

# SUMMARY AUDIT REPORT

## INTERNATIONAL CYANIDE MANAGEMENT CODE GOLD MINING OPERATION VERIFICATION AUDIT

### MARIGOLD MINE, NEVADA USA



#### Submitted to

#### INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

1400 I STREET, N.W., SUITE 550  
WASHINGTON, D.C. 20005



#### and

#### MARIGOLD MINING COMPANY (A SILVER STANDARD RESOURCES INC. COMPANY)

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#### Prepared by

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## UNITS OF MEASURE AND ABBREVIATIONS

ADR	Adsorption, Desorption and Recovery
BLM	U.S. Department of Interior, Bureau of Land Management
CDRP	Close Down and Restoration Provision
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
Chemours	The Chemours Company
Code	International Cyanide Management Code
Cyanco	Cyanco Company, LLC
DuPont	E.I. DuPont De Nemours and Company, Inc.
ERP	Emergency Response Plan
HCN	Hydrogen cyanide
HDPE	High-density polyethylene
ICMC	International Cyanide Management Code

## UNITS OF MEASURE AND ABBREVIATIONS (CONTINUED)

ICMI	International Cyanide Management Institute
LCRS	Leak detection and recovery system
LEPC	Local Emergency Planning Committee (Lander County)
Marigold	Marigold Mining Company
mg/L	milligrams per liter
MSHA	Mine Safety and Health Administration
NDEP	Nevada Department of Environmental Protection
NDOW	Nevada Department of Wildlife
PPE	Personal protective equipment
ppm	Parts per million
PVC	Polyvinyl chloride
QA/QC	Quality Assurance and Quality Control
SDS	Safety Data Sheet(s)
Sentinel	Sentinel Transportation LLC
Silver Standard	Silver Standard Resources Inc.
SOP	Standard Operating Procedure
TSF	Tailings Storage Facility
WAD	Weak-acid dissociable
WPCP	Water Pollution Control Permit (Permit No. NEV0088040; 2014 Renewal, Rev. 01)

## 0.0 GENERAL

### 0.1 Operation Contact Information

**Name of Mine:** Marigold Mine

**Name of Mine Owner:** Silver Standard Resources Inc.

**Name of Mine Operator:** Marigold Mining Company

**Name of Responsible Manager:** Duane Peck, General Manager

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### 0.2 Location and Description of Operation

Marigold Mining Company (“Marigold”), a Silver Standard Resources Inc. (“Silver Standard”) company, currently operates the Marigold Mine, an open-pit, heap leach operation utilizing an adsorption, desorption and recovery (“ADR”) process. The mine is located approximately three miles south of Valmy in the southeastern portion of Humboldt County, Nevada (see **Figure 1**). In 2014, Silver Standard acquired Marigold from Goldcorp Inc. and Barrick Gold Corporation, a joint venture.

The mining operation consists of multiple open pits and precious metal processing facilities encompassing approximately 29 square miles (19,000 acres) of private and public land. The operation is authorized to process up to 25 million tons of ore annually utilizing conventional cyanidation technology. Run-of-mine ore is hauled from the open pits to the heap leach pad. Presently, crushing operations are only conducted for producing “overliner” material for heap leach pad

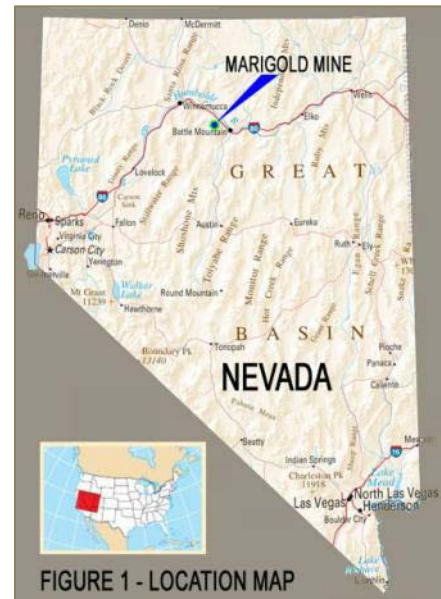


FIGURE 1 - LOCATION MAP

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construction. The facility is designed, constructed and operated to prevent release or discharge of process solution from the “fluid management system” apart from exceptional meteorological events that exceed the design storm event criteria.

The fluid management system for the heap leach facility consists of pregnant and barren solution ponds, a stormwater collection pond, ADR processing and chemical storage facilities, a lean solution recirculation system, an engineered leach pad with multiple cells, and appurtenant structures. The system is designed to contain stormwater flows and draindown from the heap leach cells during simultaneous 100-year, 24-hour storm and 24-hour power outage events. The former mill ceased operations in 1999 and has since been decommissioned and dismantled. With closure of the milling circuit, the existing 180-acre tailings storage facility (“TSF”) was taken out of service, reclaimed, and closed and will not be used for further deposition of tailings or impoundment of process solutions.

During the field component of this 2015 International Cyanide Management Code (“ICMC” or “Code”) recertification audit, the leach pad consisted of 21 cells constructed with either a clay liner (non-active cells) or a synthetic liner (active cells) over a compacted composite base. One cell was under construction and two additional cells are currently permitted, but have not yet been constructed. The heap leach cells are stacked with run-of-mine ore, which is trucked to the active cells and end-dumped in 15- to 50-foot lifts. Once a lift or portion of a lift is complete, the surface is cross-rippled to enhance solution percolation. Solution distribution lines are then placed on top of the ore, and barren solution is applied using either drip emitters or sprays at a rate of up to 15,000 gallons per minute.

The barren solution percolates through the ore collecting precious metals and exits the heap material at one of several collection areas as pregnant solution. The pregnant solution is conveyed, by gravity flow, to the pregnant solution pond or the recirculation system via high-density polyethylene (“HDPE”) pipelines located in synthetic lined ditches. Upon exiting the heap, the pregnant solution is routed to either the recirculation system or the pregnant solution pond depending upon the precious metal content of the solution. If the precious metal content is low, the solution (lean solution) is routed to the recirculation system to report to the top of the heap for extraction of additional precious metal. If the precious metal content is high enough, the pregnant solution is routed to the pregnant pond.

Marigold currently operates five carbon column trains in parallel. Solution reporting to the pregnant pond is pumped through carbon columns to recover the precious metal. Upon exiting the carbon columns, the solution is barren (void) of precious metal and flows by gravity to the barren solution pond. The barren solution is recirculated, using pumps, back to the top of the heap to continue the leaching process.

Carbon from the various carbon column trains is transferred to the Carbon Strip Circuit and processed to recover gold. Within the Carbon Strip Circuit, a hot alkaline solution is used to strip the precious metals from the loaded carbon. The solution eluate is then passed through an electrowinning circuit (located inside the Refinery within the Process Building) where the metals are electroplated. The resultant gold-bearing material is taken to the

crucible furnace located inside the Refinery, mixed with a flux, and smelted to produce doré. The stripped carbon is washed with acid and then reactivated by heating in a rotary kiln.

There are a total of four pregnant solution ponds and two barren solution ponds, interconnected with synthetic-lined channels, that cumulatively make up the “pond system.” The ponds are constructed with primary and secondary HDPE liners over a compacted clay base. A leak detection and recovery system (“LCRS”) is installed between the secondary liner and the compacted clay base of each pond, designed to meet federal and state standards. During 2003, Pregnant Pond 1 was removed from service and currently remains inactive.

### 0.3 Cyanide Facilities

The Code defines a “**cyanide facility**” as “a storage, production, waste management or regeneration unit for managing cyanide or cyanide-containing process solution,” or “a pollution control device, equipment or installation used to prevent, control or minimize the risk of a cyanide release.” The Code defines “**process solution**” as any solution with a weak-acid dissociable (“WAD”) cyanide concentration of 0.5 milligrams per liter (“mg/L”) or greater. Based on this criterion, the auditor identified the following primary, active cyanide facilities at the Marigold Mine, which comprise the existing fluid management system:

- Three Cyanide Offload/Storage Facilities (cyanide storage tanks and offload appurtenances);
- Heap Leach Pad (21 cells including Cell 1 through Cell 18 with sub-cells);
- Process Solution Ponds;
  - Barren Ponds 1 and 2 (double-lined);
  - Pregnant Ponds 1, 2, 3, and 4 (double-lined, Pregnant Pond 1 is currently decommissioned and maintained empty due to a leak in the primary liner);
- Stormwater Pond (single-lined);
- ADR circuit;
  - 25 Carbon Columns (five column trains and appurtenances);
  - Carbon Strip Circuit (carbon transfer and holding tanks, strip and acid wash vessels, pregnant and barren solution tanks, and associated process tanks and appurtenances);
- Process solution piping and lined solution collection channels;
- LCRS for the heap leach cells and the solution ponds; and
- Associated concrete and lined secondary containment structures, process solution transfer pipes, valves, and pumps.

During the field component of this 2015 ICMC recertification audit, Cell 20 of the heap leach pad was under construction and expected to become active in the fall of 2015. Marigold delayed Cell 19 construction indefinitely and plans to construct Cell 21 in 2017. Marigold will construct Pregnant Pond 5 during construction of either Cell 19 or Cell 21, whichever cell comes first.

As mentioned in **Section 0.2** above, with closure of the milling circuit, the TSF was taken out of service, reclaimed, and closed and will not be used for further deposition of tailings or impoundment of process solutions. Marigold



retired the TSF in 1999 following cessation of milling operations and completed reclamation of the TSF in 2004. In late 2012, Marigold sealed the final connection to the TSF and the ability to utilize this facility for any process-related purposes. Therefore, the TSF has not been considered by this or previous ICMC audits as a cyanide facility. The TSF has been released from the previously applicable Nevada Division of Water Resources Dam permit, although it remains under Marigold's reclamation permit and bond. Marigold continues to submit annual tailings reports with groundwater monitoring data to the Nevada Department of Environmental Protection ("NDEP") Bureau of Mining Regulation and Reclamation.

During the 2012 ICMC recertification audit, the auditor determined that the Carbon Strip Circuit, located within the existing Process Building, is a cyanide facility as it is not located inside the Refinery and because WAD cyanide concentrations in the pregnant and barren solutions range between 40 and 50 mg/L based on analyses conducted during the 2012 audit. It should be noted, that during ICMC audits prior to 2012, the Carbon Strip Circuit was not audited as a cyanide facility. For additional explanation, please refer to the March 2013, Summary Audit Report prepared for the 2012 recertification audit.

