gold Mine Cyanide Emergency Response Plan addresses decontamination procedures for spill events. The Plan includes requirements to establish a decontamination area where possible and to ensure that treatment is carried out where ground does not drain to surface waters. The use of hypochlorite where drainage to surface waters is possible (also stressed in Section 4.5) is prohibited. There is also a requirement to test soil to confirm it is <0.5ppm WAD CN.

Treatment involves the use of lime to increase pH, thus controlling release of HCN, and use of sodium hypochlorite (40t on site) to convert cyanide to the less toxic cyanate.

Good stocks of all chemicals used for detoxification and decontamination are held on site.



The Cyanide Emergency Response Plan requires environmental monitoring to confirm no environmental impact and the extent of any impact. Sampling is required to be undertaken, as relevant, for cyanide in soil, liquid discharge and in water bodies.

Standard of Practice 7.6

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

The operation is in Full compliance Substantial compliance ✓ Non-compliance

Basis for this Finding/Deficiencies Identified:

The Cyanide Emergency Response Plan (CERP) was noted in the last certification period not to have been revised/reviewed on an annual basis, as stipulated in the plan itself. It is noted that the copy of the Plan provided to the auditors is Rev 11 - dated 01/10/18. Prior to this, a revision was dated 20/11/16. There was no revision carried out in 2017.

A number of mock exercise records have been provided and address various credible scenarios. However, it appears that all revisions of the Cyanide Emergency Response Plan (CERP) during the certification period do not appear to relate to deficiencies identified during cyanide incidents or mock exercises. There have also been no other revisions directly resulting from debriefs after mock exercises.

The rating of substantial compliance has been provided on the basis that, with the exception of 2017, the ERP has been revised as required and there is no significant risk as a result of the missing update. It is noted that, in good faith, NHM have now committed to ensure the Cyanide Emergency Response Plan is updated at least annually and when de-briefs dictate that amendments are required.

In addition, A rating of substantial compliance has been provided on the basis that numerous mock exercises have been conducted in comparison to the previous recertification period. Following the on-site assessment by the audit team, a road transport exercise was also conducted on 27th December 2018. This exercise was fully recorded in the relevant report with several photographs provided for verification.

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.



The operation is in Full compliance ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:

- Cyanide safety is addressed to various degrees, dependent on positions, in:
 - Mill Induction
 - ICMC Awareness Presentation
 - Cyanide Handling Module
 - Cyanide Decontamination
 - First Aid
 - Related modules include:
 - Mill shut down and start-up processes
 - Tailings spill clean-up
 - Cyanide decontamination procedure
 - Hazardous Materials
 - Records were noted for:
 - Ore Treatment personnel
 - Managers
 - Environmental personnel
 - Supply and Logistics personnel
 - Electrical personnel
 - Safety personnel
 - ERT personnel

The ERT has also been recorded as attending emergency response training, meetings have been held to discuss cyanide hazards and the training record spreadsheets provide for refresher training. Visitors are provided with basic information on cyanide in the induction but are required to be escorted by a fully trained person at all times.

A variety of training modules have been produced to increase awareness of cyanide hazards and required risk mitigation measures. Training provided is position specific and detailed records are maintained for each individual throughout the organisation structure. Training includes the need to mitigate risk and requirements to respond to emergency events arising from residual risk. A system is in place to provide for refresher training in cyanide hazard recognition and records of expiry dates for courses were sighted in this regard.

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 ✓ **Substantial compliance** **Non-compliance**

Basis for this Finding/Deficiencies Identified:



There have been numerous operating procedures produced, including those associated with cyanide, which include specific step-by-step operating procedures.

A system is in place to verify the competency of operators before they are allowed to carry out specific tasks unsupervised. Verification of competency against these procedures is undertaken, generally after three months of mentoring by experienced personnel. Inexperienced personnel are trained to a basic level and are mentored against cyanide-related Safe Operating Procedures. They are required to attend related cyanide training, including refresher training annually. Verification of competency (VOC) is based on compliance with these operating procedures and records of training for each employee are maintained.

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 Substantial compliance ✓ Non-compliance

Basis for this Finding/Deficiencies Identified:

Training is provided in the procedures to be followed if cyanide is released. This training relates to first response only, as further response is undertaken by the ERT.

Procedures include a Risk and Hazard Control Procedure, which addresses process hazards and environmental spills. The process for raising the alarm is covered in induction material, although it is understood that non-ERT members are not required to respond to cyanide incidents, other than raising the alarm.

