



March 2018

ICMI RE-CERTIFICATION SUMMARY REPORT

Orica Australia Pty Ltd, Cyanide Production (Box to Sparge Facility) Re-Certification Summary Audit Report, Ghana, West Africa

Submitted to:

International Cyanide Management
Institute
(ICMI)
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REPORT



Report Number 1772526.501/A.0

Distribution:

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Table of Contents

1.0	SUMMARY AUDIT REPORT FOR CYANIDE PRODUCTION OPERATIONS.....	1
2.0	LOCATION DETAIL AND DESCRIPTION OF OPERATION	1
2.1	Orica Australia Pty Ltd	1
2.2	Yarwun Production Facility	1
2.3	Tarkwa Box to Sparge Transfer Facility	1
2.4	Barbex Technical Services	1
	SUMMARY AUDIT REPORT	2
	PRINCIPLE 1 – OPERATIONS	3
	PRINCIPLE 2 – WORKER SAFETY	6
	PRINCIPLE 3 – MONITORING	9
	PRINCIPLE 4 – TRAINING	11
	PRINCIPLE 5 – EMERGENCY RESPONSE	13



1.0 SUMMARY AUDIT REPORT FOR CYANIDE PRODUCTION OPERATIONS

Name of Cyanide Production Facility:	Orica Mining Chemicals, Bag to Bulk Transfer - Facility Tarkwa, Ghana
Name of Facility Owner:	Orica Australia Pty Ltd
Name of Facility Operator:	Orica Australia Pty Ltd
Name of Responsible Manager:	Julian Blake, Manager, Africa – Mining Chemicals
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2.0 LOCATION DETAIL AND DESCRIPTION OF OPERATION

2.1 Orica Australia Pty Ltd

Orica is an Australian-owned, publicly listed company with global operations. Orica is managed as discrete business units that produce a wide variety of products and services. The Mining Chemicals unit is based in Australia and exports products to Asia, Africa and the Americas, as well as supplying the local Australian industry.

2.2 Yarwun Production Facility

Orica's Yarwun facility, which is located approximately eight kilometres by road from Gladstone, Queensland, commenced operations in 1989 and is engaged in the manufacture of cyanide (both solid and liquid forms), ammonium nitrate, nitric acid, chlorine, sodium hydroxide, sodium hypochlorite, hydrochloric acid and expanded polystyrene balls. The cyanide production facility at Yarwun was certified by ICMI as being compliant with the Code on 28 November 2006, recertified on 17 March 2010, 29 October 2013 and again in February 2017.

Cyanide manufactured at Yarwun is repackaged at the Transfer Facility in Ghana.

2.3 Tarkwa Box to Sparge Transfer Facility

The Transfer Facility is used by Orica to repackage cyanide from IBCs into sparge isotainers. Orica's Tarkwa Box to Sparge Transfer Facility was certified as being fully compliant with the Code on 8 March 2011 and recertified on 21 October 2014.

2.4 Barbex Technical Services

Barbex was established in 1990 as a logistical support company. In 1997, Barbex constructed a warehouse complex (1200 m²) on the property of the former Teberebie Goldfields in Tarkwa in the Western Region of Ghana. Barbex manage the Transfer Facility on behalf of Orica.



SUMMARY AUDIT REPORT

Auditors Findings

Orica Mining Chemicals,
Tarkwa, Ghana

☒ in full compliance with

☐ in substantial compliance with

☐ not in compliance with

The International
Cyanide Management
Code

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

Audit Company: Golder Associates

Audit Team Leader: Dale Haigh - Lead Auditor

Email: dhaigh@golder.com


Dates of Audit

The field component of the audit was undertaken 6 – 8 November 2017.

The audit was undertaken by Dale Haigh and Elizabeth Sarpey both of Golder Associates. Dale Haigh is pre-certified as an ICMI Lead Auditor and ICMC Production Specialist and he acted in this capacity during the audit.

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

Orica Mining Chemicals, Tarkwa, Ghana		15 March 2018
<u>Name of Facility</u>	<u>Signature of Lead Auditor</u>	<u>Date</u>

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0



Signature of Lead Auditor

Date: 15 March 2018



PRINCIPLE 1 – OPERATIONS

Design, Construct and Operated Cyanide Production Facilities to Prevent Release of Cyanide

Production Practice 1.1: Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures

☒ in full compliance with

The operation is

☐ in substantial compliance with

Operations Practice 1.1

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 1.1 requiring the operation design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.

Quality control and quality assurance (QA/QC) programs for the design of Transfer Facility were addressed during the March 2014 Certification Audit.

Since the 2014 audit, the Transfer Facility has been subject to the minor modifications relevant to the ICMC. Notably, the reconstruction of a boundary wall within the Transfer Facility. An integrity test was completed on the wall which formed part of the facilities secondary containment.

The materials used for construction of cyanide production facilities appear to be compatible with the reagents used and the processes employed.