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## 0.4 Auditor Information

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**Audit Dates:** September 14 through 18, 2015

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute ("ICMI") and that all members of the audit team meet the applicable criteria established by the ICMI for ICMC Verification Auditors. I further attest that this Summary Audit Report accurately describes the findings of the verification audit conducted for the Marigold Mine located in Humboldt County, Nevada and that the verification audit was conducted in a professional manner in accordance with the ICMC Verification Protocol for Gold Mine Operations (dated October 2009) and using standard and accepted practices for health, safety and environmental audits.

FOR VISUS CONSULTING GROUP, INC.



Mark A. Montoya, PE, CEA  
President / Principal  
Lead Auditor and Gold Mining Technical Expert Auditor



## 0.5 Audit Findings

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with the International Cyanide Management Code.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

During the previous three-year ICMC audit cycle (occurring over the period March 20, 2013 to date), the Marigold Mine has not experienced any “*significant cyanide incidents*” subject to the notification requirements under Item 6 of the ICMC signatory application. The Marigold Mine experienced releases of cyanide-bearing solutions to soil on the mine property over the audit cycle, including a cyanide release that required reporting under applicable regulations; however, these incidents do not affect the compliance status. The Marigold Mine did not experience any other cyanide releases or exposures over the audit cycle, subject to listing under Question 3 of ICMC Standard of Practice 9.3.

Additionally, Marigold has demonstrated “continued compliance” over this ICMC audit cycle, which includes proper retention of records required for verification. Accordingly, the findings contained herein do not always restate proper records retention under each ICMC Standard of Practice.



## 0.6 Summary of ICMC Principles and Standards of Practice

For easy reference, **Table 1** below provides a summary of the ICMC Principles and associated Standards of Practice.

<b>Table 1</b> <b>Summary of ICMC Principles and Standards of Practice for Gold Mining Operations</b>	
<b>PRINCIPLE</b>	<b>STANDARDS OF PRACTICE</b>
<b>1. PRODUCTION:</b> Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.	<p>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.</p>
<b>2. TRANSPORTATION:</b> Protect communities and the environment during cyanide transport.	<p>2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.</p> <p>2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.</p>
<b>3. HANDLING AND STORAGE:</b> Protect workers and the environment during cyanide handling and storage.	<p>3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.</p> <p>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.</p>
<b>4. OPERATIONS:</b> Manage cyanide process solutions and waste streams to protect human health and the environment.	<p>4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.</p> <p>4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.</p> <p>4.3 Implement a comprehensive water management program to protect against unintentional releases.</p> <p>4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.</p> <p>4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.</p> <p>4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.</p> <p>4.7 Provide spill prevention or containment measures for process tanks and pipelines.</p> <p>4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.</p> <p>4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.</p>

<b>Table 1 (continued)</b> <b>Summary of ICMC Principles and Standards of Practice for Gold Mining Operations</b>	
<b>PRINCIPLE</b>	<b>STANDARDS OF PRACTICE</b>
<b>5. DECOMMISSIONING:</b> Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.	<p>5.1 Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.</p> <p>5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.</p>
<b>6. WORKER SAFETY:</b> Protect workers' health and safety from exposure to cyanide.	<p>6.1 Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.</p> <p>6.2 Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.</p> <p>6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.</p>
<b>7. EMERGENCY RESPONSE:</b> Protect communities and the environment through the development of emergency response strategies and capabilities.	<p>7.1 Prepare detailed emergency response plans for potential cyanide releases.</p> <p>7.2 Involve site personnel and stakeholders in the planning process.</p> <p>7.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.</p> <p>7.4 Develop procedures for internal and external emergency notification and reporting.</p> <p>7.5 Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.</p> <p>7.6 Periodically evaluate response procedures and capabilities and revise them as needed.</p>
<b>8. TRAINING:</b> Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.	<p>8.1 Train workers to understand the hazards associated with cyanide use.</p> <p>8.2 Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.</p> <p>8.3 Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.</p>
<b>9. DIALOGUE:</b> Engage in public consultation and disclosure.	<p>9.1 Provide stakeholders the opportunity to communicate issues of concern.</p> <p>9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.</p> <p>9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.</p>



## 1.0 PRODUCTION

*Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.*

### Standard of Practice 1.1

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

The operation is in	<input checked="" type="checkbox"/>	Full Compliance	with Standard of Practice 1.1.
	<input type="checkbox"/>	Substantial Compliance	
	<input type="checkbox"/>	Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Chemours Company (“Chemours”), formerly E.I. DuPont De Nemours and Company, Inc. (“DuPont”) is the cyanide producer and supplier for the Marigold Mine. Essentially, Marigold operates under the same contract that was effective during the 2012 ICMC recertification audit (between DuPont and Marigold). The contract lists DuPont (not Chemours) as the Seller; however, for purposes of this audit report, DuPont is referred to as Chemours throughout.

The current contract is effective October 1, 2012 through December 31, 2015 and continues from year to year thereafter unless terminated by Marigold or Chemours on written notice. During this 2015 ICMC recertification audit, Marigold personnel indicated that, over this current ICMC audit cycle, neither party has given notice to terminate the contract and Marigold has purchased cyanide exclusively from Chemours.

The contract specifically identifies ICMC certification requirements as a provision. Chemours is signatory to the ICMC and the auditor reviewed the ICMC Summary Audit Report for the DuPont Sodium Cyanide Production and Packaging Operations, prepared by CN Auditing Group (November 15, 2012), demonstrating full compliance with the ICMC production protocol. Chemours received its official recertification from ICMI on April 30, 2013. The audit certification includes Chemours’ Memphis Plant (Memphis, Tennessee), the Lemm Services Inc. Terminal (Memphis, Tennessee), and the Chemours Carlin Terminal (Carlin, Nevada). Chemours has retained its *full compliance* certification with the ICMC over this entire audit cycle.



## 2.0 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 2.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

Marigold's contract with Chemours to supply and transport cyanide to the Marigold Mine specifies that cyanide delivery occurs once the cyanide solution has passed across the tank flange at the designated storage facility at the site (i.e., Marigold's designated cyanide tank). Prior to the delivery, Chemours retains responsibility for transportation of the cyanide and risk of loss for the product. Furthermore, the contract specifies that during the contract period, Chemours shall remain a signatory to the ICMC and shall comply and cause Chemours' cyanide production and transportation personnel, distributors and contract transporters to comply with all applicable ICMC Principles and Standards of Practice, performance goals, audit recommendations and certification requirements applicable to Chemours' production facilities and applicable to the Marigold site. This includes the specific compliance matters set out in the Code's production and transportation verification protocols.

The contract specifically states that Chemours shall, with respect to the cyanide delivered to Marigold, be responsible for packaging, labeling, storage prior to shipment, evaluation and selection of routes, storage and security at ports of entry, interim loading, storage and unloading during shipment, transportation to the delivery locations, unloading at the delivery locations, safety and maintenance of the means of transportation throughout transport, task and safety training for transporters and handlers throughout transport, security throughout transport and emergency response throughout transport, all in accordance with the applicable ICMC Principles and Standards of Practice, performance goals, audit recommendations and certification requirements of the Code. The contract further requires that Chemours shall have, in place, emergency response plans relating to the Marigold site and conforming to the recommendations of the Code and requirements of applicable law.

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## Standard of Practice 2.2

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 2.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### **Discussion of the basis for this Finding and any Identified Deficiencies:**

As stated in ICMC Standard of Practice 2.1 above, the purchase contract between Chemours and Marigold specifies that during the contract period, Chemours shall remain a signatory to the ICMC and shall comply and cause Chemours' cyanide production and transportation personnel, distributors and contract transporters to comply with all applicable ICMC Principles and Standards of Practice, performance goals, audit recommendations and certification requirements applicable to Chemours' production facilities and applicable to the Marigold site.

Chemours produces cyanide at its Memphis, Tennessee plant and distributes the product via rail and truck. Chemours contracts Sentinel Transportation LLC ("Sentinel") to transport liquid cyanide from the Chemours Carlin terminal to the Marigold Mine. Sentinel is a signatory to the ICMC. ICMC Summary Audit Reports reviewed for the Chemours transportation supply chains demonstrate full compliance with the ICMC transportation protocol, from the production facilities to the Marigold Mine. During this 2015 ICMC recertification audit, Marigold personnel indicated that, over this current ICMC audit cycle, Marigold has purchased cyanide exclusively from Chemours and Sentinel has been the sole transporter.

The Chemours transport supply chain received official certification from ICMI on February 27, 2014. Sentinel received official recertification from ICMI on May 30, 2013. These most recent ICMC certifications are each valid for a period of three years from the respective certification dates.



### 3.0 HANDLING AND STORAGE

*Protect workers and the environment during cyanide handling and storage.*

#### Standard of Practice 3.1

*Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices, quality control/quality assurance procedures, spill prevention and spill containment measures.*

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 3.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Marigold Mine receives sodium cyanide in liquid form at 30 percent strength, and operates three cyanide offload/storage facilities at various locations as follows:

- Area 1 – located at the carbon columns;
- Area 2 – located at the Process/Refinery Building; and
- Area 3 – located at the east toe intersection of Cell 3 and Cell 12 of the leach pad (aka, Smiley Face Area).

During the initial ICMC certification audit (November 2006), auditors verified that DuPont provided written confirmation indicating that the offload facilities and storage tanks (at Area 1 and Area 2) meet their guidelines and requirements. Additionally, a professional engineer conducted an inspection of the Area 1 and Area 2 cyanide offload/storage facilities, and certified that the facilities were installed and have been maintained in excellent condition, and provide adequate protection against releases. The Area 3 cyanide offload/storage facility was constructed following the initial ICMC certification audit as a component of the Cell 13, Phase 3 leach pad expansion in accordance with applicable jurisdictional rules and sound and accepted engineering practices. During the field component of this 2015 ICMC recertification audit, the auditor inspected all three cyanide offload/storage facilities and found the facilities to be in good condition.