Records of training in first aid and cyanide decontamination have been provided and confirm that the training has been provided to other than ERT members. The first aid training record sheet shows 194 persons trained in 2017 and 2018, the majority of who are not ERT members. Cyanide decontamination training records show training has been attended by numerous personnel across all positions on site. Other training as been provided to the ERT in:

- HAZMAT
- ICMC awareness
- Fire fighting
- First aid
- Tailing spill clean-up
- Cyanide decontamination

The required detail of training provided to specific individuals appears well maintained and provides data on supplied spreadsheets and the data base as viewed.



Due to the isolation of facilities, all emergency response is undertaken by onsite trained personnel. External personnel, including community members do not play a hands-on role in emergency response. Numerous ERT drills have been conducted and records sighted. A number have included worker exposure and releases to the environment but have been conducted inside the site boundary. Drill records reviewed provided de-brief information. Some did consider training efficiency and requirements.

All of the above training includes the use of equipment which would be used in an actual emergency.

The ERT Course Matrix includes the use of emergency response equipment for various areas. Examples from the matrix where equipment is required to be used are external training related to HAZMAT, vertical rescue, SCBA and road rescue. Internal training includes fire-fighting and cyanide handling.

Photographs provided showing emergency exercises include use of emergency response equipment.

Refresher training is provided on a scheduled basis and regular mock exercises are undertaken.

A rating of substantial compliance has been provided on the basis that numerous mock exercises have been conducted in comparison to the previous recertification period. Following the on-site assessment by the audit team, a road transport exercise was also conducted on 27th December 2018. This exercise was fully recorded in the relevant report with several photographs provided for verification. This area does not present an immediate risk to employees, the community or the environment in respect of cyanide management.

Principle 9 – DIALOGUE - Engage in public consultation and disclosure

Standard of Practice 9.1

Provide stakeholders the opportunity to communicate issues of concern.

The operation is in Full compliance ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

During the period of certification to which this report relates, it is noted that there has been formal and informal communication and consultation with the community. This has been achieved by a number of formal presentations and site tours for Heads of Districts, schools, universities and community representatives.

Plans have been developed for late 2018 and 2019 addressing target audiences, key messages and a schedule.

It is noted that there is no requirement for external involvement in emergency planning, but awareness has been provided during all interactions with the community.



Standard of Practice 9.2

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

The operation is in Full compliance ✓ Substantial compliance Non-compliance

Basis for this Finding/Deficiencies Identified:

During the period of certification to which this report relates, it is noted that there has been formal and informal communication and consultation with the community and awareness of cyanide hazards and controls. This has been achieved by a number of formal presentations and site tours for Heads of Districts, schools, universities and community representatives.

Plans have been developed for late 2018 and 2019 addressing target audiences, key messages and a schedule.

Standard of Practice 9.3

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

The operation is in Full compliance Substantial compliance ✓ Non-compliance

Basis for this Finding/Deficiencies Identified:

During the period of certification to which this report relates, it is noted that there has been formal and informal communication and consultation with the community and awareness of cyanide hazards and controls. This has been achieved by a number of formal presentations and site tours for Heads of Districts, schools, universities and community representatives.

Plans have been developed for late 2018 and 2019 addressing target audiences, key messages and a schedule.

A flyer has been produced and supplied. This flyer should however be amended to include information which is specifically related to community risk and controls. It is recognised that information has been provided in training material. A rating of substantial compliance has therefore been applied as the area for improvement is readily correctible and does not present an immediate risk to employees, the community or the environment.

The CERP requires notification of the community for off-site impacts. Section 5 also requires notification to the community of any off-site transport incident.

It is noted that, in good faith, NHM have now committed to develop community friendly posters and flyers. This area for improvement is readily correctible and does not present an immediate risk to employees, the community or the environment.



List of acronyms and abbreviations

AGR	Australian Gold Reagents
CEMP	Cyanide Emergency Management Plan
CN	Cyanide
CMT	Crisis Management Team
COW	Contract of Works
EMT	Emergency Management Team
ERP	Emergency Response Plan
ERT	Emergency Response Team
HAZMAT	Hazardous Materials
HCN	Hydrogen Cyanide
ICMC	International Cyanide Management Code
ICMI	International Cyanide Institute
JSEA	Job Safety and Environmental Analysis
NHM	Pt Nusa Halamhera Minerals
mg/L	Milligrams/Litre
MMS	Maintenance Management System
MSDS	Material Safety Date Sheet
MOC	Management of Change
PPE	Personal Protective Equipment
PPM	Parts/Million
QA/QC	Quality Assurance/Quality Control
SAP	Systems Applications and Products
SOP	Standard Operating Procedure
TSF	Tailings Storage Facility
WAD Cyanide	Weak Acid Dissociable Cyanide
WPP	Water Processing Pond