Automatic systems, or “interlocks”, to shut down production systems and prevent releases due to power outages or equipment failures are not required due to safety features designed into the Transfer Facility. Key features.

Arrangements are in place to prevent overfilling of isotainers. Cyanide is managed on a concrete surface that can minimise seepage to the subsurface. All cyanide storage, transfers and the handling of waste packaging occurs in roofed warehouses on concrete floors.

Epoxy coating has been applied to the surface of the concrete in the Transfer Area, Waste Area and the Secondary containments are provided for process and storage tanks and containers constructed of materials that provide a competent barrier to leakage, and which are sized to hold a volume greater than that of the largest tank or container within the containment and any piping draining back to the tank.

The isotainer loading bay is considered to be secondary containment. It is sealed with concrete on the surface and sides to increase its effectiveness in containing any solid cyanoids spilled during filling. The loading bay is enclosed from the weather on three sides by concrete to a height of approximately 1,200 mm above ground surface and by aluminium cladding to the top of the building.

Methods to prevent the overfilling of cyanide process and storage vessels are used at the Transfer Facility.

In addition to the formalised checks, the operators can readily see whether the transfer hopper has sufficient capacity to hold a bag of cyanoids before introducing the bag to the hopper for discharge.



ICMI RE-CERTIFICATION SUMMARY REPORT

Production Practice 1.2: Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Operations Practice 1.2

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 1.2 requiring the development and implementation of plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

The facility has plans and procedures that describe the standard practices necessary for its safe and environmentally sound operation. The main procedures in use at the Transfer Facility were originally developed by employees at Orica's Yarwun Cyanide Production Facility based on experience and systems for the isotainer filling undertaken at the Yarwun Facility. The procedure is reviewed regularly.

The Transfer Facility has procedures for contingencies during upsets in its activities that may result in cyanide exposures or releases.

The operation does have procedures to identify when site operating practices have or will be changed from those on which the initial design and operating practices were predicated. Orica has updated the procedure and rolled out the new procedure to the operation.

Orica has preventive maintenance programs implemented and activities documented for equipment and devices necessary for cyanide production and handling. Orica also maintains an Active Tracker system that captures planned preventative maintenance for all its activities.

Process parameters are monitored with necessary instrumentation. The nature of the operation is such that process instrumentation does not play a critical role in managing the risk of potential exposures and releases and so there are no instruments required to be calibrated according to manufacturer's recommendations.

The Transfer Facility has an environmentally sound procedure to prevent unauthorised/unregulated discharge to the environment of any cyanide solution or cyanide-contaminated water that is collected in a secondary containment area within the designed Transfer Facility.

The Transfer Facility does have environmentally sound procedures for the disposal of waste cyanide packaging. The site has arranged with Vehrad Transport and Haulage to dispose of the cyanide contaminated solids (packaging waste) within their EPA approved incineration facility. Vehrad are an ICMC certified transporter and cyanide producer. Use of this disposal method has been in effect since January 2014.

Cyanide is stored with adequate ventilation to prevent the build-up of hydrogen cyanide gas. Cyanide is stored in IBCs in naturally ventilated warehouses. Cyanide is stored with measures to avoid or minimise the potential for exposure of cyanide to moisture. All cyanide stored onsite is contained in IBCs within roofed warehouses and sealed floors to prevent contact with moisture. Cyanide is stored in a secure area where public access is prohibited. Sparge isotainers are sealed and transported to customers once they have been loaded.

Procedural arrangements are in place to allow cyanide to be packaged as required by the political jurisdictions through which loads will pass. Orica monitors international legislation applicable to its supply of cyanide throughout the world and has determined that there is no specific legislation covering the transport of dangerous goods in Ghana at this time. However, Ghana is a signatory to the International *Maritime Dangerous Goods Code*, which establishes a reasonable expectation that dangerous goods transported within Ghana will be transported to international standards or higher.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

4





ICMI RE-CERTIFICATION SUMMARY REPORT

Production Practice 1.3: Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Operations Practice 1.3

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 1.3 requiring the inspection of cyanide production facilities to ensure their integrity and prevent accidental releases.

Routine inspections are conducted on tanks, valves, pipelines, containments and other cyanide production and storage facilities with the Orica Designed Transfer Facility. The major plant items that require inspection are those used in the handling of solid sodium cyanide from boxes through the transfer system to the isotainers. The checklists developed by Orica address the inspection of these facilities for their integrity and signs of leaks in detail. Inspections are performed for each batch of cyanide going through the plant (weekly) and these inspections are recorded.

Inspection frequencies are sufficient to assure that equipment is functioning within design parameters. Checklists are used for documenting inspections that occur batch-wise, weekly and fortnightly. There are no obvious deficiencies in the distribution of actions throughout these lists. Based on conditions observed during the audit, there is no evidence to suggest that inspections should be carried out more frequently than is currently the case.