All three offloads provide a reinforced concrete pad for the cyanide tanker with drainage to additional secondary containment and the containments provided for all three cyanide storage tanks provide protection against seepage to the subsurface. The Area 1 cyanide offload/storage facility is situated within concrete containment located on the north side of the carbon column area, which drains via gravity to the process ponds. The Area 2 cyanide offload/storage facility is situated on a concrete pad located on the east end of the Process/Refinery Building, which drains into a floor sump located inside the Process/Refinery Building. Solution collected in the

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sump is pumped to the process ponds via an HDPE pipeline and the steel tank is surrounded by concrete containment walls. The containment floor and walls are covered with HDPE liner, which provides an additional containment barrier. The Area 3 cyanide offload/storage facility is constructed on a gravel protective layer overlying an HDPE geomembrane liner. An engineered clay liner and compacted rock fill underlay the HDPE geomembrane.

The cyanide offload/storage facilities at Area 1, Area 2, and Area 3 are well situated with respect to surface and groundwater resources and do not present undue risk for human exposure. No perennial or intermittent streams or groundwater supply wells are nearby. Marigold uses only liquid cyanide stored within enclosed, insulated steel tanks, which are located outside and are well ventilated with minimal potential for hydrogen cyanide (“HCN”) gas build-up. Marigold stores cyanide separately from incompatible materials and made modifications during the field component of this 2015 ICMC recertification audit to isolate the secondary containment provided for an antiscalant storage tank located at the Area 3 cyanide offload/storage facility.

Marigold has overfilling alarm and level indicators installed on the cyanide storage tanks located at each cyanide offload/storage area and tests the operation of the alarm systems and documents tank fill values prior to beginning an offload event and during every shift for cyanide inventory control. The instrumentation is solid-state construction, and according to the instruction manuals, does not require routine maintenance, only periodic checks. Marigold routinely checks the instrumentation and provided maintenance records documenting replacement of the circuit board in the instrumentation installed at Area 1. During the field component of this 2015 ICMC recertification audit, Marigold repaired the strobe light on the alarm system located at Area 1, which was not functioning during the site inspection.

### 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 3.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

Marigold receives liquid cyanide transported to the site in tanker trucks; therefore, there are no empty cyanide containers that require treatment or disposal. The auditor observed a cyanide delivery during the field component of this 2015 ICMC recertification audit and noted that the Sentinel driver rinsed the hose connection fittings on the tanker trailer following the offload and prior to leaving the site.

Marigold has developed and implemented a Standard Operating Procedure (“SOP”) that provides systematic steps for offloading cyanide, covering both routine and emergency valve and coupling operation. The procedure defines



the valve and coupling operation for the connection of the offload hose to the truck, valve opening, and the emergency shutdown button on the passenger side of the truck. The SOP addresses appropriate personal protective equipment (“PPE”) and includes the requirement for full-time observation from a safe distance by the Marigold escort person during the hookup, offload and unhook activities. Additionally, the spotter (observer) must be familiar with emergency shutdown of the equipment as well as emergency procedures involved with cyanide.

The procedure also requires that copies of the Sentinel and Cyanco Company, LLC (“Cyanco”) procedures remain posted in the eyewash buildings located at the offload areas. Marigold has received shipments of cyanide from Cyanco in the past, although not during this current ICMC audit cycle.

A separate SOP provides systematic procedures for cleaning up cyanide spills occurring both within and outside of concrete containment.

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## 4.0 OPERATIONS

*Manage cyanide process solutions and waste streams to protect human health and the environment.*

### Standard of Practice 4.1

*Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.*

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

Please refer to **Section 0.3** above for a listing of the active cyanide facilities at the Marigold Mine. Marigold has developed and currently implements written procedural documents (i.e., SOPs), which cover the Marigold cyanide facilities and provide measures for managing cyanide in a manner that prevents or controls releases to the environment and exposures to workers and the community. The SOPs identify required PPE and the risks involved with the operating tasks, and adequately describe safe work practices.

Additionally, the Water Pollution Control Permit (“WPCP”) and the WPCP Renewal Application stipulate operating requirements for the process facilities and identify the parameters and regulatory requirements on which the Marigold process facility (fluid management system) design is based. The fluid management system includes, but is not limited to, the following process components:

- Heap leach pad cells and solution collection areas;
- Process ponds (pregnant and barren solution ponds);
- Solution collection pipes and lined collection ditches;
- Leak detection and recovery systems for the leach pad solution collection areas and the process ponds;
- Groundwater monitoring wells;
- Transfer pipes, valves, and pumps used in conveyance, control or detection of process fluids between process components; and the
- TSF (closed).



SOPs incorporate the pond design parameters into the operating procedure for maintaining the process ponds at the allowable operating levels and provide procedures to follow in response to varying degrees of upset conditions. Additionally, the WPCP Renewal Application includes emergency and spill contingency procedures for cyanide management in situations where there is an upset in the facility water balance, when monitoring or inspections identify problems, and when temporary closure or cessation of operations become necessary.

Marigold implements comprehensive inspection and preventative maintenance programs for its cyanide facilities. Well documented, routine inspection and maintenance programs address proper management of process solutions at the heap leach pad and process ponds to retain the design storage capacities. Marigold implements a specific SOP to address preventative maintenance related to critical cyanide equipment including the various pumps. Preventive maintenance for other cyanide equipment is addressed through the monthly inspection program conducted by Process personnel. The monthly inspection reports describe conditions of signs and labeling, liners, pipelines, secondary containment, high-level alarm systems, pumps, presence of cyanide salts, presence and date of antidote kits, wildlife evidence or mortality, solution ponding, pond levels and levels in sumps. Process Lead Operators monitor process pond levels on a daily basis for entry into the Water Balance Model. In accordance with its Storm Water Pollution Prevention Plan, Marigold inspects its stormwater facilities, including surface water ditches and diversions, annually and following storm events. Furthermore, the NDEP performs quarterly WPCP compliance inspections of the Marigold Mine facility. These inspections identify any issues associated with the process facilities, equipment (including monitoring and control equipment), practices, or operations regulated by the permit.

In addition to the routine visual inspections and preventative maintenance discussed above, a contractor performs annual thickness testing on the three cyanide storage tanks. Marigold inspects the leak detection systems installed in the process ponds and at the leach pad each shift and reports the results to NDEP quarterly.

Marigold implemented a formal "*Management of Change*" procedure in March 2010 to ensure that it evaluates changes for potential environmental, safety and health risks, and that it takes appropriate actions to ensure existing performance levels are not compromised. Marigold provided complete Management of Change documentation for the cyanide-related operational and facility modifications that occurred at the Marigold operation over the three-year period between the 2012 ICMC recertification audit and this 2015 recertification.

The Marigold operation has one diesel-powered generator located at the Booster Pad station capable of powering five pregnant solution pumps, or alternatively, three pregnant solution pumps and one barren solution pump. During line outages, Marigold allocates emergency power to process solution pumps as necessary. Additionally, Marigold indicated that, if necessary during prolonged outages, it could rent additional generators from Reno, Nevada, which can arrive to the site within eight hours and/or from Winnemucca or Elko depending on availability. The Marigold truck shop mechanics perform routine preventative maintenance on the generator and the auditor reviewed preventative maintenance records over the period 2013 through 2015.

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## 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	<input checked="" type="checkbox"/> Full Compliance	Standard of Practice 4.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

This ICMC Standard of Practice is not applicable, as Marigold is a heap leach operation and does not operate a mill.

## Standard of Practice 4.3

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.3.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

Marigold implements a comprehensive, probabilistic water balance model. The Process Manager updates the model on a weekly basis with actual site data and archives the model (i.e., the spreadsheet file) monthly. The auditor verified that the current version of the model incorporates the two heap leach expansions that occurred over this audit cycle. The model performs a working analysis based on actual data and a probabilistic analysis. Inflows to the model include precipitation and makeup water currently obtained from Marigold water supply wells. The Marigold heap leach facilities are designed and operated as zero-discharge facilities with no direct discharge to surface water required; therefore, outflow from the model is limited to solution losses through evaporation of spray application, pond evaporation and moisture uptake by fresh ore.

The model considers all parameters, as appropriate for the water management system, in a reasonable manner, including daily ore tonnage delivered to the heap, leach solution application rates, precipitation generated by the design storm event, snowpack, evaporation, the active heap height, open pad and channel liner areas, and ore characteristics (e.g., moisture, density, and porosity). The 100-year 24-hour event is used during model runs to simulate available pond capacity and freeboard. The Marigold heap leach facility is designed and operated such that all upgradient stormwater runoff is diverted around the facility.



Marigold collects on-site precipitation daily from a rain gauge located at the Process Building and inputs the data into the water balance model weekly for use in the working analysis. The model uses average monthly evaporation data (i.e., historical data from a Winnemucca weather station) and accounts for sublimation.

The Marigold process pond system is designed to retain runoff generated by the 100-year, 24-hour storm event, and draindown from the heap leach pad over a 24-hour period, while providing two feet of freeboard. Marigold keeps rebuilt vertical turbine pond pumps and spare parts on site and maintains a diesel-powered emergency generator on site to provide emergency power in the event of a primary power outage. Additionally, if necessary during prolonged power outages, Marigold has the option of renting additional generators from Reno, Nevada, which can arrive to the site within eight hours. Nonetheless, the model accounts for power outages or pump and equipment failures via superimposing a 24-hour power outage-induced draindown event over the water balance on a continuous basis.

Process Lead Operators monitor process pond levels on a daily basis for entry into the Water Balance Model each day. A written SOP incorporates the pond design parameters into the operating procedure for maintaining the process ponds at the allowable operating levels. The SOP also provides procedures to follow during upset conditions. Review of the operating records indicates that pond levels are maintained consistently at or near the optimal levels. The water balance analyses confirm adequate freeboard for both working and probabilistic scenarios.

## 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.4.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

At the Marigold operation, open waters in the working ponds (i.e., Pregnant Pond 2, Barren Pond 1 and Barren Pond 2) have WAD cyanide concentrations that exceed 50 mg/L on a consistent basis. The other process ponds (i.e., Pregnant Pond 1, Pregnant Pond 3, Pregnant Pond 4 and the Stormwater Pond) provide surge capacity and remain empty under normal operations. Nonetheless, all of the active process ponds are provided with avian deterrent systems (i.e., netting and/or bird balls). Pregnant Pond 1 is currently not in use. In addition to the avian deterrent systems, the process ponds are surrounded by chain-link and wire mesh fence, and perimeter fencing surrounds the Marigold site to minimize access by terrestrial wildlife and livestock.

Marigold uses netting to cover exposed pump boxes, sumps, and other areas where open solution or ponding occurs, such as at the toe of the heap adjacent to the Area 3 offload. Other potential areas where open solutions



may occur temporarily include the solution pipeline containment channels at the heap leach pad and ponds (in the event of a leaking or ruptured pipe), and on the heap itself. Framed netting is used to protect wildlife from these areas.

Marigold monitors for wildlife activity and mortalities daily as a component of the pre-shift area inspections and submits quarterly Wildlife Mortality Reports to the Nevada Department of Wildlife (“NDOW”), Habitat Bureau in accordance with Marigold’s Industrial Artificial Pond Permit. This permit also requires immediate verbal reporting of potential or known process solution related wildlife mortalities to NDOW. At its discretion, NDOW may or may not perform an autopsy; therefore, Marigold has a freezer on site to preserve carcasses as necessary. The auditor reviewed NDOW quarterly Wildlife Mortality Reports and verified that no cyanide-related wildlife mortalities have occurred at the Marigold operation since the 2012 ICMC recertification audit.

The Marigold operation utilizes both drip emitter application as well as wobbler spray application on the run-of-mine heap. Drip emitters are used for normal leaching operations while the wobblers are employed on sideslopes and/or inactive portions of the heap for evaporation and solution balance control. In 2014, Marigold began using drip emitters on sideslopes on occasion. The Marigold ore types vary, with certain ore material having higher clay content and other material being very durable and free draining rock. Marigold rips the heap surface to an average depth of nine feet prior to leaching to enhance infiltration and minimize ponding.

During the field component of this 2015 ICMC recertification audit, the auditor did not observe solution ponding on the active areas of the heap. Marigold implements an SOP to address ponding on the heap by providing a range of potential control measures. Preventing overspray of solutions off the lined pad area is a component of the heap leach SOP and is monitored by leach operators during pre-shift inspections. Visual inspection during this 2015 audit did not identify overspray of solutions off the lined pad area.

## 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.5.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

Marigold operation is designed and operated as a zero-discharge facility with no direct discharge to surface water. As a result, there are no established mixing zones.

Ephemeral surface water flows in the area occur in Trout Creek, Cottonwood Creek, the unnamed drainage west of the 8-South Pit, and the unnamed drainage to the east of the heap leach facility. Stream flow generally occurs in

the spring following periods of precipitation. Several springs are present in the mine area; however, mining and processing operations are downstream of the springs or outside of the associated meteoric water collection basins. Trout Creek, an ephemeral stream, is the closest surface water body, located roughly one-half mile to one mile away from the Marigold process facilities. The Trout Creek Diversion Dam, located upstream from the process facilities, diverts Trout Creek west into Cottonwood Creek and around the facilities.

Currently, Marigold monitors surface water at four on-site locations (identified in the WPCP) quarterly when flowing. Additionally, Marigold performs internal sampling on Cottonwood Creek and the springs when flowing. During this recertification audit, the auditor reviewed quarterly monitoring records over the period fourth quarter 2012 through second quarter 2015. WAD cyanide levels were below the analytical detection limit (<0.01 mg/L) for all quarters. The applicable numerical standard for cyanide in surface water is 0.20 mg/L WAD (Drinking Water Standard).

The Marigold operation has not experienced any indirect discharges over the three-year period between ICMC recertification audits that have caused cyanide concentrations in surface water to rise above protective standards. Although cyanide solution spills have occurred outside of containment, surface water has not been impacted.

## Standard of Practice 4.6

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.6.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

The Marigold operation is designed and operated as a zero-discharge facility. The project construction and operation include a number of seepage control technologies such as composite liner systems at the heap leach pad, double geomembrane liners with leak detection systems at the process ponds, geomembrane-lined containment channels for solution pipelines, and concrete secondary containment in process areas. Depending on the date of construction, the leach pad cells have either a clay liner (inactive cells) or a synthetic liner over a compacted composite base. The facility design and construction meets NDEP standards.

The alluvium is the main groundwater storage unit in the mine area with bedrock storage upgradient in the primary pit development areas. The unsaturated zone thickness ranges from 530 feet at the south end of the site to approximately 280 feet at the north end.

The process ponds, which cumulatively make up the "pond system," are interconnected with synthetic-lined channels. The ponds are constructed with primary and secondary HDPE liners over a compacted clay base. An



LCRS installed between the secondary liner and the compacted clay base of each pond is designed to meet federal and state standards. Marigold reports the quantity of solution reporting to the LCRS to the NDEP in accordance with its WPCP. The Stormwater Pond is constructed with a single HDPE liner and does not have an LCRS.

The numerical standard for cyanide in groundwater, applicable to the Marigold operation, is 0.20 mg/L WAD (Drinking Water Standard). Marigold monitors groundwater quality at numerous wells (identified in the WPCP) both upgradient and downgradient of the process facilities. During this audit, the auditor reviewed groundwater quality data over the three-year period between ICMC recertification audits. The data demonstrate that WAD cyanide levels were below the analytical detection limit (<0.01 mg/L) for all quarters, at all locations except one, which is located at the downstream toe of the reclaimed TSF dam. Reported values at this location ranged from 0.041 to 0.013 mg/L (well below the protective standard) with a decreasing trend over the period.

The Marigold operation has not experienced seepage over the three-year period between ICMC recertification audits that has caused cyanide concentrations in groundwater to rise above the protective standard.

## Standard of Practice 4.7

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.7.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### *Discussion of the basis for this Finding and any Identified Deficiencies:*

All cyanide process tanks at the Marigold operation are provided with competent secondary containment, which provides adequate capacity for the largest tanks located within the containments. The cyanide storage tank and the carbon columns at Area 1 are located within a curbed concrete containment with direct overflow to Barren Pond 1. The storage tank foundation is solid mass concrete (i.e., the concrete containment slab) and the carbon columns are supported above the floor slab. The concrete containment at Area 2 is over-lined with HDPE for additional protection, and contains an overflow connection to the adjacent, inactive containment bund. The cyanide tank at Area 2 rests on steel I-beams supported by the concrete containment slab. The cyanide storage tank at Area 3 is a skid-mounted horizontal tank, which sets on support beams on top of the gravel layer within the lined leach pad area. The containments provided for all three cyanide storage tanks provide protection against seepage to the subsurface.

The process tanks at the Process Building, which comprise the Carbon Strip Circuit, are provided with concrete secondary containment. The concrete floor and stem walls of the Process Building provide secondary containment for the tanks and vessels located inside. The tanks and vessels either set directly on top of the concrete floor slab or are supported above the floor. A curbed, concrete containment area located outside the building provides secondary containment for two large process tanks (former carbon-in-leach tanks) used in the Carbon Strip Circuit.

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This containment encompasses six tank foundations (two with tanks and four vacant). The exterior and interior containment areas are interlinked via a drain through the exterior wall of the Process Building. The two tanks rest on octagon-shaped, concrete ring-beam foundations with soil fill material in the center area of each ring. Design drawings indicate that the tanks were constructed with two floors; a concrete slab inside the tank supported by fill material (providing primary containment) and the steel tank bottom itself (providing secondary containment).

Cyanide solution or cyanide contaminated water collected in the secondary containment at Area 1 and Area 2 would report to the process pond system via gravity flow. At Area 1, Marigold would hose any residual spillage in the concrete containment into Barren Pond 2. Marigold implements written SOPs to manage solution collected in the isolated containment at Area 2 and other secondary containments. Cyanide solution or cyanide contaminated water collected in the secondary containment at the Carbon Strip Circuit flows into a concrete floor sump inside the building. Collected water is pumped and directly conveyed to Barren Pond 2 via a buried pipe-in-pipe system.

Marigold places large diameter process solution pipelines within HDPE-lined containment channels and concrete structures. Pipe-in-pipe systems are used for buried pipes and pipes located outside of lined or concrete containment. Buried pipes include those at road crossings and the pipeline connecting the Carbon Strip Circuit floor sump to Barren Pond 2. Additionally, the barren solution pipelines are instrumented with radio alarms that alert operators of pressure losses. No pipelines requiring special protection needs were identified at the Marigold operation.

All cyanide process tanks at the Marigold operation are constructed of carbon steel. Process solution pipeline materials are carbon steel, HDPE, polyvinyl chloride ("PVC"), stainless steel (offload hoses), and synthetic rubber (small-diameter flex hose). These materials are compatible with cyanide and high pH conditions.

## Standard of Practice 4.8

***Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.***

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.8.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

Please refer to **Section 0.3** above for a list of the active cyanide facilities at the Marigold operation and to the previous ICMC Summary Audit Reports (December 2006, October 2009 and March 2013) for the construction quality assurance and quality control ("QA/QC") documentation provided for the cyanide facilities in operation at the time of those audits.



New cyanide facilities and modifications to existing cyanide facilities constructed subsequent to the 2012 ICMC recertification audit, include:

- Heap Leach Pad Expansion – Construction of Cell 18;
- Barren Solution Pipeline Expansion; and
- Heap Leach Pad Expansion – Construction of Cell 20.

Marigold implemented a formal QA/QC program during the construction of the Cell 18 heap leach pad expansion. The construction QA/QC program addressed earthworks construction and geomembrane installation. The earthworks components include grading, transitional fill, low permeable subbase, and overliner placement. The geomembrane installation includes seams, non-destructive seam testing, geomembrane destructive seam testing and repairs. The final construction report was stamped by a professional civil engineer registered in the State of Nevada. The report provides a statement that the construction was performed and completed in accordance with design drawings and specifications, and current industry standards.

The Barren Solution Pipeline Expansion involved connecting two barren solution pipelines to improve solution distribution and Marigold considered this work routine, although, the formal Management of Change process was implemented prior to implementation because of the operational change involved. Nonetheless, Marigold did not implement a formal QA/QC program for this project.

During the field component of this 2015 ICMC recertification audit, Cell 20 was under construction and the associated QA/QC documentation was not yet complete. QA/QC documentation for Cell 20 will be verified during the next ICMC recertification audit.

Marigold retains all construction documentation associated with its cyanide facilities. The auditor verified on-site retention of heap leach facility construction reports for Cells 1/2, 3, and 9 through 18. Reports were missing for Cell 4 through Cell 9; however, Marigold indicated that it maintains some of the older reports in off-site storage. The retention of QA/QC construction documentation for the carbon columns, the cyanide offload/storage facilities, and the Carbon Strip Circuit was also verified.