Inspections are documented. The documentation (internal inspection checklists) identifies specific items observed and includes the date of the inspection, the name of the inspector, and observed deficiencies.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018



PRINCIPLE 2 – WORKER SAFETY

Protect Workers' Health and Safety from Exposure to Cyanide

Production Practice 2.1: Develop and implement procedures to protect plant personnel from exposure to cyanide.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Worker Safety Practice 2.1

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 2.1 requiring the facility to develop and implement procedures to protect plant personnel from exposure to cyanide.

Orica has developed formal procedures to minimise worker exposure during:

- Normal plant operations from receipt of raw materials through finished product packaging and shipping, Non-routine and emergency operations and Maintenance related activities.

The main procedures in use at the Transfer Facility were originally developed by employees at Orica's Yarwun Cyanide Production Facility based on experience and systems for the isotainer filling undertaken at the Yarwun facility.

The facility has implemented procedures to review proposed process and operational changes and modifications for their potential impacts on worker health and safety, and incorporate the necessary worker protection measures. The *Management of Change* procedure reflects the new management arrangements at the site. The procedure requires the use of the *Alteration Authorisation* form that includes an assessment of impact across, safety, environment, plant, quality, engineering, materials and controls systems and includes a completion checklist. Examples of completed modification assessments were observed during the site visit.

Orica through Barbex solicits and considers worker input in developing and evaluating health and safety procedures. Weekly SHE Meetings are used to obtain input regarding its health and safety procedures. Worker evaluation is also undertaken as part of employee training and during this exercise employees may also provide feedback.

The facility uses monitoring devices to confirm that controls are adequate to limit worker exposure to hydrogen cyanide gas and sodium, calcium or potassium cyanide dust to 4.7 parts per million (5 mg/m³) or less, as cyanide. Personal HCN monitors (Toxipro) are available and used in designated areas. The devices are set to alarm at 4.7 ppm and the facility requires individuals working with the transfer facility to wear a personal HCN monitor. HCN monitors are also required for unloading containers and entering the bonded warehouse.

Hydrogen cyanide monitoring equipment is maintained, tested and calibrated in accordance with manufacturer's requirements. Calibration records were available for the monitors observed on site.

Orica has identified areas and activities where workers may be exposed to HCN gas or sodium cyanide dust and requires the use of personal protective equipment, as necessary, in these areas when these activities are being performed.

If monitoring results suggest HCN levels greater than the alarm level of 4.7 ppm then use of an air powered respirator is required and use of a chemcoat with continued monitoring. If levels continue to increase up to 10 ppm then work must cease, employees must leave the area and report this to the supervisor.

The operation requires the use of PPE (including blue overalls, Air Powered RPE system with ABEK1 cartridges, PVC gauntlets, and wellington boots) and HCN detectors for any activities within the blue line.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018



ICMI RE-CERTIFICATION SUMMARY REPORT

Orica has provisions to ensure that a buddy system is used, or workers can otherwise notify or communicate with other personnel for assistance, help or aid where deemed necessary. Each work team has a supervisor that oversees the work crew and can raise the alarm verbally.

Orica through Barbex, does assess the health of employees to determine their fitness to perform their specified tasks and has established an arrangement with the Tarkwa Medical and Occupational Health Centre (although a smaller number have been performed by International SOS) for the provision of worker health services including pre-employment and periodical medicals. The pre-employment medical includes a drug and alcohol screen. Medical screening is performed on an annual basis and includes height, weight, x ray, blood sampling and testing, vision tests and hearing tests.

The facility does have a clothing change policy or procedure for employees, contractors and visitors to areas with the potential for cyanide contamination of clothing.

Warning signs are posted advising workers that cyanide is present and the necessary personal protective equipment that must be worn. Signage is placed at strategic locations around the facilities including the front entrance to the site, and entrance to the blue line areas.

Personnel are prohibited from smoking, eating and drinking, and having open flames within the Transfer Facility.

Production Practice 2.2: Develop and implement plans and procedures for rapid and effective response to cyanide exposure.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Worker Safety Practice 2.2

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 2.2 requiring the development and implementation of plans and procedures for rapid and effective response to cyanide exposure.

Barbex has written an Emergency Response Plan that includes activation, response, resources, preparedness, and first aid/treatment. It also references the Orica Emergency Response Guide.

Orica has developed specific written emergency response plans for cyanide exposures that are relevant to the Transfer Facility. Scheduled training and instruction on emergency response (during induction and specific Emergency Response training events) provides background on actions in the event of an emergency and includes instruction to administer oxygen if the casualty is not breathing.

Showers, low-pressure eye wash stations and non-acidic fire extinguishers are located at strategic locations throughout the Transfer Facility. Dry powder fire extinguishers were observed throughout the Transfer Facility and the pressure indicated that the extinguishers were charged. No carbon dioxide fire extinguishers were observed.

The Transfer Facility has medical oxygen, a resuscitator, antidote and a means of communication or emergency notification. Water is available at the facility through the safety shower system and there are hose connections around the facility. Safety showers are located strategically in the cyanide areas for ready access and are inspected daily. First aid equipment is inspected regularly.