## Standard of Practice 4.9

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 4.9.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

In accordance with its WPCP, Marigold implements the procedure “*Field Sampling Protocols*” as a field guide to standard environmental water sampling techniques. The WPCP and the WPCP Renewal Application also provide groundwater and surface water monitoring procedures.

A qualified person (i.e., a former Environmental Manager at Marigold) originally developed Field Sampling Protocols. As documented in the 2009 ICMC audit report, the plan has been reviewed and approved by a professional engineer registered in the State of Nevada and a Hydrologist. Marigold Environmental personnel periodically update the Field Sampling Protocols in parallel with WPCP renewals, primarily to incorporate changes to water monitoring points. The Marigold Environmental Manager reviews document updates for approval and NDEP reviews and approves all monitoring locations.

The water sampling procedure specifies how and where samples are collected, identifies monitoring points, monitoring parameters and monitoring frequency required by the WPCP, as well as the required analytical profiles reported to NDEP for the samples collected from the specified monitoring points. The protocol includes chain of custody and transportation procedures and provides a map with the locations of the monitoring points.

Marigold records field conditions for sampling events on the Field Monitoring Sheets. These logs record the sampling point, date, time, initials of sampler, static water level, transducer readings (if applicable, or water level meter readings), and comments such as surface water flow.

Marigold’s monitoring program is designed to adequately characterize environmental media and to identify changes in a timely fashion. The media being characterized dictate the frequency of the samples. Marigold monitors for wildlife activity and mortalities daily as a component of the pre-shift area inspections. Marigold monitors surface water quarterly when flowing. Groundwater monitoring is conducted quarterly, semi-annually and annually, depending on the well. Water samples are analyzed in accordance with the WPCP. Leak detection systems are monitored daily.

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## 5.0 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 5.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

Section 3 of the Marigold Plan of Operations provides the Reclamation Plan, which includes, but is not limited to, stabilization, detoxification and disposal measures necessary to reclaim process ponds, heaps, and equipment. The heaps will be leached until economic recovery has been achieved and then allowed to drain, with ongoing monitoring of draindown quantity and quality to determine the concentration of key constituents in the draindown solutions. The draindown solutions will be sprayed onto the side slopes of the heap using a fogger system to enhance solar evaporation and reduce the volume of solution to a level that can be accommodated by proposed evapotranspiration basins created in one or more reclaimed solution ponds, which will passively treat the draindown solutions.

Process ponds not incorporated into the evapotranspiration treatment facilities will be drained of liquid and/or the liquid will be allowed to evaporate. The synthetic liners will be removed or folded and buried in place. Residual sludge will be tested and buried in place or disposed of in accordance with state and federal regulations, as warranted by the test results. Buildings, tanks and equipment associated with the leaching facilities will be detoxified and removed. Detoxification measures include freshwater rinsing or active treatment of facilities that contained cyanide solutions. Process solutions will be evapotranspired or placed in a treatment facility. Chemicals or reagents will be removed from the heap leach facilities, and along with empty containers, will be disposed of consistent with appropriate state and federal regulations.

In accordance with regulatory requirements, Marigold must submit a Permanent Closure Plan to the NDEP at least two years before the anticipated date of permanent closure. The Permanent Closure Plan will incorporate procedures, methods and schedules for stabilizing spent process materials based on information and experience gathered throughout the active life of the facility.

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The November 2013 Reclamation Plan, provided in Section 3 of the Plan of Operations, states that the mine is projected to be in operation until approximately 2027 with concurrent reclamation conducted on inactive mine areas during this period as soon as areas become available and when reclamation is practical and safe. Up to an additional three years will be required for ongoing ore processing, site closure, and final reclamation. Chemical stabilization of the spent heap material will involve draining the heaps, conservatively estimated to take five years. The Permanent Closure Plan, developed at least two years prior to the anticipated closure date, will include detailed closure activities for each process facility component and a more detailed schedule.

As stipulated by regulatory permits, Marigold is required by the NDEP and the U.S. Department of Interior, Bureau of Land Management (“BLM”) regulations to review and update the Reclamation Plan and associated costs at least every three years. Marigold also updates its Plan of Operations and Reclamation Plan as any mine components change and during major permit revisions, as necessary. The most recent update to the Plan of Operations is dated November 1, 2013 and the prior version is dated February 2012. Additionally, under the Close Down and Restoration Provision (“CDRP”), a Silver Standard corporate internal policy, financial obligations are updated quarterly or when the reclamation bond is updated.

## Standard of Practice 5.2

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 5.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

Marigold uses the most current version of the Standardized Reclamation Cost Estimator, a cost-estimating program developed and approved by BLM and NDEP, to prepare annual bond updates. The estimate provides costs for “Detoxification / Water Treatment / Disposal of Wastes” which includes the cyanide-related decommissioning measures outlined in its Reclamation Plan. Handling of hazardous materials includes the cost of decontaminating, neutralizing, disposing, treating and/or isolating all hazardous materials used, produced, or stored on the site.

The bond estimates are based on third-party implementation of the closure and reclamation activities, and include indirect costs such as Engineering and Design, Contingency, Insurance, Performance Bond, Contractor Profit, Contract Administration, and a BLM Indirect Cost. The most recent estimate, calculates the “Detoxification / Water Treatment / Disposal of Wastes” direct costs to equal \$6.0 million, approximately 17 percent of the total direct costs for all closure and reclamation activities. The total bond estimate totals \$45.2 million, of which \$10.6 million (31 percent) is indirect costs.



As stipulated by regulatory permits, Marigold is required by the NDEP and the BLM regulations to review and update the Reclamation Plan and associated costs at least every three years. Marigold updates its reclamation bond during any Minor or Major Modification to the WPCP or Plan of Operations. Additionally, financial accounting procedures require that mine closure liabilities be reevaluated every year and under the Silver Standard CDRP internal policy, financial obligations are updated quarterly or when the reclamation bond is updated. Marigold provided written correspondence from BLM and NDEP documenting the reclamation cost updates that occurred over this current ICMC audit cycle.

Marigold has established and maintained financial assurance approved by BLM and NDEP to cover the estimated costs for cyanide-related decommissioning activities over this entire ICMC triennial audit cycle. As of April 20, 2015, the BLM Nevada State Office holds four reclamation bonds totaling \$46 million. Marigold provided copies of the Sureties issued in favor of the BLM as evidence of the current financial mechanisms established.

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## 6.0 WORKER SAFETY

*Protect workers' health and safety from exposure to cyanide.*

### Standard of Practice 6.1

*Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.*

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 6.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

As discussed under ICMC Standard of Practice 4.1 above, Marigold has developed procedures describing how cyanide-related tasks are to be conducted, including the requirement to monitor all enclosed areas or confined spaces for HCN gas content before entering. SOPs also describe how to conduct equipment decontamination prior to maintenance and require workers to complete a "Confined Space Entry" Permit if a confined space must be entered to perform work. The Marigold cyanide-related SOPs require use of proper PPE and pre-work inspections. In addition to the specific task-related SOPs, Marigold performs Area Inspections prior to every shift, whereby workers inspect for any conditions that may adversely affect safety or health.

Marigold operates under an "open door policy" and implements several programs and venues, whereby workers have the opportunity to provide input regarding health and safety matters. These programs include routine safety meetings, an environmental, health and safety committee represented by all departments, suggestion forms collected in Safety Suggestion Boxes located on site, and a program that promotes workplace safety through strategic focus on critical safety elements by setting objectives and targets that require Marigold supervisors to regularly engage employees in discussions regarding safe work practices, procedures, risk identification, and risk mitigation. Marigold also implements a program, which encourages job observations by employees and engagement if either positive or risky behavior is observed. The Marigold "Management of Change" procedure addresses worker health and safety risks (see ICMC Standard of Practice 4.1 above).

### 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 6.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Marigold pH adjustment system consists of a dry lime silo located on the haulage access to the leach pad as well as liquid caustic tanks at the carbon columns and at the Process Building. A written SOP defines the target pH level for controlling evolution of HCN gas at 10 to 10.5. Marigold takes routine samples and adjusts levels at Barren Pond 2 accordingly by adding caustic solution. To further regulate pH levels, Marigold adds lime to the run-of-mine ore prior to pad loading. The auditor reviewed daily pH records over the three-year period between ICMC recertification audits and found values within the target range in the Barren Ponds with drops below 10 occurring in the pregnant solution.

Marigold conducts periodic HCN Surveys of all cyanide process areas. Although there is not an established frequency, 10 surveys were conducted over the three-year period between the 2012 ICMC recertification audit and this audit. The HCN surveys included the carbon column area, process ponds, heap leach pad, Process Building (which includes the Carbon Strip Circuit), and all three offload areas and appurtenant facilities. Results of the surveys demonstrate that all recorded HCN gas levels were well below 4.7 parts per million (“ppm”). With the exception of the Carbon Strip Circuit, all Marigold cyanide facilities are located outside in open-air environments. The Carbon Strip Circuit is located inside the Process Building, which is well ventilated. Written SOPs require workers to monitor all enclosed areas or confined spaces for HCN content (using a handheld gas detector) before entering.

Marigold uses portable (handheld) HCN gas monitoring devices and does not utilize any fixed, continuous HCN gas monitors. At the time of this writing, Marigold had six units in service, recently calibrated by a third party. Over this current ICMC audit cycle, Marigold initially outsourced the calibrations and then began calibrating the devices internally as the Marigold Process Supervisor is trained by the manufacturer to do so. Marigold continues to bump test each unit before use. Generally, Marigold performed routine calibrations over this audit cycle on the frequency recommended by the manufacturer (every 90 days) and according to a written SOP; however, the calibration records reviewed for the past twelve months revealed some gaps. Therefore, following the field component of this 2015 ICMC recertification audit, Marigold revised its procedure to begin calibrating the monitors every 30 days to coincide with other routine equipment maintenance activities performed by the Process Department. Additionally, to create additional accountability regarding routine calibrations, Marigold initiated use of its data management/reporting system to track the calibrations.

Over this ICMC audit cycle, Marigold also maintained a multi-gas monitor in its Mine Rescue Trailer for use during emergency response events. The unit resided inside the Mine Rescue Trailer prior to construction of the new bay for the Emergency Response Vehicle (ambulance). The user manual for this device recommends monthly



calibrations and Marigold provided complete calibration records for the period January 1, 2013 through July 1, 2015. Records were not available for the months of August and September 2015 due to a software malfunction, which rendered the records unrecoverable.

Marigold has installed signs advising workers that cyanide is present and of the associated dangers. These areas include the leach pad road, process solution tanks and pipelines, process ponds, cyanide offload/storage areas, and all process areas. Marigold labels cyanide storage and process tanks and piping alerting workers of the contents and flow directions and posts other signs warning cyanide in use, no smoking, eating or drinking. In areas where reagent-strength cyanide is present (i.e., each cyanide offload/storage area), there are signs stating the cyanide strength (30%), required and specific PPE, notice not to smoke, eat or drink, emergency response procedures, and locations of first aid, the emergency shower/eyewash, fire extinguisher and cyanide antidote kit. Safety Data Sheet (“SDS”) information, safety procedures, first aid and cyanide antidote kits are provided at the three cyanide offload/storage facilities. All written information is in English, the language of the workforce.

Emergency showers, low-pressure eyewash stations, and appropriate fire extinguishers are located throughout the process areas. Marigold tests the shower/eyewash stations before each shift, and in addition, tests the stations at the cyanide/offload storage facilities before each offload. Marigold performs monthly inspections of the fire extinguishers and hires a contractor to perform annual inspections of the fire extinguishers.

Marigold implements an “Incident Investigation Program” providing guidance and the basic requirements for conducting incident investigations at the Marigold Mine. In 2015, Marigold enhanced its Incident Investigation program to include an “*Incident Investigation Report*,” which includes an Incident Severity and Reporting Matrix, general information regarding the incident, employee/eyewitness statements, controls, causes, and corrective actions. Additionally, Marigold must complete Mine Safety and Health Administration (“MSHA”) reports that include any cyanide-related worker exposures, which require treatment or result in death, and must notify NDEP of human and animal mortality or injury. Marigold Safety and Environmental personnel indicated that no such incidents have occurred at the Marigold Mine over the three-year period between the 2012 ICMC recertification audit and this recertification audit.

### Standard of Practice 6.3

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 6.3.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

The Marigold Emergency Response Plan (“ERP”) provides a listing of Medical and First Aid Equipment and Communication Equipment. The Medical and First Aid Equipment includes oxygen, automatic external

defibrillators, cyanide antidote kits and medical trauma kits (Jump Kits). Seven cyanide antidote kits are located on site; in the Assay Lab, Metallurgical Lab, Refinery, Emergency Response Vehicle, Area 1 and Area 3 cyanide offload /storage facilities and in the Safety Department office. The Metallurgical Lab and the Refinery are in the Process Building, located very close to the Area 2 cyanide offload /storage facility. Marigold inspects its medical and first aid equipment regularly. The primary means of communication while on site is the radio system and cellular and landline telephones are accessible on site as well.

The antidote kit at Area 2 (located inside the Metallurgical Lab) is stored in a cabinet at room temperature. The other kits that the auditor inspected were contained within small, electric temperature-controlled coolers regulated between 66 and 77 degrees Fahrenheit. During this recertification audit, the auditor verified that the antidotes located in the Metallurgical Lab, Emergency Response Vehicle, Area 1 and Area 3 cyanide offload /storage facilities and in the Safety Department office were stored properly and had not expired. The auditor did not inspect the antidote kits stored in the Assay Lab and Refinery.

The ERP is a detailed planning tool intended to provide in-depth information on various types of emergencies that could typically occur at the mine (please refer to ICMC Standard of Practice 7.1 below). The plan implements "Emergency Response Checklists," which provide systematic procedures that supervisors would typically implement during an emergency along with the applicable phone numbers and necessary resources typically needed for the emergency specified.

At the time of this 2015 ICMC recertification audit, Marigold had approximately 18 First Responders and 11 medical response personnel, all of which are trained to respond to cyanide exposures. Marigold maintains four or five First Responders on site at any one time. Marigold has a dedicated Emergency Response Vehicle located on site, fully equipped to treat workers exposed to cyanide (e.g., oxygen, automatic external defibrillator and a cyanide antidote kit).

On April 29, 2015, Marigold refreshed contact with Humboldt General Hospital and the Battle Mountain General Hospital by sending a letter notifying the hospitals that liquid sodium cyanide is used within the hospitals' response areas and requesting verification that the hospitals understand that a potential cyanide exposure could occur at the Marigold Mine and that the hospitals are able to respond to a cyanide poisoning. Battle Mountain General Hospital, Marigold's primary care facility for emergency response, provided written verification that its staff understands that a potential cyanide exposure could occur at the Marigold Mine site and that its staff is able to respond appropriately to a cyanide exposure.

Marigold periodically conducts mock drills in accordance with its Emergency Management Program and provided documentation for one cyanide-related mock emergency drill and one tabletop exercise conducted subsequent to the 2012 ICMC recertification audit. The mock drill simulated the entire emergency response process, including testing the full call-out procedure, treatment of an exposure victim, and the measures to halt and contain the release that caused the exposure and to remediate the area. The Battle Mountain ambulance participated in the drill. The drill record includes a description of the drill scenario, diagrams of the drill scene (including locations of victims, the truck, hazard zones, and wind direction), actual drill notification actions and the timeline. Additionally,

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the drill record identifies deficiencies in response procedures that require revision (i.e., lessons learned and action items), which Marigold subsequently addressed.



## 7.0 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Marigold Mine Emergency Response Program is organized into three individual components designed to streamline the planning and execution of the program. These components include: the Emergency Management Program, which provides the basic framework on how the entire program is managed and reviewed; the ERP, which is a detailed planning tool intended to provide in-depth information on various types of emergencies that could typically occur at the mine; and Emergency Response Checklists, which provide systematic procedures that supervisors would typically implement during an emergency along with the applicable telephone numbers and necessary resources typically needed for the emergency specified. The Emergency Response Checklists include emergency procedures for cyanide medical emergencies, hazardous materials spills, confined space rescue, process pond overflow and heap leach failure or washout. In addition to the ERP, Marigold has developed written SOPs regarding response to accidental cyanide releases and exposures. The Marigold Emergency Response Program considers the potential cyanide failure scenarios as appropriate for the operation’s circumstances.

The WPCP Renewal Application presents Marigold’s methods for prevention, containment and handling of spills and/or releases of materials outside containment (i.e., the fluid management system) and outlines responsibilities for notification of the various state and federal agencies in the event of a release. Additionally, the WPCP provides emergency and spill contingency plans for spills and releases of solutions from various portions of the fluid management system. Scenarios covered include spills of cyanide, solution pond leaks and overtopping of process solution ponds. The WPCP Renewal Application provides measures to address power outages and pump failures, and Marigold has implemented Emergency Response Checklists addressing earthquakes and flooding.

The cyanide producer and its transporter are responsible for cyanide spills up to the point of offloading at the Marigold site. Nonetheless, the Marigold ERP states that, in the event of a cyanide transportation emergency, Marigold will provide emergency response in the interim until the Chemours Response Team arrives. However, Marigold clarified that it would not provide off-site assistance unless specifically requested by Chemours, in



writing. As best management practice, Marigold will respond to transportation emergencies occurring on the mine property.

## Standard of Practice 7.2

*Involve site personnel and stakeholders in the planning process.*

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### **Discussion of the basis for this Finding and any Identified Deficiencies:**

Marigold provides the opportunity to communicate issues of concern with the public through Lander County Local Emergency Planning Committee (“LEPC”) meetings. Marigold is actively involved with the LEPC, of which current members include area hospitals, County Commissioner’s Office, Emergency Planning and Community Right-to-Know Act Facility, volunteer fire departments, the school district, County Sherriff, County Search and Rescue, and Community Health. During this recertification audit, the auditor reviewed LEPC minutes from meetings held since the 2012 ICMC recertification audit and verified that cyanide-related topics were presented and discussed. In accordance with the Marigold Mine Emergency Response Program, local emergency agencies are encouraged to participate in emergency drills. Marigold completed the most recent update to its ERP in September 2015 and provided a copy to the LEPC for review and use.

Additionally, the regulatory process for new permits and permit revisions provides opportunity for public review and comment associated with potential releases. The WPCP is renewed regularly and each renewal provides a formal opportunity for public comment. As a courtesy, Marigold notifies the Humboldt County Commissioners of WPCP revisions. The WPCP has been renewed once and modified multiple times since the 2012 ICMC recertification audit. The current permit, effective as of December 8, 2014, is valid until November 3, 2019. No public comments were received during the public comment period held for the most recent permit renewal.

In May 2015, Marigold hosted an *ICMC Awareness Training & Mini-Gap Assessment* workshop conducted by a Chemours representative. The training was offered to Marigold personnel, contractors, vendors and local emergency response/planning personnel. The training provided a basic overview of sodium cyanide and its safe use in the mining industry, basic first aid information, a site tour and observance of an actual cyanide offload event at the Marigold Mine. Although invited, no outside parties attended the training; however, following the training workshop, the Chemours representative attended the monthly LEPC meeting with members of the Marigold Safety Department.

In July 2015, Marigold partnered with Battle Mountain General Hospital and Chemours to provide cyanide basic awareness training and antidote training to the hospital and Lander County EMS. Chemours presented training at the Battle Mountain Hospital on the molecular physiology of cyanide poisoning and the clinical pharmacology of

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first aid antidote (amyl nitrite) and medical antidotes (sodium nitrite, sodium thiosulfate and hydroxocobalamin). Fifty-two people attended the training, including EMTs, nurses, one pharmacist, ambulance personnel and representatives from Newmont Gold Corporation along with Marigold Mine personnel.

### Standard of Practice 7.3

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.3.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

According to the ERP, the on-site Shift Supervisor responsible for the area where an emergency occurs, or his/her designee, will assume responsibility as the Incident Commander until relieved by a senior supervisor or manager. Duties of the Incident Commander include commanding, controlling and communicating the response. The Safety Manager and the Environmental Department will assist the Incident Commander at the incident scene if the incident is located at the mine site. Other departments (listed in the ERP) will provide needed assistance to the Incident Commander as required. The current version of the Marigold ERP describes the roles of outside responders, medical facilities and communities in the emergency response procedures.