A review of weekly inspection checklists shows they are completed regularly and equipment observed during the inspection was found to be available and in serviceable condition.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

7





ICMI RE-CERTIFICATION SUMMARY REPORT

Material Safety Data Sheets (MSDS) and first aid procedures on cyanide safety are in the language of the workforce (English) and are available to workers at the Transfer Facility. Notices concerning the symptoms of cyanide poisoning and first aid measure to be taken were also observed throughout the site. The information notices were produced by Orica. All the signs and procedures are in English, which is the official language of Ghana.

Storage tanks, containers and piping containing cyanide are identified to alert workers of their contents.

The Transfer Facility has a clothing change procedure for employees, contractors and visitors to areas with the potential for cyanide contamination of clothing.

The Transfer Facility has its own on-site capability to provide first aid, but not medical assistance to workers exposed to cyanide. All Transfer Facility personnel are trained in First Aid (every three years) and in the administration of oxygen (as part of annual emergency response training).

The Transfer Facility has a procedure to transport exposed workers to locally qualified, off-site medical facilities.

The Transfer Facility has alerted two local hospitals (Sam Jonah Hospital and Tarkwa Municipal Hospital) of the potential need to treat patients for cyanide exposure, and the operation is confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures.

The Transfer Facility has developed a procedure to transport exposed workers to locally qualified, off-site medical facilities. The ERP plan provides details on cyanide treatment and response. Scheduled training provides instruction on how to administer oxygen if the casualty is not breathing. In the event that, medical treatment is required, the response coordinator makes telephone contact with the Sam Jonah Hospital to raise the alert. Meanwhile, oxygen administration is continued whilst the affected person is transported to the Hospital.

The antidote available at the Sam Jonah medical facility are Cyanokit containing Hydroxocobalamin.

The Transfer Facility has alerted two local hospitals (Sam Jonah Hospital and Tarkwa Municipal Hospital) of the potential need to treat patients for cyanide exposure, and the operation is confident that the medical facility has adequate, qualified staff, equipment and expertise to respond to cyanide exposures. Barbex has established a relationship with the hospitals to provide routine medical support, including medical assessment of employees. The letter sent to the hospitals was followed up with a meeting where provision of support was discussed.

The Sam Jonah Hospital provides the ambulance services and have 2 equipped ambulances for this requirement. One is an advanced life support ambulance and the other a basic life support ambulance. The hospital has confirmed that they will provide the ambulances when required.

Mock emergency drills are conducted periodically to test response procedures for various exposure scenarios; and lessons learnt are incorporated into response planning. The operation has conducted numerous drills during the audit period. Documented corrective actions are tracked to completion in Orica's Action Tracker.

Procedures are in place to investigate and evaluate cyanide exposure incidents to determine if the Transfer Facility's programmes and procedures, to protect worker health and safety and to respond to cyanide exposures, are adequate or need to be revised. The Site has a formalised incident reporting procedure. There has been no cyanide exposures during the audit period.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018



PRINCIPLE 3 – MONITORING

Ensure that Process Controls are Protective of the Environment.

Production Practice 3.1: Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Monitoring Practice 3.1

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 3.1 requiring environmental monitoring to be conducted to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

The site does not have a direct discharge to surface water.

WAD cyanide concentrations in groundwater at the Transfer Facility are at or below levels that are protective of identified beneficial uses of the groundwater. The site installed three groundwater monitoring bores to monitor groundwater at the Transfer Facility during October 2007. The boreholes were positioned by a hydrogeologist with knowledge of geology and hydrogeology of the immediate area. Groundwater monitoring results during 2014-2017 were below 0.07 mg/L of WAD and free cyanide.

Seepage from the facility has not caused the cyanide concentration of the groundwater to exceed that necessary to protect its beneficial use. The Transfer Facility is not engaged in remedial activity to prevent further degradation and restore beneficial uses. Based on the groundwater monitoring results provided, no remedial action is required at the facility.

The Transfer Facility limits atmospheric process emissions of HCN gas, such that the health of workers and the community are protected. Four main activities have been identified in the Transfer Facility where atmospheric process emissions of HCN have the potential to affect the health of workers. The site has developed controls for minimising emissions of hydrogen cyanide during the Transfer Facility operations.

The Ghana EPA does not provide numerical limits for atmospheric emissions of cyanide. The exposure limits adopted for hydrogen cyanide at the Transfer Facility are based on the standards applicable to sodium cyanide as published on the Orica Safety Data Sheet. Those limits are 4.7 ppm over an eight hour period and 10 ppm peak limitation. The Orica Safety Data Sheet is based on the Australian National Occupational Health and Safety Commission where Orica's headquarters is based. All employees working in areas with the potential for HCN generation are required to wear HCN monitors that are set to alarm at 4.7 ppm and 10 ppm HCN. If monitoring results suggest HCN levels greater than the alarm level of 4.7 ppm then use of an air powered respirator is required and use of a chemcoat with continued monitoring. If levels continue to increase up to 10 ppm then work must cease, employees must leave the area and report this to the supervisor.