The ERP contains a list identifying the current (September 2015) Marigold Emergency Responders (i.e., First Responders and EMTs). The Emergency Response Checklists provide emergency contact numbers for the Chemours Cyanide Response Team and relevant local external emergency agencies, and list Mine Emergency Responders as a resource under Applicable Resources. Depending on the type of emergency, the Mine Emergency Responders may include Medical and HAZMAT Response Teams. One member of the HAZMAT Response Team must be a First Responder qualified to administer the cyanide antidote.

The ERP provides systematic Mayday call-out procedures. Marigold contacts Battle Mountain Hospital Ambulance to rendezvous at Interstate 80 for transfer of victims. If for some reason the off-site ambulance is unable to respond, Marigold transports the victim to the hospital. Alternatively, Marigold First Responders may decide to contact the medical helicopter for air evacuation depending on the severity of the incident, whereby the Marigold Emergency Response Vehicle is used to transport the victim to the on-site helipad. Marigold transports the cyanide antidote kit with the victim. Marigold has made formalized arrangements with the local hospitals regarding its use of cyanide within the hospitals' potential response areas and verified that the hospital staff is able to respond to potential cyanide exposures.



## Standard of Practice 7.4

*Develop procedures for internal and external emergency notification and reporting.*

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.4.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

The ERP and Emergency Response Checklists include procedures and contact information for notifying management, outside response providers and medical facilities. The action lists contained on each Emergency Response Checklist provide notification procedures. The ERP provides the protocol for internal communications.

The WPCP provides reporting requirements for spills and releases and the WPCP Renewal Application describes notification requirements. In accordance with the WPCP Renewal Application, depending upon the magnitude and type of spill, notification of one or all of the following agencies is required: 1) NDEP; 2) Nevada Division of Emergency Management; and 3) National Response Center. Additionally, as stated in the WPCP application, under Section 304 of the Community Right to Know Act, Marigold must report to the State and LEPC, releases involving over 10 pounds of cyanide, or of reportable quantities of other hazardous substances, beyond the facility boundary that may potentially result in exposure to individuals outside of the facility boundary. Notification procedures for such a release are provided.

The Marigold ERP provides procedures for communication with the media. The General Manager or his/her designated representative is the only person that corresponds with the media, non-mine personnel or government agencies (except to make required regulatory reports). If the General Manager is absent, all media inquiries are referred to the Silver Standard corporate office. As described above, Emergency Response Checklists include procedures and contact information for members of the LEPC (affected community). Reporting Requirements under the WPCP provide additional reporting procedures for spills and releases.

## Standard of Practice 7.5

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.5.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***



SOP “Sodium Cyanide Spills” provides the procedures for responding to cyanide spills outside of containment and contains a warning not to use sodium hypochlorite near oil or petroleum products or any surface water sources. Immediate actions include reporting the spill to the Environmental Department immediately upon discovery. Environmental personnel will then refer to the WPCP reporting requirements and verbal instructions from NDEP on how to handle/remediate/sample the spill. The SOP addresses recovery or neutralization of solutions or solids, decontamination of soils or other contaminated media, and management and/or disposal of spill clean-up debris.

The WPCP Renewal Application also provides procedures for remediation of cyanide spills. The application states that spilled cyanide solutions would be neutralized as necessary with hypochlorite, hydrogen peroxide or other acceptable methods, and spills of solid cyanide would be mixed with absorbent materials as necessary to minimize cyanide dust generation during cleanup (Marigold uses solid cyanide in its laboratories only). Cyanide spills would be disposed of on the heaps or in the solution ponds, depending upon the nature of the spill. NDEP evaluates remediation requirements for spills on a case-by-case basis. In some cases, confirmatory testing is not required if impacted soils can be feasibly excavated to a specified depth below underlying dry soils.

Marigold will conduct necessary monitoring activities in the event of a release in accordance with its WPCP and in coordination with NDEP. The Marigold WPCP presents procedures, parameters to be monitored, and analytical protocols. The number and location of soil samples are determined based on the size of the spill and area of impact. In accordance with the WPCP, in the event of spills or releases, Marigold must take all available and reasonable actions, including more frequent monitoring, to: determine the effect and extent of the incident; minimize any potential impact to the waters of the State, domestic animals and wildlife; and to minimize the endangerment of the public health and safety. NDEP may require Marigold to submit a written report summarizing any related actions, assessments, or evaluations, and including any other information necessary to determine and minimize potential impacts.

A release from the operation could not reasonably adversely impact a drinking water supply, as there are no drinking water supplies nearby the Marigold site. Marigold continues to provide bottled water to all employees, contractors and visitors as a courtesy; however, in 2012 the mine completed permitting of a Nevada-certified potable water system that draws source water from a well located on the far north side of the mine property, approximately three miles away from the process facilities.

## Standard of Practice 7.6

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 7.6.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

The Emergency Management Program requires that the Marigold Safety Manager review the ERP annually and revise it periodically, as necessary. The Safety Department makes all revisions to the ERP. If there are major changes to the ERP, the changes are communicated to mine personnel during safety meetings before going into effect and during annual refresher training. During this 2015 ICMC recertification audit, the auditor reviewed Version 2.2 of the ERP, dated September 21, 2012, and the most current version, Version 4.0, dated September 28, 2015. Primary revisions to the ERP from the previous version include: updating Marigold management personnel; adding Silver Standard corporate emergency phone numbers to the plan; adding response guide sheets from the 2008 Emergency Response Guidebook for flammable liquids, flammable gases, inert gases, oxidizers, and toxic and/or corrosive substances; adding the new radio channel created for emergency response personnel (Channel 4); referencing the cyanide antidote kit located in the Safety Department office; correcting a discrepancy regarding the name of the current air ambulance service; and replacing references to Goldcorp and DuPont with Silver Standard and Chemours, respectively.

Marigold periodically conducts mock drills in accordance with its Emergency Management Program and provided documentation for one cyanide-related mock emergency drill and one tabletop exercise conducted subsequent to the 2012 ICMC recertification audit. Drill documentation includes an *“Emergency Response Drill Critique Report”* outlining lessons learned and corrective actions for implementation. During the previous ICMC audit cycle, Marigold conducted three cyanide-related mock drills. Marigold also conducts Emergency Response Evaluations following actual incidents. The evaluations identify strengths and areas of concern regarding the response, and provide corrective actions.



A handwritten signature in black ink, appearing to be 'D. Smith', written over a horizontal line.

## 8.0 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 8.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Marigold Safety Department provides training to all Marigold employees and visitors regarding recognition of the cyanide materials present at the operation, the health effects of cyanide, symptoms of cyanide exposure, and procedures to follow in the event of exposure. The “*Marigold Cyanide Training*” slide presentation covers uses of cyanide at the Marigold operation, cyanide toxicity, HCN gas characteristics and threshold limits, exposure effects and symptoms, emergency response procedures, PPE, first aid treatment and antidote kits (locations, contents and use). Marigold uses this presentation material to train all employees. Additionally, all employees view the Marigold site-specific hazard training video (which covers cyanide) and receive a foldable pocket card summarizing symptoms and first aid/antidote procedures, to keep on person while on site. Process employees are trained on hazard recognition; the physical properties of sodium cyanide; proper PPE; general precautions and safety rules; health hazards and exposures to HCN gas; symptoms of cyanide poisoning; emergency response, first aid and medical treatment; administering the antidote, and decontamination of equipment prior to performing work.

The Marigold Environmental Department also provides New Hire Training, which includes a basic overview of air, land, vegetation, water, wildlife (controls), spills (awareness, tracking, prevention), the “*EHS 360*” program and Corporate Social Responsibility. The presentation contains a slide describing Marigold’s certification to the ICMC, providing a very high-level overview of the Code and discussing that non-compliance with Marigold’s policies and procedures related to cyanide management is grounds for disciplinary action. Each department receives department-specific environmental training, regarding SDS, spills and material management, which is more detailed than the new hire training.

Marigold provides annual refresher training regarding cyanide safety in conjunction with required MSHA annual refresher training and documents this training on MSHA Form 5000-23. Marigold uses the “*Marigold Cyanide Training*” slide presentation for annual refresher training.



The Safety Department manages and maintains all training records for all employees. The auditor reviewed personnel files to verify that employees receive the training described above.

## 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 8.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

### ***Discussion of the basis for this Finding and any Identified Deficiencies:***

Completion of “*Training Acknowledgment*” cards, which document training dates and signatures of instructors and trainees, are required for all cyanide-related (and non cyanide-related) work tasks. The “*Training Acknowledgment*” cards themselves do not authorize trainees to perform the associated work tasks unsupervised; however, the trainee must complete the training requirements and receive an MSHA Form 5000-23 before performing the tasks unsupervised. Certain cyanide-related SOPs include written exams that employees must pass before performing the tasks. Process Supervisors and lead operators provide the required training, which includes review of the related SOP and hands-on demonstration. The Marigold Process Supervisor, a qualified and MSHA certified trainer, conducts the majority of task training at Marigold. This task-specific training supplements the cyanide safety training provided to all Process employees.

In addition to the SOPs, Marigold implements a “*Part 48 Training Plan*” required by MSHA under the Code of Federal Regulations (Title 30, Part 48). This plan identifies approved instructors and tasks covered under the different training programs (i.e., annual refresher, new miner, experienced miner, and task and hazard training). Additionally, Marigold provides task-related refresher training if a worker has not performed the task over a one-year period. As previously discussed under ICMC Standard of Practice 8.1 above, cyanide safety training is provided annually.

Over the previous ICMC audit cycle (2010-2012), Marigold implemented its “*Looking Good for Safety*” program, whereby Marigold employees observed peers performing work tasks and documented findings on a standardized evaluation form. Additionally, Marigold implemented an evaluation program called “*Time to Act*,” whereby supervisors and lead personnel evaluated work tasks. Over this current ICMC audit cycle, Marigold combined its “*Looking Good for Safety*” and its “*Time to Act*” programs into a new program called “*FACETIME*.” The FACETIME program promotes workplace safety through strategic focus on critical safety elements, by setting objectives and targets that require Marigold supervisors to regularly engage employees in discussions regarding safe work practices, procedures, risk identification, and risk mitigation. Supervisors must document their FACETIME participation in the FACETIME tracker, and Department Managers monitor the tracker to ensure that supervisors

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are participating as required. Finally, Marigold conducts Field Level Risk Assessments at the beginning of special projects and non-routine tasks (and randomly) to evaluate and adequately control hazards.

The Safety Department manages and maintains training records for all employees. Each employee file contains a history of training completed over the duration of employment. The training records include the name of the trainer, date of training and topics covered. In many cases, the record of training history includes a column documenting the "Proficiency" of the trainee and certain cyanide-related SOPs include written exams that employees must pass before performing the tasks.

### Standard of Practice 8.3

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 8.3.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

The Marigold Safety Department provides training to all Marigold Process employees on emergency response, first aid and medical treatment and administering the antidote. Additionally, all employees receive a foldable pocket card summarizing symptoms and first aid/antidote procedure to keep on person while on site. The Marigold Environmental Department also provides New Hire Training, which includes a basic overview of air, land, vegetation, water, wildlife (controls), spills (awareness, tracking, prevention), the "EHS 360" program and Corporate Social Responsibility. Each department receives department-specific environmental training, regarding SDS, spills and material management, which is more detailed than the new hire training.

Personnel involved with the cyanide offloads are trained on the task-specific SOP and all Process personnel are trained on procedures specific to responding to cyanide spills. In accordance with Marigold's standard procedure for responding to cyanide incidents, workers witnessing an incident use the Mayday Procedure to contact First Responders. At the time of this recertification audit, Marigold had approximately 18 First Responders and 11 medical response personnel, all of which are trained to respond to cyanide exposures. Marigold maintains four or five First Responders on site at any one time.

Marigold First Responders must pass a written exam to become qualified and the Marigold Emergency Management Program requires all responders to be certified in accordance with state and federal requirements. First Responders are properly trained: to provide basic first aid for personnel exposed to cyanide; to administer amyl nitrite; on the location of the cyanide antidote kits; to be aware of the hazards associated with sodium cyanide and HCN gas; and on victim and rescuer decontamination procedures. First Responders receive refresher training and participate in emergency response drills whereby the use of emergency equipment is tested.

The Marigold Emergency Management Program requires that one emergency response drill be conducted annually. These documented drills involve First Responders and local emergency agencies are encouraged to participate. Marigold evaluates its emergency drills from a training perspective to determine if personnel have the knowledge and skills required for effective response.

In May 2015, Marigold hosted an *ICMC Awareness Training & Mini-Gap Assessment* workshop conducted by a Chemours representative, and in July 2015, Marigold partnered with Battle Mountain General Hospital and Chemours to provide cyanide basic awareness training and antidote training to the hospital and Lander County EMS. Please refer to ICMC Standard of Practice 7.2 above for additional detail regarding these training events.

The auditor interviewed field personnel responsible for performing cyanide-related tasks as verification regarding cyanide training received and understanding of responsibilities associated with spill response. Marigold provided documentation demonstrating that it retains records of the emergency response training discussed above. The training records for each employee include the name of the trainer, date of training and topics covered. In many cases, the record of training history includes a column documenting the "Proficiency" of the trainee and certain cyanide-related SOPs include written exams that employees must pass before performing the tasks.

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## 9.0 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	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 9.1.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

Marigold provides several means for stakeholders to communicate issues of concern regarding cyanide use and management at the mine, including LEPC meetings, external events such as educational presentations, site tours, information posted on its corporate website, and public comment related to the regulatory process for new permits and permit revisions.

### Standard of Practice 9.2

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 9.2.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

**Discussion of the basis for this Finding and any Identified Deficiencies:**

The Silver Standard annual reports provide environmental and sustainability information regarding its operations, which are available to the public in both hard copy and electronic format. The 2014 report describes Marigold's involvement in the ICMC and its proactive implementation of the Code's principles, including forming strong relationships with communities to support the local emergency response and medical facilities and to provide sustainable improvements in education and awareness regarding the safe use of cyanide. Marigold indicated that Silver Standard plans to introduce a more detailed sustainability report in 2015.

Additionally, Marigold will publish its next site-level sustainability report in early 2016, covering the period 2013 through 2015. The previous site-level sustainability report, covering the period 2011 through 2012, discusses Marigold's involvement in the ICMC and its participation in the LEPC. The report provides a summary of cyanide-specific training and emergency response drills hosted over the period.

In May 2015, Marigold hosted an *ICMC Awareness Training & Mini-Gap Assessment* workshop conducted by a Chemours representative, and in July 2015, Marigold partnered with Battle Mountain General Hospital and Chemours to provide cyanide basic awareness training and antidote training to the hospital and Lander County EMS. Please refer to ICMC Standard of Practice 7.2 above for additional detail regarding these training events.

### Standard of Practice 9.3

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

The operation is in	<input checked="" type="checkbox"/> Full Compliance	with Standard of Practice 9.3.
	<input type="checkbox"/> Substantial Compliance	
	<input type="checkbox"/> Non-Compliance	

***Discussion of the basis for this Finding and any Identified Deficiencies:***

The WPCP Renewal Application and the WPCP Permit Fact Sheet provide descriptions of the “*process fluid management*” facilities, which include the cyanide facilities. The WPCP is renewed regularly and each renewal provides a formal opportunity for public comment. The current permit, effective as of December 8, 2014, is valid until November 3, 2019. No public comments were received during the public comment period held for the most recent permit renewal.

Please refer to ICMC Standard of Practice 9.2 above regarding the Silver Standard annual reports and sustainability reports. Furthermore, as a signatory company to the ICMC, Marigold was initially certified under the Code on January 2, 2007 and subsequently on January 12, 2010 and March 20, 2013. The summary reports for these audits are made available to the public via the ICMC website. The Silver Standard corporate website advertises that Marigold is signatory to the Code and that in 2006, Marigold became the first operating mine in the world certified as fully compliant with the Code.

Marigold must complete MSHA reports that include any cyanide-related worker exposures, which require treatment or result in death and the WPCP requires oral reporting to the NDEP of human and animal mortality or injury, followed by a written incident report. Marigold indicated that no such incidents have occurred at the Marigold Mine over the three-year period between the 2012 ICMC recertification audit and this 2015 recertification audit. The WPCP provides reporting requirements for spills and releases and the WPCP Renewal Application describes notification requirements (see ICMC Standard of Practice 7.4 above). These reports become public record.

Additionally, Marigold conducts quarterly and annual reporting as set forth in the WPCP, which includes a summary of cyanide spills and releases. Spills occurring within the spill release boundary and below the reportable quantities are contained, characterized, mitigated, and recorded. Quarterly reports include results of monitoring and inspections as well as a summary of minor reportable spills that occurred within the quarter. Spills exceeding the reportable quantity are reported within specified regulatory timeframes to the appropriate agencies. The

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reports include period and location of release, agencies notified by phone (when applicable), material release and concentration, quantity release, incident description, and remedial action and cleanup activities. The NDEP reports are available to the public.

Marigold indicated that no cyanide releases off the mine site requiring response or remediation have occurred at the Marigold Mine over the three-year period between the 2012 ICMC recertification audit and this 2015 recertification audit. Additionally, Marigold has not experienced any cyanide releases over the audit cycle, on or off the mine site, resulting in significant adverse effects to health or the environment.

On January 5, 2013, approximately 443 gallons of barren solution were released when the vacuum breaker on a filter broke due to freezing and sprayed solution outside of containment at the leach pad on the south side of Cell 15. An estimated quantity of 0.57 pounds of sodium cyanide was released, which is below the reportable quantity limit for cyanide under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"). Marigold informed NDEP of the incident via telephone and formally reported the spill to NDEP under the requirements of its WPCP. Marigold pumped the freestanding solution back into containment and excavated the contaminated soil for placement within containment on the heap leach pad. On January 14, 2013, Marigold collected samples from the excavated spill area for testing to confirm that WAD cyanide levels were below 0.5 mg/L.

On May 23, 2013, approximately 58,000 gallons of barren solution was released outside of containment at the leach pad on the south side of Cell 17 when a header pipe failed at a welded connection. An estimated quantity of 48 pounds of sodium cyanide was released, which is above the reportable limit for cyanide under CERCLA. Marigold reported the incident to the National Response Center and state and federal agencies under the requirements of its WPCP, including NDEP-Bureau of Mining Regulation & Reclamation, NDEP-Bureau of Corrective Action and BLM. Marigold pumped the freestanding solution back into containment and excavated the contaminated soil for placement within containment on the heap leach pad. Marigold collected samples from the excavated spill area for testing, and on June 10, 2013, NDEP provided a letter documenting that the analytical data demonstrated that no further remedial action was required.

Both releases described above involved solution that flowed outside of containment; however, the releases were contained in relatively small geographic areas within the mine site, and no adverse environmental or human health effects resulted.

Contact information for the agencies and other sources referenced above, where the public can access information regarding cyanide releases or exposure incidents that may occur at Marigold, is provided below for easy reference:

NDEP

901 S. Stewart Street, Suite 4001  
Carson City, Nevada 89701-5249  
Phone: 775.687.4670  
Website: [www.ndep.nv.gov](http://www.ndep.nv.gov)



Nevada Division of Emergency Management

2478 Fairview Drive

Carson City, Nevada 89701

Phone: 775.687.0300 (non-emergency calls)

Website: [www.dem.nv.gov](http://www.dem.nv.gov)

National Response Center

2100 2<sup>nd</sup> Street, SW

Washington, DC 20593-0001

Phone: 202.267.2675 or toll free 800.424.8802

Website: [www.nrc.uscg.mil](http://www.nrc.uscg.mil)

LEPC

315 S. Humboldt Street

P.O. Box 187

Battle Mountain, Nevada 89820

Phone: 775.463.6592

Website: <http://serc.nv.gov/lepcs.htm#Lander>

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## 10.0 REFERENCES

- Golder Associates Inc. (Golder), 2006. "International Cyanide Management Code, Gold Mining Operation Verification Audit, Marigold Mine, Nevada." December 20
- Golder Associates Inc. (Golder), 2009. "International Cyanide Management Code, Gold Mining Operation Verification Audit, Marigold Mine, Nevada." October 13
- Visus Consulting Group, Inc. (Visus), 2013. "Detailed Audit Findings Report, International Cyanide Management Code, Gold Mining Operation Verification Audit, Marigold Mine, Nevada." March 15

## WEBSITE REFERENCES

- International Cyanide Management Code (ICMC). 2014. [www.cyanidecode.org](http://www.cyanidecode.org)