There are no communities in close proximity to the Transfer Facility however potential receptors are Metso Minerals and AngloGold Ashanti Iduapriem who share the western and northern boundaries respectively. These are located approximately 100 meters from the transfer facility.

Ambient air is monitored at the site using a portable HCN monitors.

Regulatory monitoring is conducted every six months by the Ghanaian Regulator the Inspectorate Division of Minerals Commission.

Monitoring is conducted at the sparging area, warehouses, incinerator area and general yard. No ambient air regulatory guideline has been established for HCN. Review of the results over the reporting period indicated that results for HCN ranged between <0.01 to 1.4 ppm.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

9





ICMI RE-CERTIFICATION SUMMARY REPORT

Orica monitors for cyanide in surface and groundwater up-gradient and downgradient of the site. The monitoring is for information purposes only as the Transfer Facility (including its waste disposal activities) involves the repackaging or disposal of solid product in an enclosed warehouse with sealed floors.

Weekly samples are monitored for free cyanide using a Merck Cyanide Microquant test kit which is capable of testing free cyanide levels between 0.03 to 5 mg/L free cyanide.

Monthly samples are sent to SGS laboratories in Tema, Ghana for Free and WAD cyanide analysis. A review of monitoring results for 2014 to 2017 indicated free cyanide levels <0.03 mg/L free cyanide using the Microquant. SGS results between January 2014 and September 2017 indicate free and WAD cyanide levels of <0.01 mg/L.

The monitoring results indicate consistent trends in both media. The only aberration is that the shallow groundwater bores do not always yield a sample of perched groundwater (due to being dry). Given the consistent trends in monitoring data and that cyanide is handled predominantly in dry form in a sheltered building with sealed floor surfaces, it is concluded that monitoring is conducted at frequencies adequate to characterise both the groundwater and surface water.

Health and safety monitoring for cyanide in air is undertaken through the use, of personal monitors. The personal detectors are used daily for the duration that a worker is handling cyanide.

Regulatory monitoring is conducted every six months by the Ghanaian Regulator the Inspectorate Division of Minerals Commission. The Inspectorate Division of Minerals Commission monitors for number of parameters including cyanide and all results for the audit period were observed to be below 4.7 ppm.



PRINCIPLE 4 – TRAINING

Train Workers and Emergency Response Personnel to Manage Cyanide in a Safe and Environmentally Protective Manner

Production Practice 4.1: Train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Training Practice 4.1

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 4.1 requiring employees to be trained to operate the plant in a manner that minimises the potential for cyanide exposures and releases.

The Transfer Facility trains workers to understand the hazards of cyanide and refresher training is periodically conducted. The Orica Mining Chemicals Sodium Cyanide Safety Awareness (Cyanide Safety Awareness) Presentation is provided to all staff on a yearly basis.

Records were made available to demonstrate that the Cyanide Safety Awareness training was conducted on an annual basis during 2015, 2016 and 2017.

The facility does train workers in the use of personal protective equipment and when and where this equipment is required, through the induction process (including induction and cyanide awareness training) and through site signage.

Workers are trained to perform their normal production tasks. The materials used for Sodium Cyanide Box to Sparge Training are comprehensive. They include photographs of key equipment (PPE, sparge isotainer, flange guards, transfer hatch access point, transfer hopper and chute, crane hoist including bag lifter and bag splitter) and steps involved in its use. Training records were observed confirming that training had been conducted in accordance with the training matrix.

Worker evaluation is also performed, as a means, to assess the effectiveness of training and determine if further training is required. Barbex in consultation with Orica personnel have developed a training matrix to manage the training requirements for all employees and visitors entering the Transfer Facility. A record of training undertaken by specific personnel

In addition to the training needs identified, worker evaluation is performed and recorded. Examples of worker evaluation forms were observed during the site visit.

Personnel at the operation have been trained by suitably qualified personnel. The initial training of operators was undertaken by Orica at the time of establishing the operation in a train the trainer forum. Training is provided by the Barbex Safety Advisors and by Orica who have a range of qualifications including related degree and NEBOSH and OSHA certifications.

The operation utilises external trainers for first aid training (St Johns) and initial forklift certification (Road Safety Limited) as per local requirements.

The facility evaluates the effectiveness of cyanide training by testing.

The documentation on which these evaluations have been based is filed in individual staff files. The evaluations are conducted in English, which is the official language of Ghana.



ICMI RE-CERTIFICATION SUMMARY REPORT

Production Practice 4.2: Train employees to respond to cyanide exposures and releases.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Training Practice 4.2

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 4.2 requiring employees to be trained to respond to cyanide exposures and releases.

The facility trains workers in the procedures to be followed if a cyanide release is discovered. Emergency response training for the Emergency Response Team is provided by Barbex. The annual training includes Emergency Response, Fire/Fire extinguishers, Incident Management, and PPE and MSDS training. Additional training includes: First Aid and Sodium Cyanide Safety Guidelines.

Non-Emergency Response Team also receive training on the Emergency Response plan.

The facility trains workers to respond to worker exposure to cyanide and routine drills are used to test and improve their response skills. The main component of training for workers is the Cyanide Awareness Training package that provides information on response actions. Workers are involved in mock drill exercises.

The operation has conducted numerous drills during the audit period. These drills are documented and the report includes a review of the drill along with any identified corrective actions which are tracked to completion with the Orica Action Tracker system.

Emergency drills are evaluated from a training aspect to determine if personnel have the knowledge and skills required for effective response.

The ERP requires emergency response simulation drills to be conducted twice a year whereby one specific aspect of the plan is evaluated at a time.

Confirmation of training attendance/participation records are retained throughout an individual's employment documenting the training they have received, including the names of the employee and the trainer, the date of training, the topics covered. The records indicate whether an employee demonstrated an understanding of the training materials. This is done either through a question and answer sheet or through the trainer's observations after verbalising the questions. Each worker also carries a passport detailing the training undertaken.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

12





PRINCIPLE 5 – EMERGENCY RESPONSE

Protect Communities and the Environment through the Development of Emergency Response Strategies and Capabilities.

Production Practice 5.1: Prepare detailed emergency response plans for potential cyanide releases.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.1

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.1 requiring a detailed emergency response plan for potential cyanide releases.

There is an ERP for the management of cyanide related emergencies associated with the Transfer Facility and cyanide transportation.

The Orica Mining Chemical Sodium Cyanide Emergency Response Guide is included in the ERP as an Appendix. The ERP was developed by Barbex with the assistance of Orica to ensure the ERP is consistent with emergency response guidance issued to Barbex by Orica. Orica provides oversight of the ERP and is provided opportunity to comment on revisions to the ERP.

The ERP considers the result of potential failure scenarios appropriate for its site-specific environmental and operating circumstances. In the event of an incident, the following is conducted in order of priority.

Protection and rescue of human life, Minimisation of the area impacted by the incident, Protection of plant, property and the natural and built environment, Rendering safe the incident scene and surrounding area, Decontamination and recovery of goods and equipment where practicable and Decontamination and rehabilitation of the incident scene and surrounding area.

The ERP contains sufficient procedural information to allow these actions to be conducted and details persons responsible to undertake the actions. These actions have been specified for three basic scenarios: dry sodium cyanide spill; sodium cyanide spill to water and fire.

Additional procedures have been developed to deal with spills inside, outside of the warehouse and within a sea container. Due to the nature of the operation, rupture of tanks, power outages and overtopping of ponds or impoundments are not applicable.

Production Practice 5.2: Involve site personnel and stakeholders in the planning process.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.2

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.2 requiring the operation to involving site personnel and stakeholders in the planning process.

The Transfer Facility has involved its workforce and stakeholders in the emergency response planning process. The workforce and stakeholders assigned emergency response duties are specified within the ERP. Section 5.5.1 (Emergency Response Duties) and 5.5.2 (Emergency Response Procedures) of the ERP details the duties and response actions required for individual persons involved in the management of the emergency.



ICMI RE-CERTIFICATION SUMMARY REPORT

Letters have been sent to key stakeholders (Hospitals, Fire service and Police Service) with Barbex completing a follow up discussion with the hospital each year. Copies of the Orica and Barbex ERP have been sent to the Ghana EPA and the Minerals Commission, Ghana during the audit period.

Communities have not been consulted within regard to Transfer Facility specific emergencies as no community or neighbouring business has been identified as having the potential to be affected, based on a review of the three basic release scenarios described in the ERP. This is due to the small volume of spilt product, the physical nature of the product (solid) and the distances involved.

Local response agencies such as outside responders and medical facilities have been involved in the emergency planning and response process. External responders include medical facilities, police and mine emergency response teams.

Police emergency services, and mine site responders, have been advised of their responsibilities in writing. The roles and responsibilities of the police are consistent with their normal duties associated with traffic and crowd control. Fire services for the Transfer Facility are provided by the Ghana National Fire Service Tarkwa District (Western Region).

Production Practice 5.3: Designate appropriate personnel and commit necessary equipment and resources for emergency response.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.3

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.3 requiring designated appropriate personnel and committed equipment and resources for emergency response.

The ERP:

- Designates primary and alternate emergency response coordinators. The coordinators have authority to commit resources necessary to implement the ERP during an emergency situation;
- Identifies Emergency Response Teams. Each team consists of a Team Leader and four Responders. Contact numbers for the ERT and other internal emergency numbers are listed;
- List minimum training for ERT and the training frequency. It also lists the requirement for yearly mock drills;
- Includes call-out procedures and 24-hour contact information for the coordinators and response team members;
- Specifies the duties and responsibilities of the all personnel involved in an incident, including external responders; and
- Includes a requirement to inspect all emergency response equipment kept in the Barbex warehouse, in trucks and escort vehicles.

External responders, medical facilities and communities have been advised of their roles and/or mutual aid during an emergency response. However, the nature of the Transfer Facility operation, and limited local availability of qualified external responders means that emergency response is largely self-contained.

The ERP identifies the roles and responsibilities of outside responders, and Barbex has advised them of their designated responsibilities through correspondence and their involvement in emergency response exercises.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

14





ICMI RE-CERTIFICATION SUMMARY REPORT

Production Practice 5.4: Develop procedures for internal and external emergency notification and reporting.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.5

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.4 requiring development of procedures for internal and external emergency notification and reporting.

Procedures and contact information for notifying the shipper, the receiver/consignee (various mines), regulatory agencies (EPA), outside response providers, medical facilities and potentially affected communities of an emergency are all contained in an Appendix of the ERP.

The ERP includes procedures and contact information for notifying potentially affected communities of incidents and/or response measures.

The Transfer Facility is located on the AngloGold Ashanti Iduapriem mining lease adjacent to the Goldfields Tarkwa mining lease. The closest community is approximately five kilometres from the Transfer Facility gate. Due to the nature of activities communities are unlikely to be impacted and have not been consulted with regard to Transfer Facility specific emergencies.

Responsibilities have been allocated within the ERP for communicating with the media. The ERP designates the Barbex Site Manager as the media contact in relaying important information between the organisation and the media.

Production Practice 5.5: Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.2

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.5 requiring the operation to incorporate monitoring elements that account for the additional hazards of using cyanide treatment chemicals into response plans and remediation measures.

The ERP describes specific, appropriate remediation measures, such as recovery or neutralisation of solutions or solids, decontamination of soils or other contaminated media and management and/or disposal of spill clean-up debris, and provision of an alternate drinking water supply, as appropriate.

The ERP details steps for cleaning up and decontaminating an area specifically for persons, clothing including PPE and contaminated areas and equipment.

An Appendix of the ERP also includes procedures for remediation, such as recovery or neutralisation of solutions or solids, decontamination of soils or other contaminated media and management of spill clean-up debris.

The ERP does specifically prohibit the use of chemicals such as sodium hypochlorite, ferrous sulphate and hydrogen peroxide to treat cyanide that has been released into surface water.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

15





ICMI RE-CERTIFICATION SUMMARY REPORT

The ERP does address the potential need for environmental monitoring to identify the extent and effects of a release. The ERP states that Barbex shall arrange for the incident area to be monitored in conjunction with the Ghana EPA and in accordance with direction from the Ghana EPA and the product manufacturer. The ERP details a monitoring programme to be implemented in the event of an accident or incident involving a cyanide release.

Appendices of the ERP also address the potential need for environmental monitoring to identify the extent and effects of a release; generic information of environmental monitoring and test methods for cyanide on surfaces, in water and soil.

Production Practice 5.6: Periodically evaluate response procedures and capabilities and revise them as needed.

☒ in full compliance with

The operation is

☐ in substantial compliance with

Emergency Response Practice 5.6

☐ not in compliance with

Summarise the basis for this Finding/Deficiencies Identified:

The operation is in FULL COMPLIANCE with Production Practice 5.6 requiring the operation to periodically evaluate response procedures and capabilities and revise them as needed.

The ERP contains provisions for periodically reviewing and evaluating the ERP's adequacy and they are being implemented. The ERP (Revision 17) was last reviewed on 25 August, 2017.

Mock emergency drills are conducted periodically as part of the ERP evaluation process. The ERP requires mock drills to be performed twice annually. The operation has conducted numerous drills during the audit period. Briefing notes are produced at the end of each mock drill. The briefing notes are used to amend the ERP where appropriate.

Name of Facility :

Orica Mining Chemicals, Tarkwa, Ghana

March 2018

Report No. 1772526.501/A.0

Signature of Lead Auditor

Date: 15 March 2018

16





Report Signature Page

GOLDER ASSOCIATES (UK) LTD

Dale Haigh
ICIM Production Specialist/Lead Author

Sophie Wheeler
Senior Auditor

Date: 15 March 2018

DH/EC/SW/pw

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INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

Auditor Credentials Form

Facility Audited: Orica Box to Sparge Bulk Cyanide Transfer Facility (Transfer Facility) in Ghana, West Africa

Date: 14 March 2018

Auditor and Technical Specialist Credentials:

Lead Auditor: Dale Haigh
 Auditor Certification Date: From 2010
 Certifying Organization: Institute of Environmental Management and Assessment (IEMA)
 Telephone Number: +44 (0)1522 540 069
 Address: IEMA, City Office Park, Tritton Road, Lincoln, LN6 7AS, UK
 Web Site Address: www.iema.net
 Minimum experience: 4 Audits in past 7 years as Lead Auditor

Year	Type of Facility, Type of Audit Led	Country
2017	EHS audit of large scale chemical manufacturing facility	Netherlands
2017	Recertification transportation audit for Verhad Transportation	Ghana
2016	Transportation audit under ICMI for Catoni, Georgia	Georgia
2016	EHS and process review of pharmaceutical manufacturing facility in UK. Lead Auditor.	UK
2015/2016	EHS compliance and due diligence audit at an engineering manufacturing facility in Ireland. Lead Auditor.	Ireland
2015/2016	EHS compliance and due diligence audit at 6 hazardous waste treatment facilities in Ireland and the UK. Lead Auditor.	Ireland / UK
2015	EHS compliance including explosive atmosphere assessment at 2 Eaton facilities in Cambridge and Titchfield in the UK. Lead Auditor.	UK
2014	EHS compliance audit for pharmaceutical manufacturing facility in Tilburg, Netherlands. Lead Auditor	Netherlands
2014	Lučební závody Draslovka a.s. Kolín, ICMI Manufacturing Re-certification, Transport Specialist Auditor	Czech Republic
2014	Bombardier Transportation EHS compliance audits for 3 sites in Plymouth, Crewe and Mansfield. Lead Auditor.	UK
2010 to 2014	Risk based EHS, process, management of change and Business continuity reviews for over 20 pharmaceutical contract manufacturing facilities at various locations including UK, Finland, France, Germany, Italy, Norway, Spain, Sweden and Switzerland, with reviews of other work in South Africa, South America and China. Led reviews and was sole reviewer on behalf of Pfizer. Helped train small team of reviewers (6) to provide world wide support to Pfizer. Lead Auditor for > 20 sites.	Europe
2013	Hebei Chengxin Transport Co Ltd, Lead Auditor	China
2013	EHS compliance audit at 5 Eaton facilities in Burton on the Wolds, Bristol, Aldridge, Luton, Watford, UK. Lead Auditor. Also provided review role for several other facilities in the UK.	UK

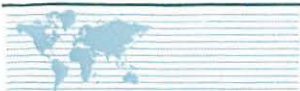


Year	Type of Facility, Type of Audit Led	Country
2012	Lead auditor for EHS review of chemical manufacturing facility in the UK and identification of related issues at other facilities worldwide (Arizona Chemicals) in Chester le Street, UK. Lead auditor.	UK
2011	Freight Forwarders Tanzania, ICMI Re-certification Audit, Transport Specialist Auditor	Dar es Salaam, Tanzania
2011	Freight Forwarders Kenya, ICMI Re-certification Audit, Transport Specialist Auditor	Mombasa, Kenya
2011	Orica Chemicals Bag to Bulk transfer facility, Production and Transport Specialist Auditor	Lima, Peru
2010	Project Manager for assessment of contaminant storage and landfill at a chemical manufacturing facility in the UK. Included assessment and review of mercury, lead, arsenic, cadmium and zinc management options for contaminants. Lead auditor.	UK
2010	EHS audit (including chemical process review, emergency response, hazardous material management and assessment of chemical exposure), and limited scope HAZOP for fuel cell manufacture for packaging facility in Ireland. Lead auditor.	Ireland
2010	EHS Compliance review for two automotive manufacturing facilities in UK and subsequent EHS system development at one facility. Lead auditor.	UK
2010	EHS audit of chemical works in the UK for third party and identification of issues relevant to development of new manufacturing process on Site. Lead auditor.	UK
2010	Waste minimisation review of pharmaceutical manufacturer in UK. Included review of manufacturing and R&D activities, identification of waste stream, review of storage, handling and treatment facilities and development of minimisation and improved treatment recommendations. Lead auditor.	UK

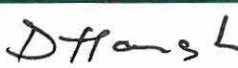
Cyanide-related Operations Experience

Each auditor must have at least 3 years; at least one auditor must have at least 7 years' experience

Auditor	Yrs.	Relevant Position Titles	Types of Operations
Dale Haigh	25	Production and Transport Technical Specialist and Lead Auditor	Dale is a senior Environmental, Health and Safety (EHS) consultant, project manager/director and Associate with Golder Associates and has over 25 years' experience applied to a wide range of EHS services. He is certified as a production and transport specialist and lead auditor with the International Cyanide Code and has significant chemical industry experience. Dale has previously completed transportation and production ICMI audits in Europe, South America, Asia and Africa.

**Statement of No Conflict**

I certify that I have not audited any component of this facility for which I was responsible for design or development; nor have I within the past year been an employee of the facility, its parent company, or associated affiliates. Excluding audits, I have not derived more than 30% of my income within the past 5 years from the facility, its parent, or associated affiliates. I have not participated in more than two consecutive Cyanide Code audits of this facility. I have participated in at least 3 health, safety, and/or environmental audits in the past 7 years and am familiar with standard audit procedures as well as with the protocols developed by the International Cyanide Management Institute for implementation of the Code.

Signed	Name	Signature	Date
Lead Auditor*	Dale Haigh		14 March 2018

Use additional pages if necessary

*The lead auditor's signature must be certified by notarization or equivalent.

R. Ofe
RUTH STEPHENS
(Solicitor)

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As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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